United States Department of the Interior

BUREAU OF OCEAN ENERGY MANAGEMENT
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123 2394

In Reply Refer To: GM 235D

December 19, 2022

Alabama Department of Environmental Management
Coastal Programs Section
Attn: Mr. Allen Phelps
3664 Dauphin St., Suite B
Mobile, Alabama 36608-1211

Dear Sir or Madam,

In accordance with 30 CFR 550.267(a)(3), enclosed for your review and coastal zone consistency determination is the following plan and its accompanying documents:

Control #	-	S-8103
Type	-	Supplemental Development Operations Coordination Document
Lease(s)	-	OCS-G 09821 Block - 520 Mississippi Canyon Area
Operator	-	BP Exploration & Production Inc.
Description	-	Subsea Well 006

Please refer to the above control number in all communication and correspondence concerning the subject plan.

Your review and comments are requested by February 2, 2023.

If you have any questions or comments please contact Nicole Martinez at nicole.martinez@boem.gov or (504)736-2971.

Sincerely,

NICOLE MARTINEZ

Digitally signed by NICOLE MARTINEZ
DN: c=US, o=U.S. Government, ou=Department of the Interior, ou=Bureau of Ocean Energy Management, cn=NICOLE MARTINEZ, 0.9.2342.19200300.100.1.1=14001003087505
Date: 2022.12.13 14:30:52 -06'00'

Nicole Martinez
Plan Coordinator
Office of Leasing and Plans,
Plans Section

Enclosure

December 19, 2022

UNITED STATES GOVERNMENT
MEMORANDUM

To: Public Information

From: Plan Coordinator, OLP, Plans Section (GM 235D)

Subject: Public Information copy of plan

Control #	-	Control S-8103
Type	-	Supplemental Development Operations Coordination Document
Lease(s)	-	OCS-G 09821 Block - 520 Mississippi Canyon Area
Operator	-	BP Exploration & Production Inc.
Description	-	Subsea Well 006
Rig Type	-	Not Found

Attached is a copy of the subject plan.

It has been deemed submitted and is under review for approval.

Nicole Martinez
Plan Coordinator

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Security Classification: Na Kika Herschel Phase 2 (H-8) Project
Internal

P&O Projects

Na Kika Herschel Phase 2 Project
(Mississippi Canyon Block 520 Well 006 (H-8))

Supplemental Development Operations Coordination Document (SDOCD)

Public Information Copy

Kathi Gamiotea
BP Exploration and Production Inc.
501 Westlake Park Blvd.
Houston, TX 77079
346-640-6725
Kathi.Gamiotea@bp.com

A01	Issued for Review	Kathi Gamiotea				Betsy Cleland	
Rev	Reason for Issue	Author	Date	Checker	Date	Approver/Issuing Authority	Date

Refresh Cycle Code (Years):	

Unique Identifier:	Not Applicable	**GPO Document Number:** GM039-PE-PRM-000-00004	BP Doc Rev
RD Type:	Not Applicable		**A01**
Refresh Cycle Code (Years):			

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Revision History*

Revision Date	Revision Number	Approver	Revision

* Only required for B02 versions and beyond.

Operating Management System (OMS)

OMS Sub-element	OMS Sub-element Title	Relevant Section(s) of this Document

MPcp/CBcp References

MPcp/CBcp/ Both	Stage	MPcp/CBcp/Both Functional Element	Relevant Section(s) of this Document

Any document which is needed to comply with the Major Projects Common Process (MPcp) or the Category B Common Process (CBcp) is noted in the MPcp / CBcp references table above.

Reviewers

Name	Role	Signature	Date Reviewed
Kathi Gamiotea	Regulations Compliance Advisor		
Matt Hurliman	Reservoir Engineer		
David Duke	Environmental Advisor		
Randesha Dawkins	Subsea Engineering Lead		
Matthew Green	Na Kika Project Manager		
Farley Burge	Senior Counsel		
Betsy Cleland	Interim Manager, Regulatory, Compliance		

* Legal review is required for all documents that are GPO OMS elements 1-4.

** SORC review required for all procedures, templates and specifications as applicable to projects.

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Plan Contents

1.1 Description of Activities

BP Exploration & Production Inc. (BP) has drilled the OCS-G 09821 Lease, Mississippi Canyon Block 520 Well 005 (H-5) under the Supplemental Exploration Plan (S-7916) filed with the BOEM on October 15, 2018 and approved on January 22, 2019. The drilling of MC520 006 (H-8) was included under Supplemental Exploration Plan (R-6955) filed with the BOEM on February 19, 2020 and approved on November 20, 2020. The Diamond Black Hornet will perform the completion operations on the MC520 006 (H-8) well.

This Supplemental Development Operations Coordination Document (SDOCD) provides for the following operations:

- The Herschel Phase 2 project consists of the subsea tie-back of the MC520 006 (H-8) well to the existing Manuel Extension project's HD PLET (PSN 20348), utilizing the existing Herschel Deep Manifold at the Herschel Drill Center. This well will be drilled near Herschel H-5 (MC520-005), approximately 10,000 ft. from the Manuel Drill Center with an expected radius of 80-100ft from the existing HD Manifold. The well will be tied back to the existing HD Manifold via rigid well jumpers. Chemicals, hydraulics, power and communication will be supplied by an existing in-field static umbilical. A new Subsea Distribution Unit (SDU) is required to support the new well.
- Commence production from the Mississippi Canyon Block 520 Well 006 (H-8).

BP will not be utilizing pile-driving in this plan.

Included in **Appendix A** are Forms BOEM 137 "OCS Plan Information Form" which provide for the installation of the proposed subsea facilities and commencement of production from the associated wells.

1.2 History of Leases

The Initial Development Operations Coordination Document (DOCD) for the Mississippi Canyon (MC) Area Block 520 Unit (Herschel Field) was submitted to the Minerals Management Service (MMS) in July 2001 by Shell Offshore Inc (SOI). The original plan called for a single subsea well tied back to a semi-submersible shaped "host" facility in Mississippi Canyon 474, approximately 17 miles to the northwest.

MC 520 is part of Unit Contract No. 754397006 consisting of G-09821, G-08823, and G-08831. The lease has a 1/8 royalty and is held by production. Record title is held 50% BP and 50% Shell Offshore Inc.

An Environmental Assessment was completed and approved on November 20, 2020, as part of EP Control No. R-6955.

The current lease operator and ownership are as follows:

Area / Block Lease No.	Operator	Ownership
Mississippi Canyon 520	BP Exploration & Production Inc.	BP Exploration & Production Inc. – 50.00% Shell Offshore Inc. – 50.00%

1.3 Location Information

The Mississippi Canyon Block 520 Well 006 (H-8) is located in MC Block 520 (Lease OCS-G 09821) in a water depth of approximately 6,693 ft.

Vicinity, Location and Bathymetry Plats are included in **Appendix B**.

Since BP proposes to use dynamically positioned construction vessels there will be no anchors associated with this activity.

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1.4 Safety and Pollution Prevention Features

No additional drilling operations will be conducted under this supplemental DOCD.

Appropriate fire drills and abandon ship drills will be conducted, and navigational aids, lifesaving equipment, and all other shipboard safety equipment will be installed and maintained as mandated by the U.S. Coast Guard regulations contained in 33 CFR Part 144.

1.5 Storage Tanks and Production Vessels

Information regarding the storage tanks that will be used to conduct the operations proposed in this plan that will store oil, as defined in 30 CFR § 254.6, is provided in the table below. Only those tanks with a capacity of 25 barrels or more are included.

Storage Tanks Construction Vessel

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel Oil	DP Flexible Lay Vessel	13,107	1	13,107	35
Fuel Oil	DP Construction/Flex-Lay Vessel	15,599	1	15,599	35

1.6 Pollution Prevention Measures

These operations do not propose activities for which the State of Florida is an affected state.

1.7 Additional Measures

Not conducting proposed activities that require reporting additional measures as per NTL 2008-G04.

2 General Information

2.1 Applications and Permits

The table below provides information on the filing or approval status of the individual and/or site-specific Federal, State and local application approvals or permits that must be obtained to conduct the proposed activities.

Application/Permit	Issuing Agency	Status
Supplemental Deepwater Operations Plan (SDWOP)	BSEE	In BSEE Review
Revised Conservation Information Document (CID)	BOEM	Pending Submission
Lease Term Pipeline Application	BSEE	In BSEE Review
Surface Commingling and Production Measurement (SCPM) Revision	BSEE	Pending Submission

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Applications for Permit to Drill (APD)	BSEE	In BSEE Review
Applications for Permit to Modify (APM) for Completions	BSEE	Pending Submission
NPDES Permit GMG290110	EPA	Existing

2.2 Drilling Fluids

There are no drilling operations proposed in this supplemental DOCD.

2.3 Anticipated Production

Anticipated Production Table (MC520 006)(H-8)

Type	Average Production Rate	Peak Production Rate	Life of Reservoir
Oil	Proprietary	Proprietary	Proprietary
Gas	Proprietary	Proprietary	Proprietary

2.4 Fluid Production Data

Fluid Properties

The fluid properties for M51 reservoirs are presented.

PVT Data

Parameter	M51 – Base (Oil)	M51 – Top (Oil)
Well	Manuel 2/ H-8	Manuel 2/ H-8
API Gravity	31.9	33.2
GOR (scf/STB)	452	474
Saturation Pressure @ Tres (psia)	1,465	1,569
Saturation Pressure @ 150°F (psia)	1,307	1,360
Saturation Pressure @ 100°F (psia)	1,170	1,197
FVF at reservoir conditions	1.240	1.274
Oil Viscosity at res. Conditions (cP)	1.620	1.59
Oil viscosity at T1 = 150°F (cP)	2.77	2.32
Oil viscosity at T2 = 100°F (cP)	4.83	3.97
CO2 fraction in gas phase at standard conditions2	0.81	0.80
CO2 fraction in total composition2	0.36	0.35

Parameter	M51 – Base (Oil)	M51 – Top (Oil)
H2S fraction in gas phase at standard conditions3	0	0
AOP (psia)	No AOP	No AOP @ Tr 3,000 psia @ 150°F
Asphaltene content (% wt.)-nC7 at Reservoir Temperature	3.6	3.7
WAT1 (°F)	80.6	82.6
Wax Content (% wt.)	1.62	1.65
Pour Point (°F)	< -10	< -10

Fluid Composition

The fluid composition for M51 is presented.

Fluid Composition

Component	M51 - Base (mol %)	M51 – Top (mol %)
CO2	0.36	0.35
H2S	0.00	0.00
N2	0.46	0.43
C1	22.95	23.25
C2	7.38	7.59
C3	7.41	7.62
i-C4	1.51	1.60
n-C4	4.30	4.41
i-C5	1.81	1.88
n-C5	2.46	2.51
C6	3.55	3.62
Mcyclo-C5	0.79	0.79
Benzene	0.20	0.20
Cyclo-C6	0.59	0.59
C7	3.22	3.29
Mcyclo-C6	1.16	1.17
Toluene	0.48	0.48
C8	3.44	3.49
C2-Benzene	0.21	0.21
m&p-Xylene	0.63	0.65
o-Xylene	0.22	0.22
C9	2.84	2.86
C10	3.68	3.69
C11	2.85	2.85
C12	2.40	2.40
C13	2.31	2.31
C14	1.92	1.92
C15	1.99	1.92
C16	1.91	1.69
C17	1.46	1.42
C18	1.48	1.37
C19	1.22	1.19
C20	1.03	1.04
C21	0.93	0.90
C22	0.82	0.82

Component	M51 - Base (mol %)	M51 – Top (mol %)
C23	0.76	0.75
C24	0.66	0.66
C25	0.64	0.61
C26	0.55	0.56
C27	0.54	0.55
C28	0.51	0.49
C29	0.48	0.46
C30+	5.89	5.19
C30+ Mole Wt.	590.35	579.99
C30+ Density	1.01	1.01

Water Chemistry

No formation water samples are available from H-8. H-8 water chemistry will be analogous to the Santa Cruz M55 reservoir based on methane isotope analyses.

H-8 water chemistry data

Santa Cruz M55 Exploration		Isabela (M55)		Santiago / Santa Cruz (M55 & M56)	
Cations (mg/L)					
Aluminium (Al)	-	Aluminium (Al)	<0.30	Aluminium (Al)	<0.3
Antimony (Sb)	-	Antimony (Sb)	<0.20	Antimony (Sb)	<0.2
Barium (Ba)	66.9	Barium (Ba)	71.9	Barium (Ba)	96.5
Boron (B)	36.2	Boron (B)	76.6	Boron (B)	72
Calcium (Ca)	3711	Calcium (Ca)	4700	Calcium (Ca)	5030
Chromium (Cr)	-	Chromium (Cr)	<0.05	Chromium (Cr)	<0.05
Cobalt (Co)	-	Cobalt (Co)	<0.05	Cobalt (Co)	<0.05
Copper (Cu)	-	Copper (Cu)	<0.05	Copper (Cu)	<0.05
Iron (Fe)	0.047	Iron (Fe)	33.8	Iron (Fe)	9.24
Lead (Pb)	-	Lead (Pb)	<0.20	Lead (Pb)	<0.20
Lithium (Li)	-	Lithium (Li)	7.88	Lithium (Li)	7.2
Magnesium (Mg)	399	Magnesium (Mg)	590	Magnesium (Mg)	601
Manganese (Mn)	3.04	Manganese (Mn)	3.78	Manganese (Mn)	4.4
Molybdenum (Mo)	-	Molybdenum (Mo)	<0.10	Molybdenum (Mo)	<0.25
Nickel (Ni)	-	Nickel (Ni)	<0.10	Nickel (Ni)	<0.10
Potassium (K)	194	Potassium (K)	391	Potassium (K)	365
Silicone (Si)		Silicone (Si)	21.7	Silicone (Si)	15.5
Sodium (Na)	40041	Sodium (Na)	45900	Sodium (Na)	49300
Strontium (Sr)	456	Strontium (Sr)	748	Strontium (Sr)	788
Titanium (Ti)	-	Titanium (Ti)	<0.10	Titanium (Ti)	<0.25
Vanadium (V)	-	Vanadium (V)	<0.05	Vanadium (V)	<0.05
Zinc (Zn)	-	Zinc (Zn)	<0.10	Zinc (Zn)	<0.10
Anions (mg/L)					
Chloride (Cl)	62184	Chloride (Cl)	79500	Chloride (Cl)	86900
Carbonate (CO3)	1.18	Carbonate (CO3)	-	Carbonate (CO3)	-

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Santa Cruz M55 Exploration		Isabela (M55)		Santiago / Santa Cruz (M55 & M56)	
*Bicarbonate (HCO3)	1044	*Bicarbonate (HCO3)	-	*Bicarbonate (HCO3)	-
Sulfate (SO4)	50.2	Sulfate (SO4)	59	Sulfate (SO4)	50
Organic Acids (mg/L)					
Acetic Acid	546	Acetic Acid	400	Acetic Acid	500
Formic Acid	17.3	Formic Acid	-	Formic Acid	-
Butyric Acid	12.8	Butyric Acid	-	Butyric Acid	-
Propionic Acid	51.7	Propionic Acid	30	Propionic Acid	40
Isobutyric Acid	-	Isobutyric Acid	-	Isobutyric Acid	<20
Butanoic Acid	-	Butanoic Acid	ND	Butanoic Acid	<20
Isovaleric Acid	-	Isovaleric Acid	<20	Isovaleric Acid	<20
Pentanoic Acid	-	Pentanoic Acid	<20	Pentanoic Acid	<20
Isocaproic Acid	-	Isocaproic Acid	<20	Isocaproic Acid	<20
Hexanoic Acid	-	Hexanoic Acid	<20	Hexanoic Acid	<20
Heptanoic Acid	-	Heptanoic Acid	<20	Heptanoic Acid	<20
Additional tests					
pH	-	pH	6.6	pH	6.8
Specific Gravity	-	Specific Gravity	1.0921	Specific Gravity	1.099
Bromide (Br), ppm	190	Bromide (Br), ppm	240	Bromide (Br), ppm	250
Total Inorganic Carbon, ppm	-	Total Inorganic Carbon, ppm	200	Total Inorganic Carbon, ppm	82
Total Dissolved Solids (TDS), mg/L	-	Total Dissolved Solids (TDS), mg/L	133,000	Total Dissolved Solids (TDS), mg/L	144,000

Exploration water chemistry data for Santa Cruz M55 reservoir, as well as most recent operational water chemistry from Isabela-1 separator (M55 zone) and Santa Cruz separator (M55 and M56 zones) are provided in the Table below. For Hershel Deep wells, it is recommended to study a range of water chemistries to identify a worst-case risk scenario for scale and corrosion management strategies

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Formation Water Chemistry for LLOG MC 387-1 (M51)

Analysis	Result
Specific Gravity	1.102
Dissolved H2S	NR
Dissolved CO2	264
Ions (mg/L)	
Aluminium (Al)	NR
Barium (Ba)	86.8
Bicarbonate (HCO3)	439.2
Boron (B)	NR
Calcium (Ca)	2,975
Carbonate (CO3)	NR
Chloride (Cl)	91,500
Chromium (Cr)	NR
Copper (Cu)	NR
Iron (Fe)	1.37
Lead (Pb)	NR
Lithium (Li)	9.50
Magnesium (Mg)	359.17
Manganese (Mn)	1.27
Nickel (Ni)	NR
Phosphate (PO4)	5.46
Potassium (K)	403.12
Sodium (Na)	33,977
Strontium (Sr)	692.05
Sulfate (SO4)	38.60
Sulphur (S)	NR
Vanadium (V)	NR
Zinc (Zn)	0.20
Total Dissolved Solids (TDS), mg/L	130,000

2.5 New or Unusual Technology

No new or unusual technology is proposed in this supplemental DOCD as defined by 30 CFR 550.200.

2.6 Bonding Information

The bonding requirements for the activities proposed in this supplemental DOCD are satisfied by an area-wide bond, furnished and maintained according to 30 CFR 556, Subpart I; NTL No. 2000-G16, "Guidelines for General Lease Surety Bonds"; and additional security under 30 CFR 556.53(d) and NTL 2008-N07, "Supplemental Bond Procedures".

2.7 Oil Spill Financial Responsibility (OSFR)

BP (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this supplemental DOCD according to 30 CFR Part 556, Subpart I, and NTL No. 2015-N04, and to the extent required under 30 CFR 556.901 and NTL No. 2016-N01.

2.8 Deepwater Well Control

BP (Operator No. 02481) has the financial capability to drill a relief well and conduct other emergency well control operations. According to NTL 2008-G04, this Section of the Plan is not applicable to the proposed operations.

2.9 Suspensions of Production

There are no approved suspensions of production in existence, or that BP currently intends to seek, to hold the leases or unit involved with the proposed DOCD activities.

2.10 Blowout Scenario

In the event of a worst-case discharge scenario from a production standpoint, BP anticipates the following at the Manuel PLEM:

(1) The pipeline system detection time for shutdown response time assuming automatic shutdown - 0.045833 hr

(2) Maximum Oil Flowrate in the flowline - 57,000 stbd (combined H-5 and Manuel wells)

(3) The highest measured oil flow rate over the preceding 12 month period (for new pipelines use predicted oil flow rate) - 109 bbls

(4) The total volume of oil that would leak from the pipeline after it is shut in (considering effects of hydrostatic pressure, gravity, frictional wall forces, length of pipeline segment, tie-ins with other pipelines, etc.) – 43 bbls

Worst-case discharge would be ~ 151 bbls of oil on this basis.

Spill response-related activities for the proposed activities under BP's DOCD are governed by the BP Regional Oil Spill Response Plan (OSRP) filed by BP America Inc. (Operator No. 21372) under cover letter dated October 8, 2021 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on October 22, 2021.

3 Geological and Geophysical Information

3.1 Geological Description

The geological description was submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

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3.2 Structure Contour Maps

Structure Contour Maps were submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

3.3 Interpreted 2-D and / or 3D Seismic Lines

Interpreted Seismic lines were submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

3.4 Geological Structure Cross-Section Maps

Geological structure cross sections were submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

3.5 Shallow Hazards Report

In 2018, an Autonomous Unmanned Vehicle (AUV) pipeline survey was conducted in Blocks 429, 430, 431, 474, 475, 476, 519, and 520, Mississippi Canyon and a Shallow Hazards and Archaeological Assessments was prepared by Fugro USA Marine, Inc. (Fugro), entitled , “AUV Shallow Geohazards and Archaeological Assessments, Block 520, Mississippi Canyon Area, Gulf of Mexico”, Project No. 02.1803-1355_Manuel_M51_Herschel, issued to BP America, Inc., June , 2018

3.6 Shallow Hazards Assessment

The Fugro Shallow Hazards and Archaeological assessment evaluated the seafloor and near-seafloor geologic condition, and identified potential hazards, constraints, and cultural resources within 2,000-feet of the well locations. The report concluded that there are no archaeologically significant artifacts identified in the vicinity of the proposed well locations.

A Site Clearance Letter was prepared for the well location by BP (BP 2019), based on the AUV data, 3D seismic data and existing contractor reports. The Site Clearance Letter determined that the well locations appear generally favorable for drilling operations and assessed a Negligible potential for shallow water flow or shallow gas.

3.7 High Resolution Seismic Lines

High resolution seismic lines were submitted with the shallow hazards report referenced above and submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

4 Hydrogen Sulfide (H_2S) Information

4.1 Concentration

BP does not anticipate encountering H_2S while conducting the proposed operations under this plan.

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4.2 Classification

In accordance with Title 30 CFR 250.490(c) the Bureau of Ocean Energy Management (BOEM) has classified the area in which the proposed operations are to be conducted in Mississippi Canyon Block 520 to be "H_2S absent" by approval letter dated November 20, 2020, for the Exploration Plan (Control No. R-6955).

4.3 H2S Contingency Plan

According to NTL 2008-G04, this Section of the Plan is not applicable to the proposed operations due to "H2S absent" classification by approval letter dated November 20, 2020, for the Exploration Plan (Control No. R-6955).

4.4 Modeling Report

According to NTL 2008-G04, this Section of the Plan is not applicable to the proposed operations due to "H2S absent" classification by approval letter dated November 20, 2020, for the Exploration Plan (Control No. R-6955).

5 Mineral Resource Conservation Information

5.1 Technology and Reservoir Engineering Practices and Procedures

The MC520 006 well is a single zone frac pack completion and to be completed in the M51 sand.

5.2 Technology and Recovery Practices and Procedures

The main recovery mechanism of the M51 is expected to be aquifer drive.

5.3 Reservoir Development

The STOOIP estimated for the Herschel M51 reservoirs is around 98 mmstb. Gross recoverable is estimated to be around 36 mmstb total, which is calculated to around 37% RF.

6 Biological, Physical, and Socioeconomic Information

6.1 Benthic Communities Report

BOEM requires site-specific surveys and reviews for proposed bottom-disturbing actions in water depths greater than 300-m in order to judge the potential of the region for supporting high-density deepwater benthic communities. NTL No. 2009–G40, formalized the process. bp has conformed to this requirement and has located wells to avoid potential sites for deepwater high-density benthic communities during the deepwater development project described by this plan.

MC 520 is located in water depths greater than 300-m; therefore, there is the potential for high-density deepwater benthic communities to be present. Shallow hazards assessments conducted for the project confirm that high-density deepwater benthic communities are not found within the vicinity of the proposed wellbores and were submitted with the Exploration Plan Control No. R-6955 approved by BOEM on November 20, 2020.

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High-resolution geophysical surveys have been conducted in the project area as part of the archaeological resources and shallow hazards assessments. Based on these, no features or areas that could support significant, high-density benthic communities were found within a 2,000 ft (610 m) buffer around the proposed pipeline corridor (Fugro, 2019).

Monitoring programs on the Gulf of Mexico continental slope have shown that benthic impacts from drilling discharges typically are concentrated within approximately 500 m (1,640 ft) of the wellsite, although detectable deposits may extend beyond this distance (Continental Shelf Associates, 2004; Neff et al., 2005; Continental Shelf Associates, 2006). In water depths such as those encountered in the project area, DP drilling vessels disturb the seafloor only around the wellbore where the bottom template and BOP are located. Depending on the specific well configuration, this area is approximately 0.25 ha (0.62 ac) per well (BOEM, 2012a).

The site clearance letter did not identify any features that could support high-density deepwater benthic communities within 610 m (2,000 ft) of the proposed wellsite (bp, 2019a,b).

6.2 Biologically Sensitive Underwater Features and Areas

The proposed activities will be conducted in water depths of approximately 6,698-ft. Therefore, requirements of NTL 2009-G39 for biologically sensitive underwater features and areas such as Topographic Features, Live Bottom (low-relief), Live Bottom (Pinnacle Trend) features, and other potentially sensitive biological features when conducting OCS operations in water depths less than 300-m (984-ft) in the Gulf of Mexico do not apply to this plan.

All proposed bottom-disturbing activities in this DOCD will occur outside of the nearest Topographic Features, "No Activity Zones", Live Bottom (low Relief), and Live Bottom (Pinnacle Trend) Stipulation Blocks described in NTL 2009-G39 and shown on BOEM December 2012 Map: "Biologically Sensitive Areas (< 300-m)".

6.3 Remotely Operated Vehicle (ROV) Monitoring Survey Plan

No longer applicable. NTL 2008-G06 "Remotely Operated Vehicle Surveys in Deepwater" has expired.

6.4 Threatened or Endangered Species, Critical Habitat and Marine Mammal Information

All marine mammals are protected under the Marine Mammal Protection Act (MMPA) and some are also protected under the Endangered Species Act (ESA).

The Sperm Whale (Endangered), Rice's Whale Giant manta ray (Threatened), Oceanic whitetip shark (Threatened) and five species of sea turtles (Green turtle is Threatened, Leatherback, Hawksbill, and Kemp's ridley turtles are Endangered) are the endangered or threatened species likely to occur in or near the lease area.

The West Indian Manatee (Threatened) is thought to be remotely located away from the project area. Most of the Gulf of Mexico manatee population is in peninsular Florida, but manatees have been seen as far west as Texas during the summer (USFWS, 2001). Critical habitat has been designated in southwest Florida.

The Rice's whale (*Balaenoptera ricei*) (Endangered) exists in the Gulf of Mexico as a small, resident population. This species was formally known as a subspecies to the Bryde's whale (*Balaenoptera edeni brydei*) until recent DNA studies identified it as a separate species (Rosel et al., 2021). It is the only baleen whale known to be resident to the Gulf. The species is severely restricted in range, being found

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only in the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016, Rosel et al., 2021). The distribution of sperm whales (*Physeter macrocephalus*), in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current and may be present throughout the year (Jochens et al., 2008; Davis et al., 2000a). Results of a multi-year tracking study show female sperm whales are typically concentrated along the upper continental slope between the 200- and 1,000-m (656 and 3,280 ft) depth contours (Jochens et al., 2008).

According to the project specific EIA, excluding the endangered/threatened species mentioned above, there are an additional 20 species of marine mammals that may be found in the Gulf of Mexico. This includes dwarf and pygmy sperm whales, 4 species of beaked whales, and 14 species of delphinid whales (dolphins). The most common non-endangered cetaceans in the deepwater environment are small odontocetes such as the pantropical spotted dolphin, spinner dolphin, and bottlenose dolphin.

The giant manta ray is a highly migratory species that is thought to utilize the Flower Garden Banks serves as nursery habitat for aggregations of juvenile giant manta rays. Mature rays have also been observed in the Flower Garden Banks.

Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude and now the species is only occasionally spotted in the GoM.

Federally listed Endangered and Threatened and protected species potentially occurring in the project area and along the northern Gulf Coast. Adapted from: U.S. Fish and Wildlife Service (2020a) and NOAA Fisheries (2020) are listed below and taken from Table 7 of **Appendix D**.

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Rice's whale	*Balaenoptera ricei*[1]	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[2]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[3]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); *Sargassum* habitat including most of the central & western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Mobula birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	*Epinephelus striatus*	T	--	X	None
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Pillar coral	*Dendrogyra cylindrus*	T	--	X	None
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	None
Lobed star coral	*Orbicella annularis*	T	--	X	None
Mountainous star coral	*Orbicella faveolata*	T	--	X	None
Boulder star coral	*Orbicella franksi*	T	--	X	None
Panama City crayfish	*Procambarus econfinae*	T	--	--	South-central Bay County, Florida
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus* subsp. *ammobates, allophrys, trissyllepsis,* and *peninsularis,* respectively	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

Source: Project Specific EIA (see Appendix D)
E = endangered; P = Proposed; T = threatened; X = potentially present; -- = not present.

[1]In 2021, National Marine Fisheries Service recognized that what had previously been accepted as a subspecies of the Bryde's whale is actually a separate species. The reclassification is formerly recognized under 86 FR 47022 effective date 22 October 2021 as the Rice's whale (*Balaenoptera ricei*).

[2]There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico.

[3]The Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead turtles is designated as Threatened (76 *Federal Register* [*FR*] 58868). The National Marine Fisheries Service and the U.S. Fish and Wildlife Service designated critical habitat for this DPS, including beaches and nearshore reproductive habitat in Mississippi, Alabama, and the Florida Panhandle as well as *Sargassum* spp. habitat throughout most of the central and western Gulf of Mexico (79 *FR* 39756 and 79 *FR* 39856).

Five species of sea turtle are known to inhabit the waters of the Gulf of Mexico:

leatherback sea turtle (*Dermochelys coriacea*)
green sea turtle (*Chelonia mydas*)
hawksbill sea turtle (*Eretmochelys imbricata*)
Kemp's ridley sea turtle (*Lepidochelys kempii*)
loggerhead sea turtle (*Caretta caretta*)

According to the project specific EIA (**Appendix D**), Endangered species include the Loggerhead (*Caretta caretta),* leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle (*Chelonia mydas*) is listed as threatened (81 FR 20057). The DPS of loggerhead turtles (*Caretta caretta*) that occurs in the Gulf of Mexico is listed as threatened, although other DPSs are endangered.

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 120 statute miles (193 km) north of the project area.

Mississippi Canyon Block 520 falls 7 miles outside Sargassum critical habitat designated for the loggerhead sea turtle. Additional information can be found in the Environmental Impact Analysis attached as **Appendix D.**

Five species of fish are the only listed threatened and endangered fish species in the Gulf of Mexico.

Smalltooth Sawfish (*Pristis pectinata*) (Endangered)
Gulf Sturgeon (subspecies *Acipenser oxyrinchus desotoi*) (Threatened)
Giant manta ray (*Manta birostris*) (Threatened)
Nassau grouper (*Epinephelus striatus*) (Threatened)

Oceanic whitetip shark (Carcharhinus longimanus) (Threatened)

According to the EIA of **Appendix D**, the smalltooth sawfish (*Pristis pectinata*) is remote from the project area and highly unlikely to be affected.

The NMFS and United States Fish and Wildlife Service (USFWS) designated critical habitat for the Gulf sturgeon in fourteen geographic areas from Florida to Louisiana, encompassing spawning rivers and adjacent estuarine areas. Therefore, the Gulf Sturgeon is remote from the project area and highly unlikely to be affected.

Nassau groupers are found within the mainly in the shallow tropical and subtropical waters of eastern Florida, the Florida Keys, Bermuda, the Yucatan Peninsula, and the Caribbean, including the U.S. Virgin Island and Puerto Rico (NOAA, nd). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 36 m (Foley et al., 2007). Three additional unconfirmed reports (i.e. lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007). Therefore, they are unlikely to be found in the project area.

The Smalltooth sawfish (Endangered) is a coastal species in Southwest Florida and therefore are unlikely to occur within the project area.

Two coastal species of birds that inhabit the GoM are protected under the ESA:

Piping Plover (*Charadrius melodus*)
Whooping Crane (*Grus americana*)

Critical overwintering habitat for the Piping plover has been designated in GoM, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida. Whooping crane critical habitat has been designated within the GoM region within the Aransas National Wildlife Refuge in Texas.

The EIA states that the Eastern Brown Pelican (*Pelecanus occidentalis*) was delisted from federal endangered status in 2009 (U.S. Fish and Wildlife Service, 2016b). However, this species remains listed as endangered by the state of Mississippi (Mississippi Natural Heritage Program, 2018). The Southern Bald Eagle (Haliaeetus leucocephalus) was delisted from its threatened status in the lower 48 states on 28 June 2007, but still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940.

The Piping Plover (Threatened) and Whooping Crane (Endangered) are both primarily coastal (Coastal Texas, Louisiana, Mississippi, Alabama, and Florida for the Piping Plover; Coastal Texas (Aransas National Wildlife Refuge) for the Whooping Crane) and therefore are unlikely to occur within the project area.

Nassau groupers (Threatened) are found mainly in the shallow tropical and subtropical waters of eastern Florida (rare), the Florida Keys, Bermuda, the Yucatán Peninsula, and the Caribbean, including the U.S. Virgin Island and Puerto Rico (NOAA, nd). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 118 ft (36 m) (Foley et al., 2007). Three additional unconfirmed reports (i.e., lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007). Therefore, they are not likely to occur within the project area.

Four beach mice species occurring in the GoM are listed as endangered under the ESA and occupy restricted habitats in the mature coastal dunes of Florida and Alabama:

Alabama beach mouse (*Peromyscus polionotus ammobates*)
Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*)
St. Andrew beach mouse (*Peromyscus polionotus peninsularis*)

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Perdido Key Beach mouse (*Peromyscus polionotus trissyllepsis*)

The Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*) is remote from the project area and highly unlikely to be affected.

There are currently seven species of corals listed as threatened under the ESA in the Gulf of Mexico, but none of them are known to be found within the project area:

- elkhorn coral (*Acropora palmata*)
- staghorn coral (*Acropora cervicornis*)
- lobed star coral (*Orbicella annularis)*
- mountainous star coral (*Orbicella faveolata)*
- boulder star coral (*Orbicella franksi)*
- Pillar coral (Dendrogyra cylindrus)
- Rough cactus coral (Mycetophyllia ferox)

The Panama City crayfish (Threatened) is coastal in South-central Bay County, Florida, and therefore is unlikely to be found within the project area.

According to the project specific EIA: "There are no other endangered animals or plants in the Gulf of Mexico that are reasonably likely to be adversely affected by either routine or accidental events." Please see Appendix D for further details.

6.5 Archaeological Report

According to NTL 2005-G07 and 2011-Joint-G01, the Mississippi Canyon Area Blocks 429, 430,431, 474, 475, 476, 519, and 520 lie within a high probability zone for the existence of historic cultural resources; therefore, an Archaeological Assessment and report is required for activities proposed in this DOCD.

Findings from the submitted Shallow Hazards and Archaeological Assessment concluded that there were no archaeologically significant artifacts identified in the vicinity of the proposed well location.

7 Waste and Discharge Information

7.1 Projected Generated Wastes

A table providing information on the projected solid and liquid wastes likely to be generated by the proposed activities is included in **Appendix C**.

7.2 Projected Ocean Discharges

A table providing information on the projected ocean discharges likely to be generated during the proposed activities is included in **Appendix C.**

8 Air Emissions Information

8.1 Emissions Screening Questions

Screening Questions for DOCD's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed exploration activities more than 90% of the amounts calculated using the following formulas: $CT = 3400D^{2/3}$ for CO, and $CT = 33.3D$ for the other air pollutants (where D = distance to shore in miles)?		X
Do your emission calculations include any emission reduction measures or modified emission factors?	X	
Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?	X	
Do you expect to encounter H_2S at concentrations greater than 20 parts per million (ppm)?		X
Do you propose to flare or vent natural gas in excess of the criteria set forth under 30 CFR 250.1105(a)(2) and (3)?		X
Do you propose to burn produced hydrocarbon liquids?		X
Are your proposed development and production activities located within 25 miles (40 kilometers) from shore?		X
Are your proposed development and production activities located within 124 miles (200 kilometers) of the Breton Wilderness Area?	X	

8.2 Air Emissions Summary

An emission workbook (BOEM Form 0139) showing Plan total emissions associated with the activities proposed in this supplemental DOCD document is included in Attachment 1 in **Appendix E**. The complex total emissions are the same as Plan R-6910 AQR. That AQR is provided as Attachment 2 in **Appendix E.** The proposed total Plan emissions are summarized in the Table below. The proposed Total plan emissions are less than BOEM's emission exemption thresholds and as a result, no further review or controls are required.

8.3 Emissions Reductions Measures

Emission Source	Emission Reduction Method	Proposed Reductions (Tons/Year)	Monitoring System
Ocean Black Hornet	Actual Fuel Usage Rate	904	Maintain records of actual fuel consumed while operating for the Project.
West Auriga Drillship	Actual Fuel Usage Rate	918	Maintain records of actual fuel consumed while operating for the Project.

8.4 Distance to Shore for Emission Exemption Thresholds (EET)

The distance to shore in statute miles is based on the same coordinate system used in the lease sale documents for the lease.

8.5 Non-Exempt Facilities

The calculated maximum projected emissions of the facility are less than the respective EET calculated at 30 CFR § 550.303(d). The facility is therefore exempt from the requirements in 30 CFR § 550.303(e) through (i).

8.6 Hydrogen Sulfide

The requirements related to hydrogen sulfide (H2S) are not repeated here as they are addressed in section 4 of the Plan.

8.7 Environmental Impact Analysis (EIA)

The requirements related to EIA are not repeated here as they are addressed in **Appendix D** of this Plan.

9 Oil Spill Response Information

9.1 Oil Spill Response Planning

9.1.1 Regional OSRP Information

Spill response-related activities for the proposed activities under BP's DOCD are governed by the BP Regional Oil Spill Response Plan (OSRP) filed by BP America Inc. (Operator No. 21372) under cover letter dated October 8, 2021 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on October 22, 2021. Any spill from the vessel(s) conducting the activities covered by this DOCD would also be addressed by the vessel operator in accordance with the response plan of the vessel(s) from which the spill emanated.

Pursuant to 30 CFR 254.30(b), on (July 12, 2022) BP submitted to BSEE a revision to the Oil Spill Response Plan referenced above. Revision changes are listed in the Record of Revision Form (Figure 2-1) of the revised OSRP.

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9.1.2 Spill Response Site

Primary Response Equipment Location	Preplanned Staging Location(s)
Tampa, FL; Pascagoula, MS; Houma, LA.; Leeville, LA; Morgan City, LA; Lake Charles, LA.; Venice, LA; Galveston, TX;; Ingleside, TX.	Fourchon, LA.

9.1.3 OSRO Information

BP is a member of the Marine Spill Response Corporation (MSRC) and Clean Gulf Associates (CGA) and would utilize said Oil Spill Response Organization (OSRO) personnel and equipment in the event of an oil spill at Mississippi Canyon Area Block 520.

9.1.4 Worst-Case Scenario Determination

Category	Regional OSRP approved 10/22/2021 Production	Supplemental DOCD Production
Type of Activity	Production > 10 miles	Production > 10 miles
Facility Location	MC 822	MC 520
Facility Designation	Thunder Horse Well – MC 822-11	SS Well MC520-005
Distance to Nearest Shoreline	68-miles	68.4-miles
Volume Facility Storage:	0-bbls	0-bbls
Max Tanks /Vessels	42,000-bbls	15,599-bbls
Flowlines	8,000-bbls	43-bbls
Lease Term pipelines	13,000-bbls	109-bbls
Daily Production Volume	55,000-bbls	57,000-bbls*
Volume Uncontrolled Blowout (Day 1)	0-bbls	0-bbls
Total Volume	118,000-bbls	151-bbls
Type of Oil(s) – (Crude Oil, Condensate, Diesel)	Crude	Crude
API Gravity(s)	33.0	29.0

*** Daily Production Volume not accounted for in total volume due to the pipeline system detection for shutdown response time assuming automatic shutdown = 3 minutes.**

BP has determined that the worst-case scenario from the activities proposed in this plan does not supersede the worst-case scenario in BP's GoM Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated October 8, 2021, on behalf of several companies listed in the plan and approved by BSEE on October 22, 2021. Therefore, pursuant to NTL No. 2008-G04, BP makes the following statement:

Since BP Exploration & Production Inc. has the capability to respond to the worst-case spill scenario included in its Regional Oil Spill Response Plan approved on October 22, 2021, and since the worst-case scenario determined for this DOCD does not replace the appropriate worst-case scenario in our regional OSRP, BP hereby certifies that it has the capability to respond, to the maximum extent practicable, to a worst-case discharge, or a substantial threat of such a discharge, resulting from the activities proposed in this DOCD.

9.2 Oil Spill Response Discussion

Not conducting proposed activities that require reporting Oil Spill Response Discussion as per NTL 2008-04

10. Environmental Monitoring and Mitigation Measures

10.1. Monitoring Systems

Operational personnel have been instructed to check for pollution frequently during their tour of duty and, in the event pollution is spotted, to identify and shut-off the source and make immediate external notifications as per instructions provided in Section 8 of BP's certified OSRP. Also, in accordance with the measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 26, 2021)], a person onboard the vessel(s) will visually monitor the moonpool(s) using a remote camera system. Logs will be kept for each shift documenting the observed presence/absence of marine animals in the moonpool(s). If a protected species is observed in the moonpool(s), required reporting to the appropriate agencies will be made.

10.2. Incidental Takes

To mitigate against incidental takes, activities will be conducted in adherence to 2020 revisions of BSEE NTL 2015-G03 "Marine Trash and Debris Awareness Training and Elimination", NTL 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" and BOEM NTL 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting". As required by BSEE NTL 2015-G03, BP submits an annual certification letter for its Marine Debris Awareness Training Process. The marine debris awareness training is required annually by the BSEE and is identified by "BP's Gulf of Mexico (GoM) Environmental Training Matrix" and "BP's GoM Health, Safety, and Environmental (HSE) Training Needs Assessment", both of which are located on BP's GoM HSE website. Additionally, mitigation measures described in Appendices A, B, C and J of the NMFS 2020 Biological Opinion [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 26, 2021)] will be implemented to the extent they are applicable to the activities outlined in this plan. Monitoring activities are conducted by personnel on vessels to prevent accidental loss of materials overboard, and to report sightings of injured/ dead protected species. Reporting of dead/ injured protected species is addressed in BP's "Incident Notification and Investigation Procedure - Attachment 1".

Further mitigation measures can be found throughout the supporting EIA found in Appendix D.

10.3. Flower Garden Banks National Marine Sanctuary

All proposed activities will occur outside of the Protective Zones of the Flower Garden Banks National Marine Sanctuary boundaries.

11. Lease Stipulations

Oil and gas exploration activities on the OCS are sometimes subject to mitigations in the form of lease stipulations.

11.1. Lease Stipulation Information

Lease Stipulation for Protected Species

Mitigation measures described in Appendices A, B, C and J of the 2020 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 21, 2021) will be implemented to the extent they are applicable to the activities outlined in this plan. Additionally, all activities will be conducted in adherence to NTL 2015-G03 "Marine Trash and Debris Awareness Training and Elimination"; BOEM NTL 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" which has largely been replaced by Appendix C of the 2020 Biological Opinion, amended in 2021, and BOEM NTL 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program", as necessary. Mitigation to prevent takes varies based on the activity underway and it can include worker training on waste management and trash and debris containment procedures to avoid accidental loss overboard and its potential impact on protected species, and training on reporting of dead/injured protected species addressed in BP's Incident Notification and Investigation Procedure.

12. Related Facilities and Operations Information

12.1 Related OCS Facilities and Operations

The Herschel Phase 2 project consists of the MC520 006 (H-8) well subsea tie-back to the existing Manuel Extension project's subsea facilities (PSN 20348), more specifically to the Herschel PLET utilizing the existing Herschel Deep Manifold at the Herschel Drill Center. The H-8 well will be drilled near Herschel H-5 (MC520-005), approximately 10,000 ft. from the Manuel Drill Center with an expected radius of 80-100ft from the existing HD Manifold. These wells will be tied back to the existing HD Manifold via rigid well jumpers. Chemicals, hydraulics, power and communication will be supplied by an existing in-field static umbilical. A new Subsea Distribution Unit (SDU) is required to support the new wells.

Production from well MC520 006 (H-8) will be commingled with the other Manuel wells in the Manuel tieback system and will terminate at BP's existing Mississippi Canyon Area Block 474 A (Na Kika) FDPS, RUE OCS-G 23624. These incoming produced hydrocarbons will be separated and measured with the existing production processed at Na Kika.

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The anticipated flow rates and shut-in times for the proposed pipeline are as follows:

Origination Point	Flow Rates	Shut-in Time
MC520 006	**13.5 MMCF/D 17,500 BO/D**	**< 3 Minutes**

12.2 Transportation System

The Na Kika production will be transported by the existing export pipeline system.

Gas production from subsea wells produced to the Na Kika facility will continue to be measured for sales and royalty purposes on the Na Kika Mississippi Canyon Block 474 A Platform, a semisubmersible FDPS, prior to delivery to shore via Operations System DTN.

Liquid hydrocarbons from subsea wells produced to the Na Kika facility will continue to be measured for sales and royalty purposes using a LACT unit located on this same facility prior to delivery to shore via Operations System No. 51.1.

12.3 Produced Liquid Hydrocarbon Transportation Vessels

According to NTL 2008-G04, this Section of the Plan is not applicable to the proposed operations.

13. Support Vessels and Aircraft Information

13.1 General

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Helicopter	760-gals	2	2 / week
Supply Boats	5,000-bbls	1	2 / week

13.2 Diesel Oil Supply Vessels

Not conducting proposed activities that require reporting Oil Spill Response Discussion as per NTL 2008-G04.

13.3 Drilling Fluids Transportation

There are no drilling operations proposed in this supplemental DOCD.

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13.4 Solid and Liquid Wastes Transportation

Information about the transportation of solid and liquid wastes generated by proposed activities has been included in **Appendix C**.

13.5 Vicinity Map

A vicinity map depicting the location of the proposed activities relative to the shoreline, the distance of the proposed activities from the shoreline, and the primary route(s) of the support vessels and aircraft when traveling between the onshore support facilities and the project areas is included in **Appendix B.** In accordance with Appendices A, B, C, and J of the 2020 *Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 26, 2021), transit routes will avoid the Rice's whale area. As outlined in the table below, vessels will transit from shorebases in Louisiana to the blocks where activities will occur under this plan.

14. Onshore Support Facilities Information

14.1 General

The onshore support base for the proposed operations will be in Fourchon, Louisiana. Mississippi Canyon Block 520 is located approximately 130.1 miles from the existing onshore support base located in Fourchon, Louisiana, as indicated on the vicinity map in **Appendix B.**

The following table provides information of the existing onshore facility that will be used to provide supply and service support for the activities proposed in this plan.

Name	Location	Existing / New / Modified
C-Port	Fourchon, LA	Existing
Heliport	Houma, LA	Existing

BP will primarily use the existing C-Port Fourchon Shorebase located in Fourchon, Terrebonne Parish, Louisiana to support general vessel operations. No expansion of these physical facilities is expected to result from the proposed revised activities. The C-Port Fourchon facility is located approximately 130.1-miles from the general activity area, provides a vehicle parking lot, office space, radio communication equipment, outside and warehouse storage space, crane, forklifts, water and fueling facilities, and boat dock space. The base is in operation 24-hours each day. Helicopters will be based out of Houma, Louisiana.

A small amount of vessel and helicopter traffic may originate from bases other than those described above in order to address changes in weather conditions. It is expected that this vessel traffic will originate from bases and locations that are in the near vicinity of the bases previously described.

14.2 Support Base Construction or Expansion

BP will utilize existing support bases for the proposed activities and will not require the construction or expansion of additional support bases.

14.3 Waste Disposal

Information about the onshore facilities used to store and dispose of solid and liquid wastes generated by proposed activities has been included in **Appendix C**.

15. Coastal Zone Management Act (CZMA) Information

15.1 Consistency Certification

The elements of the Alabama Coastal Zone Management Act consistency certification from SDOCD Dated April 16, 2021 is still valid with the scope of this DOCD, according to 15 CFR Part 930.76(b) and (c) for the State of Alabama, and is included as **Appendix F**.

16. Environmental Impact Analysis (EIA)

Attached as **Appendix D** is an Environmental Impact Analysis (EIA) prepared for the proposed project by bp.

BOEM (or its predecessor, the Minerals Management Service) has conducted extensive environmental analyses examining the possible impacts produced by oil and gas exploration and production activities, which evaluated impacts from similar activities on the areas in the Gulf of Mexico covered by the present plan. Additionally, mitigation measures described in Appendices A, B, C and J of the 2020 [*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico*, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 26, 2021) will be implemented to the extent they are applicable to the activities outlined in this plan.

The EIA addresses potential impacts to environmental resources found in the deepwater Gulf of Mexico (GoM), coastal habitats, protected areas, and onshore. Based on the activity set of the project, these included:

> Drilling rig presence, physical disturbance to the seafloor, air emissions, effluent discharges, water intake, onshore waste disposal, marine debris, support vessel/helicopter traffic, and unintended releases to the marine environment.

The EIA outlines high level mitigation measures that will be in place to reduce associated potential impacts.

17. Administrative Information

17.1 Exempted Information Description

In accordance with 43 CFR Part 2, Appendix E, sections (4) and (9), the following information has been determined by the BOEM GOMR exempt from public disclosure:

Production rates and life of reservoirs
Proprietary New or Unusual Technology

This information is excluded from the "Public Information" copies of the submitted plan.

17.2 Bibliography

Any previously submitted EP, DPP, DOCD, study report, survey report, or any other material referenced in this DOCD is listed below:

Plan Control No	Lease	Blk	Operator Name	Operator Number	Plan Type Code	Received Date	Final Action Code	Final Action Date
R-6955	G09821	MC 520	BP Exploration & Production Inc	02481	EP	2/19/2020	A	11/4/2020
S-8048	G09821	MC 520	BP Exploration & Production Inc	02481	DOCD	4/16/2021	A	9/17/2019
S-7916	G09821	MC 520	BP Exploration & Production Inc	02481	EP	10/15/2018	A	01/22/2019
R-6758	G09821	MC 520	BP Exploration & Production Inc	02481	EP	08/30/2018	A	10/18/2018
S-7883	G09821	MC 520	BP Exploration & Production Inc	02481	EP	01/23/2018	A	04/19/2018
S-7333	G09821	MC 520	BP Exploration & Production Inc.	02481	DOCD	06/18/2009	A	09/04/2009
R-4919	G09821	MC 520	BP Exploration & Production Inc.	02481	EP	02/12/2009	A	02/20/2009
R-3770	G09821	MC 520	Shell Offshore Inc.	689	EP	03/04/2002	A	04/10/2002
R-7166	G09821	MC 520	Shell Offshore Inc.	689	DOCD	06/11/2001	A	03/04/2002
N-5468	G09821	MC 520	BP America Production	114	POE	07/16/1996	A	08/29/1996

17.3 Other Reference Items

[i]*Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico,* Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (March 13, 2020, as amended April 26, 2021)

Bureau of Ocean Energy Management. 2017a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2025. Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261. Final Multisale Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-009.

Bureau of Ocean Energy Management. 2017b. Gulf of Mexico OCS Oil and Gas Lease Sale. Final Supplemental Environmental Impact Statement 2018. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-074.

"AUV Shallow Geohazards and Archaeological Assessments, Block 520, Mississippi Canyon Area, Gulf of Mexico", Project No. 02.1803-1355_Manuel_M51_Herschel, issued to BP America, Inc., June, 2018

17.4 Service Processing Fee

A receipt in the amount of $ $4,238.00 for the service processing fee as required by 30 CFR § 550.125 is included in **Appendix G**.

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Appendixes

Appendix A: OCS Plan Information Forms – Form BOEM-0137

Appendix B: Vicinity, Location and Bathymetry Plats

Appendix C: Waste and Discharge Information

Appendix D: Environmental Impact Assessment

Appendix E: Air Emissions Information – Form BOEM-0139

Appendix F: Coastal Zone Management Certifications (AL)

Appendix G: Service Processing Fee

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Appendix A: OCS Plan Information Forms – Form BOEM-0137

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OCS PLAN INFORMATION FORM – Public Copy

General Information

Type of OCS Plan:		Exploration Plan (EP)	Development Operations Coordination Document (DOCD)	X	
Company Name: BP Exploration & Production Inc.			BOEM Operator Number: 02481		
Address: 501 Westlake Park Blvd			Contact Person: Kathi Gamiotea		
Houston, TX 77079			Phone Number: 346-640-6725		
			E-Mail Address: Kathi.Gamiotea@bp.com		
If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$4,238.00	Receipt No.	76096176871	

Project and Worst Case Discharge (WCD) Information

Lease(s): OCS-G 09821			Area: MC		Block(s): 520	Project Name (If Applicable): Herschel Phase 2			
Objective(s)	X	Oil		Gas		Sulphur		Salt	Onshore Support Base(s): Fourchon, LA
Platform/Well Name: MC520 006/007			Total Volume of WCD: 151 bbls				API Gravity: 29.0°		
Distance to Closest Land (Miles): 68.4 statute miles					Volume from uncontrolled blowout: 57,000 STBO/day				

Have you previously provided information to verify the calculations and assumptions for your WCD?	Y	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	EP S-7916			
Do you propose to use new or unusual technology to conduct your activities?		Yes	X	No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	X	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?		Yes	X	No

Description of Proposed Activities and Tentative Schedule (Mark all that apply)

Proposed Activity	Start Date	End Date	No. of Days
Installation of lease term jumpers and Subsea Distribution Unit and commission subsea infrastructure	March 2023	May 2023	~50
Commence production	May 2023	May 2023	1

Description of Drilling Rig

	Jackup		Drillship
	Gorilla Jackup		Platform rig
	Semisubmersible		Submersible
	DP Semisubmersible		Other (Attach Description)

Drilling Rig Name (If Known):

Description of Structure

	Caisson		Tension leg platform
	Fixed platform		Compliant tower
	Spar		Guyed tower
X	Floating production system		Other (Attach Description)

Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
Well MC520 006 (H-8)	Herschel Deep Manifold (MC520)	6.625-in.	82-ft

OCS PLAN INFORMATION FORM (CONTINUED)

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name):MC520 006 (H-8) formerly Location C	Previously reviewed under an approved EP or DOCD? EP R-6955	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API No.	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?			Yes	X	No	

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 290,000	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	29.0°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 09821		OCS OCS
Area Name	Mississippi Canyon		
Block No.	520		
Blockline Departures (in feet)	N/S Departure: 6,545' FNL		N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 3,265.46' FEL		E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 1,263,934.54'		X: X: X:
	Y: 10,336,975.00'		Y: Y: Y:
Latitude/ Longitude	Latitude 28° 28' 46.502" N		Latitude Latitude Latitude
	Longitude 88° 10' 20.141" W		Longitude Longitude Longitude

Water Depth (Feet): 6,693	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	N/A			

Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

Anchor Name or No.	**Area**	**Block**	**X Coordinate**	**Y Coordinate**	**Length of Anchor Chain on Seafloor**
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	
			X =	Y =	

Appendix B: Vicinity, Location and Bathymetry Plats

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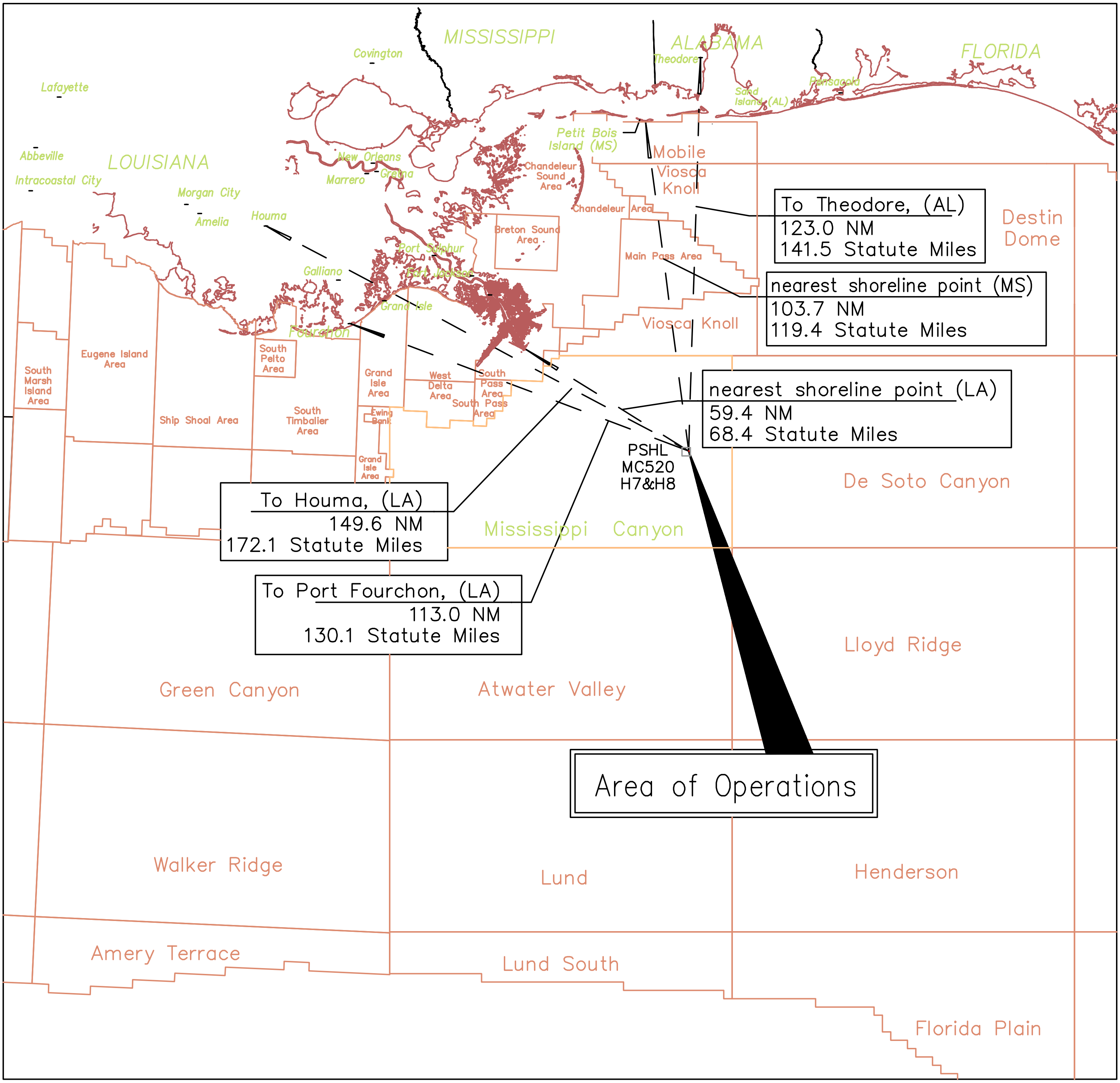


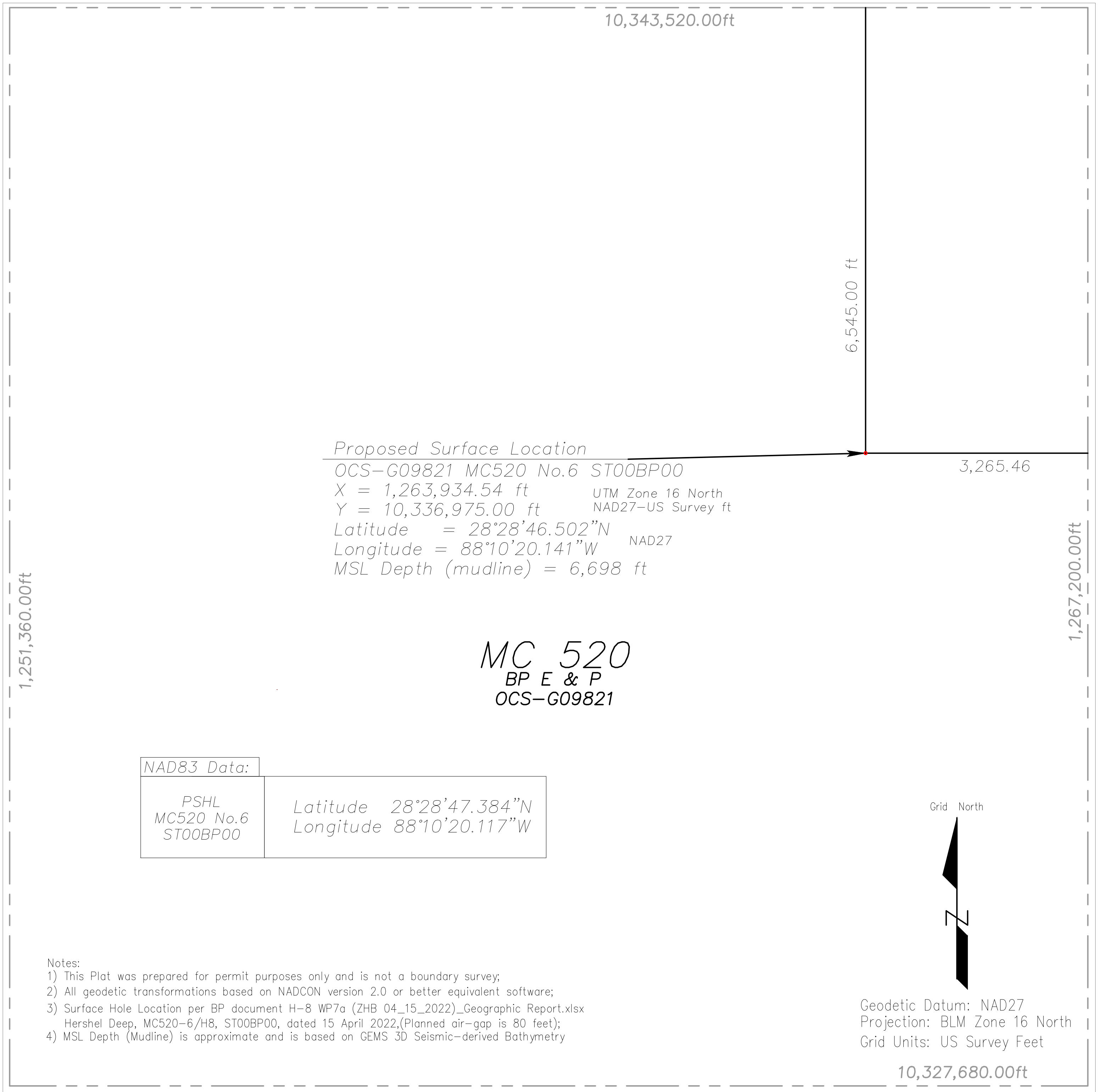
Note: Nearest Louisiana shoreline distance was computed from the Proposed Surface Location of the MC520 H7&H8 to the nearest shoreline feature as represented in the NOAA 1:24k Continuously Updated Shoreline Product (CUSP). This vector Database is a more current, detailed, and correct representation of the actual shoreline than the NOAA 1:80k Medium-Resolution Vector Shoreline Database, which was based on medium-scale charts compiled by NOAA in the 1980's and which no longer accurately reflects the actual shoreline position in many locations, especially along the Mississippi River Delta.

N
Grid North
W E
S

Grid: UTM Zone 16 North
Datum: NAD27
Units: US Survey Feet

"VICINITY CHART"

BP EXPLORATION AND PRODUCTION	Scale 1" = 50 miles
Proposed Well Location OCS-G09821 MC520 H7&H8	Date: 22 July 2022
Mississippi Canyon Area (OPD# NH16-10) Block 520 Offshore Federal	
Plat prepared by: Kyle Beeson, Surveyor, bp America, Inc.	BKB



STATE OF LOUISIANA
RALPH A. COLEMAN
REG. No. 4691
REGISTERED PROFESSIONAL LAND SURVEYOR

RALPH A. COLEMAN
PROFESSIONAL LAND SURVEYOR
LOUISIANA REGISTRATION No. 4691
07/25/2022

I, Ralph A. Coleman, hereby certify that the Proposed Surface Hole Location of BP EXPL & PROD. OCS-G09821 MC 520 No. 06 ST00BP00 is as follows:

Location: 6,545.00 feet from the North Line and
3,265.46 feet from the East Line of
Mississippi Canyon Block 520

"Public Information"

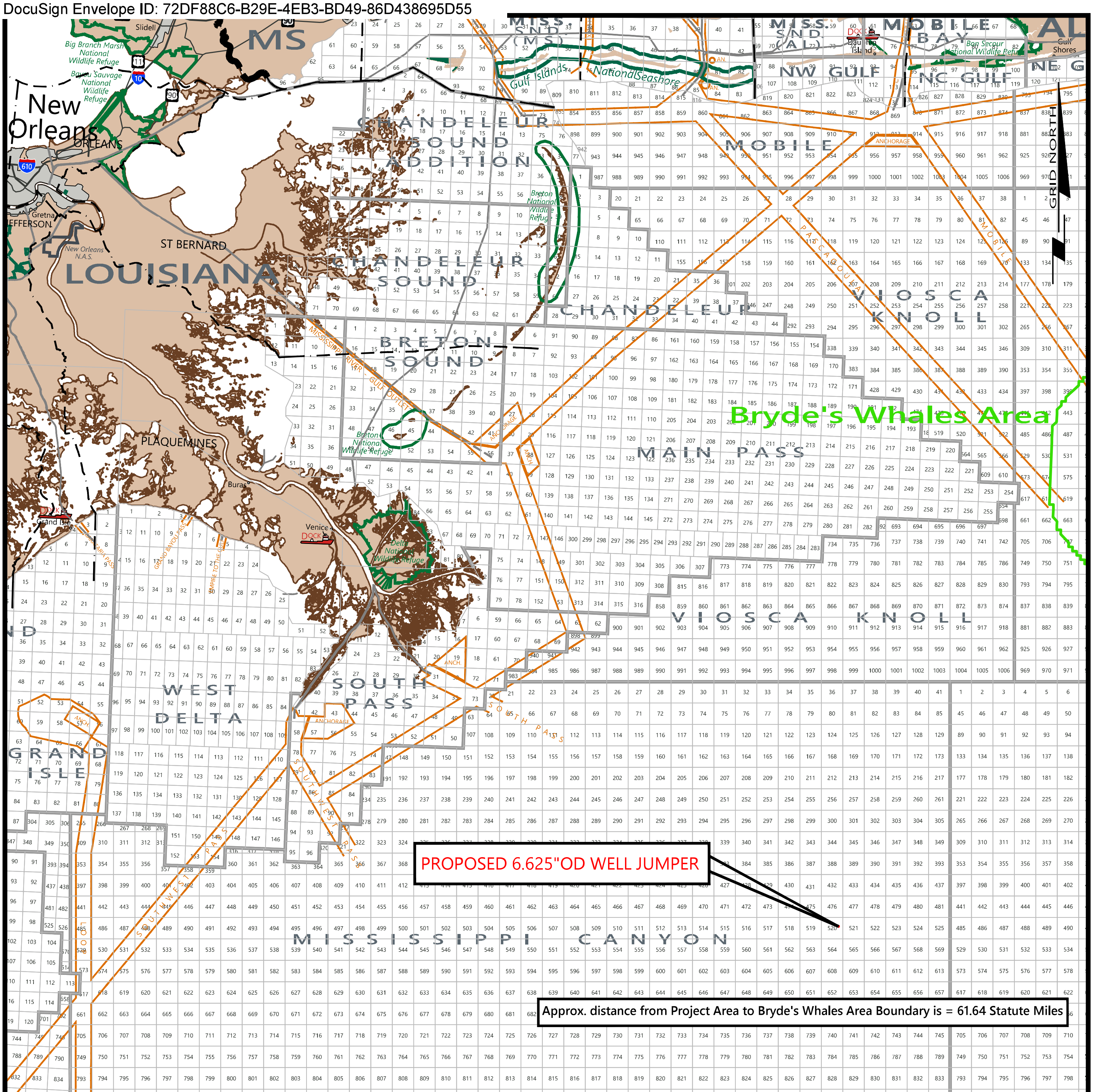
Prepared by:
Ralph A Coleman Surveying LLC
LA License No. VF 855
190 Clarence Cormier Rd
Carencro LA 70520
337.654.7520
For: 4DNav

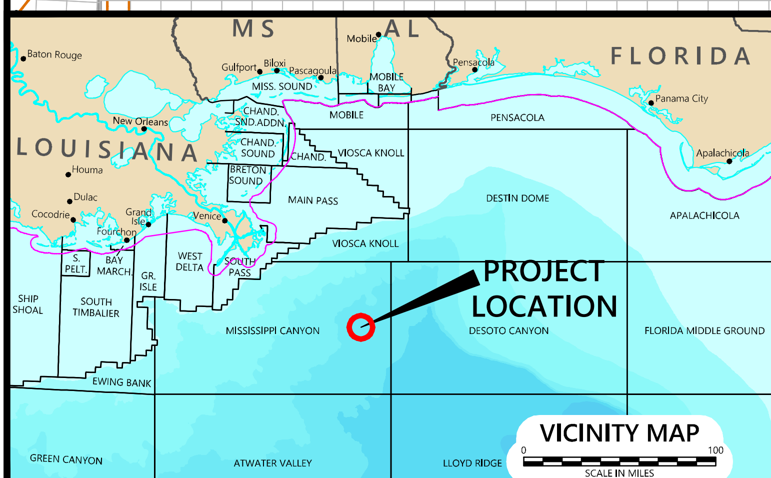
BP EXPLORATION AND PRODUCTION

Proposed Well Location OCS-G09821 MC520 No.06 ST00BP00
Mississippi Canyon Area (OPD# NH16-10) Block 520 Offshore Federal

Scale 1" = 2000 ft
Date: 25 July 2022
Drafted: BKB

DocuSign Envelope ID: 72DF88C6-B29E-4EB3-BD49-86D438695D55





bp

PROPOSED 6.625" OD WELL JUMPER
PROPOSED WELL H-8 TO MANIFOLD

BLOCK 520
MISSISSIPPI CANYON AREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 16 (NORTH)
Grid Units: US SURVEY FEET

FUGRO USA MARINE, INC.
6100 Hillcroft Ave.
Houston, Texas 77081
(713) 346-3700

SCALE 1:1200000 — 0 to 100000 FEET

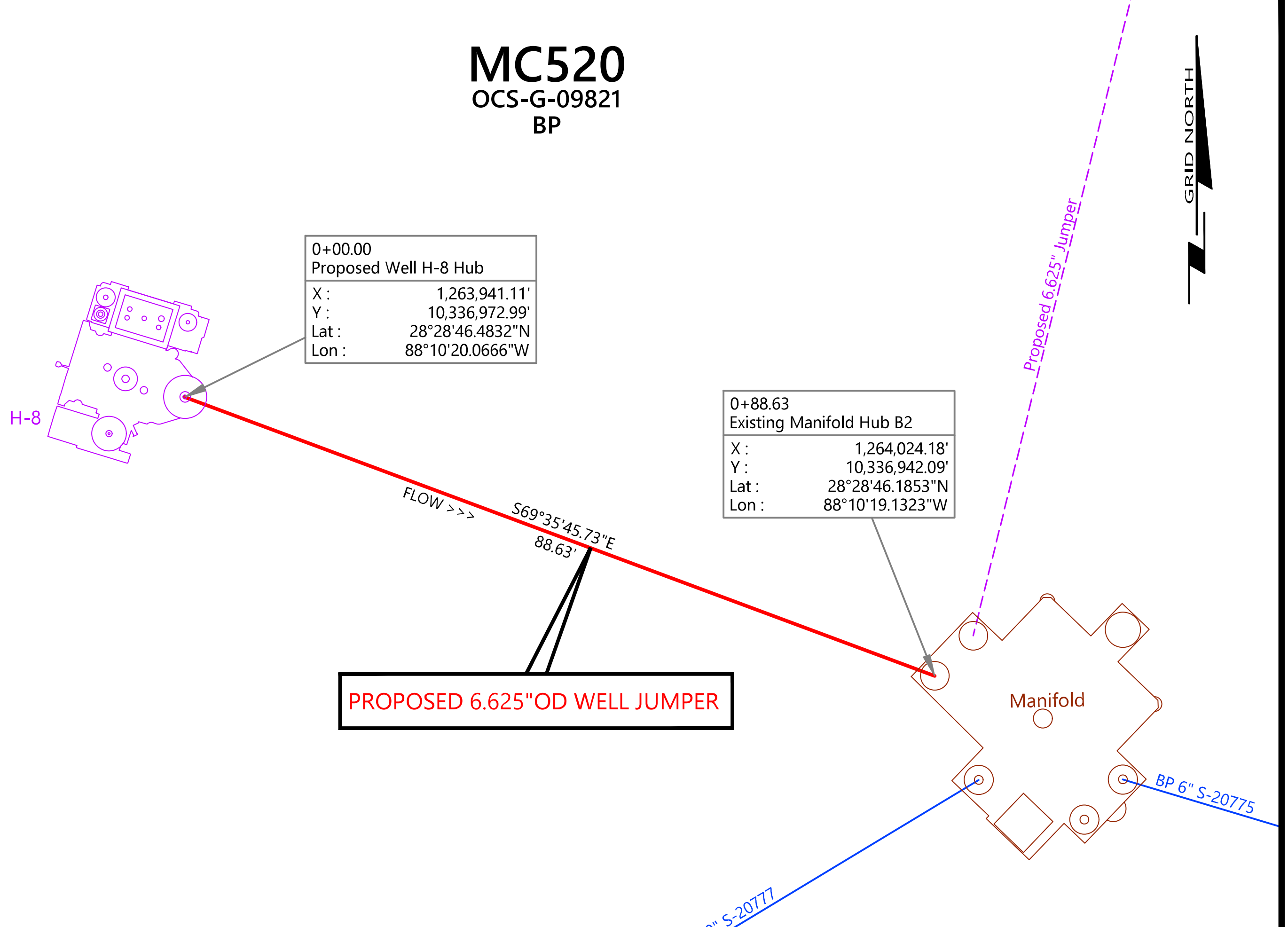
Job No.: 22000401 | Date: 6/30/2022 | Drwn: EA | Chart: 1 Of: 2

DWG File: 22000401_MC520_H8_Mfold_Well-Jumper

7/07/2022

DocuSign Envelope ID: 72DF88C6-B29E-4EB3-BD49-86D438695D55

MC520
OCS-G-09821
BP

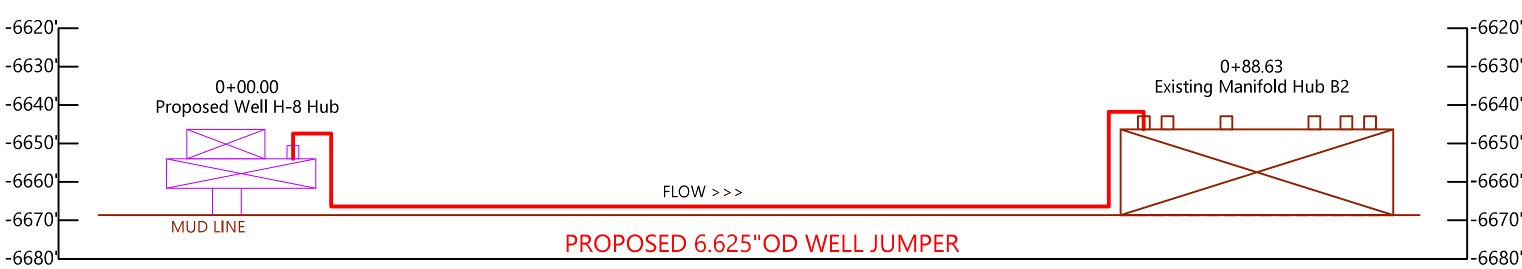


NOTE:
THIS PLAT WAS PREPARED FOR PERMIT PURPOSES ONLY, AND IS NOT A PROPERTY BOUNDARY SURVEY, AND AS SUCH DOES NOT COMPLY WITH THE "STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS" AS ADOPTED BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.

DESIGN CHARACTERISTICS OF THIS PIPELINE ARE IN COMPLIANCE WITH APPLICABLE REGULATIONS.

AREA ENGINEER

PLAN



0 20' HORIZONTAL SCALE IN FEET

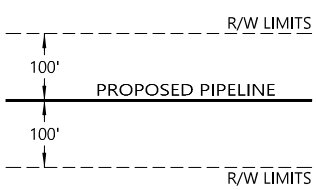
PROFILE

0 20' VERTICAL SCALE IN FEET

THE RIGHT OF WAY OF THE PROPOSED ROUTE IS ACCURATELY REPRESENTED.

STATE OF LOUISIANA
DUHAMEL R. PRINCIPE
License No. 5267
PROFESSIONAL LAND SURVEYOR

DUHAMEL R. PRINCIPE PLS #5267
STATE OF LOUISIANA
FIRM REGISTRATION NO. VF485



RIGHT-OF-WAY DETAIL

bp

PROPOSED 6.625" OD WELL JUMPER
PROPOSED WELL H-8 TO MANIFOLD

BLOCK 520
MISSISSIPPI CANYON AREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 16 (NORTH)
Grid Units: US SURVEY FEET

SCALE 1:240 — 0 20 FEET

FUGRO
FUGRO USA MARINE, INC.
6100 Hillcroft Ave.
Houston, Texas 77081
(713) 346-3700

Job No.: 22000401	Date: 6/30/2022	Drwn: EA	Chart: 2	Of: 2
DWG File: 22000401_MC520_H8_Mfold_Well-Jumper				7/07/2022

Appendix C: Waste and Discharge Information

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TABLE of WASTES

Project: **H-5 Project**

Number of Operational Days: 74

	Projected Generated Waste		Solid and Liquid Wastes Transportation		Waste Disposal		
Type of Waste	**Composition**		**Transport Method**		**Name/Location of Facility**	**Amount (total for 74 days)**	**Disposal Method**
Will drilling occur? If yes, fill in the muds and cuttings.							
N/A - drilling not addressed in this Plan							
Will you produce hydrocarbons? If yes fill in for produced sand.							
N/A							
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.							
EXAMPLE: trash and debris (recylables)	*Plastic, paper, aluminum*		*barged in a storage bin*		*ARC, New Iberia, LA*	**Amount in tons (total for 74 days)**	*Recycled*
Chemical product wastes	Pills, spacers, additives etc.				N/A	0.0	
Domestic waste	Municipal trash		Macerated (as per CFR)		At sea	17.8	N/A
Excess cement	Excess cement from vessel tank cleaning				N/A	0.0	
Recyclables	Recycled materials (these would be contractor owned wastes, not BP owned - Plastic, paper, aluminum, etc.)		Landed for proper disposal		C-Port; Tech Oil, Iberia, LA	73.6	Recycle
Scrap Metal	Scrap piping, grating and other metals				N/A	0.0	
Trash and debris	Municipal trash		Landed for proper disposal (Supersacks)		C-Port; River Birch Landfill, Avondale, LA	302.7	Landfill
Universal Waste- these are contractor owned, not BP	Batteries				N/A	0.0	
Universal Waste- these are contractor owned, not BP	Fluorescent light bulbs				N/A	0.0	
Used oil	Used oil, hydraulic oil		Landed for proper disposal (Totes)		C-Port / American Recovery; Omega Waste Management, Patterson, LA	13.1	Recycle
Vessel Maintenance Wastes (non hazardous) - these are contractor owned, not BP	Oily rags, pads, oil filters etc.		Landed for proper disposal (DOT Drums)		C-Port / American Recovery; Omega Waste Management, Patterson, LA	13.1	Recycle
Vessel Maintenance Wastes (painting, blasting) - these are contractor owned, not BP	Paint thinner, paint chips, blast media, aerosol cans		Landed for proper disposal (Drum)		C-Port / American Recovery;River Birch Landfill, Avondale, LA and Chemical Waste Management, Sulphur, LA	1.1	Incineration / Landfill
Wash water			Landed for proper disposal (Totes)		C-Port / American Recovery; Omega Waste Management, Patterson, LA	13.1	Disposal

NOTE: If you will not have a type of waste, enter NA in the row.

TABLE 1. WASTES YOU WILL GENERATE, TREAT AND DOWNHOLE DISPOSE OR DISCHARGE TO THE GOM

please specify if the amount reported is a total or per well amount

Herschel Phase 2 (H-8) Basis: Construction phase of Herschel drill center - well jumper, flying lead, and subsea distribution unit installation. C-Constructor / Holiday 21 days + 35% Contingency = 29. Island Venture Vessel used as a basis.			**Projected ocean discharges**		**Projected Downhole Disposal**
Type of Waste	**Composition**	**Projected Amount**	**Discharge Rate**	**Discharge Method**	**Answer yes or no**
Will drilling occur ? If yes, you should list muds and cuttings					
Water Based Fluid	Spent drilling fluid drilling riserless hole plus pad mud to fill the hole	bbl/well	65 days @ 0 bbl/day	Seafloor	No
Cuttings wetted with Water Based Fluid	Water base interval	bbl/well	65 days @ 0 bbl/day	Seafloor	No
Excess Cement Slurry	Excess mixed cement, including additives & waste from equipment wash down after a cement operation	bbl/well	65 cmt jobs @ 0.00 bbl/cmt job	Surface	No
Cuttings wetted with Synthetic Based Fluid	Drill cuttings, cement cuttings, & synthetic base mud retained on cuttings	bbl/well	65 days @ 0 bbl/day	Below Water Surface Line	No
Small Volume Drilling Fluid Discharges associated with Cuttings	Displaced interfaces, accumulated solids in sand traps, pit clean-out solids, & centrifuge discharges made while changing the mud weight	bbl/well	65 days @ 0 bbl/day	Surface	No
Will humans be there? If yes, expect conventional waste					
Domestic Waste / Gray Water	Food waste, drainage from dishwasher, shower, laundry, bath, & washbasin drains	2,755 bbl/well	29 days @ 95 bbl/day	Surface	No
Sanitary Waste	Treated human body waste discharged from toilets & urinals	290 bbl/well	29 days @ 10 bbl/day	Surface	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Deck washdown & rain water	2,460 bbl/well	29 days @ 85 bbl/day (avg)	Surface	No
Will you conduct well treatment, completion, or workover?					
Well Treatment Fluids	Stimulations fluids including acids, solvents & propping agents	bbl/well	0 events @ 0 bbl/event	Surface	No
Completion Fluids	Salt solutions, weighted brines, polymers & various additives	bbl/well	0 days @ 0 bbl/day	Surface	No
Workover Fluids - **If applicable**	Salt solutions, weighted brines, polymers, & other speciality additives	bbl/well	0 days @ #DIV/0! bbl/day	Surface	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization Unit Discharge	Wastewater associated with the process of creating freshwater from seawater	0 bbl/well	29 days @ 220 bbl/day	Surface	No
Blowout Preventer Fluid	Fluid used to actuate the hydraulic equipment on the BOP	bbl/well	65 events @ 0 bbl/event	N/A	N/A
Uncontaminated Ballast Water	Uncontaminated seawater added or removed to maintain proper draft	0 bbl/well	29 days @ 0 bbl/day (avg)	Surface	No
Uncontaminated Bilge Water	Water that collects in the vessels bilge	0 bbl/well	29 days @ 0 bbl/day (avg)	Surface	N/A
Cement discharged at seafloor	Excess mixed cement slurry	bbl/well	65 event @ bbl/day	Seafloor	No
Fire Water	Uncontaminated seawater/freshwater used for fire control	899 bbl/well	29 days @ 217 bbl/week	Surface	No
Cooling Water / Utility Water	Uncontaminated seawater	6,293 bbl/well	29 days @ 0 bbl/day	Surface	No
Sea Water / Fresh Water that has been Chemically Treated	Biocide, corrosion inhibitors, or other chemicals used to prevent corrosion or fouling of piping or equipment	0 bbl/well	event @ #DIV/0! bbl/event	Surface	No
Sub Sea Fluid Discharges	Wellhead Preservation, Hydrate Control, Umbilical Steel Tube Storage, Leak Tracer, & Riser Tensioner Fluids	0 bbl/well	event @ #DIV/0! bbl/event	N/A	N/A
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced Water	Water brought up from hydrocarbon-bearing strata during extraction of oil & gas	0	29 days @ 0 bbl/day	N/A	N/A
Will you be covered by an individual or General NPDES permit ?		**GEG460000**			
NOTE: If you will not have a type of waste, enter NA in the row.		Red = Drlg Eng, **Yellow** = Completion Eng, **Blue** = Waste Specialist, **Green = Calculator Tool**			

PROVIDED BY Water SME:
Lerato Matlamela
PROVIDED BY CONSTRUCTION ENGINEERS:
Brandon Reynolds
Last Revision: 9/28/2022

Appendix D: Environmental Impact Assessment

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Environmental Impact Analysis

for a

SUPPLEMENTAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
for
Mississippi Canyon Block 520 (OCS-G09821)
Offshore Alabama

July 2022

Prepared for:

BP Exploration & Production Inc.
501 Westlake Park Boulevard
Houston, Texas 77079-2696

Contents

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(Continued)

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List of Figures

Acronyms and Abbreviations

§	section
µPa	micropascal
ac	acre
ADIOS	Automated Data Inquiry for Oil Spills
AQR	Air Quality Emissions Report
bbl	barrel
BOEM	Bureau of Ocean Energy Management
bp	BP Exploration & Production Inc.
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
dB	decibel
DOCD	Development Operations Coordination Document
DP	dynamic positioning
DPS	distinct population segment
EFH	Essential Fish Habitat
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAD	fish-aggregating device
FR	Federal Register
GMFMC	Gulf of Mexico Fishery Management Council
ha	hectare
HAPC	Habitat Area of Particular Concern
IPF	impact-producing factor
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Mississippi Canyon
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MWCC	Marine Well Containment Company
NAAQS	National Ambient Air Quality Standards
nd	no date
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSRA	Oil Spill Risk Analysis
OSRP	Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbon
PM	particulate matter
re	referenced to
SEL_{24h}	sound exposure level over 24-hours
SPL	sound pressure level
SPL_{rms}	root-mean-square sound pressure level
USCG	U.S. Coast Guard
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCD	worst case discharge

Introduction

Project Summary

BP Exploration & Production Inc. (bp) is submitting a Supplemental Development Operations Coordination Document (DOCD) for Mississippi Canyon (MC) Block 520 for the Herschel Phase 2 project which consists of the subsea tie-back of the MC520 006 (H-8) well to the existing Manuel Extension project's HD PLET (PSN 20348), utilizing the existing Herschel Deep Manifold at the Herschel Drill Center. This well will be drilled near Herschel H-5 (MC520-005), approximately 10,000 ft. from the Manuel Drill Center with an expected radius of 80-100ft from the existing HD Manifold. The well will be tied back to the existing HD Manifold via a rigid well jumper. Chemicals, hydraulics, power and communication will be supplied by an existing in-field static umbilical. A new Subsea Distribution Unit (SDU) is required to support the new well.

The Environmental Impact Analysis (EIA) provides information on potential impacts to environmental, archaeological, and socioeconomic resources that could be affected by bp's proposed activities in the project area under this DOCD. MC 520 is located within the Central Gulf of Mexico OCS Planning Area, approximately 68 miles (109 kilometers [km]) from the nearest shoreline (Plaquemines Parish, Louisiana), 128 miles (209 km) from the regional onshore support base (Port Fourchon, Louisiana), and 169 miles (272 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The estimated water depth at the proposed project location is 6,693 ft (2,040 m). All miles are presented as statute miles. Installation of the subsea infrastructure will be accomplished with a dynamically positioned (DP) drilling ship MODU vessel which is expected to be on site for 210 days to complete the proposed operations.

Purpose of the Environmental Impact Analysis

The EIA was prepared pursuant to the requirements of the Outer Continental Shelf Lands Act (OCSLA), 43 United States Code §§ 1331-1356 as well as applicable regulations including 30 Code of Federal Regulations (CFR) § 550.242(s) and § 550.261. The EIA is a project- and site-specific analysis of bp's planned activities under this DOCD.

The EIA presents data, analyses, and conclusions to support the Bureau of Ocean Energy Management (BOEM) reviews as required by the National Environmental Policy Act (NEPA) and other relevant federal laws, including the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA). The EIA addresses impact-producing factors (IPFs), resources, and impacts associated with the proposed project activities. It identifies mitigation measures to be implemented in connection with the planned activities. Potential environmental impacts of a worst-case discharge (WCD) are also analyzed.

Potential impacts have been analyzed at a broader level in the 2017 to 2022 Programmatic Environmental Impact Statement (EIS) for the Outer Continental Shelf (OCS) Oil and Gas Leasing Program (BOEM, 2016a) and in multisale EISs for the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a).

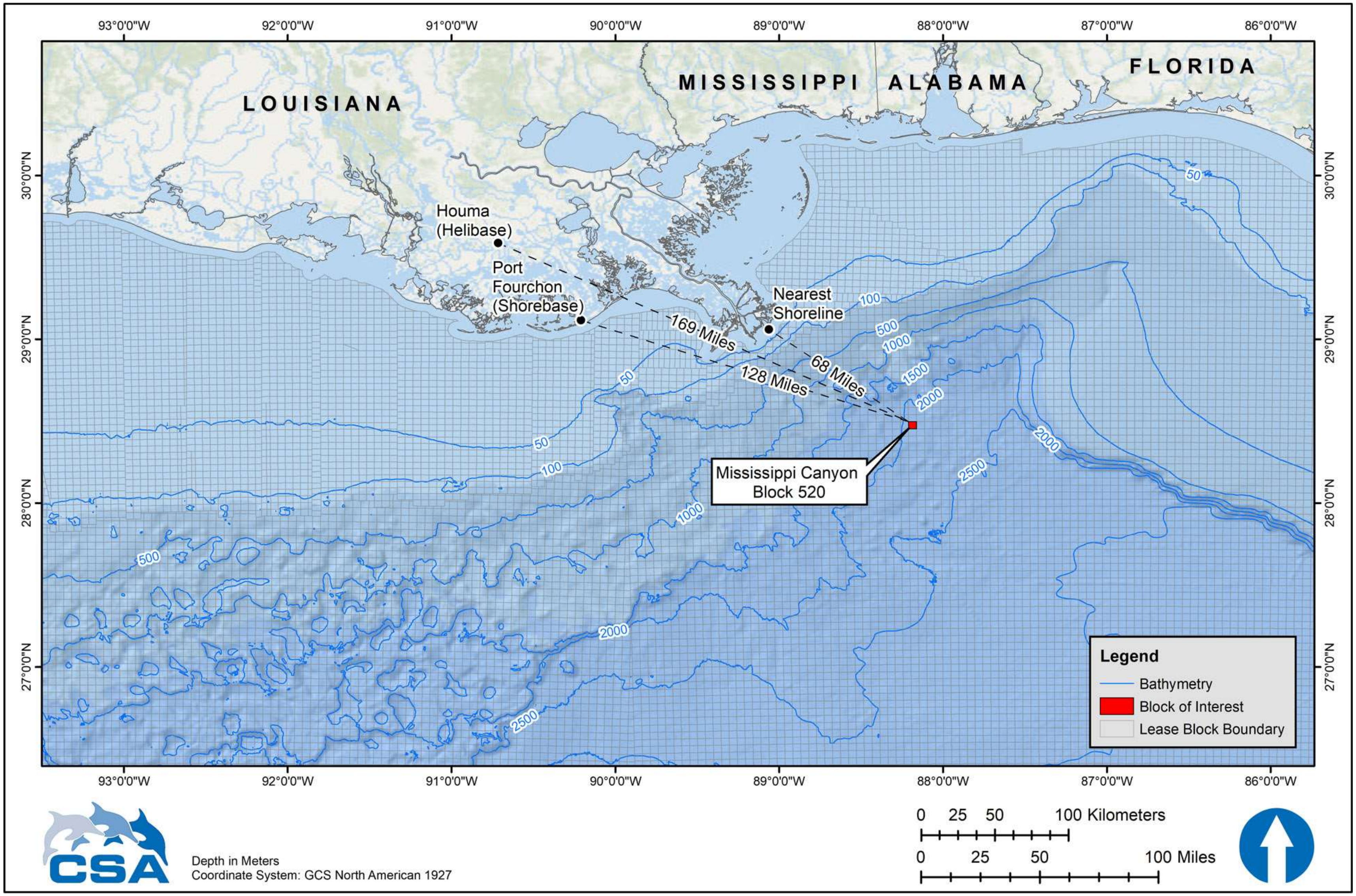

Figure 1. Location of Mississippi Canyon Block 520. Distances are in statute miles.

The most recent multisale EISs update environmental baseline information in light of the Macondo (Deepwater Horizon) incident and address potential impacts of a catastrophic spill (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a). Numerous technical studies have also been conducted to address the impacts of the incident. The findings of the post Deepwater Horizon incident studies have been incorporated into this report and are supplemented by site-specific analyses, where applicable. The EIA relies on the analyses from these documents, technical studies, and post Deepwater Horizon incident studies, where applicable, to provide BOEM and other regulatory agencies with the necessary information to evaluate bp's DOCD and ensure that oil and gas exploration activities are performed in an environmentally sound manner, with minimal impacts on the environment.

Outer Continental Shelf Regulatory Framework

The regulatory framework for OCS activities in the Gulf of Mexico is summarized by BOEM in its Final Programmatic EIS for the OCS Oil and Gas Leasing Program for 2017 to 2022 (BOEM, 2016a). Under the OCSLA, the U.S. Department of the Interior (USDOI) is responsible for the administration of mineral exploration and development of the OCS. Within the USDOI, BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) are responsible for managing and regulating the development of OCS oil and gas resources in accordance with the provisions of the OCSLA. The BSEE offshore regulations are in 30 CFR Chapter II, Subchapter B. BOEM offshore regulations are in 30 CFR Chapter V, Subchapter B.

In implementing its responsibilities under the OCSLA and NEPA, BOEM consults numerous federal departments and agencies that have authority to comment on permitting documents under their jurisdiction and maintain ocean resources pursuant to other federal laws. Among these are the U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), and the National Oceanic and Atmospheric Administration (NOAA) through the National Marine Fisheries Service (NMFS). Federal laws (e.g., ESA, MMPA, Coastal Zone Management Act of 1972, Magnuson-Stevens Fishery Conservation and Management Act) establish the consultation and coordination processes with federal, state, and local agencies. The 2020 NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico assess impacts and mitigation measures to listed species, as amended in 2021 (NMFS, 2020a).

In addition, Notices to Lessees and Operators (NTLs) are formal documents issued by BOEM and BSEE that provide clarification, description, or interpretation of pertinent regulations or standards. **Table 1** lists and summarizes the NTLs applicable to the EIA.

Table 1. Notices to Lessees and Operators (NTLs) that are applicable to this Environmental Impact Analysis (EIA), ordered from most recent to oldest.

NTL	Title	Summary
BOEM 2020-G01	Air Quality Information Requirements for Exploration Plans, Development Operations Coordination Documents, and Development and Production Plans in the Gulf of Mexico Region	Cancels and supersedes the air emission information portion of NTL 2008-G04, Information Requirement for Exploration Plans and Development Operations Coordination Documents, effective date May 5, 2008.
BOEM-2016-G01 or Appendix C (NMFS 2020a)	Vessel Strike Avoidance and Injured/Dead Protected Species Reporting	Recommends protected species identification training; recommends that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species; and requires operators to report sightings of any injured or dead protected species. Reissued in June 2020 to address instances where guidance in the 2020 National Marine Fisheries Service (NMFS) Biological Opinion Appendix C (NMFS, 2020a) replaces compliance with this NTL.
BSEE-2015-G03 or Appendix B (NMFS 2020a)	Marine Trash and Debris Awareness and Elimination	Instructs operators to exercise caution in the handling and disposal of small items and packaging materials; requires the posting of placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion Appendix B (NMFS, 2020a) replaces compliance with this NTL.
BOEM-2015-N02	Elimination of Expiration Dates on Certain Notice to Lessees and Operators Pending Review and Reissuance	Eliminates the expiration dates on past or upcoming expiration dates from NTLs currently posted on the Bureau of Ocean Energy Management website.
BOEM-2015-N01	Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the Outer Continental Shelf (OCS) for Worst Case Discharge (WCD) Blowout Scenarios	Provides guidance regarding information required in WCD descriptions and blowout scenarios.
BOEM-2014-G04	Military Warning and Water Test Areas	Provides contact links to individual command headquarters for the military warning and water test areas in the Gulf of Mexico.
BSEE-2014-N01	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the Bureau of Safety and Environmental Enforcement website.

Table 1. (Continued).

NTL	Title	Summary
BSEE-2012-N06	Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans	Provides clarification, guidance, and information for preparation of regional Oil Spill Response Plans. Recommends description of response strategy for WCD scenarios to ensure capability to respond to oil discharges is both efficient and effective.
2010-N10	Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources	Informs operators using subsea or surface blowout preventers on floating facilities that applications for well permits must include a statement signed by an authorized company official stating that the operator will conduct all activities in compliance with all applicable regulations, including the increased safety measures regulations (75 *Federal Register* 63346). Informs operators that the Bureau of Ocean Energy Management will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to promptly respond to a blowout or other loss of well control.
2009-G40	Deepwater Benthic Communities	Provides guidance for avoiding and protecting high-density deepwater benthic communities (including chemosynthetic and deepwater coral communities) from damage caused by OCS oil and gas activities in water depths greater than 984 ft (300 m). Prescribes separation distances of 2,000 ft (610 m) from each mud and cuttings discharge location and 250 ft (76 m) from all other seafloor disturbances.
2009-G39	Biologically Sensitive Underwater Features and Areas	Provides guidance for avoiding and protecting biologically sensitive features and areas (i.e., topographic features, pinnacles, low-relief live bottom areas, and other potentially sensitive biological features) when conducting OCS operations in water depths less than 984 ft (300 m) in the Gulf of Mexico.
2009-N11	Air Quality Jurisdiction on the OCS	Clarifies jurisdiction for regulation of air quality in the Gulf of Mexico OCS.
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on the information requirements for OCS plans, including EIA requirements and information regarding compliance with the provisions of the Endangered Species Act and the Marine Mammal Protection Act.
2005-G07	Archaeological Resource Surveys and Reports	Provides guidance on regulations regarding archaeological discoveries, specifies requirements for archaeological resource surveys and reports, and outlines options for protecting archaeological resources. Reissued in June 2020 to comply with Executive Order 13891 of October 9, 2019 and to rescind NTL 2011-JOINT-G01.

Oil Spill Prevention and Contingency Planning

Oil spill response-related activities for wells to be drilled under this DOCD are governed by the bp Regional Oil Spill Response Plan (OSRP), as filed by BP America Inc. (Operator No. 21372) under cover letter dated October 8, 2022. The OSRP was filed on behalf of several bp companies, including BP Exploration & Production Inc. (Operator No. 02481) and approved by the Bureau of Safety and Environmental Enforcement (BSEE) on October 22, 2021. The bp OSRP should meet the requirements contained in 30 CFR Part 254. BP Exploration & Production Inc. (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this DOCD, according to 30 CFR Part 553 and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities." The OSRP details bp's plan for response to manage oil spills that may result from drilling and production operations. bp has designed its response program based on a regional capability of response to spills ranging from small operations-related spills to a worst-case discharge (WCD) from a well blowout. bp's spill response program is intended to meet the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. It also includes information regarding bp's incident management team and dedicated response assets, potential spill risks, and local environmentally sensitive areas. The OSRP describes personnel and equipment mobilization, the incident management team organization, and an overview of strategies, actions and notifications to be taken in the event of a spill.

Environmental Impact Analysis Organization

The EIA is organized into **Sections A** through **I** corresponding to the requirements of NTL 2008-G04 (as extended by NTL 2015-N02 and partially amended by 2020-G01), which provides guidance regarding information required by 30 CFR Part 550 for EIAs. The main impact-related discussions are in **Section A** (Impact-Producing Factors) and **Section C** (Impact Analysis).

A. Impact-Producing Factors

Based on the description of bp's proposed activities, a series of IPFs have been identified. **Table 2** identifies the environmental resources that may be affected in the left column and identifies sources of impacts associated with the proposed project across the top. **Table 2** was adapted from Form BOEM-0142 and developed *a priori* to focus the impact analysis on those environmental resources that may be impacted as a result of one or more IPFs. The tabular matrix indicates which routine activities and accidental events could affect specific resources. An "X" indicates that an IPF could reasonably be expected to affect a certain resource, and a dash (--) indicates no impact or negligible impact. Where there may be an effect, an analysis is provided in **Section C**. Potential IPFs for the proposed activities are listed below and briefly discussed in the following sections.

- Drilling rig presence (including noise and lights);
- Physical disturbance to the seafloor;
- Air pollutant emissions;
- Effluent discharges;
- Water intake;
- Onshore waste disposal;
- Marine debris;
- Support vessel and helicopter traffic (includes vessel collisions with resources and marine sound); and
- Accidents.

Table 2. Matrix of impact producing- factors and affected environmental resources. X = potential impact on the resource; dash (--) = no impact or negligible impact on the resource.

Environmental Resources	Impact-producing Factors									
	Lay Vessel Presence (incl. noise & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helicopter Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Physical/Chemical Environment										
Air quality	--	--	**X**(5,9)	--	--	--	--	--	**X**(6)	**X**(6)
Water quality	--	--	--	**X**	--	--	--	--	**X**(6)	**X**(6)
Seafloor Habitats and Biota										
Soft bottom benthic communities	--	**X**	--	--	--	--	--	--	--	**X**(6)
High-density deepwater benthic communities	--	--(4)	--	--(4)	--	--	--	--	--	**X(6)**
Designated topographic features	--	--(1)	--	--(1)	--	--	--	--	--	--
Pinnacle trend area live bottoms	--	--(2)	--	--(2)	--	--	--	--	--	--
Eastern Gulf live bottoms	--	--(3)	--	--(3)	--	--	--	--	--	--
Threatened, Endangered, and Protected Species and Critical Habitat										
Sperm whale (Endangered)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Rice's whale (Endangered)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
West Indian manatee (Endangered)	--	--	--	--	--	--	--	**X**(8)	--	**X**(6,8)
Non-endangered marine mammals (protected)	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Sea turtles (Endangered/Threatened)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Piping Plover (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Whooping Crane (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Oceanic whitetip shark (Threatened)	**X**	--	--	--	--	--	--	--	--	**X**(6)
Giant manta ray (Threatened)	**X**	--	--	--	--	--	--	--	--	**X**(6)
Gulf sturgeon (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Nassau grouper (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Smalltooth sawfish (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Beach mice (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Florida salt marsh vole (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Panama City Crayfish (Threatened)	--	--	--	--	--	--	--	--	--	**X(6)**
Threatened coral species	--	--	--	--	--	--	--	--	--	**X**(6)
Coastal and Marine Birds										
Marine birds	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Coastal birds	--	--	--	--	--	--	--	**X**	--	X(6)
Fisheries Resources										
Pelagic communities and ichthyoplankton	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Essential Fish Habitat	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Archaeological Resources										
Shipwreck sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Prehistoric archaeological sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Coastal Habitats and Protected Areas										
Coastal Habitats and Protected Areas	--	--	--	--	--	--	--	**X**	--	X(6)
Socioeconomic and Other Resources										
Recreational and commercial fishing	**X**	--	--	--	--	--	--	--	**X**(6)	**X**(6)
Public health and safety	--	--	--	--	--	--	--	--	--	**X**(5,6)
Employment and infrastructure	--	--	--	--	--	--	--	--	--	**X**(6)
Recreation and tourism	--	--	--	--	--	--	--	--	--	**X**(6)
Land use	--	--	--	--	--	--	--	--	--	**X**(6)
Other marine uses	--	--	--	--	--	--	--	--	--	**X**(6)

Numbers in parentheses refer to table footnotes on the following page.

Table 2 Footnotes and Applicability to this program:

(1) *Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well, platform site, or any anchors will be on the seafloor within the following:*
   (a) *4-mile zone surrounding the Flower Garden Banks, or the 3-mile zone of Stetson Bank;*
   (b) *1,000-m, 1-mile, or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an Outer Continental Shelf (OCS) lease;*
   (c) *Essential Fish Habitat (EFH) criteria of 500 ft from any no-activity zone; or*
   (d) *Proximity of any submarine bank (500-ft buffer zone) with relief greater than 2 m that is not protected by the Topographic Features Stipulation attached to an OCS lease.*
   - None of these conditions (a through d) are applicable. The project area is not within the given range (buffer zone) of any marine sanctuary, topographic feature, or no-activity zone. There are no submarine banks in the project area.

(2) *Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.*
   - The Live Bottom (Pinnacle Trend) Stipulation is not applicable to the project area.

(3) *Activities within any Eastern Gulf OCS block and portions of Pensacola and Destin Dome area blocks in the Central Planning Area where seafloor habitats are protected by the Live Bottom (Low-Relief) Stipulation attached to an OCS lease.*
   - The Live Bottom (Low-Relief) Stipulation is not applicable to the project area.

(4) *Activities on blocks designated by the Bureau of Ocean Energy Management (BOEM) as being in water depths 300 m or greater.*
   - No impacts on high-density deepwater benthic communities are anticipated. A shallow hazards assessment found that no features indicative of high-density chemosynthetic communities or coral communities were identified within a 2,000 ft (610 m) buffer of the proposed pipeline corridor (Fugro, 2019).

(5) *Exploration or production activities where hydrogen sulfide (H_2S) concentrations greater than 500 parts per million might be encountered.*
   - Mississippi Canyon Block 520 is classified as H_2S “absent”. Based on the H_2S absent classification, no further discussion on H_2S impacts is warranted.

(6) *All activities that could result in an accidental spill of produced liquid hydrocarbons or diesel fuel that you determine would impact these environmental resources. If the proposed action is located a sufficient distance from a resource that no impact would occur, the Environmental Impact Analysis (EIA) can note that in a sentence or two.*
   - Accidental hydrocarbon spills could affect the resources marked (X) in the matrix, and impacts are analyzed in **Section C**.

(7) *All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which the planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or prehistoric site that no impact would occur, the EIA can note that in a sentence or two.*
   - No impacts on archaeological resources are expected from routine activities. The locations of the proposed activities are well beyond the 197 ft (60 m) depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. As discussed in **Section C.6**, the shallow hazard assessments identified two sonar contacts within the project area, but none were identified as archaeologically significant (Fugro, 2019).

(8) *All activities that might have an adverse effect on Endangered or Threatened marine mammals or sea turtles or their critical habitats.*
   - IPFs that may affect marine mammals or sea turtles include Floating Production System and Vessel presence and emissions, support vessel and helicopter traffic, and accidents. See **Section C**.

(9) *Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.*
   - Not applicable.

A.1 Drill Ship Vessel Presence (including noise and lights)

The well proposed in this EP will be drilled using a DP drillship. DP vessels use a global positioning system (GPS), specific computer software, and sensors in conjunction with a series of thrusters to maintain position. Through satellite navigation and position reference sensors, the location of the drilling rig is precisely monitored while thrusters, positioned at various locations about the rig pontoons, are activated to maintain position. This allows operations at sea in areas where mooring or anchoring is not feasible. Consequently, there will be no anchoring of the drilling rig in MC 520 during this project. The selected drilling rig is expected to be on site for an estimated 210 days. The drilling rig will maintain exterior lighting in accordance with applicable federal navigation and aviation safety regulations (International Regulations for Preventing Collisions at Sea, 1972 [72 COLREGS], Part C).

Potential impacts to marine resources from the drilling rig include the physical presence of the drilling rig in the ocean, entanglement and entrapment from moon pools and equipment in the water, working and safety lighting on the rig, and underwater noise produced during operations.

The physical presence of the drilling vessel in the ocean can attract pelagic fishes and other marine life. The lay vessel would be a single structure that may concentrate small epipelagic fish species, resulting in the attraction of epipelagic predators. See **Section C.5.1** for further discussion.

The drilling vessel will maintain exterior lighting for working at night and navigational and aviation safety in accordance with federal navigation and aviation safety regulations (International Regulations for Preventing Collisions at Sea, 1972 [72 COLREGS], Part C). Artificial lighting may attract and directly or indirectly impact natural resources, particularly birds, as discussed in **Section C.4**.

Drilling operations produce underwater sounds that may impact certain marine resources. Sources of drilling-related sounds include, for example, riser rotation, DP thrusters, remotely operated vehicle (ROV) operations, and seabed mounted active acoustics (such as ultra-short baseline systems) for positioning. Only sound related to DP thruster activity is expected to produce sound at levels which could result in potential impacts on marine life.

Entanglement and entrapment of protected species can occur from equipment with slack or looping lines and cables in the water. Marine mammals and sea turtles can become entangled in vessel lines in the water with loops or sufficient looping to trap the animals if they come into contact with them. Entanglement and entrapment can be minimized with proper maintenance of equipment lines in the water by encasing flexible lines, removing excess lines, and keeping lines taught to remove slack and line loops.

Installation vessels can be expected to produce noise during installation of subsea equipment. The noise levels produced by DP vessels largely depend on the level of thruster activity required to keep position and, therefore, vary based on environmental site conditions, vessel thruster specifications, and operational requirements. Representative source levels for vessels in DP mode range from 184 to 190 decibels referenced to one micropascal meter (dB e 1 µPa m) with a primary frequency below 600 hertz (Hz) (Blackwell and Greene Jr., 2003; McKenna et al., 2012; Kyhn et al., 2014). BOEM (2012a) stated that source levels from oil and gas production platforms are low, with a frequency range of 50 to 500 Hz. Zykov (2016) characterized a noisier MODU thruster at 190 to 195 dB re 1 µPa at 1m SPL_{rms}. The source level for the thrusters used by Zykov (2016) were estimated for power output close to the nominal value (the maximum sustainable) for all thrusters; it is highly unlikely that all the thrusters of all vessels will be operated at such conditions for a prolonged period of time.

Drilling operations produce noise that includes strong tonal components at low frequencies. When drilling, the drill string represents a long vertical sound source (McCauley, 1998). Source levels associated with drilling activities have a maximum broadband (10 Hz to 10 kHz) energy of approximately 190 dB re 1 µPa m (Hildebrand, 2005). Based on available data, source levels generated from MODUs during drilling and in the absence of thrusters can be expected to range between 154 and 176 dB re 1 µPa m (Nedwell et al., 2001). The use of thrusters, whether drilling or not, can elevate sound source levels from a drillship or semisubmersible to approximately 188 dB re 1 µPa m (Nedwell and Howell, 2004).

Positioning of the drilling rig requires the use of a vessel-mounted transducer and a series of transceivers placed on the seafloor. The transducer employs a high frequency acoustic signal (i.e., main energy between 21 and 31 kHz) throughout the operation. While the acoustic signal emitted by the transducer is similar to that emitted by a commercial echosounder, its source level will vary depending upon water depth (i.e., higher source levels required in deeper water). Source levels for the vessel-mounted transceiver, expressed as SPL, are estimated to be >200 dB re 1 µPa m, with the energy focused towards the seafloor (Equinor, 2019). The directionality and frequency of the source results in minimal propagation outside the main beam of the pulse.

The response of marine mammals, sea turtles, and fishes to a perceived marine sound depends on a range of factors, including 1) the sound pressure level (SPL), frequency, duration, and novelty of the sound; 2) the physical and behavioral state of the animal at the time of perception; and 3) the ambient acoustic features of the environment (Hildebrand, 2004).

A.2 Physical Disturbance to the Seafloor

BOEM (2012a) estimated an area of seafloor disturbance between 1.2 ac (0.5 ha) and 2.5 ac (1.0 ha) per kilometer of pipeline or flowline installation. Due to the water depth in the project area, it is anticipated that the subsea equipment will not be buried by trenching, but instead will be placed on the seafloor, decreasing the area of impact.

In water depths of 600 m (1,969 ft) or greater, DP drilling rigs disturb only a very small area of the seafloor around the wellbore where the bottom template and blowout preventer (BOP) are located. Depending on the specific well configuration, the total disturbed area is estimated to be 0.25 hectares (ha) (0.62 acres [ac]) per well (BOEM, 2012a).

A.3 Air Pollutant Emissions

Estimates of air pollutant emissions are provided in DOCD Section 8. Offshore air pollutant emissions will result from operations of the lay vessel as well as service vessels and helicopters. These emissions occur mainly from combustion of diesel. Primary air pollutants typically associated with OCS activities are suspended particulate matter ($PM_{2.5}$ and PM_{10}), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), (Reşitoğlu et al., 2015) and ammonia (NH_3), and lead (Pb) (NTL 2020-G01).

The project area is located westward of 87.5° W longitude; thus, air quality is under BOEM jurisdiction, as explained in NTL 2009-N11. Anticipated emissions from the proposed project activities are calculated in the Air Quality Emissions Report (AQR) (see DOCD Section 8) prepared in accordance with BOEM requirements provided in 30 CFR Part 550 Subpart C. The AQR shows that the projected emissions associated with the proposed activities meet BOEM's exemption criteria and it can be concluded that the emissions will not significantly affect the air quality of the onshore area for any of the criteria pollutants.

A.4 Effluent Discharges

Effluent discharges from the proposed operations are summarized in DOCD Section 7. Discharges from the lay vessel are expected to comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for Oil and Gas Activities (Permit No. GMG290000). Support vessel discharges are expected to be in accordance with USCG regulations.

Other effluent discharges from the lay vessel and support vessels are expected to include treated sanitary and domestic wastes, deck drainage, desalination unit discharge, ballast water, bilge water, fire water, and non-contact cooling water. All discharges are expected to comply with the NPDES General Permit and/or USCG regulations, as applicable.

A.5 Water Intake

Seawater will be drawn from the ocean for once-through, non-contact cooling of machinery on the drilling rig. Section 316(b) of the Clean Water Act requires NPDES permits to ensure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available to minimize adverse environmental impact from impingement and entrainment of aquatic organisms. The General NPDES Permit specifies design requirements for facilities for which construction commenced after 17 July 2006 with a cooling water intake structure having a design intake capacity of greater than two million gallons of water per day, of which at least 25% is used for cooling purposes. It is expected that the drilling rig ultimately selected for this project will be in compliance with all applicable cooling water intake structure design requirements, monitoring, and limitations. Where applicable, the drilling rig operator takes responsibility for obtaining necessary NPDES permit coverage for its cooling water intake structure and associated permit compliance.

A.6 Onshore Waste Disposal

A list of the solid and liquid wastes generated during this project to be disposed of onshore are tabulated in DOCD Appendix C. Typical waste streams requiring onshore disposal from a project of this nature include the following:

- Well-related hazardous waste;
- Rig maintenance wastes (hazardous and non-hazardous);
- Used rig oil (e.g., lube oil, hydraulic oil, glycol);
- Domestic (e.g., municipal trash) and universal wastes (e.g., batteries, florescent light bulbs);
- Nonhazardous domestic recyclables (e.g., plastic, paper, aluminum);
- Scrap metal;
- Oily water;
- Radioactive waste; and

- Miscellaneous unused chemicals.

These waste streams are expected to be segregated on the lay vessel and transported to shore for disposal in an appropriately permitted facility. All other wastes generated by bp and its contractors are managed by their respective waste management procedures. Compliance with established practices and procedures is expected to result in either no or negligible impacts from this factor.

A.7 Marine Debris

bp and its contractors intend to comply with all applicable regulations relating to solid waste handling, transportation, and disposal, including the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex V requirements, the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 1972, and USEPA, USCG, BSEE, and BOEM regulations. These regulations include prohibitions and compliance requirements regarding the deliberate discharging of containers and other similar materials (i.e., trash and debris) into the marine environment as well as the protective measures to be implemented to prevent the accidental loss of solid material into the marine environment. For example, BSEE regulations 30 CFR 250.300(a) and (b)(6) prohibit operators from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment, and 30 CFR 250.300(c) requires durable identification markings on equipment, tools, containers (especially drums), and other material. The USEPA and USCG regulations require operators to be proactive in avoiding accidental loss of solid materials by developing waste management plans, posting informational placards, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Additionally, the debris awareness training, instruction, and placards required by the Protected Species Lease Stipulation should minimize the amount of debris that is accidentally lost overboard by offshore personnel (NMFS [2020] Appendix B). bp is expecting to comply with NTL BSEE-2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of informational placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process. Compliance with these requirements is expected to result in minimal and only accidental loss of solid waste. Consequently, there will be either no or negligible impacts from this factor.

A.8 Support Vessel and Helicopter Traffic

A.8.1 Physical Presence

IPFs associated with support vessel and helicopter traffic include their physical presence and operational sound. Each factor is discussed below.

bp will use existing shorebase facilities at Port Fourchon, Louisiana, for support vessel activities. Support helicopters are expected to be based at heliport facilities in Houma, Louisiana. No terminal expansion or construction is planned at either location.

NMFS (2020a) has found that support vessel traffic has the potential to disturb protected species (e.g., marine mammals, sea turtles, fishes) and creates a risk of vessel collisions. The probability of a vessel collision depends on the number, size, and speed of vessels as well as the distribution, abundance, and behavior of the species (Laist et al., 2001; Jensen and Silber, 2004;

Hazel et al., 2007; Vanderlaan and Taggart, 2007; Conn and Silber, 2013; NMFS, 2020a). To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. Supply vessels will normally move to the project area via the most direct route from the shorebase.

A helicopter will make approximately 2 round trips per week between the lay vessel and the heliport. The helicopter will be used to transport personnel and small supplies and will normally take the most direct route of travel between the shorebase and the project area when air traffic and weather conditions permit. Offshore support helicopters typically maintain a minimum altitude of 700 ft (213 m) while in transit offshore, 1,000 ft (305 m) over unpopulated areas or across coastlines, and 2,000 ft (610 m) over populated areas and sensitive habitats such as wildlife refuges and park properties. Additional guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (NMFS, 2020a).

Table 3 summarizes the estimated fuel capacity and trip frequency of the support vessels and aircraft.

Table 3. Support vessel and aircraft fuel capacity and trip frequency or duration in Mississippi Canyon Block 520 during the proposed project.

Vessel/Aircraft Type	Maximum Fuel Tank Storage Capacity	Trip Frequency or Duration
Helicopter	760 gal	2 flights per week
Supply Boats	5,000 bbl	2 trips per week

A.8.2 Noise

Vessel noise is one of the main contributors to overall noise in the sea (National Research Council, 2003b; Jasny et al., 2005). Offshore supply and service vessels associated with the proposed project will contribute to the overall acoustic environment by transmitting noise through both air and water. The support vessels will use conventional diesel-powered screw propulsion. Vessel noise is a combination of narrow-band (tonal) and broadband sound (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012). The vessel tonal noise typically dominates frequencies up to approximately 50 Hz, whereas broadband sounds may extend to 100 kHz. The primary sources of vessel noise are propeller cavitation, propeller singing (high-pitched, clear harmonic tone), and propulsion; other sources include auxiliary engine noise, flow noise from water dragging along the hull, and bubbles breaking in the vessel's wake while moving through the water (Richardson et al., 1995). The intensity of noise from service vessels is approximately related to ship size, weight, and speed. Large ships tend to be noisier than small ones, and ships underway with a full load (or towing or pushing a load) produce more noise than unladed vessels. For any given vessel, relative noise tends to increase with increased speed, and propeller cavitation is usually the dominant underwater noise source. Broadband source levels for most small ships (a category that includes support vessels) are anticipated to be in the range of 150 to 180 dB re 1 µPa m (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012).

Helicopters used for offshore oil and gas operational support are potential sources of noise to the marine environment. Helicopter noise is generated from their jet turbine engines, airframe, and rotors. The dominant tones for helicopters are generally below 500 Hz (Richardson et al., 1995). Richardson et al. (1995) reported received SPLs in water of 109 dB re 1 µPa from a Bell 212 helicopter flying at an altitude of 500 ft (152 m). Penetration of helicopter noise below the sea surface is greatest directly below the aircraft; at angles greater than 13 degrees from vertical, much of the sound is reflected from the sea surface and so does not penetrate into the water (Richardson et al., 1995). The duration of underwater sound from passing aircraft is much shorter in water than air. For example, a helicopter passing at an altitude of 500 ft (152 m) that is audible in air for 4 minutes may be detectable under water for only 38 seconds at 10 ft (3 m) depth and for 11 seconds at 59 ft (18 m) depth (Richardson et al., 1995). Additionally, the sound amplitude is greatest as the aircraft approaches or leaves a location.

Offshore support vessels associated with the proposed project will contribute to the overall acoustic environment by transmitting sound through both air and water. The support vessels will use conventional diesel-powered screw propulsion. Vessel sound is a combination of narrow band (tonal) and broadband sound (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012). Tones typically dominate up to approximately 50 Hz, whereas broadband sounds may extend to 100 kHz. The primary sources of vessel sound are propeller cavitation, propeller singing, and propulsion; other sources include engine sound, flow sound from water dragging along the hull, and bubbles breaking in the vessel's wake (Richardson et al., 1995). The intensity of sound from support vessels is roughly related to ship size, weight, and speed. Broadband source levels for smaller boats (a category that include supply and other service vessels) are in the range of 150 to 180 dB re 1 µPa m (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012).

Penetration of aircraft sound below the sea surface is greatest directly below the aircraft. Aircraft sound produced at angles greater than 13 degrees from vertical is mostly reflected from the sea surface and does not propagate into the water (Richardson et al., 1995). The duration of underwater sound from passing aircraft is much shorter in water than air; for example, a helicopter passing at an altitude of 500 ft (152 m) that is audible in air for 4 minutes may be detectable under water for only 38 seconds at 10 ft (3 m) depth and for 11 seconds at 59 ft (18 m) depth (Richardson et al., 1995).

Dominant tones for helicopters are generally below 500 Hz with source levels of approximately 149 to 151 dB re 1 µPa m (for a Bell 212 helicopter) (Richardson et al., 1995). However, underwater sound levels received from passing aircraft depend on the aircraft's altitude, the aspect (direction and angle) of the aircraft relative to the receiver, receiver depth, water depth, and seafloor type (Richardson et al., 1995). The received level diminishes with increasing receiver depth when an aircraft is directly overhead, but may be stronger at mid-water than at shallow depths when an aircraft is not directly overhead (Richardson et al., 1995). Because of the relatively high expected airspeeds during transits and these physical variables, aircraft-related sound (including both airborne and underwater sound) is expected to be very brief in duration.

A.9 Accidents

The analysis in the EIA focuses on two types of potential accidents:

- a small fuel spill, which is the most likely type of spill during OCS exploration activities; and
- a large oil spill, up to and including the WCD for this DOCD.

The following subsections summarize assumptions about the sizes and fates of these spills as well as bp's spill response plans. Impacts are analyzed in **Section C**.

Recent EISs (BOEM, 2012a;b; 2013; 2014; 2015; 2016b; 2017a) analyzed three types of accidents relevant to drilling operations that could lead to potential impacts to the marine environment: loss of well control, vessel collision, and chemical and drilling fluid spills. These types of accidents, along with a H_2S release, are discussed briefly below.

Loss of Well Control. A loss of well control is the uncontrolled flow of a reservoir fluid that may result in the release of gas, condensate, oil, drilling fluids, sand, or water. A loss of well control is not considered to be a risk during the proposed activities which are limited to subsea installations and are therefore not discussed further.

Pipeline Failures. Pipeline failures can result from mass sediment movements and mudslides, impacts from anchor drops, and accidental excavation in the case that the exact location of a pipeline is uncertain (BOEM, 2012a, 2013, 2015). The project area has been evaluated through geologic and geohazard surveys and found to be geologically suitable for the proposed activities (Fugro, 2019).

Dropped Objects. Objects dropped overboard the DP lay vessel could potentially pose a risk to existing live subsea pipelines or other infrastructure. If a dropped pipe or other subsea equipment landed on existing seafloor infrastructure, loss of integrity of seafloor pipelines, umbilicals, etc. could result in a spill. Dropped objects could also result in seafloor disturbance and potential impacts to benthic communities. bp and its contractors intend to comply with all BOEM and BSEE safety requirement to minimize the potential for objects dropped overboard.

Vessel Collisions. BSEE data show that there were 171 OCS-related collisions between 2007 and 2018 (BSEE, 2018). Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. Approximately 10% of vessel collisions with platforms in the OCS resulted in diesel spills, and in several collision incidents, fires resulted from hydrocarbon releases. To date, the largest diesel spill associated with a collision occurred in 1979 when an anchor-handling boat collided with a drilling platform in the Main Pass project area, spilling 1,500 bbl. Diesel fuel is the product most frequently spilled, but oil, natural gas, corrosion inhibitor, hydraulic fluid, and lube oil have also been released as the result of vessel collisions. Human error accounted for approximately half of all reported vessel collisions from 2006 to 2009. As summarized by BOEM (2017c), vessel collisions occasionally occur during routine operations. Some of these collisions have caused spills of diesel fuel or chemicals. bp intends to comply with all USCG- and BOEM-mandated safety requirements to minimize the potential for vessel collisions.

Chemical Spills. Chemicals are stored and used for pipeline hydrostatic testing, and during drilling and in well completion operations. The relative quantities of their use is reflected in the largest volumes spilled (BOEM, 2017c). Completion, workover, and treatment fluids are the largest quantity used and comprise the largest releases. Any potential leak due to pressure testing failure will be limited to a single line leak and would be limited to less than 1bbl. Potentially spilled fluids include Transaqua HT, MEG 50/50, or methanol. Between 2007 and 2014, an average of two chemical spills <50 bbl in volume and three chemical spills >50 bbl in volume occurred each year (BOEM, 2017a).

Drilling Fluid Spills. There is the potential for drilling fluids, specifically SBMs, to be spilled due to an accidental riser disconnect (BOEM, 2017a). SBMs are relatively nontoxic to the marine environment and have the potential to biodegrade (BOEM, 2014). The majority of SBM releases are <50 bbl in size, but accidental riser disconnects may result in the release of medium (238 to 2,380 bbl) to large (>2,381 bbl) quantities of drilling fluids. In the event of an SBM spill, there could be short-term localized impacts on water quality and the potential for localized benthic impacts due to SBM deposition on the seafloor. Benthic impacts would be similar to those described in Section C.2.1. The potential for riser disconnect SBM spills will be minimized by adhering to the requirements of applicable regulations.

H_2S Release. MC 520 is classified as H_2S "absent". All marine fuels that bp expects to use in the proposed activities are H_2S-free. Based on the H_2S absent classification, no further discussion on H_2S impacts is warranted.

A.9.1 Small Fuel Spill

Spill Size. According to the analysis by BOEM (2017a), the most likely type of small spill (<1,000 bbl) resulting from OCS activities is a failure related to the storage of oil or diesel fuel. Historically, most diesel spills have been ≤1 bbl, and this is predicted to be the most common spill volume in ongoing and future OCS activities in the Western and Central Gulf of Mexico Planning Areas (Anderson et al., 2012). As the spill volume increases, the incident rate declines dramatically (BOEM, 2017a). The median size for spills ≤1 bbl is 0.024 bbl, and the median volume for spills of 1 to 10 bbl is 3 bbl (Anderson et al., 2012). For the EIA, a small diesel fuel spill of 3 bbl is used. Operational experience suggests that the most likely cause of such a spill would be a rupture of the fuel transfer hose resulting in a loss of contents (<3 bbl of fuel) (BOEM, 2012a).

Spill Fate. The fate of a small fuel spill in the project area would depend on meteorological and oceanographic conditions at the time of the spill as well as the effectiveness of spill response activities. However, given the open ocean location of the project area and the short duration of a small spill, it is expected that the opportunity for impacts to occur would be very brief.

The water-soluble fractions of diesel are dominated by two- and three-ringed polycyclic aromatic hydrocarbons (PAHs), which are moderately volatile (National Research Council, 2003a). The constituents of these oils are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. Diesel density is such that it will not sink to the seafloor unless it is dispersed in the water column and adheres to suspended sediments, but this generally occurs only in coastal areas with high-suspended solids loads (National Research Council, 2003a). Adherence to suspended sediments is not expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico. Diesel oil is readily and completely degraded by naturally occurring microbes (NOAA, 2019). Sheens from small fuel spills are expected to persist for relatively short periods of time, ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl), and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a).

The fate of a small diesel fuel spill was estimated using NOAA's Automated Data Inquiry for Oil Spills (ADIOS) 2 model (NOAA, 2016a). This model uses the physical properties of oils in its database to predict the rate of evaporation and dispersion over time as well as changes in the density, viscosity, and water content of the product spilled. It is estimated that more than 90% of a small diesel spill would evaporate or naturally disperse within 24 hours. Based on the results of the ADIOS 2 model, the area of diesel fuel on the sea surface would range from 1.2 to 12 acres (ac) (0.5 to 5 hectares [ha]), depending on sea state and weather conditions.

The ADIOS2 results, coupled with spill trajectory information discussed below for a large spill, indicate that a small fuel spill would not impact coastal or shoreline resources. The project area is 68 miles (109 km) from the nearest shoreline (Louisiana). Slicks from fuel spills are expected to persist for relatively short periods of time ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl) and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a). Because of the distance from shore of these potential spills and their lack of persistence, it is unlikely that a small diesel spill would make landfall prior to dissipation (BOEM, 2012a).

Spill Response. In the unlikely event the shipboard procedures fail to prevent a fuel spill, response equipment and trained personnel would be activated so that any spill effects would be localized and would result only in short-term environmental consequences.

Weathering. Following a diesel fuel spill, several physical, chemical, and biological processes, collectively called weathering, interact to change the physical and chemical properties of the diesel, and thereby influence its harmful effects on marine organisms and ecosystems. The most important weathering processes include spreading, evaporation, dissolution, dispersion into the water column, formation of water-in-oil emulsions, photochemical oxidation, microbial degradation, adsorption to suspended particulate matter, and stranding on shore or sedimentation to the seafloor (National Research Council, 2003a, International Tanker Owners Pollution Federation Limited, 2018).

Weathering decreases the concentration of diesel fuel and produces changes in its chemical composition, physical properties, and toxicity. The more toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and dissolution from the slick on the water surface. Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of diesel fuel on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics. Other petroleum components are biodegraded more slowly (National Research Council, 2003a). Diesel fuel spill response-related activities for facilities included in this DOCD are governed by bp's Regional OSRP, which meets the requirements contained in 30 CFR 254.

A.9.2 Large Oil Spill (Worst Case Discharge)

Spill Size. No drilling will occur under the DOCD. bp has determined the worst-case discharge for the proposed activities is a discharge of approximately 150 to 200 bbl per day of crude oil from the H-8 well. This volume is indicative of peak production for the well.

Spill Probability. Statistics from offshore drilling in the U.S. Gulf of Mexico provide a reasonable basis for evaluating oil spill risk during exploratory drilling. Historically, blowouts are rare events and most do not result in oil spills. A 2010 analysis using the SINTEF[1] database estimates a blowout frequency of 0.0017 per exploratory well for non-North Sea locations (International Association of Oil & Gas Producers, 2010). BOEM has updated spill frequencies to include the *Deepwater Horizon* incident and found that spill rates (bbl spilled per bbl produced) for OCS platform spills were unchanged for spills >1,000 bbl when compared with previously published data (Anderson et al., 2012).

bp is expected to comply with NTL 2010-N10 and the drilling safety regulations in 30 CFR Part 250, Subparts D and G, which specify additional safety measures for OCS activities.

Spill Trajectory. The fate of a large oil spill in the project area would depend on meteorological and oceanographic conditions at the time. The Oil Spill Risk Analysis (OSRA) model is a computer simulation of oil spill transport that uses realistic data for winds and currents to predict spill fate. The OSRA report by Ji et al. (2004) provides conditional contact probabilities for shoreline segments in the Gulf of Mexico for a large spill.

The results for Launch Area 57 (where MC 520 is located) are presented in **Table 4**. The model predicts a 4% chance of shoreline contact within three days of a spill (Plaquemines Parish, Louisiana), and a 1% to 14% chance of shoreline contact within 10 days of a spill (Terrebonne, Lafourche, St. Bernard, and Plaquemines Parishes). Shoreline contact is predicted within 30 days for shorelines ranging from Cameron Parish, Louisiana, to Bay County, Florida. The conditional probability of shoreline contact is low (1% to 3%) for most shorelines with predicted contact within 30 days. However, the conditional probability of shoreline contact to Plaquemines Parish, Louisiana, is 21% within 30 days.

Table 4. Conditional probabilities of a spill in Mississippi Canyon Block 520 (MC 520) contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004). Values are conditional probabilities that a hypothetical spill in MC 520 (represented by OSRA Launch Area 57) could contact shoreline segments within 3, 10, or 30 days.

Shoreline Segment	County or Parish, State	Conditional Probability of Contact[1] (%)		
		3 Days	10 Days	30 Days
C13	Cameron Parish, Louisiana	--	--	1
C14	Vermilion Parish, Louisiana	--	--	1
C17	Terrebonne Parish, Louisiana	--	1	2
C18	Lafourche Parish, Louisiana	--	1	2
C20	Plaquemines Parish, Louisiana	4	14	21
C21	St. Bernard Parish, Louisiana	--	1	3
C22	Hancock and Harrison Counties, Mississippi	--	--	1
C23	Jackson County, Mississippi	--	--	1
C24	Mobile County, Alabama	--	--	1
C25	Baldwin County, Alabama	--	--	1
C26	Escambia County, Florida	--	--	1
C28	Okaloosa County, Florida	--	--	1
C29	Walton County, Florida	--	--	1

[1] Stiftelsen for industriell og teknisk forskning (Foundation for Scientific and Industrial Research, Norwegian Institute of Technology).

C30	Bay County, Florida	--	--	1

[1] Conditional probability refers to the probability of contact within the stated time period, assuming that a spill has occurred (-- indicates <0.5%). Values are conditional probabilities that a hypothetical spill in the project area (represented by OSRA Launch Area 57) could contact shoreline segments within 3, 10, or 30 days.

The original OSRA modeling runs reported by Ji et al. (2004) did not evaluate the fate of a spill over time periods exceeding 30 days, nor did they estimate the fate of a release that continues over a period of weeks or months. As noted by Ji et al. (2004), the OSRA model does not consider the chemical composition or biological weathering of oil spills, the spreading and splitting of oil spills, or spill response activities. The model does not specify a particular spill size but has been used by BOEM to evaluate contact probabilities for spills greater than 1,000 bbl.

BOEM presented additional OSRA modeling to simulate a spill that continues for 90 consecutive days, with e ach trajectory tracked for 60 days during four seasons. In this updated OSRA model (herein referred to as the 60-day OSRA model), 60 days was chosen as a conservative estimate of the maximum duration that spilled oil would persist on the sea surface following a spill (BOEM, 2017b). The spatial resolution is limited, with five launch points in the entire Western and Central Planning Areas of the Gulf of Mexico. These launch points were deliberately located in areas identified as having a high possibility of containing large oil reserves. The 60-day OSRA model launch point most appropriate for modeling a spill in the project area is Launch Point 2. The 60-day OSRA results for Launch Point 2 are presented in **Table 5**.

Table 5. Shoreline segments with a 1% or greater conditional probability of contact from a spill starting at Launch Point 2 based on the 60-day Oil Spill Risk Analysis (OSRA). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days. Modified from: BOEM (2017a).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Matagorda, Texas	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Vermilion, Louisiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Terrebonne, Louisiana	--	--	--	--	--	--	--	1	--	--	--	--	--	--	2	2
Lafourche, Louisiana	--	--	--	--	--	--	--	--	--	--	1	1	--	--	--	1
Jefferson, Louisiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1
Plaquemines, Louisiana	--	2	3	3	2	9	17	19	2	17	24	24	1	12	18	20
St. Bernard, Louisiana	--	5	6	6	1	8	13	14	1	8	10	10	1	5	8	8
Hancock, Mississippi	--	2	3	3	--	2	2	2	1	2	3	3	--	1	2	3
Harrison, Mississippi	2	5	5	5	1	4	5	5	1	2	3	3	2	3	4	4
Jackson, Mississippi	7	13	14	14	3	6	8	8	6	11	12	13	6	10	12	13
Mobile, Alabama	13	18	19	19	4	9	10	10	8	12	12	13	9	12	13	13
Baldwin, Alabama	8	15	18	18	2	8	9	9	1	2	3	3	3	6	7	7
Escambia, Florida	1	6	9	10	1	4	6	6	--	1	1	1	--	2	2	3
Okaloosa, Florida	--	1	2	2	--	1	2	2	--	--	--	--	--	--	--	--
Walton, Florida	--	--	1	1	--	1	1	1	--	--	--	1	--	--	--	--
Bay, Florida	--	2	3	3	--	1	2	3	--	--	--	--	--	--	--	1
Gulf, Florida	--	1	3	4	--	--	2	2	--	--	--	--	--	--	--	--
Franklin, Florida	--	--	1	2	--	--	1	1	--	--	--	--	--	--	--	--
Dixie, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--

Table 5. (Continued).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Levy, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
State Coastline	Conditional Probability of Contact[1] (%)															
Texas	--	--	--	--	--	--	--	1	--	--	1	2	--	--	--	2
Louisiana	--	6	8	9	3	17	30	35	3	25	36	36	2	18	29	33
Mississippi	9	20	22	22	5	12	15	15	8	15	18	19	8	15	18	20
Alabama	21	33	37	37	6	17	20	20	9	14	15	15	12	18	20	20
Florida	1	11	19	26	1	7	14	16	--	1	3	3	--	2	4	5

[1] Conditional probability refers to the probability of contact within the stated time period assuming that a spill has occurred (-- indicates <0.5%). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days.

From Launch Point 2, potential shorelines with a 1% or greater conditional probability of contact within 60 days range from Matagorda County, Texas (winter season), to Levy County, Florida (spring season). Based on statewide contact probabilities within 60 days, Louisiana has the highest likelihood of contact during summer, fall and winter (ranging from 33% to 36% conditional probability), while Alabama has the highest probability of contact in spring (37% conditional probability). The model predicts potential contact with Mississippi shorelines in any season ranging from a 15% conditional probability in summer to a 22% conditional probability in spring (within 60 days of a spill). Texas shorelines are predicted to be potentially contacted only during summer, fall, or winter, with conditional probabilities of contact 2% or less within 60 days. Florida shorelines are predicted to be potentially contacted during any season, with a probability up to 26% in spring. Based on the 60-day trajectories, counties or parishes with 10% or greater contact probability during any season include Plaquemines and St. Bernard Parishes in Louisiana; Jackson County in Mississippi; Mobile and Baldwin counties in Alabama; and Escambia County, Florida (**Table 5**).

OSRA is a preliminary risk assessment model. In the event of an actual oil spill, real-time monitoring and trajectory modeling would be conducted using current and wind data available from the rigs and permanent production structures in the area. Satellite and aerial monitoring of the plume and real-time trajectory modeling using wind and current data would continue on a daily basis to help position equipment and human resources throughout the duration of any major spill or uncontrolled release.

<u>Weathering</u>. Following an oil spill, several physical, chemical, and biological processes, collectively called weathering, interact to change the properties of the oil, and thereby influence its potential effects on marine organisms and ecosystems. The most important weathering processes include spreading, evaporation, dissolution, dispersion into the water column, formation of water-in-oil emulsions, photochemical oxidation, microbial degradation, adsorption to suspended PM, and stranding on shore or sedimentation to the seafloor (National Research Council, 2003a, International Tanker Owners Pollution Federation Limited, 2018).

Weathering decreases the concentration of oil and produces changes in its chemical composition, physical properties, and toxicity (BOEM, 2017a). The more toxic, light aromatic and aliphatic hydrocarbons in the oil are lost rapidly by evaporation and dissolution on the water surface. Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of oil on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics from the oil. Other petroleum components are biodegraded more slowly. Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface.

Spill Response. All proposed activities and facilities in this DOCD will be covered by the Gulf of Mexico Regional OSRP filed by BP America Inc. (Operator No. 21372) under cover letter dated October 8, 2021 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on October 22, 2021.

bp's OSRP includes information about enhanced measures for responding to a spill in open water, near shore spill response, and shoreline spill response based on lessons learned from the *Deepwater Horizon* oil spill. In compliance with the requirements of 30 CFR 254 and related NTLs, bp's OSRP includes the following:

- Provisions to maintain access to a supply of dispersant and booms for use in the event of an uncontrolled, long-term blowout, for the length of time required to drill a relief well;
- Contingencies for maintaining an ongoing response for the length of time required to drill a relief well;
- A description of the measures and equipment necessary to maximize the effectiveness and efficiency of the response equipment used to recover the discharge on the water's surface. The description will include methods to increase encounter rates, the use of vessel tracking, and the use of remote sensing technologies;
- Information on remote sensing technology and equipment to be used to track oil slicks, including oil spill detection systems and remote thickness detection systems (such as X-band/infrared systems);
- Information pertaining to the use of vessel tracking systems and communication systems between response vessels and spotter personnel;
- A shoreline protection strategy that is consistent with applicable area contingency plans; and
- For operations using a subsea blowout preventer or a surface blowout preventer on a floating facility, a discussion regarding strategies and plans related to source abatement and control for blowouts from drilling.

bp is a member of the Marine Spill Response Corporation and Clean Gulf Associates. bp would utilize oil spill response organization personnel and equipment in the event of an oil spill in the Gulf of Mexico. Primary response equipment for the activation of bp's OSRP is located in Houma, Louisiana; Lake Charles, Louisiana; Galveston, Texas; Mobile, Alabama; Pascagoula, Mississippi; and Venice, Louisiana. The preplanned staging area for this DOCD is Port Fourchon, Louisiana.

B. Affected Environment

MC 520 is located within the Central Gulf of Mexico OCS Planning Area, approximately 68 miles (109 km) from the nearest shoreline (Plaquemines Parish, Louisiana), 128 miles (209 km) from the regional onshore support base (Port Fourchon, Louisiana), and 169 miles (272 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The estimated water depth at the proposed project location is 6,693 ft (2,040 m) (**Figure 2**).

No seafloor anomalies were identified within a 2,000 ft (610 m) corridor around the proposed seafloor infrastructure (Fugro, 2019). The shallow hazards assessment identified two sonar contacts within MC 520; however, these were interpreted as modern debris associated with prior lease development or fishing activities and were not interpreted to be archaeologically significant (Fugro, 2019).

The seafloor in the project area is hummocky resulting from the surface expression of buried rafted blocks within a mass transport deposit. Drill cuttings and drilling mud splays are present radiating from the well, and drag scars were evident. Seabed sediments were interpreted to be mainly soft clays (Fugro, 2019).

A detailed description of the regionally affected environment is provided by BOEM (2016b, 2017a), including meteorology, oceanography, geology, air and water quality, benthic communities, Threatened and Endangered species, biologically sensitive resources, archaeological resources, socioeconomic conditions, and other marine uses. These regional descriptions are based on extensive literature reviews and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource are presented in **Section C**, including site-specific or new information if available.

The local environment in the project area is not known to be unique with respect to the physical/chemical, biological, or socioeconomic conditions found in this region of the Gulf of Mexico. The baseline environmental conditions in the project area are expected to be consistent with the regional description of the locations evaluated by BOEM (2016b, 2017a).

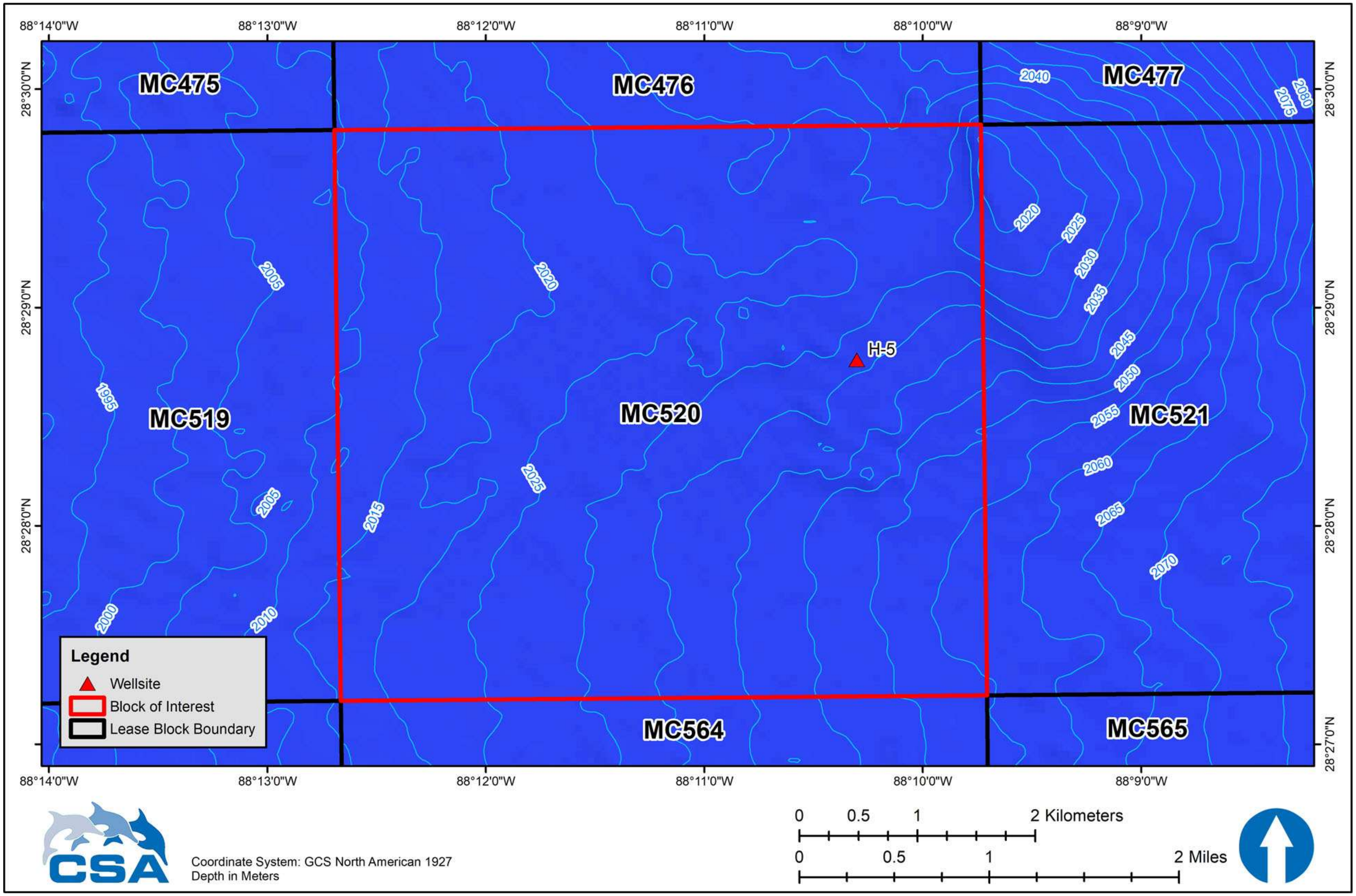

Figure 2. Bathymetric map of the project area showing the surface hole location of the wellsite in Mississippi Canyon Block 520 where installation activities will occur.

C. Impact Analysis

This section analyzes the potential direct and indirect environmental impacts of routine activities and accidents; cumulative impacts are discussed in **Section C.9**.

Environmental impacts have been analyzed extensively in lease sale EISs for the Central and Western Gulf of Mexico Planning Areas (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a). Site-specific issues are addressed in this section as appropriate and are organized by the environmental resources identified in **Table 2** that addresses each potential IPF.

C.1 Physical/Chemical Environment

C.1.1 Air Quality

Due to the distance from shore-based pollution sources, offshore air quality is expected to be good. The attainment status of federal OCS waters is unclassified because there is no provision in the Clean Air Act for classification of areas outside state waters (BOEM, 2012a).

In general, ambient air quality on coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012a). As of February 2021, Mississippi, Alabama, and Florida Panhandle coastal counties are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2021). St. Bernard Parish in Louisiana and Hillsborough County in Florida are nonattainment areas for sulfur dioxide based on the 2010 standard. One coastal metropolitan area in Texas (Houston-Galveston-Brazoria) is a nonattainment area for 8-hour ozone (2015 Standard). One coastal metropolitan area in Florida (Tampa) was reclassified in 2018 from a nonattainment area to maintenance status for lead based on the 2008 Standard (USEPA, 2021).

Winds in the region are driven by the clockwise circulation around the Bermuda High (BOEM, 2017a). The Gulf of Mexico is located to the southwest of this center of circulation, resulting in a prevailing southeasterly to southerly flow, which is conducive to transporting emissions toward shore. However, circulation is also affected by tropical cyclones (hurricanes) during summer and fall and by extratropical cyclones (cold fronts) during winter.

As noted earlier, based on calculations made pursuant to applicable regulations, emissions from installation activities are not expected to be significant. Therefore, the only potential effects to air quality would be from air pollutant emissions associated with routine operations and accidental spills (a small fuel spill or a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Air Pollutant Emissions

Air pollutant emissions are the only routine IPF anticipated to affect air quality. Offshore air pollutant emissions will result from the operation of the lay vessel and associated equipment as well as helicopters and supply vessels as described in **Section A.3**. These emissions occur mainly from combustion or burning of diesel and Jet-A aircraft fuel. Primary air pollutants typically associated with OCS activities are suspended PM, SO_x, NO_x, VOCs, CO, NH_3, and Pb. As noted by BOEM (2017b), emissions from routine activities are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, anticipated emission rates, anticipated heights of emission sources, and the distance to shore of the proposed activities. However, support vessel and helicopter traffic entering or departing coastal facilities will release air pollutants in these areas during the project period. The incremental contribution to cumulative impacts from activities similar to bp's proposed activities is not significant and is not expected to cause or contribute to a violation of NAAQS. Given the levels of expected emissions and the distance of the project from shore, emissions from the activities described in bp's proposed DOCD are not likely to contribute to violations of any NAAQS onshore.

Greenhouse gas emissions may contribute to climate change, with important effects on temperature, rainfall, frequency of severe weather, ocean acidification, and sea level rise (Intergovernmental Panel on Climate Change, 2014). Greenhouse gas emissions from this proposed project represent a negligible contribution to the total greenhouse gas emissions from reasonably foreseeable activities in the Gulf of Mexico area and are not expected to significantly alter or exceed any of the climate change impacts evaluated in the Programmatic EIS (BOEM, 2016a). Carbon dioxide (CO_2) and methane (CH_4) emissions from the project would constitute a small incremental contribution to greenhouse gas emissions from all OCS activities. According to Programmatic and OCS lease sale EISs (BOEM, 2016a; 2017a), estimated CO_2 emissions from OCS oil and gas sources are 0.4% of the U.S. total. Because of the distance from shore, routine operations in the project area are not expected to have any impact on air quality conditions along the coast, including nonattainment areas.

The Breton Wilderness Area, which is part of the Breton National Wildlife Refuge (NWR), is designated under the Clean Air Act as a Prevention of Significant Deterioration (PSD) Class I air quality area. BOEM is required to notify the U.S. Fish and Wildlife Service (USFWS) if emissions from proposed projects may affect the Breton Class I area. The project area is approximately 88 miles [2] (142 km) from the Breton Wilderness Area. bp and its contractors intend to comply with all BOEM requirements regarding air emissions.

There are three Class I air quality areas on the west coast of Florida: St Mark's Wildlife Refuge in Wakulla County, Florida, Chassahowitzka Wilderness Area in Hernando County, Florida, and Everglades National Park in Monroe, Miami-Dade, and Collier counties, Florida. The project area is approximately 263 miles (423 km) from the closest Florida Class I air quality area (Saint Mark's Wildlife Refuge Class I Air Quality Area). bp intends to comply with emissions requirements as directed by BOEM. No further analysis or control measures are required.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on air quality are expected to be consistent with those analyzed and discussed by BOEM (2012a, 2015, 2016b, 2017a). **Section A.9.1** discusses the size and fate of a potential small diesel fuel spill as a result of bp's proposed activities. Given the open ocean location of the project area, the extent and duration of air quality impacts at the project area from a small spill would not be significant.

A small fuel spill would likely affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The ADIOS 2 model (see **Section A.9.1**) indicates that more than 90% of a small diesel spill would evaporate or disperse within 24 hours. The area of diesel

[2] Distance calculated based on the nearest point of block MC 520 (Lat: 28° 29' 50.979" N Long: 88° 12' 41.810" W) to the Breton Wilderness Area. Coordinate geodesy: WGS 1984.

fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions. Given the open ocean location of the project area, the extent and duration of air quality impacts at the project area from a small spill would not be significant.

A small fuel spill would not affect coastal air quality because the spill would be expected to dissipate prior to making landfall or reaching coastal waters (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on air quality are expected to be consistent with those analyzed and discussed by BOEM (2012a, 2015, 2016b, 2017a).

A large oil spill would likely affect air quality by introducing VOCs into the atmosphere through evaporation from the oil on the water surface. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. Additional air quality impacts could occur if response measures approved by the Unified Command included *in situ* burning of the floating oil. If employed, *in situ* burning would generate a plume of black smoke offshore and result in emissions of NO_x, SO_x, CO, and PM as well as greenhouse gases. However, *in situ* burning would occur only after authorization from the USCG Federal On-Scene Coordinator. This approval would also be based upon consultation with the regional response team (RRT), including USEPA.

Because of the project area's location (68 miles [109 km]) from the nearest shoreline, most air quality impacts would occur in offshore waters with minimal chance to affect onshore air quality. However, depending on the spill trajectory and the effectiveness of spill response measures, coastal air quality could be affected if oil on the sea surface approaches or contacts the coast.

C.1.2 Water Quality

There are no site-specific baseline water quality data for the project area. Deepwater areas in the northern Gulf of Mexico are relatively similar with respect to patterns of water column temperature, salinity, and oxygen (BOEM, 2017a). Kennicutt (2000) noted that the deepwater region has little evidence of contaminants in the dissolved or particulate phases of the water column. Within the northern Gulf of Mexico, there are localized areas (termed natural seeps) that release natural seepage of oil, gas, and brines from sub-surface deposits into near surface sediments and up through the water column. No natural seeps were noted within a 2,000 ft (610 m) corridor of the proposed pipeline (Fugro, 2019).

The only IPFs that may affect water quality are effluent discharges associated with routine operations and two types of accidents (a small fuel spill and a large oil spill) as discussed below.

Impacts of Effluent Discharges

Discharges of treated SBM cuttings may produce temporary, localized increases in suspended solids in the water column around the drilling rig. In general, turbid water can be expected to extend between a few hundred meters and several kilometers down current from the discharge point for water-based drilling muds and cuttings (Neff, 1987). SBMs will be collected on the rig and either reused by the vendor or transported to Port Fourchon, Louisiana, for recycling and disposal at an approved facility. Cuttings wetted with SBMs and SBM discharges associated with weekly safety diverter valve testing on the MODU are expected to be treated to SBM levels at or below NPDES requirements and discharged overboard at the drillsite in accordance with all NPDES permit limitations and requirements. After discharge, SBMs retained on cuttings would be expected to adhere tightly to the cuttings particles and, consequently, would not produce substantial turbidity as the cuttings sink through the water column (Neff et al., 2000). No persistent impacts on water quality in the project area are expected.

Water-based drilling muds and cuttings will be released at the seafloor during the initial well intervals before the marine riser, which allows returns to the surface, is set. Excess cement slurry also will be released at the seafloor during casing installation for the riserless portion of the drilling operations. The seafloor discharges of WBM and associated drill cuttings will result in seafloor disturbances that will produce locally turbid conditions in the water column near the seafloor. The turbidity plume will be carried away from the well by near-bottom currents and, based on current speed(s), may be detectable within tens to hundreds of meters of the wellbore. As suspended WBM and resuspended sediments settle to the seafloor, the water clarity will return to background conditions within minutes to a few hours after drilling of these well intervals ceases (Neff, 1987). Discharges of WBM and cuttings are likely to have little or no impact on water quality due to the low toxicity and rapid dispersion of these discharges (National Research Council, 1983; Neff, 1987; Hinwood et al., 1994).

Treated sanitary and domestic wastes will be discharged by the lay vessel and support vessels and may have a transient effect on water quality in the immediate vicinity of these discharges. NPDES permit limits and USCG requirements (as applicable) are expected to be met, as applicable, and little or no impact on water quality is anticipated.

Deck drainage includes all effluents resulting from rain, deck washings, and runoff from curbs, gutters, and drains (including drip pans) in work areas. Rainwater that falls on uncontaminated areas will flow overboard without treatment. However, rainwater that falls on other areas such as chemical storage areas and places where equipment is exposed (such as drip or containment pans) will be collected, and oil and water will be separated to meet NPDES permit requirements. Based on expected adherence to permit limits and applicable regulations, little or no impact on water quality from deck drainage is anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine; uncontaminated cooling water, firewater, ballast water, bilge water, and other discharges of seawater and freshwater to which treatment chemicals have been added are expected to dilute rapidly and have little or no impact on offshore water quality.

Support vessels will discharge treated sanitary and domestic wastes. These are not expected to have a significant impact on water quality in the vicinity of the discharges. Support vessel discharges are expected be in accordance with USCG and MARPOL 73/78 regulations and, as applicable, the NPDES Vessel General Permit, and therefore are not expected to cause significant impacts on water quality.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a; 2015; 2016b; 2017a). In the EIA, the small spill scenario is proposed to occur in offshore waters at or near the lay vessel. The probability of a small spill would be minimized by the contractor's and bp's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of the contractor's and bp's OSRP is expected to potentially help mitigate and reduce the impacts.

The water-soluble fractions of diesel are dominated by two- and three-ringed PAHs, which are moderately volatile (National Research Council, 2003a). The constituents of these oils are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. Diesel oil is much lighter than water (specific gravity is between 0.83 and 0.88, compared to 1.03 for seawater). When spilled on water, diesel oil spreads very quickly to a thin film of rainbow and silver sheens, except for marine diesel, which may form a thicker film of dull or dark colors. However, because diesel oil has a very low viscosity, it is readily dispersed into the water column when winds reach 5 to 7 knots or with breaking waves (NOAA, 2019). It is possible for diesel oil that is dispersed by wave action to form droplets that are small enough to be kept in suspension and moved by the currents.

Diesel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high suspended solids loads (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico.

The extent and persistence of water quality impacts from a small diesel fuel spill would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. It is estimated that more than 90% of a small diesel spill would evaporate or disperse within 24 hours (see **Section A.9.1**). The sea surface area covered with a very thin layer of diesel fuel would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel oil are readily and completely degraded by naturally occurring microbes (NOAA, 2019). Given the open ocean location of the project area, the extent and duration of water quality impacts from a small spill would not be significant.

A small fuel spill would not affect coastal water quality because the spill would not be expected to make landfall or reach coastal waters due to response efforts that would be undertaken as well as natural degradation and dilution (**Section A.9.1**).

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a, 2015, 2016b, 2017a). A large spill would likely affect water quality by producing a slick on the water surface and increasing the concentrations of petroleum hydrocarbons and their degradation products.

Most of the spilled oil would be expected to form a slick at the surface, although information from the Deepwater Horizon incident indicates that submerged oil droplets can be produced when subsea dispersants are applied at the wellhead (Camilli et al., 2010; Hazen et al., 2010; NOAA, 2011a,b,c). Dispersants would be applied only after approval from the Federal On-Scene Coordinator with collaboration from the USEPA and Regional Response Team Region 6.

The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill as well as the effectiveness of the spill response measures. Most of the spilled oil would be expected to form a slick at the surface, although information from the *Deepwater Horizon* incident indicates that submerged oil droplets can be produced when subsea dispersants are applied at the wellhead (Camilli et al., 2010; Hazen et al., 2010; NOAA, 2011a; b; c). Dispersants would be applied only after approval from the Federal On-Scene Coordinator with collaboration from the USEPA and Regional Response Team Region 6.

Hazen et al. (2010) studied the impacts and fate of oil released in the deepwater environment after the 2010 *Deepwater Horizon* incident. Initial studies suggested that the potential exists for rapid intrinsic bioremediation (bacterial degradation) of subsea dispersed oil in the water column by deep-sea indigenous microbial activity without significant oxygen depletion (Hazen et al., 2010), although other studies showed that oil bioremediation caused oxygen drawdown in deep waters (Kessler et al., 2011; Dubinsky et al., 2013). Additional studies investigated the effects of deepwater dissolved hydrocarbon gases (e.g., methane, propane, and ethane) and the microbial response to a deepwater oil spill. Results suggest deepwater dissolved hydrocarbon gases may promote rapid hydrocarbon respiration by low-diversity bacterial blooms, thus priming indigenous bacterial populations for rapid hydrocarbon degradation of subsea oil (Kessler et al., 2011; Du and Kessler, 2012; Valentine et al., 2014). A 2017 study identified water temperature, taxonomic composition of initial bacterial community, and dissolved nutrient levels as factors that may regulate oil degradation rates by deep-sea indigenous microbes (Liu et al., 2017).

Once oil enters the ocean, a variety of physical, chemical, and biological processes take place that degrade and disperse the oil. These processes include spreading, evaporation of the more volatile constituents, dissolution into the water column, emulsification of small droplets, agglomeration sinking, microbial modification, photochemical modification, and biological ingestion and excretion (National Research Council, 2003a). Marine water quality would be temporarily affected by the dissolved components and small oil droplets that do not rise to the surface or are mixed down by surface turbulence. Liu et al. (2017) observed that after the *Deepwater Horizon* incident, hydrocarbon levels were reduced in the surface waters from May 2010 to August 2010 by either rapid weathering and/or physical dilution. A combination of dispersion by currents that dilutes the constituents and microbial degradation which removes the oil from the water column reduces concentrations to background levels. Most crude oil blends will emulsify quickly when spilled, creating a stable mousse that presents a more persistent cleanup and removal challenge (NOAA, 2017).

A large oil spill could result in a release of gaseous hydrocarbons that could affect water quality. During the *Deepwater Horizon* incident, large volumes of CH_4 were released, causing localized oxygen depletion as methanotrophic bacteria rapidly metabolized the hydrocarbons (Joye et al., 2011, Kessler et al., 2011). However, a broader study of the deepwater Gulf of Mexico found that although some stations showed slight depression of dissolved oxygen concentrations relative to climatological background values, the findings were not indicative of hypoxia (<2.0 mg L^{-1}) (Operational Science Advisory Team, 2010). Stations revisited around the Macondo wellhead in October 2010, approximately 6 months after the beginning of the event showed no measurable oxygen depressions (Operational Science Advisory Team, 2010).

Due to the project area being located approximately 68 miles (109 km) from the nearest shoreline (Plaquemines Parish, Louisiana), it is expected that most water quality impacts would occur in offshore waters before low molecular weight alkanes and volatiles are weathered (Operational Science Advisory Team, 2011), especially in the event of a spill lasting less than 30 days. The 30-day OSRA modeling (**Table 4**) indicates nearshore waters and embayments of Plaquemines Parish, Louisiana, are the coastal areas with the most potential for water quality to be affected (4% probability within three days; 14% probability within 10 days; and 21% probability within 30 days). Other Louisiana shorelines may be affected within 10 days, and shorelines in Mississippi, Alabama, and Florida could be affected within 30 days. The 60-day OSRA model predicts contact of shorelines between Matagorda County, Texas, and Levy County Florida, with a maximum conditional probability of contact of 24% in Plaquemines Parish, Louisiana (**Table 5**) (BOEM, 2017b).

C.2 Seafloor Habitats and Biota

The water depth at the proposed project area is approximately 6,698 ft (2,041 m). According to BOEM (2016b, 2017a), existing information for the deepwater Gulf of Mexico indicates that the seafloor is composed primarily of soft sediments; exposed hard substrate habitats and associated biological communities are rare. No features or areas that could support significant, high-density benthic communities were found within a 2,000 ft (610 m) pipeline corridor (Fugro, 2019). As a result, high-density deepwater benthic communities are not expected to be present.

C.2.1 Soft Bottom Benthic Communities

There are no site-specific benthic community data from the project area. However, data from various gulf-wide studies have been conducted to regionally characterize the continental slope habitats and benthic ecology (Wei, 2006, Rowe and Kennicutt, 2009, Wei et al., 2010, Carvalho et al., 2013, Spies et al., 2016), which can be used to describe typical baseline benthic communities that could be present in vicinity of the proposed installation activities. **Table 6** summarizes data from two stations in the vicinity of the proposed activities.

Table 6. Baseline benthic community data from stations near to the project area in water depths similar to those sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (From: Wei, 2006; Rowe and Kennicutt, 2009).

Station	Water Depth (m)	Density		
		Meiofauna (individuals m^{-2})	Macroinfauna (individuals m^{-2})	Megafauna (individuals ha^{-1})
HiPro	1,565	343,118	5,076	--
S37	2,387	291,179	2,192	1,451

-- = no data available. m = meter, ha = hectare.

Densities of meiofauna (animals that pass through a 0.5-millimeter sieve but are retained on a 0.062-millimeter sieve) in sediments collected at water depths representative of the project area ranged from approximately 290,000 to 340,000 individuals m^{-2} (**Table 6**) (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant groups in the meiofauna, accounting for approximately 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the intrinsically low primary production in surface waters of the Gulf of Mexico continental slope (Wei, 2006). Densities decrease exponentially with water depth (Carvalho et al., 2013). Based on an equation presented by Wei (2006), the macroinfaunal density in the water depth of the project area is estimated to be approximately 1,499 individuals m^{-2}; however, actual densities at the project area are unknown and often highly variable.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods (Rowe and Kennicutt, 2009). Carvalho et al. (2013) found polychaete abundance to be higher in the central region of the northern Gulf of Mexico when compared to the eastern and western regions. Wei (2006) recognized four depth-dependent faunal zones (1 through 4), two of which (Zones 2 and 3) are divided horizontally. The project area is in Zone 2E, which extends from the Texas-Louisiana slope to the west Florida terrace. The most abundant species in this zone were the polychaetes *Aricidea suecica*, *Litocorsa antennata*, *Paralacydonia paradoxa*, and *Tharyx marioni*; and the bivalve *Heterodonta* spp. (Wei, 2006).

Megafaunal density at a station in the vicinity of the project area was approximately 1,451 individuals ha^{-1} (**Table 6**). Common megafauna included motile groups such as decapods, holothurians, and demersal fishes as well as sessile groups such as sponges, gorgonians, and alcyonaria (Rowe and Kennicutt, 2009).

Bacteria are the foundation of deep-sea chemosynthetic communities (Ross et al., 2012) and are an important component in terms of biomass and cycling of organic carbon (Cruz-Kaegi, 1998). Bacterial biomass at the depth range of the project area typically is approximately 1 to 2 g C m^{-2} in the top 6 inches (15 cm) of sediments (Rowe and Kennicutt, 2009). In deep-sea sediments, Main et al. (2015) observed that microbial oxygen consumption rates increased and bacterial biomass decreased with hydrocarbon contamination.

IPFs that could potentially affect benthic communities are physical disturbance to the seafloor and a large oil spill. A small fuel spill would not affect benthic communities because the diesel fuel would float and dissipate on the sea surface.

Impacts of Effluent Discharges

Drilling mud and cuttings are the only effluents that could be present in vicinity of the wellsite that are likely to affect local soft bottom benthic communities. During initial well drilling interval(s) before the marine riser is set, cuttings and water-based mud will be released at the seafloor. Excess cement slurry will also be released at the seafloor during casing installation for the riserless portion of the drilling operations. Cement slurry components typically include cement mix and some of the same chemicals used in water-based drilling muds (Boehm et al., 2001; Fink, 2016). The main impacts will be burial and smothering of benthic organisms within several meters to tens of meters around the wellbore where cuttings and water-based muds physically contact the seafloor. Soft bottom sediments disturbed by cuttings, drilling muds, and cement slurry will eventually be recolonized through larval settlement and migration from adjacent areas. Because some deep-sea biota grow and reproduce slowly, recovery may require several years for the area within meters to tens of meters of the wellbore.

Discharges of washed SBM cuttings from the rig may affect benthic communities, primarily within several hundred meters of the wellsite. The fate and effects of SBM cuttings have been reviewed by Neff et al. (2000), and monitoring studies have been conducted in the Gulf of Mexico by Continental Shelf Associates (2004; 2006). In general, washed cuttings with adhering SBMs tend to clump together and form thick cuttings piles close to the drillsite. Areas of SBM cuttings deposition may develop elevated organic carbon concentrations and anoxic conditions (Continental Shelf Associates, 2006). Where SBM cuttings accumulate in concentrations of approximately 1,000 mg kg-1 or higher, benthic infaunal communities may be adversely affected due to both the toxicity of the base fluid and organic enrichment (with resulting anoxia) (Neff et al., 2000). Infauna numbers may increase and diversity may decrease as opportunistic species that tolerate low oxygen and high H2S predominate (Continental Shelf Associates, 2006). As the base synthetic fluid is decomposed by microbes, the area will gradually return to pre-drilling conditions. Disturbed sediments will be recolonized through larval settlement and migration from adjacent areas.

The areal extent of impacts from drilling discharges will be small. Assuming a typical effect radius of 500 m (1,640 ft), the affected area around the wellsite would represent about 3% of the seafloor within a lease block. Soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway, 1988; Gallaway et al., 2003; Rowe and Kennicutt, 2009). Impacts from drilling discharges are expected to have no significant impact on soft bottom benthic communities in the region. It is expected that the rig will move to safe zones for short periods of time to perform maintenance on critical equipment. All discharges during these times are expected to meet NPDES permit requirements.

Impacts of Physical Disturbance to the Seafloor

BOEM (2012a) estimated an area of seafloor disturbance between 1.2 ac (0.5 ha) and 2.5 ac (1.0 ha) per kilometer of pipeline or flowline installation. Due to the water depth in the project area, it is anticipated that the subsea equipment and flowlines will not be buried by trenching, but instead will be placed on the seafloor, decreasing the area of impact.

The areal extent of these impacts from the lay vessel are expected to be small compared to the project area itself, and these types of soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway, 1988; Gallaway et al., 2003; Rowe and Kennicutt, 2009). Impacts from the physical disturbance of the seafloor during this project are expected be spatially localized and temporally short term. Therefore, these disturbances will not likely have a significant impact on soft bottom benthic communities in the region.

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on the benthic community are expected to be consistent with those analyzed and discussed by BOEM (2012a, 2015, 2016b, 2017a). Impacts from an oil spill at the seafloor could include smothering and exposure to toxic hydrocarbons from oiled sediment settling to the seafloor. The most likely effects of a large spill on benthic communities would be within a few hundred meters of the spill location. While coarse sediments (sands) would probably settle at a rapid rate within 400 m (1,312 ft) from the blowout site, fine sediments (silts and clays) could be resuspended for more than 30 days and dispersed over a wider area. Based on previous studies, surface sediments at the project area are assumed to largely be silt and clay (Rowe and Kennicutt, 2009).

While impacts from a large oil spill are anticipated to be confined to the immediate vicinity of the wellhead, depending on the specific circumstances of the incident, additional benthic community impacts could extend beyond the immediate vicinity of the wellhead (BOEM, 2017a). During the *Deepwater Horizon* incident, subsurface oil plumes were reported in water depths of approximately 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010).

C.2.2 High-Density Deepwater Benthic Communities

As defined in NTL 2009-G40, high-density deepwater benthic communities are features or areas that could support high-density chemosynthetic communities, high-density deepwater corals, or other associated high-density hard bottom communities. Chemosynthetic communities were discovered in the central Gulf of Mexico in 1984 and have been studied extensively (MacDonald, 2002). Deepwater coral communities are also known from numerous locations in the Gulf of Mexico (Cordes et al., 2008; Brooks et al., 2012; Demopoulos et al., 2017; Hourigan et al., 2017). These communities occur almost exclusively on exposed authigenic carbonate rock created by a biogeochemical (microbial) process, and on shipwrecks.

High-resolution geophysical surveys have been conducted in the project area as part of the archaeological resources and shallow hazards assessments. Based on these, no features or areas that could support significant, high-density benthic communities were found within a 2,000 ft (610 m) buffer around the proposed pipeline corridor (Fugro, 2019).

Monitoring programs on the Gulf of Mexico continental slope have shown that benthic impacts from drilling discharges typically are concentrated within approximately 500 m (1,640 ft) of the wellsite, although detectable deposits may extend beyond this distance (Continental Shelf Associates, 2004; Neff et al., 2005; Continental Shelf Associates, 2006). In water depths such as those encountered in the project area, DP drilling vessels disturb the seafloor only around the wellbore where the bottom template and BOP are located. Depending on the specific well configuration, this area is approximately 0.25 ha (0.62 ac) per well (BOEM, 2012a).

The site clearance letter did not identify any features that could support high-density deepwater benthic communities within 610 m (2,000 ft) of the proposed wellsite (bp, 2019a,b).

The only IPF identified for this project that could affect high-density deepwater benthic communities is a large oil spill from a well blowout at the seafloor. A small fuel spill would not affect benthic communities because the diesel fuel would float and dissipate on the sea surface. Physical disturbance and effluent discharge are not considered IPFs for deepwater benthic communities because these communities are not expected to be present down current of the proposed wellsite.

Impacts of a Large Oil Spill

A large oil spill caused by a seafloor blowout could cause direct impacts (i.e., caused by the physical impacts of a blowout) on benthic communities within approximately 300 m (984 ft) of the wellhead (BOEM, 2012a; 2013). However, based on the shallow hazards assessment for the project location (Fugro, 2019), there are no seafloor features that could support high-density deepwater benthic communities within a 2,000 ft (610 m) buffer around the proposed pipeline corridor. Therefore, this type of impact is not expected.

Additional benthic community impacts could extend beyond the immediate vicinity of the wellhead, depending on the specific circumstances (BOEM, 2017a). During the *Deepwater Horizon* spill, subsurface plumes were reported at a water depth of approximately 1,100 m (3,600 ft), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). Oil plumes that contact sensitive benthic communities before degrading could potentially impact the resource (BOEM, 2017a). Potential impacts on sensitive resources would be an integral part of the decision and approval process for the use of dispersants, and such approval would be obtained from the Federal On-Scene Coordinator upon consultation with the RRT, including USEPA, prior to the use of dispersants.

The biological effects and fate of the oil remaining in the Gulf of Mexico from the Deepwater Horizon incident are still being studied, but numerous papers have been published discussing the nature of subsea oil plumes (e.g., Ramseur, 2010; Reddy et al., 2012; Valentine et al., 2014). Hazen et al. (2010) reported changes in plume hydrocarbon composition with distance from the source. Incubation experiments with environmental isolates demonstrated faster than expected hydrocarbon biodegradation rates at 5°C (41°F). Based on these results, Hazen et al. (2010) suggested the potential exists for intrinsic bioremediation of the oil plume in the deepwater column without substantial oxygen drawdown.

Potential impacts of oil on high-density deepwater benthic communities are discussed in recent EISs (BOEM, 2012a; 2015; 2016b; 2017a). Oil droplets or oiled sediment particles could come into contact with chemosynthetic organisms or deepwater corals in the vicinity of the spill site. Impacts could include loss of habitat, biodiversity, and live coral coverage; destruction of hard substrate; reduction or loss of one or more commercial and recreational fishery habitats; or changes in sediment characteristics (BOEM, 2012a; 2017a).

C.2.3 Designated Topographic Features

The project location is not within or near a designated topographic feature or a no-activity zone as identified in NTL 2009-G39. The nearest designated topographic feature stipulation block is approximately 78 miles (126 km) from the project area. There are no IPFs associated with either routine operations or accidents that could cause impacts to designated topographic features due to their distance from the project area.

Due to the distance from the project area, it is unlikely that designated topographic features could be affected by an accidental spill. A small fuel spill would float and dissipate on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge.

C.2.4 Pinnacle Trend Area Live Bottoms

The project area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined in NTL 2009-G39, the nearest pinnacle trend block is approximately 48 miles (77 km) from the project area. There are no IPFs associated with either routine operations or accidents that could cause impacts to pinnacle trend area live bottoms due to the distance from the project area.

Due to the distance from the project area, it is unlikely that pinnacle trend live bottom areas would be affected by an accidental spill. A small fuel spill would float on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge.

C.2.5 Eastern Gulf Live Bottoms

The project area is not covered by the Live Bottom (Low-Relief) Stipulation, which pertains to seagrass communities and low-relief hard bottom reef within the Gulf of Mexico Eastern Planning Area blocks in water depths of 328 ft (100 m) or less and portions of Pensacola and Destin Dome Area Blocks in the Central Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined in NTL 2009-G39, is located approximately 65 miles (105 km) from the project area. There are no IPFs associated with either routine operations or accidents that could cause impacts to eastern Gulf of Mexico live bottom areas due to the distance from the project area.

Because of the distance from the project area, it is unlikely that Eastern Gulf live bottom areas would be affected by an accidental spill. A small fuel spill would float and dissipate on the surface and would not reach these seafloor features. In the event of an oil spill from a well blowout, a surface slick would not contact these seafloor features. If a subsurface plume were to occur, impacts on these features would be unlikely due to the distance and the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf.

C.3 Threatened, Endangered, and Protected Species and Critical Habitat

This section discusses species listed as Endangered or Threatened under the ESA. In addition, it includes marine mammal species in the region that are protected under the MMPA.

Endangered, Threatened, or species of concern that may occur in the project area and/or along the northern Gulf Coast are listed in **Table 7**. The table also indicates the location of designated critical habitat in the Gulf of Mexico. Critical habitat is defined as (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. NMFS has jurisdiction over ESA-listed marine mammals (cetaceans) and fishes in the Gulf of Mexico, and USFWS has jurisdiction over ESA-listed birds and the West Indian manatee. These two agencies share federal jurisdiction over sea turtles, with NMFS having lead responsibility at sea and USFWS on nesting beaches.

Table 7. Federally listed Endangered and Threatened species potentially present in the project area and along the northern Gulf Coast. Adapted from U.S. Fish and Wildlife Service (2020a) and NOAA Fisheries (2020).

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Rice's whale	*Balaenoptera ricei*[1]	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[2]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[3]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida; *Sargassum* habitat including most of the central and western Gulf of Mexico.
Green turtle	*Chelonia mydas*	T	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Fishes					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	X	--	None
Giant manta ray	*Mobula birostris*	T	X	X	None
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida
Nassau grouper	*Epinephelus striatus*	T	--	X	None
Smalltooth sawfish	*Pristis pectinata*	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	*Acropora cervicornis*	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	*Dendrogyra cylindrus*	T	--	X	None
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	None
Lobed star coral	*Orbicella annularis*	T	--	X	None
Mountainous star coral	*Orbicella faveolata*	T	--	X	None
Boulder star coral	*Orbicella franksi*	T	--	X	None
Panama City crayfish	*Procambarus econfinae*	T	--	X	South-central Bay County, Florida
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus subsp. Ammobates, allophrys, trissyllepsis, and peninsularis, respectively*	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	*Microtus pennsylvanicus dukecampbelli*	E	--	X	None

E = Endangered; T = Threatened; X = potentially present; -- = not present

1 In 2021, National Marine Fisheries Service recognized that what had previously been accepted as a subspecies of the Bryde's whale is actually a separate species. The reclassification is formerly recognized under 86 FR 47022 effective date 22 October 2021 as the Rice's whale (Balaenoptera ricei).

2 There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of Mexico to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern Mexico to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of Mexico.

3 The Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead turtles is designated as Threatened (76 *Federal Register* [*FR*] 58868). The National Marine Fisheries Service and the U.S. Fish and Wildlife Service designated critical habitat for this DPS, including beaches and nearshore reproductive habitat in Mississippi, Alabama, and the Florida Panhandle as well as *Sargassum* spp. habitat throughout most of the central and western Gulf of Mexico (79 *FR* 39756 and 79 *FR* 39856).

Coastal Endangered or Threatened species that may occur along the U.S. Gulf Coast include the West Indian manatee (*Trichechus manatus*), Piping Plover (*Charadrius melodus*), Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*), Whooping Crane (*Grus americana*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), smalltooth sawfish (*Pristis pectinata*), and four subspecies of beach mouse. Critical habitat has been designated for all these species (except the Florida salt marsh vole) as indicated in **Table 7** and discussed in individual sections. Two other coastal bird species (Bald Eagle [*Haliaeetus leucocephalus*] and Brown Pelican [*Pelecanus occidentalis*]) are no longer federally listed as Endangered or Threatened; these are discussed in **Section C.4.2**.

Five sea turtle species, the sperm whale (*Physeter macrocephalus*), and the oceanic whitetip shark (*Carcharhinus longimanus*) are the only Endangered or Threatened species likely to occur within the project area. The listed sea turtles include the leatherback turtle (*Dermochelys coriacea*), Kemp's ridley turtle (*Lepidochelys kempii*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), and green turtle (*Chelonia mydas*) (Pritchard, 1997). Effective August 11, 2014, NMFS has designated certain marine areas as critical habitat for the northwest Atlantic distinct population segment (DPS) of the loggerhead sea turtle (**Section C.3.5**). No critical habitat has been designated in the Gulf of Mexico for the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, or the green turtle. Listed marine mammal species include one odontocete (sperm whale) which is known to occur in the Gulf of Mexico (Würsig, 2017); no critical habitat has been designated for the sperm whale.

The Rice’s whale (*Balaenoptera ricei*) exists in the Gulf of Mexico as a small, resident population. This species was formally known as a subspecies to the Bryde’s whale (*Balaenoptera edeni brydei*) until recent DNA studies identified it as a separate species (Rosel et al., 2021). It is the only baleen whale known to be resident to the Gulf. The species is severely restricted in range, being found only in the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016, Rosel et al., 2021) and are therefore not likely to occur within the project area. The giant manta ray (*Mobula birostris*) could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower Garden Banks. The Nassau grouper (*Epinephelus striatus*) has been observed in the Gulf of Mexico at the Flower Garden Banks but is most commonly observed in shallow tropical reefs of the Caribbean and is not expected to occur in the project area. The smalltooth sawfish is a coastal species limited to shallow areas off the west coast of Florida and is not expected to occur in the project area.

Four Endangered mysticete whales (blue whale [*Balaenoptera musculus*], fin whale [*Balaenoptera physalus*], North Atlantic right whale [*Eubalaena glacialis*], and sei whale [*Balaenoptera borealis*]) have been reported from the Gulf of Mexico but are considered rare or extralimital (Würsig et al., 2000). These species are not included in the most recent NMFS stock assessment report (Hayes et al., 2020) nor in the most recent BOEM multisale EIS (BOEM, 2017a) as present in the Gulf of Mexico; therefore, they are not considered further in the EIA.

The Rice’s whale exists in the Gulf of Mexico as a small, resident population. This species was formally known as a subspecies to the Bryde’s whale (Balaenoptera edeni brydei) until recent DNA studies identified it as a separate species (Rosel et al., 2021). It is the only baleen whale known to be resident to the Gulf. The species is severely restricted in range, being found only in the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016, Rosel et al., 2021) and are therefore not likely to occur within the project area. The giant manta ray could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower

Garden Banks. The Nassau grouper (Epinephelus striatus) has been observed in the Gulf of Mexico at the Flower Garden Banks but is most commonly observed in shallow tropical reefs of the Caribbean and is not expected to occur in the project area. The smalltooth sawfish is a coastal species limited to shallow areas off the west coast of Florida and is not expected to occur in the project area.

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral (*Acropora palmata*), staghorn coral (*Acropora cervicronis*), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), boulder star coral (*Orbicella franksi*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*). None of these species are expected to be present in the project area (see **Section C.3.15**).

There are no other Threatened or Endangered species in the Gulf of Mexico that are reasonably likely to be affected by either routine or accidental events.

C.3.1 Sperm Whale (Endangered)

The only Endangered marine mammal likely to be present at or near the project area is the sperm whale. Resident populations of sperm whales occur within the Gulf of Mexico. Gulf of Mexico sperm whales are classified as an Endangered species and a "strategic stock" by NMFS (Waring et al., 2016). A "strategic stock" is defined by the MMPA as a marine mammal stock that meets the following criteria:

- The level of direct human-caused mortality exceeds the potential biological removal level;
- Based on the best available scientific information, is in decline and is likely to be listed as a Threatened species under the ESA within the foreseeable future; or
- Is listed as a Threatened or Endangered species under the ESA or is designated as depleted under the MMPA.

Current threats to sperm whale populations worldwide are discussed in a final recovery plan for the sperm whale published by NMFS (2010a). Threats are defined as "any factor that could represent an impediment to recovery," and include fisheries interactions, anthropogenic noise, vessel interactions, contaminants and pollutants, disease, injury from marine debris, research, predation and natural mortality, direct harvest, competition for resources, loss of prey base due to climate change and ecosystem change, and cable laying. In the Gulf of Mexico, the impacts from many of these threats are identified as either low or unknown (BOEM, 2012a).

The distribution of sperm whales in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current (Jochens et al., 2008). Sperm whale populations in the north-central Gulf of Mexico are present there throughout the year (Davis et al., 2000). Results of a multi-year tracking study show female sperm whales typically concentrated along the upper continental slope between the 656- and 3,280-foot (200- and 1,000-meter) depth contours (Jochens et al., 2008). Male sperm whales were more variable in their movements and were documented in water depths greater than 9,843 ft (3,000 m). Generally, groups of sperm whales sighted in the Gulf of Mexico during the Minerals Management Service-funded Sperm Whale Seismic Study consisted of mixed-sex groups comprising adult females and juveniles, and groups of bachelor males. Typical group size for mixed groups was 10 individuals (Jochens et al., 2008). A review of sighting reports from seismic mitigation surveys in the Gulf of Mexico conducted over a 6-year period found a mean group size for sperm whales of 2.5 individuals (Barkaszi et al., 2012).

A review of PSO sighting reports from seismic mitigation surveys in the Gulf of Mexico conducted over a 6-year period found a mean group size for sperm whales of 2.5 individuals (Barkaszi et al., 2012). In these mitigation surveys, sperm whales were the most common large cetacean encountered. Tagging and observation data from the surveys also showed that sperm whales transit through the vicinity of the project area. Movements of satellite-tracked individuals suggest that this area of the continental slope is within the home range of the Gulf of Mexico population (within the 95% utilization distribution) (Jochens et al., 2008).

IPFs that could potentially affect sperm whales include lay vessel presence, noise, and lights; support vessel and helicopter traffic; and both types of spill accidents: a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on sperm whales due to rapid dilution, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these marine mammals. Compliance with NTL BSEE-2015-G03 is intended to minimize the potential for marine debris-related impacts on sperm whales.

Though NMFS (2020a) stated marine debris as an IPF, compliance with BSEE NTL 2015-G03 and NMFS (2020a) Appendix B will minimize the potential for marine debris-related impacts on sperm whales. NMFS (2020a) estimates that no more than three sperm whales will be nonlethally taken, with one sperm whale lethally taken through the ingestion of marine debris over 50 years of proposed action. Therefore, marine debris is likely to have negligible impacts on sperm whales and is not further discussed (See **Table 2**).

Impacts of Drilling Vessel Presence, Noise, and Lights

Noise from routine drilling activities (see Section A.1) and subsea installation activities has the potential to disturb individuals or groups of sperm whales or mask the sounds they would normally produce or hear. Behavioral responses to noise by marine mammals vary widely and overall, are short-term and include, temporary displacement or cessation of feeding, resting, or social interactions (NMFS, 2009a; Gomez et al., 2016). Additionally, behavioral changes resulting from auditory masking sounds may induce an animal to produce more calls, longer calls, or shift the frequency of the calls. For example, masking caused by vessel noise was found to result in a reduced number of whale calls in the Gulf of Mexico (Azzara et al., 2013).

Behavioral responses to sound by marine mammals vary widely and overall, are short-term and include, temporary displacement or cessation of feeding, resting, or social interactions (NMFS, 2009a; Gomez et al., 2016). Additionally, behavioral changes resulting from auditory masking sounds may induce an animal to produce more calls, longer calls, or shift the frequency of the calls. For example, masking caused by vessel sound was found to result in a reduced number of whale calls in the Gulf of Mexico (Azzara et al., 2013).

NMFS (2018a) lists sperm whales in the same functional hearing group (i.e., mid frequency cetaceans) as most dolphins and other toothed whales, with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, vessel-related noise is likely to be heard by sperm whales. Frequencies <150 Hz produced by the proposed operations are not likely to be perceived with any significance by mid-frequency cetaceans. The sperm whale may possess better low frequency hearing than some of the other odontocetes, although not as low as many baleen whale species that primarily produce sounds between 30 Hz and 5 kHz (Wartzok and Ketten, 1999). Generally, most of the acoustic energy produced by sperm whales is present at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with source levels up to 236 dB re 1 µPa m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the proposed installation operations, sperm whales would move away from the proposed operations area, and noise levels that could cause auditory injury would be avoided. Noise associated with proposed vessel operations may cause behavioral (disturbance) effects to sperm whales. Observations of sperm whales near offshore oil and gas operations suggest an inconsistent response to anthropogenic marine sound (Jochens et al., 2008). Most observations of behavioral responses of marine mammals to anthropogenic sounds, in general, have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions (NMFS, 2016a). Animals can determine the direction from which a sound arrives based on cues, such as differences in arrival times, sound levels, and phases at the two ears. Thus, an animal's directional hearing capabilities have a bearing on its ability to avoid noise sources (National Research Council, 2003b).

NMFS (2018a) presents criteria that are used to determine physiological (i.e., injury) thresholds for marine mammals. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS 2018a) and therefore, revert to thresholds established and published by NMFS in 70 *Federal Register* (*FR*) 1871. Behavioral disturbance thresholds for marine mammals and are applied equally across all functional hearing groups. Received SPL_{rms} of 120 dB re 1 µPa from a non-impulsive source are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, in the case of behavioral responses, received levels alone do not indicate a behavioral response and, more importantly, do not equate to biologically important responses (Southall et al., 2016; Ellison et al., 2012).

For mid frequency cetaceans exposed to a non-impulsive source (such as installation operations), permanent threshold shifts are estimated to occur when the mammal has received a cumulative sound exposure level (SEL_{cum}) of 198 dB re 1 μPa^2 s over a 24-hour period (NMFS, 2016a). Similarly, temporary threshold shifts are estimated to occur when the mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. Based on transmission loss calculations (Urick, 1983), typical sources with DP thrusters are not expected to produce SPL_{rms} greater than 160 dB re 1 µPa beyond 105 ft (32 m) from the source. Due to the short propagation distance of above-threshold SPL_{rms}, the transient nature of sperm whales, and the stationary nature of the proposed activites, it is not expected that any sperm whales will receive exposure levels necessary for the onset of auditory threshold shifts.

The vessel will be located within a deepwater, open ocean environment. Sounds generated by project operations will be generally non-impulsive, with some variability in sound level. This analysis assumes that the continuous nature of sounds produced by the lay vessel will provide individual whales with cues relative to the direction and relative distance (sound intensity) of the sound sources. Subsea installation-related noise associated with this project will contribute to increases in the ambient noise environment of the Gulf of Mexico, but it is not expected to be in amplitudes sufficient enough to cause hearing effects to sperm whales.

There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar marine noise sources. Drilling-related marine noise associated with this project may contribute to increases in the marine sound environment within the region, but it is not expected to be at amplitudes sufficient to result in auditory injuries to sperm whales. The proposed activity may cause behavioral effects, primarily avoidance or temporary displacement from the project area, but are not expected to be biologically significant for the population. Drilling rig lighting and presence are not expected to impact sperm whales (NMFS, 2007; BOEM, 2016a; 2017a). DP MODU lighting and rig presence are not identified as IPFs for sperm whales (NMFS, 2007, 2020b; BOEM, 2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sperm whales and creates a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (NMFS, 2010a). To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a). In addition, when sperm whales are sighted, vessel operators and crews are required to attempt to maintain a distance of 328 ft (100 m) or greater whenever possible (NTL BOEM 2016-G01 and NMFS, 2020a).

Vessel operators are required to reduce vessel speed to 10 knots or less, as safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel (NTL BOEM-2016-G01). When sperm whales are sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale's course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the sperm whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS [2020a] Appendix C). Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing sperm whales. However, this mitigation is effective only during daylight hours and during periods of adequate visibility.

NMFS (2020a) analyzed the potential for vessel collisions and harassment of sperm whales in its Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. NMFS concluded that the observed avoidance of passing vessels by sperm whales is an advantageous response to avoid a potential threat and is not expected to result in any significant effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the level of the population. With the implementation of the NMFS vessel collision protocols listed in Appendix C of NMFS (2020a) in addition to the NTL BOEM-2016-G01, NMFS concluded that the likelihood of collisions between vessels and sperm whales would be reduced during daylight hours. During nighttime and during periods of poor visibility, it is assumed that vessel noise and sperm whale avoidance of moving vessels would reduce the chance of vessel collisions with this species. It is, however, likely that a collision between a sperm whale and a moving support vessel would result in severe injury or mortality of the stricken animal. The current Potential Biological Removal (PBR) level for the Gulf of Mexico stock of sperm whales is 1.1 (Hayes et al., 2019). The PBR level is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Mortality of a single sperm whale would constitute a significant impact to the local (Gulf of Mexico) stock of sperm whales but would not likely be significant at the species level.

Helicopter traffic also has the potential to disturb sperm whales. Smultea et al. (2008) documented responses of sperm whales offshore Hawaii to fixed wing aircraft flying at an altitude of 804 ft (245 m). A reaction to the initial pass of the aircraft was observed during 3 (12%) of 24 sightings. All three reactions consisted of a hasty dive and occurred at less than 1,180 ft (360 m) lateral distance from the aircraft. Additional reactions were seen when aircraft circled certain whales to make further observations. Based on other studies of cetacean responses to sound, the authors concluded that the observed reactions to brief overflights by the aircraft were short-term and limited to behavioral disturbances (Smultea et al., 2008).

While flying offshore in the Gulf of Mexico, support helicopters maintain altitudes above 213 m (700 ft) during transit to and from the working area. In the event that a whale is observed during transit, the helicopter will not approach or circle the animals. Although whales may respond to helicopters (Smultea et al., 2008), NMFS (2020a) concluded that this altitude would minimize the potential for disturbing sperm whales. Therefore, no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals including sperm whales are discussed by NMFS (2020a) and BOEM (2012a, 2015, 2016b, 2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the Marine Mammal Commission (MMC) (2011). For the EIA, there are no unique site-specific issues with respect to spill impacts on sperm whales that were not analyzed in the previous documents.

The probability of a fuel spill will be minimized by the contractor's and bp's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of the contractor's and bp's OSRP will mitigate and lessen the potential for impacts on sperm whales. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be brief.

A small fuel spill in offshore waters would produce a thin sheen on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and marine sound of response vessels and aircraft (MMC, 2011). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill as well as the mobility of sperm whales, no significant impacts would be expected.

The probability of a fuel spill will be minimized by the contractor's and bp's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of the contractor's and bp's OSRP will mitigate and lessen the potential for impacts on sperm whales. Given the open ocean location of the project area, the duration of a small spill and therefore potential for impacts to occur are expected to be brief.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals including sperm whales are discussed by BOEM (2012a, 2015, 2016b, 2017a), and NMFS (2020a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). For the EIA, there are no unique site-specific issues with respect to spill impacts on sperm whales.

Impacts of oil spills on sperm whales can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine noise, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and marine noise of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2020). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals, including displacement from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sperm whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for colliding with or disturbing these animals. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL. Based on the current PBR level for the Gulf of Mexico stock of sperm whales (2.0), mortality of a single sperm whale would constitute a significant impact to the local (Gulf of Mexico) stock of sperm whales but would not likely be significant at the species level.

C.3.2 Rice's Whale (Endangered)

A recent study by Rosel et al. (2021), identified the genetically distinct Northern Gulf of Mexico Bryde's whale stock as a new species of baleen whale named the Rice's whale through DNA analysis. The reclassification was approved by NMFS under 86 FR 47022 and was effective 22 October 2021.

The Rice's whale is the only year-round resident baleen whale in the northern Gulf of Mexico. The Rice's whale is most frequently sighted in the waters over the DeSoto Canyon between the 100 m (328 ft) and 400 m (3,280 ft) isobaths (Rosel et al., 2016; Hayes et al., 2019). Most sightings have been made in the DeSoto Canyon region and off western Florida, although there have been some in the west-central portion of the northeastern Gulf of Mexico. Based on the available data, it is possible that Rice's whales could occur in the project area though unlikely.

In 2014, a petition was submitted to designate the northern Gulf of Mexico population as a DPS and list it as Endangered under the ESA (Natural Resources Defense Council, 2014). This petition received a 90-day positive finding by NMFS in 2015 and a proposed rule to list was published in 2016 (Hayes et al., 2019). On 15 April 2019, NMFS issued a final rule to list the Gulf of Mexico DPS of Bryde's whale as Endangered under the ESA. NMFS final rule on the reclassification (86 FR 47022) does not affect the ESA standing; thus, the Rice's whale is listed as an Endangered species.

IPFs that could affect the Rice's whales include lay vessel presence, marine sound, and lights; support vessel and helicopter traffic; and both types of spill accidents: a small fuel spill and a large oil spill. It is unlikely that the Rice's whales could occur in the project area. Effluent discharges are likely to have negligible impacts on Rice's whales due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility and low abundance of Rice's whales in the Gulf of Mexico.

Though NMFS (2020a) identified marine debris as an IPF, compliance with BSEE NTL 2015-G03 and NMFS (2020a) Appendix B will minimize the potential for marine debris-related impacts on Rice's whales. NMFS (2020a) estimated one sublethal take and no lethal takes of Rice's whales (at the time identified as Bryde's whale) from marine debris over 50 years of proposed action. Therefore, marine debris is likely to have negligible impacts on Rice's whales and is not further discussed (See **Table 2**).

Impacts of Drilling Vessel Presence, Noise, and Lights

Noise produced by the drilling rig may be emitted at levels that could potentially disturb individual whales or mask the sounds animals would normally produce or hear. Noise associated with drilling and installation activities is relatively low in intensity relative to impulsive sources such as airgun noise, and an individual animal's sound exposure would be transient. As discussed in Section A.1, an actively drilling rig may produce broadband (10 Hz to 10 kHz) source levels ranging from approximately 180 to 190 dB re 1 µPa m (Hildebrand, 2005). Noise produced by the drilling rig and construction vessel may be emitted at levels that could potentially disturb individual whales or mask the sounds animals would normally produce or hear. Source levels associated with drilling and installation activities is relatively weak in intensity, and an individual animal's noise exposure would be transient. As discussed in Section A.1, an actively drilling rig may produce broadband (10 Hz to 10 kHz) noise with a maximum source level ranging from 180 to 190 dB re 1 µPa m (Hildebrand, 2005).

NMFS (2018a) lists Rice's whales in the functional hearing group of low frequency cetaceans (baleen whales), with an estimated hearing sensitivity from 7 Hz to 35 kHz. Therefore, vessel-related sound is likely to be heard by Rice's whales. Frequencies <1,000 Hz produced by the drilling operations are more likely to be perceived by low-frequency cetaceans.

It is expected that, due to the relatively stationary nature of the vessel, Rice's whales would move away from the proposed operations area, and sound levels that could cause auditory injury would be avoided. Sound associated with proposed vessel operations may cause behavioral (disturbance) effects to individual Rice's whales. NMFS (2018a) presents criteria that are used to determine physiological (i.e., injury) thresholds for marine mammals. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS 2018a) and therefore, revert to thresholds established and published by NMFS in 70 *FR* 1871. Received SPL_{rms} of 120 dB re 1 µPa from a non-impulsive source are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to a SPL_{rms} of 120 dB re 1 µPa alone does not equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur (Southall et al., 2016; Ellison et al., 2012).

For low frequency cetaceans, specifically the Rice's whale, permanent and temporary threshold shift onset from non-impulsive sources is estimated to occur at SEL_{cum} of 199 dB re 1 μPa^2 s and 179 re 1 μPa^2 s, repectively. DP thrusters are not expected to reach permanent or temporary theshold shift values, and based on open water transmission loss calculations (Urick, 1983). The drilling rig will be located within a deepwater, open ocean environment. Sounds generated by drilling operations will be generally non-impulsive, with some variability in sound level and frequency, and are not expected to reach permanent or temporary threshold shift values. This analysis assumes that the continuous nature of sounds produced by the drilling rig will provide individual whales with cues relative to the direction and relative distance of the sound source, and the fixed position of the drilling rig will allow for active avoidance of potential physical impacts. Drilling-related noise associated with this project may contribute to increases in the ambient noise environment of the Gulf of Mexico, but it is not expected to be in amplitudes sufficient enough to cause hearing effects to Rice's whales and due to the low density of Rice's whales in the Gulf of Mexico, no significant impacts are expected.

The drilling vessel will be located within a deepwater, open ocean environment. This analysis assumes that the continuous nature of sounds produced by the lay vessel will provide individual whales with cues relative to the direction and relative distance (sound intensity) of the sound source, and the fixed position of the drilling vessel will allow for active avoidance of potential physical impacts. Subsea installation-related sound associated with this project will contribute to increases in the ambient noise environment of the Gulf of Mexico, but it is not expected to be in amplitudes sufficient enough to cause hearing effects to Rice's whales. Furthermore, it is very unlikely that Rice's whales occur within the project area as they occur only in low densities in the Gulf of Mexico; therefore, no significant impacts are expected. Drilling vessel lighting and presence are not expected to impact Rice's whales (BOEM, 2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb Rice's whales and creates a potential for vessel collisions. To reduce the potential for vessel collisions, BOEM has issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. When whales are sighted, vessel operators and crews are required to attempt to maintain a distance of 1,640 ft (500 m) or greater whenever possible (NTL BOEM-2016-G01; NMFS, 2020a). Vessel operators are required to reduce vessel speed to 10 knots or less, as safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel (NTL BOEM-2016-G01). When a Rice's whale is sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale's course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS [2020a] Appendix C). However, this mitigation is effective only during daylight hours and during periods of adequate visibility.

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing Rice's whales. The current PBR level for the Gulf of Mexico stock of Rice's whale is 0.03 (Hayes et al., 2019). Mortality of a single Rice's whale would constitute a significant impact to the species. However, it is very unlikely that Rice's whales occur within the project area, including the transit corridor for support vessels; consequently, the probability of a vessel collision with this species is extremely low.

Helicopter traffic also has the potential to disturb Rice's whales. Based on studies of cetacean responses to sound, the observed reactions to brief overflights by aircraft were short-term and limited to behavioral disturbances (Smultea et al., 2008). Helicopters maintain altitudes above 700 ft (213 m) during transit to and from the offshore working area. In the event that a whale is seen during transit, the helicopter will not approach or circle the animal(s). In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 1,000 ft (305 m) within 1,640 ft (500 m) of marine mammals (BOEM, 2016a, 2017a, NMFS, 2020a). Due to the brief potential for disturbance the low density of Rice's whales thought to reside in the Gulf of Mexico, no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by NMFS (2020a) and BOEM (2012a, 2015, 2016b, 2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). In the unlikely event of a spill, implementation of bp's OSRP will mitigate and reduce the potential for impacts on Rice's whales. Given the open ocean location of the project area and the duration of a small spill, any impacts are expected to be brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill as well as the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft (MMC, 2011). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, as well as the mobility of Rice's whales and the unlikelihood of Rice's whales in the project area, no significant impacts are expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a, 2015, 2016b, 2017a), and NMFS (2020a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011).

Potential impacts of a large oil spill on Rice's whales could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, noise, dispersants) (MMC, 2011). Direct physical and physiological effects could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Hayes et al., 2019). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb Rice's whales and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 (see Table 1) to reduce the potential for colliding with or disturbing these animals. In the event of oil from a large spill contacting Rice's whales, it is expected that impacts resulting in the injury or death of individual Rice's whales would be significant based on the current PBR level for the Gulf of Mexico subspecies and stock (0.03). Mortality of a single Rice's whale would constitute a significant impact to the species. The core distribution area for Rice's whales is within the eastern Gulf of Mexico OCS Planning Area; therefore, it is very unlikely that Rice's whales occur within the project area and surrounding waters. Consequently, the probability of spilled oil from a project-related spill reaching Rice's whales is extremely low.

C.3.3 West Indian Manatee (Threatened)

Most of the Gulf of Mexico West Indian manatee population is located in peninsular Florida, but manatees have been seen as far west as Texas during the summer (U.S. Fish and Wildlife Service, 2001a). A species description is presented in the West Indian manatee recovery plan (U.S. Fish and Wildlife Service, 2001a). Critical habitat has been designated in southwest Florida in Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe counties.

Manatee sightings in Louisiana have increased as the species extends its presence farther west of Florida in the warmer months (Wilson, 2003). Manatees are typically found in coastal and riverine habitats, but have rarely been seen in deepwater areas, usually in colder months when they seek refuge from colder coastal waters (USFWS, 2001a; Fertl et al., 2005; Pabody et al., 2009). There have been three verified reports of Florida manatee sightings by protective species observers on the OCS during seismic mitigation surveys in mean water depths of over 1,969 ft (600 m) (Barkaszi and Kelly, 2019).

IPFs that potentially may affect manatees include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect manatees because the project area is approximately 68 miles (109 km) from the nearest shoreline. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with NTL BSEE 2015-G013 (see **Table 1**) will minimize the potential for marine debris-related impacts on manatees.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic associated with installation activities has the potential to disturb manatees, and there is also a risk of vessel collisions, which are identified as a threat in the recovery plan for this species (USFWS, 2001a). Manatees are expected to be limited to inner shelf and coastal waters, and impacts are expected to be limited to transits of these vessels and helicopters through these waters. To reduce the potential for vessel collisions, BOEM has issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. Vessel collision avoidance measures described in NMFS (2020a) for the marine mammal species managed by that agency may also provide some additional indirect protections to manatees. If a manatee is sighted, vessels associated with the operation should operate at "no wake/idle speed within that area, follow routes in deep water whenever possible, and attempt to maintain a distance of 50 m if practical. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling).

Compliance these mitigation measures will minimize the likelihood of vessel collisions, and no significant impacts on manatees are expected. The current PBR level for the Florida subspecies of Antillean manatee is 14 (USFWS, 2014). In the event of a vessel collision during support vessel transits, the mortality of a single manatee would constitute an adverse but insignificant impact to the subspecies.

Helicopter traffic also has the potential to disturb manatees. Rathbun (1988) reported that manatees were disturbed more by helicopters than by fixed-wing aircraft; however, the helicopter was flown at relatively low altitudes of 66 to 525 ft (20 to 160 m). Helicopters used in support operations maintain a minimum altitude of 700 ft (213 m) while in transit offshore, 1,000 ft (305 m) over unpopulated areas or across coastlines, and 2,000 ft (610 m) overpopulated areas and sensitive habitats such as wildlife refuges and park properties. In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2012a,b, NMFS, 2020a). This mitigation measure will minimize the potential for disturbing manatees, and no significant impacts are expected.

Impacts of a Large Oil Spill

The potential for significant impacts to manatees from a large oil spill would be most likely associated with coastal oiling in areas of manatee habitats. The OSRA results summarized in **Table 4** predict that Plaquemines Parish in Louisiana is the coastal area most likely to be affected (4% probability within 3 days; 14% probability within 10 days; and 21% probability within 30 days). Other Louisiana shorelines may be affected within 10 days, and shorelines in Mississippi, Alabama, and Florida could be affected within 30 days. There is no manatee critical habitat designated in these areas, and the number of manatees potentially present is a small fraction of the population residing in peninsular Florida. The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, may be contacted within 60 days of a spill. This range does not include any areas of manatee critical habitat.

In the event that manatees were exposed to oil, effects could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include asphyxiation, acute poisoning, lowering of tolerance to other stress, nutritional stress, and inflammation from infection (BOEM, 2017a). Indirect impacts include stress from the activities and sound of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event that a large spill reached coastal waters where manatees were present, the level of vessel and aircraft activity associated with spill response could disturb manatees and potentially result in vessel collisions, entanglement, or other injury or stress. Response vessels would be expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1**) to reduce the potential for colliding with or disturbing these animals. The current PBR level for the Florida subspecies of Antillean manatee is 14 (USFWS, 2014). It is not anticipated that groups of manatees would occur in coastal waters of the north central GOM; therefore, in the event of mortality of individual manatees from a large oil spill would constitute an adverse but insignificant impact to the subspecies.

C.3.4 Non-Endangered Marine Mammals (Protected)

Excluding the three Endangered or Threatened species that have been cited previously, there are 20 additional species of whales and dolphins (cetaceans) that may be found in the Gulf of Mexico, including dwarf and pygmy sperm whales, four species of beaked whales, and 14 species of delphinid whales (dolphins). All marine mammals are protected species under the MMPA. The most common non-endangered cetaceans in the deepwater environment are small odontocetes such as the pantropical spotted dolphin, spinner dolphin, and bottlenose dolphin. A brief summary is presented below, and additional information on these groups is presented by BOEM (2017a).

<u>Dwarf and pygmy sperm whales</u>. At sea, it is difficult to differentiate dwarf sperm whales (*Kogia sima*) from pygmy sperm whales (*Kogia breviceps*), and sightings are often grouped together as *Kogia* spp. Both species have a worldwide distribution in temperate to tropical waters. In the Gulf of Mexico, both species occur primarily along the continental shelf edge and in deeper waters off the continental shelf (Mullin et al., 1991; Mullin, 2007; Waring et al., 2016). Either species could occur in the project area.

<u>Beaked whales</u>. Four species of beaked whales are known to occur in the Gulf of Mexico: Blainville's beaked whale (*Mesoplodon densirostris*), Sowerby's beaked whale (*Mesoplodon bidens*), Gervais' beaked whale (*Mesoplodon europaeus*), and Cuvier's beaked whale (*Ziphius cavirostris*). Stranding records (Würsig et al., 2000) as well as passive acoustic monitoring in the Gulf of Mexico (Hildebrand et al., 2015) suggest that Gervais' beaked whale and Cuvier's beaked whale are the most common species in the region. The Sowerby's beaked whale is considered extralimital, with only one document stranding in the Gulf of Mexico (Bonde and O'Shea, 1989).

There are a number of extralimital strandings and sightings reported beyond the recognized range of Sowerby's beaked whale (e.g., Canary Islands, Mediterranean Sea), including from the eastern Gulf of Mexico (Pitman and Brownell, 2020). Blainville's beaked whales are rare, with only four documented strandings in the northern Gulf of Mexico (Würsig et al., 2000) and three sightings in the Gulf of Mexico (Hayes et al., 2021).

Due to the difficulties of at sea identification, beaked whales in the Gulf of Mexico are identified either as Cuvier's beaked whales or are grouped into an undifferentiated species complex (*Mesoplodon* spp.). In the northern Gulf of Mexico, they are broadly distributed in water depths greater than 1,000 m (3,281 ft) over lower slope and abyssal landscapes (Davis et al., 2000; Hldebrand et al., 2015). Any of these species could occur in the project area (Waring et al., 2016; Hayes et al., 2021).

Delphinids. Fourteen species of delphinids are known from the Gulf of Mexico, including Atlantic spotted dolphin (*Stenella frontalis*), bottlenose dolphin (*Tursiops truncatus*), Clymene dolphin (*Stenella clymene*), false killer whale (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), pantropical spotted dolphin (*Stenella attenuata*), pygmy killer whale (*Feresa attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), spinner dolphin (*Stenella longirostris*), and striped dolphin (*Stenella coeruleoalba*). Any of these species could occur in the project area (Waring et al., 2016; Hayes et al., 2021).

The bottlenose dolphin (*Tursiops truncatus*) is a common inhabitant of the northern Gulf of Mexico, particularly within continental shelf waters. There are two ecotypes of bottlenose dolphins, a coastal form and an offshore form, which are genetically isolated from each other (Waring et al., 2016). The offshore form of the bottlenose dolphin may occur within the project area. Inshore populations of coastal bottlenose dolphins in the northern Gulf of Mexico are separated into 31 geographically distinct population units, or stocks, for management purposes by NMFS (Hayes et al., 2019).

IPFs that potentially may affect non-endangered marine mammals include lay vessel presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on marine mammals due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of marine mammals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on marine mammals.

Impacts of Drilling Vessel Presence, Noise, and Lights

The presence of the drilling vessel presents an attraction to pelagic food sources that may attract cetaceans. Some odontocetes have shown increased feeding activity around lighted platforms at night (Todd et al., 2009). Therefore, prey congregation could pose an attraction to protected species that exposes them to higher levels or longer durations of sound that might otherwise be avoided. Vessel and support vessel presence and lighting are not considered as IPFs for marine mammals (BOEM, 2017a).

If the vessel is equipped with a moon pool, a trained crew member or company representative must monitor the moon pool area for marine mammals during operations. If a marine mammal is detected in the moon pool, immediate reporting to NMFS, BOEM, and BSEE is required (NMFS, 2020a).

Noise from routine installation activities has the potential to disturb marine mammals. Three functional hearing groups are represented in the 20 non-endangered cetaceans found in the Gulf of Mexico (NMFS, 2018a). Eighteen of the 19 odontocete species are considered to be in the mid-frequency functional hearing group and two species (dwarf and pygmy sperm whales) are in the high frequency functional hearing group (NMFS, 2018a). Thruster and installation sound will affect each group differently depending on the frequency bandwiths produced by operations.

For mid frequency cetaceans exposed to a non-impulsive source (like drilling operations), permanent threshold shifts are estimated to occur when the mammal has received a SEL_{cum} of 198 dB re 1 μPa^2 s over a 24-hour period. Simlarly, temporary threshold shifts are estimated to occur when the mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. Based on transmission loss calculations (Urick, 1983), open water propagation of noise produced by typical sources with intermittent use of DP thrusters during offshore operations, are not expected to produce SPL_{rms} greater than 160 dB re 1 µPa beyond 105 ft (32 m) from the source. Due to the short propagation distance of above-threshold SPL_{rms}, the transient nature of marine mammals and the stationary nature of the proposed activites, it is not expected that any marine mammals will receive exposure levels necessary for the onset of auditory threshold shifts. NMFS (2018a) presents criteria that are used to determine physiological (i.e., injury) thresholds for marine mammals. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS, 2018a) and therefore, revert to thresholds established and published by NMFS in 70 *FR* 1871. Received SPL_{rms} of 120 dB re 1 µPa from a non-impulsive source are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, in the case of behavioral responses, received levels alone do not indicate a behavioral response and, more importantly, do not equate to biologically important responses (Southall et al., 2016; Ellison et al., 2012).

There are other OCS facilities and activities near the project area, and the region, as a whole, has a large number of similar sources. Due to the limited scope, timing, and geographic extent of the installation activities, this project would represent a small temporary contribution to the overall noise regime, and any short-term impacts are not expected to be biologically significant to marine mammal populations.

Drilling vessel lighting and presence is not identified as an IPF for marine mammals by BOEM (2016b, 2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb marine mammals, and there is also a risk of vessel collisions. Data concerning the frequency of vessel collisions are presented by BOEM (2017a; 2012a). To reduce the potential for vessel collisions, BOEM has issued NTL BOEM-2016-G01 (see **Table 1**), which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species and requires operators to report sightings of any injured or dead protected species. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL. The NTL also requires that operators and crews maintain a vigilant watch for marine mammals and report sightings of any injured or dead protected species Vessel operators and crews are required to attempt to maintain a distance of 100 m (328 ft) or greater when toothed whales are sighted and 50 m (164 ft) when small cetaceans are sighted (NMFS, 2020a). When cetaceans are sighted while a vessel is underway, vessels must attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction until the cetacean has left the area. Vessel operators are required to reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. These mitigation measures are only effective during daylight hours, or in sea and weather conditions where cetaceans are sighted. All vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all "other aquatic protected species" including sea turtles, with an exception made for those animals that approach the vessel. Vessel speeds must also be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages (greater than three) of any marine mammal are observed near a vessel. Although vessel strike avoidance measures described in NMFS (2020a) are only applicable to ESA-listed species, complying with them may provide additional indirect protections to non-listed species as well. However, this mitigation is effective only during daylight hours and during periods of adequate visibility.

When aquatic protected species are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array, site clearance trawling). Use of these measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing cetaceans. The current PBR level for several non-endangered cetacean species in the Gulf of Mexico are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf and pygmy sperm whales = 0.9) (Hayes et al., 2019). Mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

Helicopter traffic also has the potential to disturb marine mammals (Würsig et al., 1998). However, while flying offshore, helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2017a, NMFS, 2020a). Maintaining this altitude will minimize the potential for disturbing marine mammals, and no significant impacts are expected (BOEM, 2017a; NMFS, 2020a).

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2016b, 2017a), and oil impacts on marine mammals in general are discussed by Geraci and St. Aubin (1990). For the EIA, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill is expected to be minimized by the contractor's and bp's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of the contractor's and bp's OSRP is expected to lessen the potential for impacts on marine mammals. Given the open ocean location of the project area, the limited duration of a small spill, and response efforts, it is expected that any impacts would be brief and minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft (MMC, 2011). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, as well as the mobility of marine mammals, no significant impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2016b, 2017a). For the EIA, there are no unique site-specific issues. Impacts of oil spills on marine mammals can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, noise, dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems (DeGuise et al., 2017), physiological stress, declining physical condition, and death. Kellar et al. (2017) estimated reproductive success rates for two northern Gulf of Mexico stocks affected by oil were less than a third (19.4%) of those previously reported in other areas (64.7%) not impacted. Behavioral responses can include displacement of animals from prime habitat (McDonald et al., 2017); disruption of social structure; changing prey availability and foraging distribution and/or patterns; changing reproductive behavior/productivity; and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic, potential use of dispersants, and remediation activities (e.g., controlled burns, skimmers, boom) (BOEM, 2017a). The increased level of vessel and aircraft activity associated with spill response could disturb marine mammals, potentially resulting in behavioral changes. The large number of response vessels could result in vessel collisions, entanglement or other injury, or stress. Response vessels would operate in accordance with NTL BOEM-2016-G01 to reduce the potential for striking or disturbing these animals, and therefore no significant impacts are expected. The application of dispersants greatly reduces exposure risks to marine mammals as the dispersants would remove oil from the surface thereby reducing the risk of contact and rendering it less likely to adhere to skin, baleen plates, or other body surfaces (BOEM, 2017a). Based on the current PBR level for several non-endangered cetacean species in the Gulf of Mexico that are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf and pygmy sperm whales = 0.9) (Hayes et al. 2019), mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

C.3.5 Sea Turtles (Endangered/Threatened)

Five species of Endangered or Threatened sea turtles may be found near the project area. Endangered species include the leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle (*Chelonia mydas*) is listed as Threatened (81 *FR* 20057). The DPS of loggerhead turtles (*Caretta caretta*) that occurs in the Gulf of Mexico is listed as Threatened, although other DPSs are Endangered.

Critical habitat has been designated for the loggerhead turtle in the Gulf of Mexico as shown in **Figure 3**. Loggerhead turtles in the Gulf of Mexico are part of the Northwest Atlantic Ocean DPS (76 *FR* 58868). In July 2014, NMFS and the USFWS designated critical habitat for this DPS (NMFS, 2014b). The USFWS designation (79 *FR* 39756) includes nesting beaches in Jackson County, Mississippi; Baldwin County, Alabama; and Bay, Gulf, and Franklin Counties in the Florida Panhandle as well as several counties in southwest Florida and the Florida Keys (and other areas along the Atlantic coast). The NMFS designation (79 *FR* 39856) includes nearshore reproductive habitat within 0.99 miles (1.6 km) seaward of the mean high-water line along these same nesting beaches. NMFS also designated a large area of shelf and oceanic waters, termed *Sargassum* habitat, in the Gulf of Mexico (and Atlantic Ocean) as critical habitat. *Sargassum* is a brown algae (Class Phaeophyceae) that takes on a planktonic, often pelagic existence after being removed from reefs during rough weather. Rafts of *Sargassum* serve as important foraging and developmental habitat for numerous fishes, and young sea turtles, including loggerhead turtles. NMFS designated three other categories of critical habitat; of these, two (migratory habitat and overwintering habitat) are along the Atlantic coast and the third (breeding habitat) is found in the Florida Keys and along the Florida east coast (NMFS, 2014b).

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 235 statute miles (378 km) north of the project area. The project area is located within the designated Sargassum critical habitat for loggerhead sea turtles (**Figure 3**).

Leatherbacks are the species most likely to be present near the project area, as they feed on populations of gelatinous plankton, such as jellyfish and salps in all water depths. Loggerhead, green, hawksbill, and Kemp's ridley turtles are typically inner-shelf and nearshore species but may be found transiting in oceanic waters during seasonal migrations. Loggerheads are more likely to occur or be attracted to offshore structures than the other species. Hatchlings or juveniles of any of the sea turtle species may be present in deepwater areas, including the project area, where they may be associated with *Sargassum* spp. and other flotsam. All five sea turtle species in the Gulf of Mexico are migratory and use different marine habitats according to their life stage. These habitats include high-energy beaches for nesting females and emerging hatchlings and pelagic convergence zones for hatchling and juvenile turtles. As adults, green, hawksbill, and loggerhead turtles forage primarily in shallow, benthic habitats. Leatherback turtles are the most pelagic of the sea turtles, feeding primarily on jellyfish.

Sea turtle nesting in the northern Gulf of Mexico can be summarized by species as follows:

- Loggerhead turtles—loggerhead turtles nest in significant numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, 2017a) and, to a lesser extent, from Texas through Alabama (NMFS and USFWS, 2008);
- Green and leatherback turtles—green and leatherback turtles infrequently nest on Florida Panhandle beaches (Florida Fish and Wildlife Conservation Commission, 2017b,c);
- Kemp's ridley turtles—The main nesting site is Rancho Nuevo beach in Tamaulipas, Mexico (NMFS et al., 2011). A total of 262 Kemp's ridley turtle nests were counted on Texas beaches for the 2020 nesting season. This is an increase from 2019 but similar to 2018. A total of 190 Kemp's ridley turtle nests were counted on Texas beaches during the 2019 nesting season and a total of 250 Kemp's ridley turtle nests were counted on Texas beaches during the 2018 nesting season (Turtle Island Restoration Network, 2020). Padre Island National Seashore, along the coast of Willacy, Kenedy, and Kleberg Counties in southern Texas, is the most important nesting location for this species in the U.S.; and
- Hawksbill turtles—hawksbill turtles typically do not nest anywhere near the project area, with most nesting in the region located in the Caribbean Sea and on beaches of the Yucatán Peninsula (USFWS, 2016a).

IPFs that could potentially affect sea turtles include drilling vessel presence, noise, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on sea turtles due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Though NMFS (2020a) stated marine debris as an IPF, compliance with NTL BSEE 2015-G03 (See **Table 1**) and NMFS (2020a) Appendix B will minimize the potential for marine debris-related impacts on sea turtles. NMFS (2020a) estimated a small proportion of individual sea turtles would be adversely affected from exposure to marine debris. Therefore, marine debris is likely to have negligible impacts on sea turtles and is not further discussed (See **Table 2**).

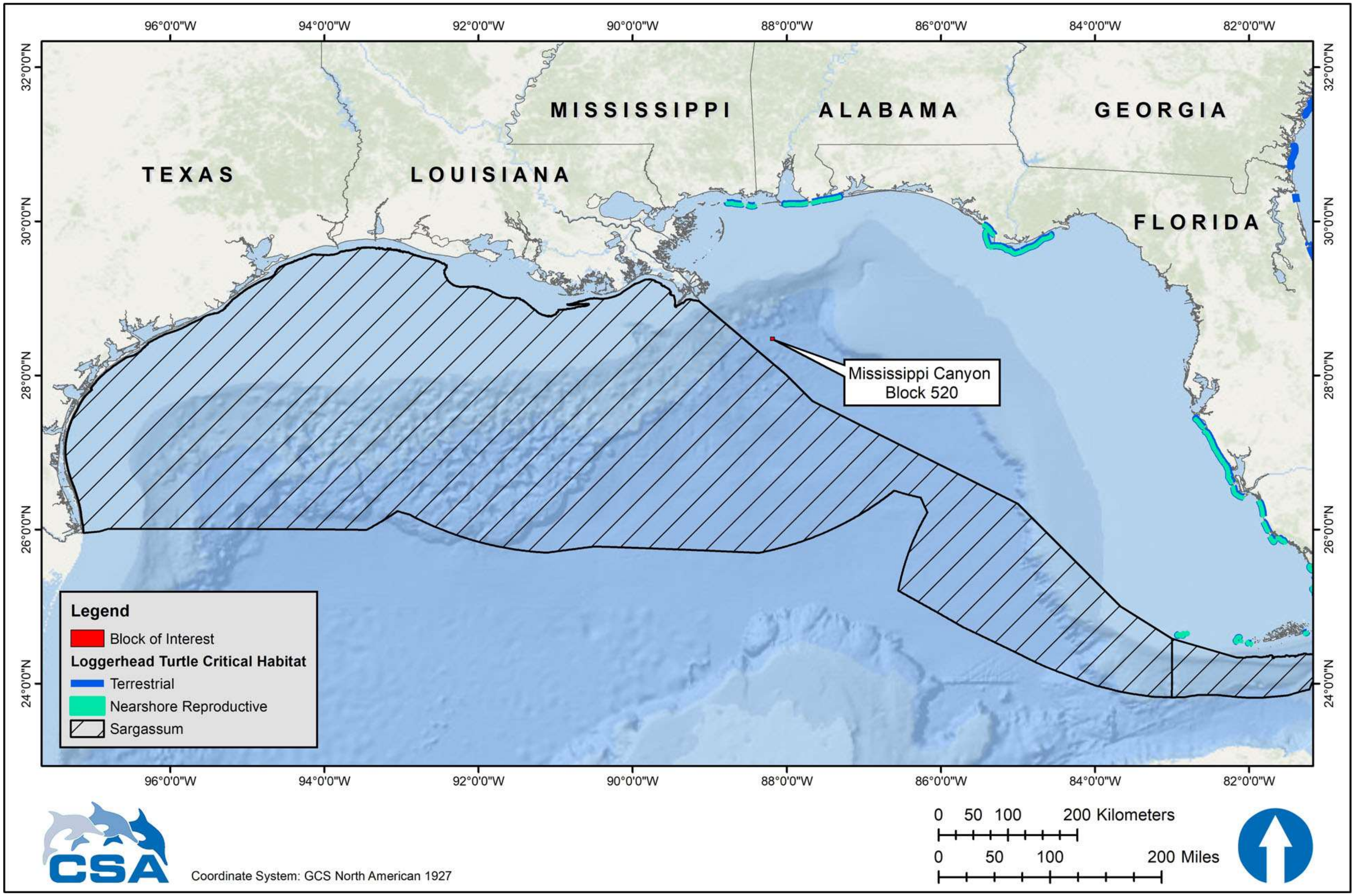

Figure 3. Location of loggerhead turtle critical habitat in United States waters in the northern Gulf of Mexico in relation to the project area. The critical habitat includes terrestrial habitat (nesting beaches) and nearshore reproductive habitat in Mississippi, Alabama, and the Florida Panhandle as well as *Sargassum* habitat.

Impacts of Drilling Vessel Presence, Noise, and Lights

Drilling activities produce broadband sounds at frequencies and intensities that may be detected by sea turtles (Samuel et al., 2005, Popper et al., 2014). Potential impacts could include behavioral disruption and displacement from the area near the sound source. There is scarce information regarding hearing and acoustic thresholds for marine turtles.

Sea turtles can hear low to mid-frequency sounds and they appear to hear best between 200 and 750 Hz and do not respond well to sounds above 1,000 Hz (Ketten and Bartol, 2005). The currently accepted hearing and response estimates are derived from fish hearing data rather than from marine mammal hearing data in combination with the limited experimental data available (Popper et al., 2014). NMFS Biological Opinion (NMFS, 2020a) lists the sea turtle underwater acoustic SPL_{rms} injury threshold as 207 dB re 1 µPa; Blackstock et al. (2018) identified the sea turtle underwater acoustic SPL_{rms} behavioral threshold as 175 dB re 1 µPa. No distinction is made between impulsive and non-impulsive sources for these thresholds. Based on transmission loss calculations (Urick, 1983), open water propagation of noise produced by typical sources with DP thrusters in use during installation activities, are not expected to produce SPL_{rms} greater than 160 dB re 1 µPa beyond 105 ft (32 m) from the source. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997; Colman et al., 2020) and thus, may be more susceptible to impacts from sounds produced during routine activities. Helicopters and support vessels may also affect sea turtles because of machinery noise or visual disturbances. Any impacts would likely be short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope, these short-term impacts are not expected to be biologically significant to sea turtle populations.

Artificial lighting can disrupt the nocturnal orientation of sea turtle hatchlings (Tuxbury and Salmon, 2005; Berry et al., 2013; Simões et al., 2017). However, hatchlings may rely less on light cues when they are offshore than when they are emerging on the beach (Salmon and Wyneken, 1990). NMFS (2007) concluded that the effects of lighting from offshore structures on sea turtles are insignificant.

NMFS (2020a) stated sea turtles have the potential to be entangled or entrapped in moon pools, and though many sea turtles could exit the moon pool under their own volition, sublethal effects could occur. If the vessel is equipped with a moon pool, a trained crew member or company representative will monitor the moon pool area for sea turtles during operations. If a sea turtle is detected in the moon pool, it will be immediately reported to agencies including NMFS, BOEM, and BSEE per NMFS (2020a); compliance with ensuing agency guidance is expected. Resuscitation of any trapped sea turtles is expected to occur in compliance with NMFS (2020a) Appendix J.

Based on the moon pool entrapment cases of sea turtles reported and successful rescues and releases that have occurred, NMFS (2020a) estimated approximately about one sea turtle will be sub-lethally entrapped in moon pools every year. Therefore, no significant impacts are expected.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sea turtles, and there is also a risk of vessel collisions. Data show that vessel traffic is one cause of sea turtle mortality in the Gulf of Mexico

(Lutcavage et al., 1997). While adult sea turtles are visible at the surface during the day and in clear weather, they can be difficult to spot from a moving vessel when resting below the water surface, during nighttime, or during periods of inclement weather. To reduce the potential for vessel collisions, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for sea turtles and slow down or stop their vessel to avoid colliding with protected species, and requires operators to report sightings of any injured or dead protected species. When sea turtles are sighted, vessel operators and crews must, to the maximum extent possible, attempt to maintain a distance of 164 ft (50 m) or greater whenever possible (NMFS [2020] Appendix C). When sea turtles are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If aquatic protected species are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear (e.g., source towed array and site clearance trawling). Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing sea turtles. Therefore, no significant impacts are expected.

Noise generated from support helicopter traffic also has the potential to disturb sea turtles. However, while flying offshore, helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. This altitude is intended to minimize the potential for disturbing sea turtles, and no significant impacts are expected (NMFS, 2007; BOEM, 2012a).

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by NMFS (2020a) and BOEM (2017a). For this DOCD, there are no unique site-specific issues with respect to spill impacts on sea turtles.

The probability of a fuel spill is expected to be minimized by the contractor and bp's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of the contractor and bp's OSRP is expected to minimize potential impacts on sea turtles. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and sound of response vessels and aircrafts (NMFS, 2014a). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be evaporated or dispersed naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, no significant impacts to sea turtles from direct or indirect exposure would be expected.

Loggerhead Critical Habitat – Nesting Beaches. A small fuel spill in the project area would be unlikely to affect sea turtle nesting beaches because the project area is 68 miles (109km) from the nearest shoreline (Louisiana). Loggerhead turtle nesting beaches and nearshore reproductive habitat designated as critical habitat are located in Mississippi, Alabama, and the Florida Panhandle, at least 117 miles (188 km) from the project area. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to natural dispersion.

Loggerhead Critical Habitat – *Sargassum*. The project area is approximately 14 miles (23 km) from the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 3**). Due to the distance from the project area, a small diesel fuel spill is unlikely to affect *Sargassum* and juvenile turtles in this habitat. However, if juvenile sea turtles come into contact with or ingest diesel oil, impacts could include death, injury, or other sublethal effects. Effects of a small spill on *Sargassum* critical habitat for loggerhead turtles would be limited to the small area (0.5 to 5 ha [1.2 to 12 ac]) likely to be impacted by a small spill. An impact area of 5 ha (12 ac) would represent a negligible portion of the approximately 40,662,810 ha (100,480,000 ac) designated *Sargassum* critical habitat for loggerhead turtles in the northern Gulf of Mexico. However, if juvenile sea turtles are present in the area impacted, significant impacts to the regional population could occur.

Impacts of a Large Oil Spill

Impacts of oil spills on sea turtles can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine noise, dispersants). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes and smoke (e.g., from *in situ* burning of oil); ingestion of oil (and dispersants) directly or via contaminated food; and stress from the activities and noise of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, change in food availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011; NMFS, 2014a; NOAA, 2010, NMFS 2020b). In the unlikely event of a spill, implementation of bp's OSRP is expected to minimize the potential for these types of impacts on sea turtles. DOCD Section 9 provides further details on spill response measures.

Studies of oil effects on loggerheads in a controlled setting (Lutcavage et al., 1995, NOAA, 2010) suggest that sea turtles show no avoidance behavior when they encounter an oil slick, and any sea turtle in an affected area would be expected to be exposed. Sea turtles' diving behaviors also put them at risk. Sea turtles rapidly inhale a large volume of air before diving and continually resurface over time, which may result in repeated exposure to volatile vapors and oiling (NMFS, 2020a).

Loggerhead Critical Habitat – Nesting Beaches. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2007). An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions (NMFS, 2007).

The 30-day OSRA results summarized in **Table 4** estimate that Louisiana, Mississippi, Alabama, and Florida shorelines that may support limited sea turtle nesting could be contacted within 30 days (1 to 21% conditional probability). Plaquemines Parish in Louisiana is the coastal area most likely to be affected (4% probability within 3 days; 14% probability within 10 days; and 21% probability within 30 days). The 60-day OSRA modeling (**Table 5**) predicts the conditional probability of contacting Mississippi, Alabama, and Florida Panhandle shorelines that support significant loggerhead sea turtle nesting is 24% or less. The nearest nearshore reproductive critical habitat for the loggerhead turtle in Baldwin County, Alabama is 85 miles (137 km) from the project area and is predicted by the 60-day OSRA model to have an 18% or less conditional probability of contact within 60 days of a spill.

Loggerhead Critical Habitat – *Sargassum* Habitat. The project area is approximately 14 miles (23 km) from the loggerhead turtle critical habitat designated as *Sargassum* habitat, which includes most of the Western and Central Planning Areas in the Gulf of Mexico and parts of the southern portion of the Eastern Planning Area (**Figure 3**) (NMFS, 2014b). If the habitat was contacted by oil, because *Sargassum* spp. is a floating, pelagic species, it would only be affected by oiling that occurs near the surface.

The effects of oiling on *Sargassum* spp. vary with severity, but moderate to heavy oiling that could occur during a large spill could cause complete mortality to *Sargassum* spp. and its associated communities (BOEM, 2017a). *Sargassum* spp. also has the potential to sink during a large spill; thus temporarily removing the habitat and possibly being an additional pathway of exposure to the benthic environment (Powers et al., 2013). Lower levels of oiling may cause sublethal affects, including reduced growth, productivity, and recruitment of organisms associated with *Sargassum* spp*.* The *Sargassum* spp. algae itself could be less impacted by light to moderate oiling than associated organisms because of a waxy outer layer that might help protect it from oiling (BOEM, 2016b). *Sargassum* spp. have a yearly seasonal cycle of growth and a yearly cycle of dispersal from the Gulf of Mexico to the western Atlantic. A large spill could affect a large portion of the annual crop of the algae; however, because of its ubiquitous distribution and seasonal cycle, recovery of the Sargassum spp. community would be expected to occur within one to two years (BOEM, 2017a).

A large spill could affect a large portion of the annual crop of the algae; however, because of its ubiquitous distribution and seasonal cycle, recovery of the *Sargassum* spp. community would be expected to occur within one to two years (BOEM, 2017a).

Impacts to sea turtles from a large oil spill and associated cleanup activities would depend on spill extent, duration, and season (relative to turtle nesting season); the amount of oil reaching the shore; the importance of specific beaches to sea turtle nesting; and the level of cleanup vessel and beach crew activity required. In the event of oil from a large spill, it is expected that impacts resulting in the injury or death of individual sea turtles would be adverse but not likely significant at the population level. In the event that spilled oil reached nesting beaches during nesting period(s), the level of mortality (and impact) would increase.

C.3.6 Piping Plover (Threatened)

The Piping Plover is a migratory shorebird that overwinters along the southeastern U.S. and Gulf of Mexico coasts. This Threatened species experienced declines in population as a result of hunting, habitat loss and modification, predation, and disease (USFWS, 2003). However, as a result of intensive conservation and management, populations of Piping Plover appear to have been increasing since 1991 throughout its range (Bird Life International, 2018). Critical overwintering habitat has been designated, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 4**). Piping Plovers inhabit coastal sandy beaches and mudflats, feeding by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening (USFWS, 2010). A species description is presented by BOEM (2017a, USFWS, nd).

A large oil spill is the only IPF that potentially may affect Piping Plovers. A small fuel spill in the project area would be unlikely to affect Piping Plovers because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Sound from helicopters would be unlikely to significantly affect piping plover populations, because it is assumed that helicopters will maintain an altitude of 305 m (1,000 ft) over unpopulated areas or across coastlines.

Impacts of a Large Oil Spill

The project area is approximately 66 miles (106 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 4**). The 30-day OSRA modeling (**Table 4**) predicts that Piping Plover critical habitat in Plaquemines Parish, Louisiana, could be contacted within 3 days of a spill (4% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that during the fall, there is a 24% conditional probability that an oil spill from the project area would reach a shoreline designated as critical habitat for the Piping Plover within 60 days of a spill.

Plovers could physically oil themselves while foraging on oiled shores or secondarily contaminate themselves through ingestion of oiled intertidal sediments and prey (BOEM, 2017a). Piping Plovers congregate and feed along tidally-exposed banks and shorelines, following the tidal boundary and foraging at the water's edge. It is possible that some deaths of Piping Plovers could occur, especially if spills occur during winter months when plovers are most common along the coastal Gulf or if spills contacted critical habitat. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. bp has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

However, a large spill that contacts shorelines would not necessarily substantially impact Piping Plovers. In the aftermath of the *Deepwater Horizon* incident, Gibson et al. (2017) completed thorough surveys of coastal Piping Plover habitat in coastal Louisiana, Mississippi, and Alabama and found that only 0.89% of all observed Piping Plovers were visibly oiled, leaving the authors to conclude that the *Deepwater Horizon* incident did not substantially affect Piping Plover populations.

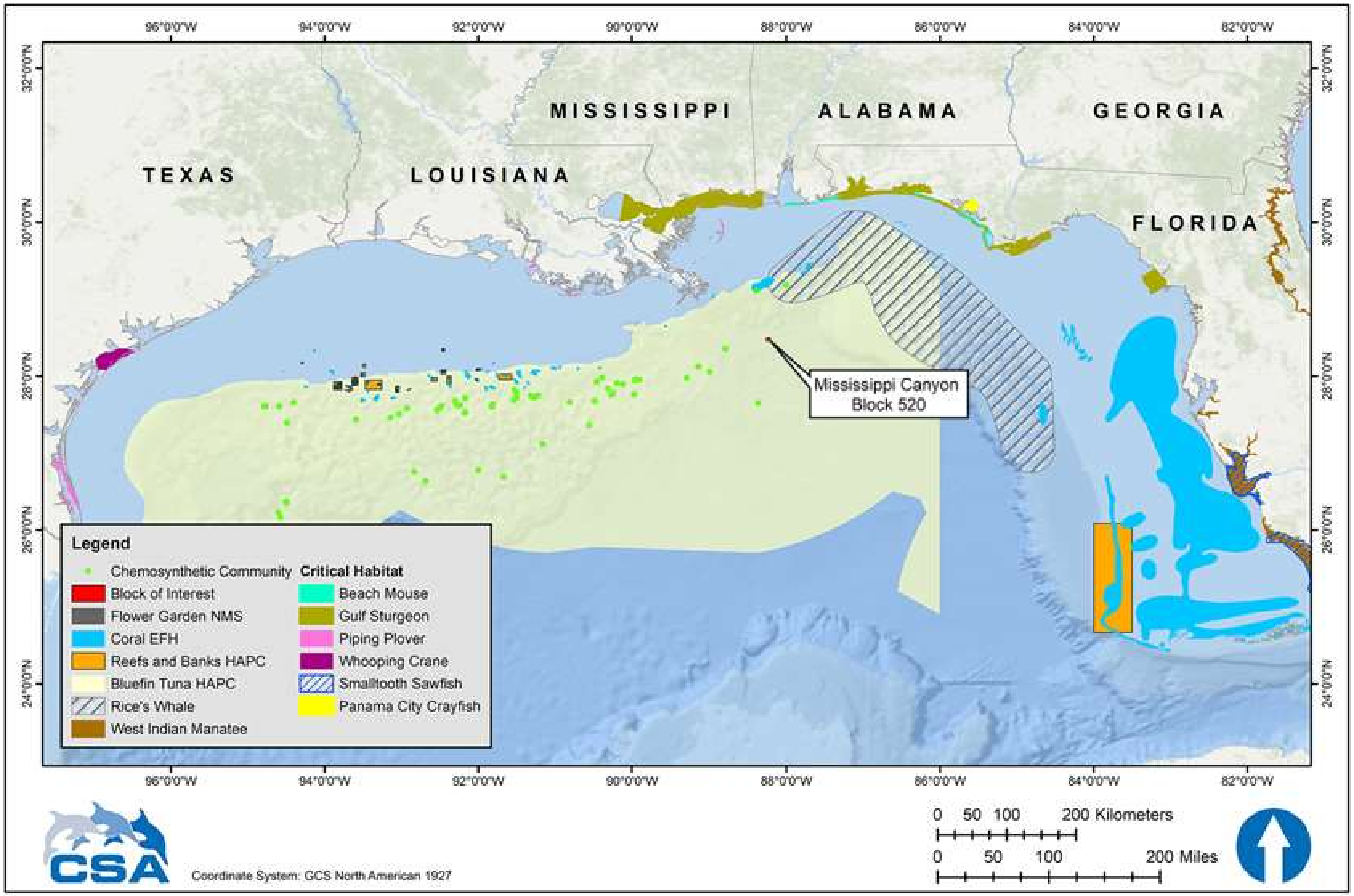

Figure 4. Location of selected environmental features in relation to the project area.

C.3.7 Whooping Crane (Endangered)

The Whooping Crane is a large omnivorous wading bird and a federally listed Endangered species. Three wild populations live in North America (National Wildlife Federation, 2016b). One of these populations winters along the Texas coast at Aransas NWR and summers at Wood Buffalo National Park in Canada. This population represents the majority of the world's population of free-ranging Whooping Cranes, reaching an estimated population of 506 at Aransas NWR during the 2019 to 2020 winter (USFWS, 2020b). A non-migrating population was reintroduced in central Florida, and another reintroduced population summers in Wisconsin and migrates to the southeastern U.S. for the winter (USFWS, 2015). Whooping Cranes breed, migrate, winter, and forage in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields (USFWS, 2007). About 22,240 ac (9,000 ha) of salt flats in Aransas NWR and adjacent islands comprise the principal wintering grounds of the Whooping Crane. Aransas NWR is designated as critical habitat for the species (**Figure 4**). A species description is presented by BOEM (2012a).

A large oil spill is the only IPF that potentially may affect Whooping Cranes. A small fuel spill in the project area would also be unlikely to affect Whooping Cranes, due to the distance from Aransas NWR. As explained in Section A.9.1, a small fuel spill would not be expected to make landfall or reach coastal waters prior natural dispersion.

Impacts of a Large Oil Spill

A large oil spill is unlikely to affect Whooping Cranes as the project area is approximately 502 miles (808 km) from the Aransas NWR, which is the nearest designated critical habitat. The 30-day OSRA modeling (**Table 4**) predicts a <0.5% or less chance of oil contacting Whooping Crane critical habitat within 30 days of a spill. The 60-day OSRA model (**Table 5**) predicts that there is a <0.5% or less chance oil contacting Whooping Crane critical habitat within 60 days of a spill.

In the event of oil exposure, Whooping Cranes could physically oil themselves while foraging in oiled areas or secondarily contaminate themselves through ingestion of contaminated shellfish, frogs, and fishes. It is possible that some Whooping Crane deaths could occur, especially if a spill occurred during winter months when Whooping Cranes are most common along the Texas coast and if the spill contacts their critical habitat in Aransas NWR. Impacts could also occur from vehicular traffic on beaches and other activities associated with spill cleanup. In the event of a spill, bp would work with the applicable state and federal agencies to prevent impacts on Whooping Cranes. bp has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

C.3.8 Oceanic Whitetip Shark (Threatened)

The oceanic whitetip shark was listed as Threatened under the ESA in 2018 by NMFS (83 *FR* 4153). Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude, and historically were one of the most widespread and abundant species of shark (Rigby et al., 2019). However, based on reported oceanic whitetip shark catches in several major long-line fisheries, the global population appears to have suffered substantial declines (Camhi et al., 2008) and the species is now only occasionally reported in the Gulf of Mexico (Rigby et al., 2019).

Oceanic whitetip shark management is complicated due to it being globally distributed, highly migratory, and overlapping in areas of high fishing; thus, leaving assessment of population trends on fishery dependent catch-and-effort data rather than scientific surveys (Young and Carlson, 2020). A comparison of historical shark catch rates in the Gulf of Mexico by Baum and Myers (2004) noted that most recent papers dismissed the oceanic whitetip shark as rare or absent in the Gulf of Mexico. NMFS (2018b) noted that there has been an 88% decline in abundance of the species in the Gulf of Mexico since the mid-1990s due to commercial fishing pressure.

IPFs that could affect the oceanic whitetip shark include lay vessel presence, noise, and lights, and a large oil spill. Though NMFS (2020a) lists a small diesel fuel spill as an IPF, in the project area, a small diesel fuel spill would be unlikely to affect oceanic whitetip sharks due to rapid natural dispersion of diesel fuel and the low density of oceanic whitetip sharks potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (**Table 2**).

Impacts of Lay Vessel Presence, Noise, and Lights

Offshore activities produce a broad array of sounds at frequencies and intensities that may be detected by elasmobranchs including the Threatened oceanic whitetip shark. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013), which includes frequencies exhibited by individual species such as the nurse shark (*Ginglymostoma cirratum*; 300 and 600 Hz) and the lemon shark (*Negaprion brevirostris*; 20 Hz to 1 kHz) (Casper and Mann, 2006). These frequencies overlap with SPLs associated with production activities (195 dB re 1 µPa m with peak frequencies at 40 to 100 Hz) (Hildebrand, 2005). Impacts from offshore activities (i.e., non-impulsive sound) could include masking or behavioral change (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the lay vessel, impacts would be limited in geographic scope and no population level impacts on oceanic whitetip sharks are expected.

Impacts of a Large Oil Spill

Information regarding the direct effects of oil on elasmobranchs, including the oceanic whitetip shark are largely unknown. A study by Cave and Kajiura (2018) reported that when exposed the crude oil, the Atlantic stingray (*Hypanus sabinus*) experienced impaired olfactory function which could lead to decreased fitness. In the event of a large oil spill, oceanic whitetip sharks could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Because oceanic whitetip sharks may be found in surface waters, they could be more likely to be impacted by floating oil than other species which only reside at depth.

It is possible that a large oil spill could affect individual oceanic whitetip sharks and result in injuries or deaths. However, due to the low density of oceanic whitetip sharks thought to exist in the Gulf of Mexico, it is unlikely that a large spill would result in population-level effects.

C.3.9 Giant Manta Ray (Threatened)

The giant manta ray is a Threatened elasmobranch species that is a slow-growing, migratory, planktivorous species than inhabits tropical, subtropical, and temperate bodies of water worldwide (NOAA, 2018). The giant manta ray became listed as Threatened under the ESA in 2018.

Commercial fishing is the primary threat to giant manta rays (NOAA, 2018a). The species is targeted and caught as bycatch in several global fisheries throughout its range. Although protected in U.S. waters, protection of populations is difficult as they are highly migratory with sparsely distributed and fragmented populations throughout the world. Some estimated regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NOAA, 2018a). Stewart et al. (2018) recently reported evidence that the Flower Garden Banks serves as nursery habitat for aggregations of juvenile manta rays. Approximately 100 unique individuals have been positively identified at the Flower Garden Banks based on unique underbelly coloration (Belter et al., 2020). Genetic and photographic evidence in the Flower Garden Banks over 25 years of monitoring showed that 95% of identified giant manta ray male individuals were smaller than mature size (Stewart et al., 2018).

IPFs that may affect giant manta rays include lay vessel presence, noise, and lights, and a large oil spill. Though NMFS (2020a) lists a small diesel fuel spill as an IPF, in the project area a small diesel fuel spill would be unlikely to affect giant manta rays due to rapid natural dispersion of diesel fuel and the low density of giant manta rays potentially present in the project area. Therefore, no significant impacts are expected from small diesel fuel spills and they are not further discussed (See **Table 2**).

Impacts of Drilling Vessel Presence, Noise, and Lights

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by elasmobranchs including the giant manta ray. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013). Studies indicate that the most sensitive hearing ranges for individual species were 300 and 600 Hz (yellow stingray [*Urobatis jamaicensis*]) and 100 to 300 Hz (little skate [*Erinacea raja*]) (Casper et al., 2003; Casper and Mann, 2006). These frequencies overlap with SPLs associated with production activities (195 dB re 1 µPa m with peak frequencies at 40 to 100 Hz) (Hildebrand, 2005). Impacts from offshore activities (i.e., continuous sound) could include masking or behavioral change (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the lay vessel, impacts would be limited in geographic scope and no population level impacts on giant manta rays are expected.

Impacts of a Large Oil Spill

A large oil spill in the project area could reach coral reefs at the Flower Garden Banks, which is the only known location of giant manta ray aggregations in the Gulf of Mexico, although individuals may occur anywhere in the Gulf. Information regarding the direct effects of oil on elasmobranchs, including the giant manta ray, are largely unknown. In the unlikely event of a large oil spill impacting areas with giant manta rays, individual rays could be affected by direct ingestion of oil which could cover their gill filaments or gill rakers, or by ingestion of oiled plankton. A study by Cave and Kajiura (2018) reported that when exposed to crude oil, the Atlantic stingray experienced impaired olfactory function which could lead to decreased fitness. Giant manta rays typically feed in shallow waters of less than 33 ft (10 m) depth (NOAA, 2018a). Because of this shallow water feeding behavior, giant manta rays may be more likely to be impacted by floating oil than other species which only reside at depth.

In the event of a large oil spill, due to the distance between the project area and the Flower Garden Banks, it is unlikely that oil would impact the threatened giant manta ray nursery habitat. It is possible that a large oil spill could contact individual giant manta rays, but due to the low density of individuals thought to occur in the Gulf of Mexico, there would not likely be any population-level impacts.

C.3.10 Gulf Sturgeon (Threatened)

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a Threatened fish species that inhabits major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida (Barkuloo, 1988; Wakeford, 2001). Sturgeon are anadromous fish that migrate from the ocean upstream into coastal rivers to spawn in freshwater.

The historic range of the species extended from the Texas/Louisiana border to Tampa Bay, Florida (Pine and Martell, 2009). This range has contracted to encompass major rivers and inner shelf waters from the Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi to the Suwannee River, Florida (NOAA, 2018b). Populations have been depleted or even extirpated throughout the species' historical range by fishing, shoreline development, dam construction, water quality changes, and other factors (Barkuloo, 1988; Wakeford, 2001). These declines prompted the listing of the Gulf sturgeon as a Threatened species in 1991.
The best-known populations occur in the Apalachicola and Suwannee Rivers in Florida (Carr, 1996; Sulak and Clugston, 1998), the Choctawhatchee River in Alabama (Fox et al., 2000), and the Pearl River in Mississippi/Louisiana (Morrow et al., 1998). Rudd et al. (2014) reconfirmed the spatial distribution and movement patterns of Gulf sturgeon by surgically implanting acoustic telemetry tags. Critical habitat in the Gulf extends from Lake Borgne, Louisiana (St. Bernard Parish), to Suwannee Sound, Florida (Levy County) (NMFS, 2014b) (**Figure 4**). Species descriptions are presented by BOEM (2012a) and in the recovery plan for this species (USFWS et al., 1995).

A large oil spill is the only IPF that potentially may affect Gulf sturgeon. There are no IPFs associated with routine project activities that could affect these fish. A small fuel spill in the project area would be unlikely to affect Gulf sturgeon because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Vessel collisions to Gulf sturgeon would be unlikely based on the location of the support vessel base and that NMFS (2020a) estimated one non-lethal Gulf sturgeon strike in the 50 years of proposed action. Due to the distance of the project area from the nearest Gulf sturgeon critical habitat (117 miles [188 km]) and the support vessel base being in Port Fourchon, Louisiana, it is anticipated impacts from vessel collisions due to project activities will be negligible.

Impacts of a Large Oil Spill

Potential spill impacts on Gulf sturgeon are discussed by NMFS (2007) and BOEM (2012a; 2017a). For this DOCD, there are no unique site-specific issues with respect to this species.

The project area is approximately 117 miles (188 km) from the nearest Gulf sturgeon critical habitat. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 10 days of a spill and 3% or less conditional probability within 30 days. The 60-day OSRA modeling (**Table 5**) predicts that a spill in the project areas has a 19% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 60 days of a spill.

In the event of oil reaching Gulf sturgeon habitat, the fish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the life history of this species, subadult and adult Gulf sturgeon would be most vulnerable to an estuarine or marine oil spill, and would be vulnerable from approximately October through April when this species is foraging in estuarine and shallow marine habitats (NMFS, 2020a).

C.3.11 Nassau Grouper (Threatened)

The Nassau grouper is a Threatened, long-lived reef fish typically associated with hard bottom structures such as natural and artificial reefs, rocks, and underwater ledges (NOAA, nd). Once one of the most common reef fish species in the coastal waters of the United States and Caribbean (Sadovy, 1997), the Nassau grouper has been subject to overfishing and is considered extinct in much of its historical range. Observations of current spawning aggregations compared with historical landings data suggest that the Nassau grouper population is substantially smaller than its historical size (NOAA, nd). The Nassau grouper was listed as Threatened under the ESA in 2016 (81 *FR* 42268).

Nassau groupers are found mainly in the shallow tropical and subtropical waters of eastern Florida (rare), the Florida Keys, Bermuda, the Yucatán Peninsula, and the Caribbean, including the U.S. Virgin Island and Puerto Rico (NOAA, nd). There has been one confirmed sighting of Nassau grouper from the Flower Garden Banks in the Gulf of Mexico at a water depth of 118 ft (36 m) (Foley et al., 2007). Three additional unconfirmed reports (i.e., lacking photographic evidence) of Nassau grouper have also been documented from mooring buoys and the coral cap region of the West Flower Garden flats (Foley et al., 2007).

There are no IPFs associated with routine project activities that could affect Nassau grouper. A small fuel spill would not affect Nassau grouper because the fuel would float and dissipate on the sea surface and would not be expected to reach the Flower Garden Banks or Florida Keys. A large hydrocarbon spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 5**), a large hydrocarbon spill would be unlikely (<0.5% probability) to reach Nassau grouper habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks and the difference in water depth between the project area the Banks. While on the surface, hydrocarbons would not be expected to contact subsurface fish.

In the unlikely event that hydrocarbons contact Nassau grouper habitat, hydrocarbon droplets or contaminated sediment particles could come into contact with Nassau grouper present on the reefs. Individual fish could be affected by direct ingestion of hydrocarbons which could cover their gill filaments or gill rakers, result in ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills.

C.3.12 Smalltooth Sawfish (Endangered)

The smalltooth sawfish, named after their flat, saw-like rostrum, is an elasmobranch ray which lives in shallow coastal tropical seas and estuaries where they feed on fish and invertebrates such as shrimp and crabs (NOAA Fisheries, nd). Once found along most of the northern Gulf of Mexico coast from Texas to Florida, their current range in Gulf of Mexico is restricted to areas primarily in southwest Florida (Brame et al., 2019) where several areas of critical habitat have been designated (**Figure 4**). A species description is presented in the recovery plan for this species (NMFS, 2009a).

Listed as Endangered under the ESA in 2003, population numbers have drastically declined over the past century primarily due to accidental bycatch (Seitz and Poulakis, 2006). Although there are no reliable estimates for smalltooth sawfish population numbers throughout its range (NMFS, 2018c), data from 1989 to 2004 indicated a slight increasing trend in population numbers in Everglades National Park during that time period (Carlson et al., 2007). More recent data resulted in a similar conclusion, with indications that populations were stable or slightly increasing in southwest Florida (Carlson and Osborne, 2012).

There are no IPFs associated with routine project activities that could affect smalltooth sawfish. A small fuel spill would not affect smalltooth sawfish because the fuel would float and dissipate on the sea surface and would not be expected to reach smalltooth sawfish habitat in coastal areas (see **Section A.9.1**). A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

The project area is approximately 375 miles (604 km) from the nearest smalltooth sawfish critical habitat in Charlotte County, Florida. Based on the 30-day OSRA modeling (**Table 4**), coastal areas containing smalltooth sawfish critical habitat are unlikely to be affected within 30 days of a spill (<0.5% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts a <0.5% probability of shoreline contact within 60 days of a spill in two coastal areas containing smalltooth sawfish critical habitat in Collier and Monroe counties, Florida.

Information regarding the direct effects of oil on elasmobranchs, including the smalltooth sawfish are largely unknown. A recent study by Cave and Kajiura (2018) reported that when exposed the crude oil, the Atlantic stingray (*Hypanus sabinus*) experienced impaired olfactory function which could lead to decreased fitness. In the event of oil reaching smalltooth sawfish habitats, the smalltooth sawfish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the shallow, coastal habitats preferred by smalltooth sawfish, individuals in areas subject to coastal oiling could be more likely to be impacted than other species that reside at depth.

C.3.13 Beach Mouse (Endangered)

Four subspecies of Endangered beach mouse occur on the barrier islands of Alabama and the Florida Panhandle: the Alabama (*Peromyscus polionotus ammobates*), Choctawhatchee (*P. p. allophrys*), Perdido Key (*P. p. trissyllepsis*), and St. Andrew beach mouse (*P. p. peninsularis*). Critical habitat has been designated for all four subspecies and is shown combined in **Figure 4**. One additional species of beach mouse inhabiting dunes on the western Florida Panhandle, the Santa Rosa beach mouse (*P. p. leucocephalus*), is not listed under the ESA. A large oil spill is the only IPF that potentially may affect beach mice. are no IPFs associated with routine project activities that could affect these animals due to the distance from shore and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect beach mice because a small fuel spill would not be expected to reach beach mice habitat prior to dissipating (see Section A.9.1).

Impacts of a Large Oil Spill

Potential spill impacts on Endangered beach mice are discussed by BOEM (2017a). For this DOCD, there are no unique site-specific issues with respect to these species that were not analyzed in these documents.

Beach mouse critical habitat in Baldwin County, Alabama, is approximately 119 miles (192 km) from the project area. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 30 days. The 60-day OSRA modeling (**Table 5**) predicts that a spill in the project area has an 18% or less conditional probability of contacting any coastal areas containing beach mouse critical habitat within 60 days of a spill.

In the event of oil contacting these beaches, beach mice could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. However, any such impacts are unlikely due to the distance from shore and response actions that would occur in the event of a spill.

C.3.14 Florida Salt Marsh Vole (Endangered)

The Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*) is a small, dark brown or black rodent found only in saltgrass (*Distichlis spicata*) meadows in the Big Bend region of Florida that was listed as Endangered under the ESA in 1991. Only two populations of Florida salt marsh vole are known to exist: one near Cedar Key in Levy County, Florida and one in the Lower Suwanee National Wildlife Refuge in Dixie County, Florida (Florida Fish and Wildlife Conservation Commission, nd). No critical habitat has been established for the Florida salt marsh vole in part due to concerns over illegal trapping or trespassing if the location of the populations were publicly disclosed (USFWS, 2001b).

A large oil spill is the only IPF that potentially may affect the Florida salt marsh vole. There are no IPFs associated with routine project activities that could affect these animals due to the distance from the project area to their habitat and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect the Florida salt marsh vole because a small fuel spill would not be expected to reach their habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Florida salt marsh vole habitat in Levy and Dixie counties, Florida is approximately 292 miles (470 km) from the project area. The 30-day OSRA modeling (**Table 4**) predicts that a spill in the project area has <0.5% or less conditional probability of contacting any coastal areas containing Florida salt marsh voles within 30 days. The 60-day OSRA modeling (**Table 5**) predicts a 1%

probability of shoreline contact within 60 days of a spill between to coastal areas containing Florida salt marsh vole habitat in Levy and Dixie counties, Florida.

In the event of oil contacting beaches containing these animals, Florida salt marsh voles could experience several types of direct and indirect impacts. Contact with spilled oil could cause skin and eye irritation and subsequent infection; matting of fur; irritation of sweat glands, ear tissues, and throat tissues; disruption of sight and hearing; asphyxiation from inhalation of fumes; and toxicity from ingestion of oil and contaminated food. Indirect impacts could include reduction of food supply, destruction of habitat, and fouling of nests. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. Impacts associated with an extensive oiling of coastal habitat containing Florida salt marsh voles from a large oil spill are expected to be significant. Due to the extremely low population numbers, extensive oiling of Florida salt marsh vole habitat could result in the extinction of the species. However, any such impacts are unlikely due to the distance from the project area to Florida salt marsh vole habitat and response actions that would occur in the event of a spill.

C.3.15 Panama City Crayfish (Threatened)

The USFWS issued a Final Rule designating the Panama City crayfish as Threatened under the ESA on 5 January 2022 (effective 4 February 2022). The Panama City crayfish is a semi-terrestrial crayfish that grows up to 2 inches (51 mm) in size and is found in south-central Bay County, Florida. Medium to dark brown in color, the crayfish prefers area dominated by herbaceous vegetation and shallow or fluctuating water levels (Keppner and Keppner, 2004). Historically prevalent in shallow freshwater bodies in pine and prairie communities, urban development has largely replaced these habitats. The Panama City crayfish is now generally found in wet or semi-wet swales, ditches, slash pine plantations, undeveloped utility rights-of-way, and remnant wetlands (Florida Fish and Wildlife Conservation Commission, 2016).

A large oil spill is the only IPF that potentially may affect the Panama City crayfish. There are no IPFs associated with routine project activities that could affect these animals due to the distance from the project area to their habitat and the lack of any onshore support activities near their habitat. A small fuel spill in the project area would not affect the Panama City crayfish because a small fuel spill would not be expected to reach their habitat prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Panama City crayfish critical habitat in Bay County, Florida is approximately 357 miles (574 km) from the project area. The 30-day OSRA modeling (Table 4) predicts that a spill in the project area has <0.5% or less conditional probability of contacting any coastal areas containing Panama City crayfish critical habitat within 30 days. The 60-day OSRA modeling (Table 5) predicts that a spill in the project area has 1% or less conditional probability of contacting any coastal areas containing Panama City crayfish critical habitat within 60 days of a spill.

Effects of oiling on the Panama City crayfish are largely unknown. In general, crayfishes use chemoreception to orient themselves in their environmental, to find food, and to avoid predators (Bergman and Moore, 2005). Exposure to hydrocarbons has been shown to damage receptor cells that crayfish use for chemoreception, thus decreasing their fitness (Tierney et al., 2010). Similar experiments in American lobsters (Homarus americanus) have also shown exposure to hydrocarbons disrupts feeding and mating behaviors by confusing their chemoreception system (Gulf of Maine Research Institute, 2012).

Indirect impacts of oiling of Panama City crayfish habitat could include reduction of food supply, destruction of habitat, and fouling of burrows. Impacts could also occur from vehicular traffic and other activities associated with spill cleanup. Impacts associated with an extensive oiling of coastal habitat containing Panama City crayfish from a large oil spill are expected to be significant. Due to the low population numbers and restricted range, extensive oiling of Panama City crayfish habitat could be significant at the species level. However, any such impacts are unlikely due to the distance from the project area to Panama City crayfish habitat and response actions that would occur in the event of a spill.

C.3.16 Threatened Coral Species

Seven Threatened coral species are known from the northern Gulf of Mexico: elkhorn coral, staghorn coral, lobed star coral, mountainous star coral, boulder star coral, pillar coral, and rough cactus coral. Elkhorn coral, lobed star coral, mountainous star coral, and boulder star coral have been reported from the coral cap region of the Flower Garden Banks (NOAA, 2014), but are unlikely to be present as regular residents in the northern Gulf of Mexico because they typically inhabit coral reefs in shallow, clear tropical, or subtropical waters. Staghorn coral, pillar coral, and rough cactus coral are not known to inhabit reefs of the Flower Garden Banks, but are present on reefs in the Florida Keys and Dry Tortugas (Florida Fish and Wildlife Conservation Commission, 2018). Other Caribbean coral species evaluated by NMFS in 2014 (79 *FR* 53852) either do not meet the criteria for ESA listing or are not known from the Flower Garden Banks, Florida Keys, or Dry Tortugas. Critical habitat has been designated for elkhorn coral and staghorn coral in the Florida Keys (Monroe County, Florida) and Dry Tortugas, but none has been designated for the other Threatened coral species included here. A species description of elkhorn coral is presented in the recovery plan for the species (NMFS, 2015).

In November 2020, NMFS proposed to designate critical habitat for the boulder star coral, lobed star coral, mountainous star coral, pillar coral, and rough cactus coral in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. For the areas in the Gulf of Mexico this includes the Flower Garden Banks and the waters near Miami-Dade and Monroe counties, Florida, and the Dry Tortugas.

There are no IPFs associated with routine project activities that could affect threatened corals in the northern Gulf of Mexico. A small fuel spill would not affect threatened coral species because the oil would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 5**), a large oil spill would be unlikely (<0.5% probability) to reach elkhorn coral critical habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks (approximately 328 miles [528 km]), and the difference in water depth between the project area (approximately 6,698 ft [2,041 m]) and the Banks (approximately 17 to 145 m [56 to 476 ft]). While on the surface, oil would not be expected to contact corals on the seafloor. Natural or chemical dispersion of oil could cause a subsurface plume which would have the possibility of contacting seafloor corals.

If a subsurface plume were to occur, impacts on the Flower Garden Banks would be unlikely due to the distance between the project area and corals within the Flower Garden Banks (approximately 328 miles [528 km]), and the shallow location of the coral cap of the Banks. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge. Valentine et al. (2014) observed the spatial distribution of excess hopane, a crude oil tracer from *Deepwater Horizon* spill sediment core samples, to be in the deeper waters and not transported up the shelf, thus confirming that near-bottom currents flow along the isobaths.

In the unlikely event that a subsurface plume reached reefs at the Flower Garden Banks or other Gulf of Mexico reefs, oil droplets or oiled sediment particles could come into contact with reef organisms or corals. As discussed by BOEM (2017a), impacts could include loss of habitat, biodiversity, and live coral coverage; destruction of hard substrate; change in sediment characteristics; and reduction or loss of one or more commercial and recreational fishery habitats. Sub-lethal effects could be long-lasting and affect the resilience of coral colonies to natural disturbances (e.g., elevated water temperature and diseases) (BOEM, 2017a).

Due to the distance between the project area and coral habitats, there is a low chance of oil contacting threatened coral habitat in the event of a spill, and no significant impacts on threatened coral species are expected.

C.4 Coastal and Marine Birds

C.4.1 Marine Birds

Marine birds include seabirds and other species that may occur in the pelagic environment of the project area (Clapp et al., 1982a,b; Clapp et al., 1983; Peake, 1996; Hess and Ribic, 2000). Seabirds spend much of their lives offshore over the open ocean, except during breeding season when they nest on islands and along the coast. Other waterbirds, such as waterfowl, marsh birds, and shorebirds may occasionally be present over open ocean areas. No Endangered or Threatened bird species are likely to occur at the project area. For a discussion of coastal birds, see **Section C.4.2**.

Seabirds of the northern Gulf of Mexico were surveyed from ships during the GulfCet II program (Davis et al., 2000). Davis et al. (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater area. From these surveys, four ecological categories of seabirds were documented in the deepwater areas of the Gulf: summer migrants (shearwaters, storm-petrels, boobies); summer residents that breed along the Gulf coast (Sooty Tern [*Onychoprion fuscatus*], Least Tern [*Sternula antillarum*], Sandwich Tern [*Thalasseus sandvicensis*], Magnificent Frigatebird [*Fregata magnificens*]); winter residents (gannets, gulls, jaegers); and permanent resident species (Laughing Gulls [*Leucophaeus atricilla*], Royal Terns [*Thalasseus maximus*], Bridled Terns [*Onychoprion anaethetus*]) (Davis et al., 2000).

Common marine bird species include Wilson's Storm-Petrel (*Oceanites oceanicus*), Magnificent Frigatebird (*Fregata magnificens*), Northern Gannet (*Morus bassanus*), Masked Booby (*Sula dactylatra*), Brown Booby (*Sula leucogaster*), Cory's Shearwater (*Calonectris diomedea*), Greater Shearwater (*Puffinus gravis*), and Audubon's Shearwater (*Puffinus lherminieri*). Seabirds are distributed Gulf-wide and are not specifically associated with the project area.

Relationships with hydrographic features were found for several marine bird species, possibly due to effects of hydrography on nutrient levels and productivity of surface waters where birds forage. The GulfCet II study did not estimate bird densities; however, Haney et al. (2014) indicated that marine bird densities over the open ocean were estimated to be 0.62 birds $mile^{-2}$ (1.6 birds km^{-2}) (Haney et al., 2014).

The distributions and relative densities of seabirds within the deepwater areas of the Gulf of Mexico, including the project area, vary temporally (i.e., seasonally) and spatially. In GulfCet II studies (Davis et al., 2000), species diversity and density varied by hydrographic environment and by the presence and relative location of mesoscale features such as Loop Current eddies that may enhance nutrient levels and productivity of surface waters where these seabird species forage (Davis et al., 2000).

Trans-Gulf migrant birds including shorebirds, wading birds, and terrestrial birds may also be present in the project area. Migrant birds may use offshore structures, including platforms and semisubmersibles for resting, feeding, or as temporary shelter from inclement weather (Ronconi et al., 2015). Some birds may be attracted to offshore structures because of the lights and the fish populations that aggregate around these structures.

IPFs that potentially may affect marine birds include drilling rig presence, marine noise, lighting, support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges permitted under the NPDES are likely to have negligible impacts on the birds due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these animals. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on birds. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Vessel Presence, Noise, and Lights

Marine birds migrating over water have been known to strike offshore structures, resulting in death or injury (Wiese et al., 2001; Russell, 2005). Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in platform collisions appear to be similar. In some cases, migrants simply do not see a part of the platform until it is too late to avoid it. In other cases, navigation may be disrupted by noise or lighting (Russell, 2005; Ronconi et al., 2015). However, offshore structures may in some cases serve as suitable stopover habitats for trans-Gulf migrant species, particularly in the spring (Russell, 2005; Ronconi et al., 2015). Due to the limited scope and short duration of drilling activities described in this DOCD, any impacts on populations of either seabirds or trans-Gulf migrant birds are not expected to be significant.

Trans-Gulf migrant birds including shorebirds, wading birds, and terrestrial birds may also be present in the project area. Migrant birds may use offshore structures, including platforms and semisubmersibles for resting, feeding, or as temporary shelter from inclement weather (Russell, 2005). Some birds may be attracted to offshore structures because of the lights and the fish populations that aggregate around these structures. A study in the North Sea indicated that rig lighting causes circling behavior in various birds, especially on cloudy nights; apparently the birds' geomagnetic compass is upset by the red part of the spectrum from the lights currently in use (Van de Laar, 2007; Poot et al., 2008). The numbers varied greatly, from none to some tens of thousands of birds per night per rig, with an apparent effect radius of up to 3 miles (5 km)

(Poot et al., 2008). A study in the Gulf of Mexico also noted the phenomenon but did not recommend mitigation (Russell, 2005). One factor to consider in evaluating this impact in the Gulf of Mexico would include the lower incidence of cloudy and foggy days in the Gulf of Mexico versus the North Sea. In laboratory experiments, Poot et al. (2008) found the magnetic compass of migratory birds to be wavelength dependent. Migratory birds require light from the blue-green part of the spectrum for magnetic compass orientation, whereas red light (visible long-wavelength) disrupts their magnetic orientation. They designed a field study to test if and how changing light color influenced migrating birds under field conditions. During field studies they found that nocturnally migrating birds were disoriented and attracted by red and white light (containing visible long-wavelength radiation), whereas they were clearly less disoriented by blue and green light (containing less or no visible long-wavelength radiation) (Poot et al., 2008). Overall, potential negative impacts to birds from drilling rig lighting, noise, collisions, or other adverse effects are highly localized (considering the single structure) and may affect individual birds during migration periods. Noise generated from the drilling rig is not expected to impact marine birds. Therefore, these potential impacts are not expected to affect marine birds at the population or species level and are not significant.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to substantially disturb marine birds in open, offshore waters. Schwemmer et al. (2011) showed that several sea birds showed behavioral responses and altered distribution patterns in response to ship traffic, which could potentially cause loss of foraging time and resting habitat. However, it is likely that individual birds would experience, at most, only short-term behavioral disruption resulting from support vessel and helicopter traffic, and the impact would not be significant.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues with respect to spill impacts on marine birds.

The probability of a fuel spill will be minimized by the contractor’s and bp’s preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of the contractor’s and bp’s OSRP is expected to reduce the potential for impacts on marine birds. Given the open ocean location of the project area and the expected short duration of a small fuel spill, the potential exposure period for marine birds would be brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Marine birds exposed to oil on the sea surface could experience direct physical and physiological effects including skin irritation; chemical burns of skin, eyes, and mucous membranes; and inhalation of VOCs. Because of the limited areal extent and short duration of water quality impacts from a small fuel spill, secondary impacts due to ingestion of oil via contaminated prey or reductions in prey abundance are unlikely. Due to the low densities of birds in open ocean areas, the small area affected, and the brief duration of the surface slick, no significant impacts on marine birds are expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine birds are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues with respect to spill impacts on marine birds.

Pelagic seabirds could be exposed to oil from a spill at the project area. Hess and Ribic (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater Gulf of Mexico (>200 m). Haney et al. (2014) estimated that seabird densities over the open ocean are approximately 1.6 birds km^{-2}. The number of marine birds that could be affected in open, offshore waters would depend on the extent and persistence of the oil slick.

Data following the *Deepwater Horizon* incident provide relevant information about the species of pelagic birds that may be affected in the event of a large oil spill. Birds that were treated for oiling include several pelagic species such as the Northern Gannet, Magnificent Frigatebird, and Masked Booby (U.S. Fish and Wildlife Service, 2011). The Northern Gannet is among the species with the largest numbers of birds affected by the spill. Exposure of marine birds to oil can result in adverse health with severity, depending on the level of oiling. Effects can range from plumage damage and loss of buoyancy from external oiling to more severe effects, such as organ damage, immune suppression, endocrine imbalance, reduced aerobic capacity, and death as a result of oil inhalation or ingestion (NOAA, 2016b).

C.4.2 Coastal Birds

Threatened and Endangered bird species present in the Gulf of Mexico (Piping Plover and Whooping Crane) are discussed in **Section C.3**. Various species of non-endangered coastal birds are also found along the northern Gulf Coast, including diving birds, shorebirds, marsh birds, wading birds, and waterfowl. Gulf Coast marshes and beaches also provide important feeding grounds and nesting habitats. Species that nest on beaches, flats, dunes, bars, barrier islands, and similar coastal and nearshore habitats include the Sandwich Tern, Wilson's Plover (*Charadrius wilsonia*), Black Skimmer (*Rynchops niger*), Forster's Tern (*Sterna forsteri*), Gull-Billed Tern (*Gelochelidon nilotica*), Laughing Gull, Least Tern, and Royal Tern (USFWS, 2010). Additional information is presented by BOEM (2012a, 2017a).

The Eastern Brown Pelican (*Pelecanus occidentalis*) was delisted from federal Endangered status in 2009 (USFWS, 2016b) and was delisted from state species of special concern status by the State of Florida in 2017 (Florida Fish and Wildlife Conservation Commission, 2016) and Louisiana (Louisiana Wildlife & Fisheries, 2020). However, this species remains listed as endangered by Mississippi (Mississippi Natural Heritage Program, 2018). Brown Pelicans inhabit coastal habitats and forage within both coastal waters and waters of the inner continental shelf. Aerial and shipboard surveys, including GulfCet and GulfCet II (Davis et al., 2000) indicate that Brown Pelicans do not occur over deep offshore waters (Fritts and Reynolds, 1981; Peake, 1996). Nearly half the southeastern population of Brown Pelicans lives in the northern Gulf Coast, generally nesting on protected islands (USFWS, 2010).

The Bald Eagle (*Haliaeetus leucocephalus*) was delisted from its federal Threatened status in 2007. However, this species is listed as endangered in Mississippi (Mississippi Natural Heritage Program, 2018). The Bald Eagle is also listed as threatened in Texas (Texas Parks and Wildlife Department, 2017). The Bald Eagle still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940 (USFWS, 2015). The Bald Eagle is a terrestrial raptor widely distributed across the southern U.S., including coastal habitats along the Gulf of Mexico. The Gulf Coast is inhabited by both wintering migrant and resident Bald Eagles (Buehler, 2000; Johnsgard, 1990; Ehrlich et al., 1992).

IPFs that potentially may affect shorebirds and coastal nesting birds include support vessel and helicopter traffic and a large oil spill. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with NTL BSEE 2015-G013 will minimize the potential for marine debris-related impacts on shorebirds.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters will transit coastal areas near Port Fourchon and Houma, Louisiana, where shorebirds and coastal nesting birds may be found. These activities could periodically disturb individuals or groups of birds within coastal habitats (e.g., wetlands that may support feeding, resting, or breeding birds).

Vessel traffic may disturb some foraging and resting birds. Flushing distances vary among species and individuals (Rodgers and Schwikert, 2002; Schwemmer et al., 2011; Mendel et al., 2019). The disturbances will be limited to flushing birds away from vessel pathways; known distances are from 65 to 160 ft (20 to 49 m) for personal watercraft and 75 to 190 ft (23 to 58 m) for outboard-powered boats (Rodgers and Schwikert, 2002). Flushing distances may be similar or less for the support vessels to be used for this project, and some species such as gulls are attracted to boats. Support vessels will not approach nesting or breeding areas on the shoreline, so nesting birds, eggs, and chicks will not be disturbed. Vessel operators will use designated navigation channels and comply with posted speed and wake restrictions while transiting sensitive inland waterways. Due to the limited scope, duration, and geographic extent of the project activities, any short-term impacts are not expected to be significant to coastal bird populations.

Helicopter traffic can cause some disturbance to birds onshore and offshore. Responses highly depend on the type of aircraft, bird species, activities that animals were previously engaged in, and previous exposures to overflights (Efroymson et al., 2001). Helicopters seem to cause the most intense responses over other human disturbances for some species (Bélanger and Bédard, 1989; Rojek et al., 2007; Fuller et al., 2018). However, Federal Aviation Administration Advisory Circular No. 91-36D recommends that pilots maintain a minimum altitude of 2,000 ft (610 m) when flying over noise-sensitive areas such as wildlife refuges, parks, and areas with wilderness characteristics. This is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied in Efroymson et al. (2001). With these guidelines in effect, it is likely that individual birds would experience, at most, only short-term behavioral disruption. The potential impacts are not expected to be significant to bird populations or species in the project area.

Impacts of Large Oil Spill

The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

Coastal birds can be exposed to oil as they float on the water surface, dive during foraging, or wade in oiled coastal waters. Oiled birds can lose the ability to fly, dive for food, or float on the water, which could lead to drowning (U.S. Fish and Wildlife Service, 2010). Oil interferes with the water repellency of feathers and can cause hypothermia in the right conditions. As birds groom themselves, they can ingest and inhale the oil on their bodies. Scavengers such as Bald Eagles and gulls can be exposed to oil by feeding on carcasses of contaminated fish and wildlife. While ingestion can kill animals immediately, more often it results in lung, liver, and kidney damage, which can lead to death (BOEM, 2017a). Bird eggs may be damaged if an oiled adult sits on the nest.

Brown and White Pelicans are especially at risk from direct and indirect impacts from spilled oil within inner shelf and inshore waters, such as embayments. The range of these species is generally limited to these waters and surrounding coastal habitats. Brown Pelicans feed on mid-sized fish that they capture by diving from above ("plunge diving") and then scooping the fish into their expandable gular pouch, while White Pelicans feed from the surface by dipping their beaks in the water. These behaviors make pelicans susceptible to plumage oiling if they feed in areas with surface oil or an oil sheen. They may also capture prey that has been physically contaminated with oil or has ingested oil. Issues for Brown and White Pelicans include direct contact with oil, disturbance by cleanup activities, and long-term habitat contamination (BOEM, 2017a).

The Bald Eagle may also be at risk from direct and indirect impacts from spilled oil. This species often captures fish within shallow water areas (snatching prey from the surface or wading into shallow areas to capture prey with their bill) and so may be susceptible to plumage oiling and, as with the Brown and White Pelicans, they may also capture prey that has been physically contaminated with oil or has ingested oil (BOEM, 2017a). It is expected that impacts to coastal birds from a large oil spill resulting in the death of individual birds would be adverse but not significant at population levels.

C.5 Fisheries Resources

C.5.1 Pelagic Communities and Ichthyoplankton

Biggs and Ressler (2000) reviewed the biology of pelagic communities in the deepwater environment of the northern Gulf of Mexico. The biological oceanography of the region is dominated by the influence of the Loop Current, whose surface waters are among the most oligotrophic in the world's oceans. Superimposed on this low-productivity condition are productive "hot spots" associated with entrainment of nutrient-rich Mississippi River water and mesoscale oceanographic features. Anticyclonic and cyclonic hydrographic features play an important role in determining biogeographic patterns and controlling primary productivity in the northern Gulf of Mexico (Biggs and Ressler, 2000).

Most fishes inhabiting shelf or oceanic waters of the Gulf of Mexico have planktonic eggs and larvae (Ditty, 1986; Ditty et al., 1988; Richards et al., 1989; Richards et al., 1993). A study by Ross et al. (2012) on midwater fauna to characterize vertical distribution of mesopelagic fishes in selected deepwater areas in the Gulf of Mexico substantiated high species richness, but the community was dominated by relatively few families and species.

IPFs that could potentially affect pelagic communities and ichthyoplankton include lay vessel presence, noise, and lights; effluent discharges; water intakes; and two types of accidents (a small fuel spill and a large oil spill).

Impacts of Drilling Vessel Presence, Noise, and Lights

The drilling vessel, as a floating structure in the deepwater environment, will act as a fish-aggregating device (FAD). In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks, which are commonly attracted to fixed and drifting surface structures (Holland, 1990; Higashi, 1994; Relini et al., 1994). Positive fish associations with offshore rigs and platforms in the Gulf of Mexico are well documented (Gallaway and Lewbel, 1982; Wilson et al., 2003; Wilson et al., 2006; Edwards and Sulak, 2006). The FAD effect could possibly enhance the feeding of epipelagic predators by attracting and concentrating smaller fish species. Drillling vessel noise could potentially cause acoustic masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). The only defined acoustic threshold levels for continuous noise are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) estimated threshold SPL_{rms} of 170 dB re 1 µPa accumulated over a 48-hour period for onset of recoverable injury and 158 dB re 1 µPa accumulated over a 12-hour period for onset temporary auditory threshold shifts. However, no consistent behavioral thresholds for fish have been established (Popper et al., 2014). Noise may also influence fish behaviors, such as predator-avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). Fish aggregating is likely to occur to some degree due to the presence of the drilling vessel, but the impacts would be limited in geographic scope and no population level impacts are expected.

Few data exist regarding the impacts of noise on pelagic larvae and eggs. Generally, it is believed that larval fish will have similar hearing sensitivities as adults, but may be more susceptible to barotrauma injuries associated with impulsive noise (Popper et al., 2014). Larval fish were experimentally exposed to simulated impulsive sounds by Bolle et al. (2012). The controlled playbacks produced SEL_{cum} of 206 dB re 1 μPa^2 s but resulted in no increased mortality between the exposure and control groups. Non-impulsive noise sources (such as installation operations) are expected to be far less injurious than impulsive noise. Based on transmission loss calculations (Urick, 1983), open water propagation of noise produced by typical sources with DP thrusters in use during drilling, are not expected to produce received SPL_{rms} greater than 160 dB re 1 µPa beyond 105 ft (32 m) from the source. Because of the limited propagation distances of above-threshold SPL_{rms} and the periodic and transient nature of ichthyoplankton, no impacts to these life stages are expected.

Impacts of Effluent Discharges

Muds and cuttings discharges may have a slight effect on the benthic environment near the wellsite, including a localized increase in water turbidity, the limited blanketing of seafloor sediments and slightly increased concentrations of hydrocarbons and metals. Treated cuttings are monitored for visible sheen prior to discharge. Contaminants released into the water column will be diluted rapidly within the open ocean environment. Minimal impacts on benthic organisms are anticipated.

Treated sanitary and domestic wastes may have little or no effect on the pelagic environment in the immediate vicinity of these discharges. These wastes may have elevated levels of nutrients, organic matter, and chlorine, but should dilute rapidly to undetectable levels within tens to hundreds of meters from the source. As a result of quick dilution, minimal impacts on water quality, plankton, and nekton are anticipated.

Deck drainage will have little or no impact on the pelagic environment in the immediate vicinity of these discharges. Deck drainage from oily areas will be passed through an oil-and-water separator prior to release, and discharges will be monitored for visible sheen. The discharges may have slightly elevated levels of hydrocarbons but should dilute rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine; uncontaminated cooling water, firewater, ballast water, bilge water, and other discharges of seawater and freshwater to which treatment chemicals have been added are expected to dilute rapidly and have little or no impact on water column biota.

Impacts of Water Intakes

Seawater will be drawn from the ocean for once-through, non-contact cooling of machinery on the drilling rig. The intake of seawater for cooling water will entrain plankton. The low intake velocity should allow most strong-swimming juvenile fishes and smaller adults to escape entrainment or impingement (Electric Power Research Institute, 2000). However, drifting plankton would not be able to escape entrainment with the exception of a few fast-swimming larvae of certain taxonomic groups. Those organisms entrained may be stressed or killed (Cada, 1990; Mayhew et al., 2000), primarily through changes in water temperature during the route from cooling intake structure to discharge structure and mechanical damage (turbulence in pumps and condensers). Due to the limited scope and short duration of drilling activities, any short-term impacts of entrainment are not expected to be significant to plankton or ichthyoplankton populations (BOEM, 2017a). The drilling rig ultimately chosen for this project is expected to be in compliance with all cooling water intake requirements.

Impacts of a Small Fuel Spill

Potential spill impacts on fisheries resources are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill will be minimized by the contractor’s and bp’s preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of the contractor’s and bp’s OSRP will mitigate and reduce the potential for impacts on pelagic communities, including ichthyoplankton. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on phytoplankton, zooplankton, ichthyoplankton, and nekton. Due to the limited areal extent and short duration of water quality impacts, a small fuel spill would be unlikely to produce detectable impacts on pelagic communities.

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues.

A large oil spill could directly affect water column biota including phytoplankton, zooplankton, ichthyoplankton, and nekton. While adult and juvenile fishes may actively avoid a large spill, planktonic eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes in the upper layers of the water column are especially vulnerable to oiling; certain toxic fractions of spilled oil may be lethal to these life stages. Impacts would be potentially greater if local scale currents retained planktonic larval assemblages (and the floating oil slick) within the same water mass. Impacts to ichthyoplankton from a large spill would be greatest during spring and summer when concentrations of ichthyoplankton on the continental shelf peak (BOEM, 2014, 2015, 2016b).

Oil spill impacts to phytoplankton include changes in community structure and increases in biomass, which have been attributed to the effects of oil contamination and of decreased predation due to zooplankton mortality (Abbriano et al., 2011; Ozhan et al., 2014). Ozhan et al. (2014) reported that the formation of oil films on the water surface can limit gas exchange through the air-sea interface and can reduce light penetration into the water column which will limit phytoplankton photosynthesis. Determining the impact of a diesel spill on phytoplankton is a complex issue as some phytoplankton species are more tolerant of oil exposure than others while some species are more tolerant under low concentrations and some under high concentrations (Ozhan et al., 2014). Phytoplankton populations can change quickly on small temporal and spatial scales making it difficult to predict how a phytoplankton community, as a whole, will respond to an oil spill.

Mortality of zooplankton has been shown to be positively correlated with oil concentrations (Lennuk et al., 2015). Spills that are not immediately lethal can have short- or long-term impacts on biomass and community composition, behavior, reproduction, feeding, growth and development, immune response and respiration (Harvell et al., 1999; Wootton et al., 2003; Auffret et al., 2004; Hannam et al., 2010; Bellas et al., 2013; Blackburn et al., 2014). Zooplankton are especially vulnerable to acute oil pollution, showing increased mortality and sublethal changes in physiological activities (Moore and Dwyer, 1974; Linden, 1976; Lee et al., 1978; Suchanek, 1993). Zooplankton may also accumulate PAHs through diffusion from surrounding waters, direct ingestion of micro-droplets (e.g., Berrojalbiz et al., 2009, Lee et al., 2012, Lee, 2013), and by ingestion of droplets that are attached to phytoplankton (Almeda et al., 2013). Bioaccumulation of hydrocarbons can lead to additional impacts among those higher trophic level consumers that rely on zooplankton as a food source (Almeda et al., 2013; Blackburn et al., 2014).

Planktonic communities have a high capacity for recovery from the effects of oil spill pollution due to their short life cycle and high reproductive capacity (Abbriano et al., 2011). Planktonic communities drift with water currents and recolonize from adjacent areas. Because of these attributes, plankton usually recover relatively rapidly to normal population levels following hydrocarbon spill events.

C.5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. Under the Magnuson-Stevens Fishery Conservation and Management Act, as amended, federal agencies are required to consult on activities that may adversely affect EFH designated in Fishery Management Plans developed by the regional Fishery Management Councils.

The Gulf of Mexico Fishery Management Council (GMFMC) has prepared Fishery Management Plans for corals and coral reefs, shrimps, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum (*Sciaenops ocellatus*). In 2005, the EFH for these managed species was redefined in Generic Amendment No. 3 to the various Fishery Management Plans (GMFMC, 2005). The EFH for most of these GMFMC-managed species is on the continental shelf in waters shallower than 600 ft (183 m). The shelf edge is the outer boundary for coastal migratory pelagic fishes, reef fishes, and shrimps. EFH for corals and coral reefs includes some shelf-edge topographic features located approximately 42 miles (68 km) from the project area.

Highly migratory pelagic fishes, which occur as transients in the project area, are the only remaining group for which EFH has been identified in the deepwater Gulf of Mexico. Species in this group, including tunas, swordfishes, billfishes, and sharks, are managed by NMFS. **Table 8** lists the highly migratory fish species and their life stages with EFH at or near the project area.

Table 8. Migratory fish species with designated Essential Fish Habitat at or near Mississippi Canyon Block 520, including life stage(s) potentially present within the project area (Adapted from National Marine Fisheries Service, 2009b).

Common Name	Scientific Name	Life Stage(s) Potentially Present Within or Near the Project Area
Atlantic bluefin tuna	*Thunnus thynnus*	Spawning, eggs, larvae, adults
Bigeye tuna	*Thunnus obesus*	Juveniles, adults
Bigeye thresher shark	*Alopias superciliosus*	All
Blue marlin	*Makaira nigricans*	Juveniles, adults
Longbill spearfish	*Tetrapturus pfluegeri*	Juveniles, adults
Longfin mako shark	*Isurus paucus*	All
Oceanic whitetip shark	*Carcharhinus longimanus*	All
Silky Shark	*Carcharhinus falciformis*	All
Skipjack tuna	*Katsuwonus pelamis*	Spawning, adults
Swordfish	*Xiphias gladius*	Larvae, juveniles, adults

Whale shark	*Rhincodon typus*	All
White marlin	*Tetrapturus albidus*	Juveniles, adults
Yellowfin tuna	*Thunnus albacares*	Spawning, juveniles, adults

Research indicates the central and western Gulf of Mexico may be important spawning habitat for Atlantic bluefin tuna (Theo and Block, 2010), and NMFS (2009b) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, including the project area (**Figure 4**). The areal extent of the HAPC is approximately 115,830 miles^2 (300,000 km^2). Atlantic bluefin tuna follow an annual cycle of foraging in June through March off the eastern U.S. and Canadian coasts, followed by migration to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009b). The Atlantic bluefin tuna has also been designated as a species of concern (NMFS, 2011). An amendment to the original EFH Generic Amendment was finalized in 2005 (GMFMC, 2005). One of the most significant proposed changes in this amendment reduced the extent of EFH relative to the 1998 Generic Amendment by removing the EFH description and identification from waters between 100 fathoms and the seaward limit of the Exclusive Economic Zone (EEZ). The Highly Migratory Species Fisheries Management Plan was amended in 2009 to update EFH and HAPC to include the bluefin tuna spawning area (NMFS, 2009c).

NTLs 2009-G39 and 2009-G40 provide guidance and clarification of regulations for biologically sensitive underwater features and areas and benthic communities that are considered EFH. As part of an agreement between BOEM and NMFS to complete a new programmatic EFH consultation for each new Five-Year Program, an EFH consultation was initiated between BOEM's Gulf of Mexico Region and NOAA's Southeastern Region during the preparation, distribution, and review of BOEM's 2017-2022 WPA/CPA Multisale EIS (BOEM, 2017a). The EFH assessment was completed and there is ongoing coordination among NMFS, BOEM, and BSEE, including discussions of mitigation (BOEM, 2016c).

Other HAPCs have been designated in the GMFMC (2005, 2010). These include the Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and several other reefs and banks of the northwestern Gulf of Mexico (**Figure 4**). The nearest HAPC is Madison Swanson Marine Reserve, which is located approximately 145 miles (233 km) from the project area.

IPFs that could potentially affect EFH and fisheries resources include vessel presence, noise, and lights; effluent discharges; and water intakes. In addition, two types of accidents (a small fuel spill and a large oil spill) may potentially affect EFH and fisheries resources.

Impacts of Drilling Vessel Presence, Noise, and Lights

The drilling vessel, as floating structure in the deepwater environment, will act as a FAD.
In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks, which are commonly attracted to fixed and drifting surface structures (Holland, 1990; Higashi, 1994; Relini et al., 1994; Gates et al., 2017). The FAD effect would possibly enhance feeding of epipelagic predators by attracting and concentrating smaller fish species.

Drilling rig vessel noise could potentially cause acoustic masking for fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Noise may also influence fish behaviors such as predator avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). The only defined acoustic threshold levels for non-impulsive noise are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) recommended SPL threshold levels of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and an SPL threshold of 158 dB re 1 µPa over a 12-hour period for onset temporary auditory threshold shifts. No consistent behavioral thresholds for fish resulting from non-impulsive noise have been established (Hawkins and Popper, 2014) and the current recommended behavioral threshold for fish is SPL of 150 dB re 1 µPa defined by the Fisheries Hydroacoustic Working Group (2008) for impulsive sound sources. Because the drilling rig is a temporary structure, any impacts on EFH for managed species are considered negligible.

Impacts of Effluent Discharges

Other effluent discharges affecting EFH by diminishing ambient water quality include treated sanitary and domestic wastes, deck drainage, and miscellaneous discharges such as desalination unit discharge, ballast water, bilge water, fire water, and cooling water. Impacts on EFH from effluent discharges are anticipated to be similar to those described in **Section C.5.1** for pelagic communities. No significant impacts on EFH for highly migratory pelagic fishes or coral are expected from these discharges.

Impacts of Water Intakes

As noted previously, cooling water intake will cause entrainment and impingement of plankton, including fish eggs and larvae (ichthyoplankton). Due to the limited scope, timing, and geographic extent of the installation activities, any short-term impacts on EFH for highly migratory pelagic fishes are not expected to be biologically significant. The recent lease sale EIS (BOEM, 2017a) discusses cooling water discharge. Water with an elevated temperature may accumulate around the discharge pipe. However, the warmer water should be diluted rapidly to ambient temperature levels within 100 m (328 ft) of the discharge pipe. Any impacts to pelagic species would be extremely localized and brief (BOEM, 2014).

Impacts of a Small Fuel Spill

Potential spill impacts on EFH are discussed by BOEM (2017a). For this DOCD, there are no unique site-specific issues with respect to spill impacts.

The probability of a fuel spill is expected to be minimized by the contractor’s and bp’s preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of the contractor’s and bp’s OSRP is expected to help diminish the potential for impacts on EFH. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a slick on the water surface and increase the concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. **Section A.9.1** discusses the likely fate of a small fuel spill and indicates that over 90% would be dissipated naturally within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on EFH for highly migratory pelagic fishes, including tunas, swordfishes, billfishes, and sharks. These species occur as transients in the project area. A spill would also produce short-term impact on water quality in the HAPC for spawning bluefin tuna, which covers much of the deepwater Gulf of Mexico. The areal extent of the affected area would represent a negligible portion of the HAPC.

A small fuel spill would likely not affect EFH for corals and coral reefs, the nearest EFH being the topographic features located approximately 42 miles (68 km) northwest of the project area. A small fuel spill would float and dissipate on the sea surface and would not contact these features.

Impacts of a Large Oil Spill

Potential spill impacts on EFH are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues with respect to EFH.

An oil spill in offshore waters would temporarily increase hydrocarbon concentrations on the water surface and potentially the subsurface as well. Given the extent of EFH designations in the Gulf of Mexico (GMFMC, 2005; NMFS, 2009b), some impact on EFH would be unavoidable.

A large spill could affect EFH for many managed species including shrimps, stone crab, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum. It would result in adverse impacts on water quality and water column biota including phytoplankton, zooplankton, and nekton. In coastal waters, sediments could be contaminated and result in persistent degradation of the seafloor habitat for managed demersal fish and shellfish species.

The project area is within the HAPC for spawning bluefin tuna (NMFS, 2009b). A large spill could temporarily degrade a small portion of the HAPC due to increased hydrocarbon concentrations in the water column, with the potential for lethal or sublethal impacts on spawning tuna. Potential impacts would depend in part on the timing of a spill, as this species migrates to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009b).

The nearest feature designated as EFH for corals is located 111 miles (179 km) from the project area. An accidental spill would be unlikely to affect this area, since a surface slick would be unlikely to reach these features due to their depth.

C.6 Archaeological Resources

C.6.1 Shipwreck Sites

In BOEM (2012a), information was presented that altered the impact conclusion for archaeological resources which came to light as a result of BOEM-sponsored studies and industry surveys. Evidence of damage to significant cultural resources (i.e., historic shipwrecks) has been shown to have occurred because of an incomplete knowledge of seafloor conditions in project areas >656 ft (200 m) water depth that have been exempted from high-resolution surveys. Since significant historic shipwrecks have recently been discovered outside the previously designated high-probability areas (some of which show evidence of impacts from permitted activities prior to their discovery), a survey is now required for exploration and development projects.

No archaeologically significant sonar contacts were identified within a 2,000 ft (610 m) buffer of the proposed pipeline corridor (Fugro, 2019). No archaeological impacts are expected from routine activities in the project area.

Because no historic shipwreck sites are known to be present in the project area (see DOCD Section 6.5), there are no routine IPFs that are likely to affect these resources. A small fuel spill would not affect shipwrecks in adjoining blocks because the oil would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

The 2017-2025 Lease Sale EIS (BOEM, 2017a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-m (984-ft) radius. Because there are no historic shipwrecks along the proposed pipeline corridor, this impact would not be relevant. Should there be any indication that potential shipwreck sites could be affected, in accordance with NTL 2005-G07, bp will immediately halt drilling or other project operations, take steps to ensure that the site is not disturbed in any way, and contact the BOEM Regional Supervisor, Leasing and Environment, within 48 hours of its discovery. bp would cease all operations within 1,000 ft (305 m) of the site until the Regional Supervisor provides instructions on steps to take to assess the site's potential historic significance and protect it.

Beyond this radius, there is the potential for impacts from oil, dispersants, and depleted oxygen levels. These impacts could include chemical contamination, alteration of the rates of microbial activity (BOEM, 2017a), and reduced biodiversity at shipwreck-associated sediment microbiomes (Hamdan et al., 2018). During the *Deepwater Horizon* incident, subsurface plumes were reported at a water depth of about 3,600 ft (1,100 m), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could have the potential to contact shipwreck sites beyond the 984 ft (300 m) radius estimated by BOEM (2012a), depending on its extent, trajectory, and persistence.

A spill entering shallow coastal waters could conceivably contaminate an undiscovered or known coastal shipwreck site. BOEM (2012a) stated that if an oil spill contacted a coastal historic site, such as a fort or a lighthouse, the major impact would be a visual impact from oil contact and contamination of the site and its environment.

C.6.2 Prehistoric Archaeological Sites

With a water depth of approximately 6,698 ft (2,041 m), the project area is well beyond the 197 ft (60 m) depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. Because prehistoric archaeological sites are not found in the project area, the only relevant IPF is a large oil spill. A small fuel spill would not affect prehistoric archaeological resources because the oil would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

Because prehistoric archaeological sites are not found in the project area, they would not be affected by the physical effects of a subsea blowout. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 300-m (984-ft) radius.

Along the northern Gulf Coast, prehistoric sites exist along the barrier islands and mainland coast and along the margins of bays and bayous (BOEM, 2017a). The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

If a spill did reach a prehistoric site along these shorelines, it could coat fragile artifacts or site features and compromise the potential for radiocarbon dating organic materials in a site (although other dating methods are available, and it is possible to decontaminate an oiled sample for radiocarbon dating). Coastal prehistoric sites could also be damaged by spill cleanup operations (e.g., by destroying fragile artifacts and disturbing the provenance of artifacts and site features).

C.7 Coastal Habitats and Protected Areas

Coastal habitats in the northern Gulf of Mexico that may be affected by oil and gas activities are described in previous EISs (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a) and are tabulated in the OSRP. Coastal habitats inshore of the project area include coastal and barrier island beaches and dunes, wetlands, oyster reefs, and submerged seagrass beds. Most of the northern Gulf of Mexico is fringed by coastal and barrier island beaches, with wetlands, oyster reefs, and submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

Because of the distance from shore, the only IPF associated with routine activities in the project area that could affect beaches and dunes, wetlands, oyster reefs, seagrass beds, coastal wildlife refuges, wilderness areas, or any other managed or protected coastal area is support vessel traffic. The support bases at Port Fourchon and Houma, Louisiana are not located in wildlife refuges or wilderness areas. Potential impacts of support vessel traffic are briefly addressed below.

Impacts of support vessel traffic and a large oil spill are the only IPFs analyzed for coastal habitats and protected areas. A small fuel spill in the project area would be unlikely to affect coastal habitats, as the project area is 68 miles (109 km) from the nearest shoreline (Louisiana). As explained in Section A.9.1, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating.

Impacts of a Large Oil Spill

Potential spill impacts on coastal habitats are discussed by BOEM (2017a). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs and submerged seagrass beds. For this DOCD, there are no unique site-specific issues with respect to coastal habitats.

The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

The shorelines within the geographic range predicted by the OSRA modeling (**Tables 4** and **5**) include extensive barrier beaches and wetlands, oyster reefs with submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries. NWRs and other protected areas along the coast are discussed in BOEM (2017a) and bp's OSRP. Coastal and near-coastal wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts based on the 30-day OSRA model (**Table 4**) are presented in **Table 9**.

The level of impacts from oil spills on coastal habitats depends on many factors, including the oil characteristics, the geographic location of the landfall, and the weather and oceanographic conditions at the time (BOEM, 2017a; b).

Table 9. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts after 30 days of a hypothetical spill from Launch Area 57 based on the 30-day OSRA model.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Cameron, Louisiana	Sabine National Wildlife Refuge
	Rockefeller State Wildlife Refuge and Game Preserve
	Peveto Woods Sanctuary
Vermilion, Louisiana	Paul J. Rainey Wildlife Refuge and Game Preserve
	Rockefeller State Wildlife Refuge and Game Preserve
	State Wildlife Refuge
Terrebonne, Louisiana	Isles Dernieres Barrier Islands Refuge
	Pointe aux Chenes Wildlife Management Area
Lafourche, Louisiana	East Timbalier Island National Wildlife Refuge
	Pointe aux Chenes Wildlife Management Area
	Wisner Wildlife Management Area (Includes Picciola Tract)
Plaquemines, Louisiana	Breton National Wildlife Refuge
	Delta National Wildlife Refuge
	Pass a Loutre Wildlife Management Area
St. Bernard, Louisiana	Biloxi Wildlife Management Area
	Breton National Wildlife Refuge
	Saint Bernard State Park
Hancock and Harrison, Mississippi	Buccaneer State Park
	Grand Bayou Preserve
	Jourdan River Preserve
	Hancock County Marshes Preserve
	Bayou Portage Preserve
	Biloxi River Marshes Preserve

Table 9. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
	Cat Island Preserve
	Deer Island Preserve
Hancock and Harrison, Mississippi (cont'd)	Gulf Islands National Seashore
	Hiller Park Recreation Area
	Sandhill Crane Refuge Preserve
	Ship Island Preserve
	Wolf River Preserve
Jackson, Mississippi	Bellefontaine Marsh Preserve
	Davis Bayou Preserve
	Escatawpa River Marsh Preserve
	Grand Bay National Estuarine Research Reserve
	Grand Bay Savanna Preserve
	Graveline Bay Preserve
	Gulf Islands National Seashore
	Gulf Islands Wilderness
	Horn Island Preserve
	Old Fort Bayou Preserve
	Pascagoula River Marsh Preserve
	Petit Bois Island Preserve
	Round Island Preserve
	Shepard State Park
Mobile, Alabama	Grand Bay National Wildlife Refuge
	Grand Bay Savanna State Nature Preserve
	Mobile-Tensaw Delta WMA
	Penalver Park
	The Grand Bay Savanna Tract (and Addition Tract)
	W.L. Holland WMA
Baldwin, Alabama	Betty and Crawford Rainwater Perdido River Nature Preserve
	Bon Secour NWR
	Gulf State Park
	Meaher State Park
	Mobile-Tensaw Delta CIAP Parcel State Habitat Area
	Mobile-Tensaw Delta WMA
	Perdido River Water Management Area
	W.L. Holland WMA
	Weeks Bay Harris and Worcester Tracts
	Weeks Bay National Estuarine Research Reserve
	Weeks Bay Reserve Addition - Beck Tract
	Betty and Crawford Rainwater Perdido River Nature Preserve

Table 9. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Escambia, Florida	Bayou Marcus Wetlands
	Big Lagoon State Park
	Blue Angel Recreation Park
	Bay Bluffs Park
	Ft. Pickens Aquatic Preserve
	Gulf Islands National Seashore
	Mallory Heights Park #3
	Perdido Bay/Crown Pointe Preserve
	Perdido Key State Park
	Tarkiln Bayou Preserve State Park
	USS Massachusetts (BB-2) Underwater Archaeological Preserve
	Wayside Park
Okaloosa, Florida	Eglin Beach Park
	Fred Gannon Rocky Bayou State Park
	Gulf Islands National Seashore
	Henderson Beach State Park
	Rocky Bayou Aquatic Preserve
	Yellow River Wildlife Management Area
Walton, Florida	Choctawhatchee River Delta Preserve
	Choctawhatchee River Water Management Area
	Deer Lake State Park
	Grayton Beach State Park
	Point Washington State Forest
	Topsail Hill Preserve State Park
Bay, Florida	Camp Helen State Park
	SS Tarpon Underwater Archaeological Preserve
	St. Andrews Aquatic Preserve
	St. Andrews State Park
	Vamar Underwater Archaeological Preserve

Coastal wetlands are highly sensitive to oiling and can be significantly affected because of the inherent toxicity of hydrocarbon and non-hydrocarbon components of the spilled substances (Beazley et al., 2012; Lin and Mendelssohn, 2012; Mendelssohn et al., 2012). Numerous variables such as oil concentration and chemical composition, vegetation type and density, season or weather, preexisting stress levels, soil types, and water levels may influence the impacts of oil exposure on wetlands. Light oiling could cause plant die back, followed by recovery in a fairly short time. Vegetation exposed to oil that persists in wetlands could take years to recover (BOEM, 2017a). In addition to the direct impacts of oil, cleanup activities in marshes may accelerate rates of erosion and retard recovery rates (BOEM, 2017a). Impacts associated with an extensive oiling of coastal wetland habitat from a large oil spill are expected to be significant.

A review of studies by BOEM (2012a) determined that effects of oil on marsh vegetation depend on the type of oil, the type of vegetation, and environmental factors of the area. Impacts to slightly oiled vegetation are considered short term and reversible as recent studies suggest that they will experience plant die-back, followed by recovery without replanting (BOEM, 2012a). Vegetation coated with oil experiences the highest mortality rates due to decreased photosynthesis (BOEM, 2012a). A recent review of the literature and new studies indicated that oil spill impacts to seagrass beds are often limited and may be limited to when oil is in direct contact with these plants (Fonseca et al., 2017).

Impacts of Support Vessel Traffic

Support operations, including the crew boats and supply boats as detailed in DOCD Section 13, may have a minor incremental impact on coastal and barrier island beaches, wetlands, oyster reefs, and protected habitats. Over time with a large number of vessel trips, vessel wakes can erode shorelines along inlets, channels, and harbors, resulting in localized land loss. Impacts will be minimized by following the speed and wake restrictions in harbors and channels.

Support operations, including crew boats and supply boats are not anticipated to have a significant impact on submerged seagrass beds. While submerged seagrass beds have the potential to be uprooted, scarred, or lost due to direct contact from vessels, use of navigation channels and adherence to local requirements and implemented programs will decrease the likelihood of impacts to submerged seagrass beds BOEM (2017a, 2017c).

C.8 Socioeconomic and Other Resources

bp's "Management of Environmental and Social Performance" document (No. GDP 3.6-0001; bp, 2019) and "Environmental and Social Recommendations for Projects" (No. GRP 3.6-0001; bp, 2010) outline bp's process for community complaints management. This process is intended to receive, investigate, and respond to complaints or grievances from affected communities in a timely, fair, and consistent manner.

C.8.1 Recreational and Commercial Fishing

Potential impacts to recreational and commercial fishing are analyzed by BOEM (2017a). The major species sought by commercial fishermen in federal waters of the Gulf of Mexico include shrimp, menhaden, red snapper (*Lutjanus campechanus*), tunas, and groupers (BOEM, 2017a). However, most of the fishing effort for these species is on the continental shelf in shallow waters. The main commercial fishing activity in deep waters of the northern Gulf of Mexico is pelagic longlining for tunas, swordfishes, and other billfishes (Continental Shelf Associates, 2002; Beerkircher et al., 2009). Pelagic longlining has occurred historically in the project area, primarily during spring and summer. In August 2000, the federal government closed two areas in the northeastern Gulf of Mexico to longline fishing (65 FR 47214). The lease is outside of the closure areas.

Longline gear consists of monofilament line deployed from a moving vessel and generally allowed to drift for 4 to 5 hours (Continental Shelf Associates, 2002). As the mainline is put out, baited leaders and buoys are clipped in place at regular intervals. It takes 8 to 10 hours to deploy a longline and about the same time to retrieve it. Longlines are often set near oceanographic features such as fronts or downwellings, with the aid of sophisticated on-board temperature sensors, depth finders, and positioning equipment. Vessels typically are 10 to 30 m (33 to 98 ft) long, and their trips last from about 1 to 3 weeks.

It is unlikely that any commercial fishing activity other than longlining will occur at or near the project area due to the water depth at the project area. Benthic species targeted by commercial fishers occur on the upper continental slope, well inshore of the project area. Royal red shrimp (*Pleoticus robustus*) are caught by trawlers in water depths of approximately 820 to 1,804 ft

(250 to 550 m) (Stiles et al., 2007). Tilefishes (primarily *Lopholatilus chamaeleonticeps*) are caught by bottom longlining in water depths from approximately 540 to 1,476 ft (165 to 450 m) (Continental Shelf Associates, 2002).

Most recreational fishing activity in the region occurs in water depths less than 656 ft (200 m) (Continental Shelf Associates, 1997, 2002; Keithly and Roberts, 2017). In deeper water, the main attraction to recreational fishers is petroleum rigs offshore Texas and Louisiana. Due to the project site's distance from shore, it is unlikely that recreational fishing activity is occurring in the project area.

The only IPFs associated with routine operations that potentially may affect fisheries is drilling rig presence which may present an entanglement risk for longline fisheries. Two types of potential accidents are also addressed below (a small fuel spill and a large oil spill). These IPFs with potential impacts are discussed below.

Impacts of Drilling Vessel Presence, Noise, and Lights

There is a slight possibility of pelagic longlines becoming entangled in the drilling vessel. For example, in January 1999, a portion of a pelagic longline snagged on the acoustic Doppler current profiler of a drillship working in the Gulf of Mexico (Continental Shelf Associates, 2002). The line was removed without incident. Generally, longline fishers use radar and are aware of offshore structures and ships when placing their sets. Therefore, little or no impact on pelagic longlining is expected.

No other adverse impacts on fishing activities are anticipated. The presence of the drilling vessel would result in a limited area being unavailable for fishing activity, but this effect is considered negligible. Other factors such as effluent discharges are likely to have negligible impacts on commercial or recreational fisheries due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Impacts of a Small Fuel Spill

The probability of a fuel spill is expected to be minimized by the contractor's and bp's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of the contractor's and bp's OSRP is expected to potentially mitigate and reduce the potential for impacts. Given the open ocean location of the project area, the duration of a small spill and opportunity for impacts to occur would be very brief.

Pelagic longlining activities in the project area, if any, could be interrupted in the event of a small fuel spill. The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions (see **Section A.9.1**). Fishing activities could be interrupted due to the activities of response vessels operating in the project area. A small fuel spill would not affect coastal water quality because the spill would not be expected to make landfall or reach coastal waters prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

Potential spill impacts on fishing activities are discussed by BOEM (2016b, 2017a). For this DOCD, there are no unique site-specific issues with respect to this activity.

Pelagic longlining activities in the project area and other fishing activities in the northern Gulf of Mexico could be temporarily interrupted in the event of a large oil spill. A spill may or may not result in fishery closures, depending on the duration of the spill, the oceanographic and meteorological conditions at the time, and the effectiveness of spill response measures. The *Deepwater Horizon* incident provides information about the maximum potential extent of fishery closures in the event of a large oil spill in the Gulf of Mexico (NMFS, 2010a). At its peak on 12 July 2010, closures encompassed 217,821 km^2 (84,101 mi^2), or 34.8% of the U.S. Gulf of Mexico EEZ.

According to BOEM (2012a; 2017a), the potential impacts on commercial and recreational fishing activities from an accidental oil spill are anticipated to be minimal because the potential for oil spills is very low, the most typical events are small and of short duration, and the effects are so localized that fishes are typically able to avoid the affected area. Fish populations may be affected by an oil spill event should it occur, but they would be primarily affected if the oil reaches the productive shelf and estuarine areas where many fishes spend a portion of their life cycle (BOEM, 2012a). The probability of an offshore spill affecting these nearshore environments is also low. Should a large oil spill occur, economic impacts on commercial and recreational fishing activities would likely occur, but are difficult to predict because impacts would differ by fishery and season (BOEM, 2016b).

C.8.2 Public Health and Safety

There are no IPFs associated with routine operations that are expected to affect public health and safety. A small fuel spill that is dissipated within a few days would have little or no impact on public health and safety, as the spill response would be completed entirely offshore, 68 miles (109 km) from the nearest shoreline. A large oil spill is the only IPF that has the potential to affect public health and safety.

Impacts of a Large Oil Spill

In the event of a large spill, the main safety and health concerns are those of the offshore personnel involved in the incident and those responding to the spill. Once released into the water column, crude oil weathers rapidly (National Research Council, 2003a). Depending on many factors such as spill rate and duration, the physical/chemical characteristics of the oil, meteorological, and oceanographic conditions at the time, and the effectiveness of spill response measures, weathered oil may remain present on the sea surface and reach coastal shorelines.

Based on data collected during the Deepwater Horizon Incident, the health risks resulting from a large oil spill appear to be minimal (Centers for Disease Control and Prevention, 2010). Health risks for spill responders and wildlife rehabilitation workers responding to a major oil spill are similar to the health risks incurred by response personnel during any large-scale emergency or disaster response (U.S. Department of Homeland Security, 2014), which includes the following:

- Possible accidents associated with response equipment;
- Hand, shoulder, or back pain, along with scrapes and cuts;
- Itchy or red skin or rashes due to potential chemical exposure;
- Heat or cold stress depending upon the working environment; and
- Possible upper respiratory symptoms due to potential dust inhalation, allergies, or potential chemical exposure.

C.8.3 Employment and Infrastructure

There are no IPFs associated with routine operations that are expected to affect employment and infrastructure. The project involves drilling with support from existing shorebase facilities in Louisiana. No new or expanded facilities will be constructed, and no new employees are expected to move permanently into the area. The project will have a negligible impact on socioeconomic conditions such as local employment, existing offshore and coastal infrastructure (including major sources of supplies, services, energy, and water), and minority and lower income groups. Impacts of a large oil spill are addressed below. A small fuel spill that dissipates within a few days would have little or no economic impact as the spill response would use existing facilities, resources, and personnel.

Impacts of a Large Oil Spill

Potential socioeconomic impacts of an oil spill are discussed by BOEM (2017a). For the EIA, there are no unique site-specific issues with respect to employment and coastal infrastructure. A large spill could cause economic impacts in several ways: it could result in extensive fishery closures that put fishermen out of work; it could result in temporary employment as part of the response effort (including the establishment of spill response staging areas); it could result in adverse publicity that affects employment in coastal recreation and tourism industries; and it could result in suspension of OCS drilling activities, including service and support operations that are an important part of local economies.

Non-market effects such as traffic congestion, strains on public services, shortages of commodities or services, and disruptions to the normal patterns of activities or expectations could also occur in the short-term. These negative, short-term social and economic consequences of a spill are expected to be modest in terms of projected cleanup expenditures and the number of people employed in cleanup and remediation activities (BOEM, 2017a). Net employment impacts from a spill would not be expected to exceed 1% of baseline employment in any given year (BOEM, 2017a).

C.8.4 Recreation and Tourism

For this DOCD, there are no unique site-specific issues with respect to recreation and tourism. There are no known recreational or tourism uses in the project area. Recreational resources and tourism in coastal areas would not be affected by routine activities due to the distance from shore. Compliance with NTL BSEE-2015-G013 (See **Table 1**) will minimize the chance of trash or debris being lost overboard from the lay vessel and subsequently washing up on beaches. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dispersing naturally. Therefore, a small fuel spill in the project area would be unlikely to affect recreation and tourism. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

Potential impacts of an oil spill on recreation and tourism are discussed by BOEM (2017a). For this DOCD, there are no unique site-specific issues with respect to these impacts.

Impacts on recreation and tourism would vary depending on the duration of the spill and its fate, including the effectiveness of response measures. A large spill that reached coastal waters and shorelines could adversely affect recreation and tourism by contaminating beaches and wetlands, resulting in negative publicity that encourages people to stay away. The 30-day OSRA results summarized in **Table 4** estimate that shorelines Plaquemines Parish could be contacted within 3 days (4% conditional probability), Terrebonne, Lafourche, Plaquemines, and St Bernard Parishes in Louisiana could be contacted within 10 days (1 to 14% conditional probabilities) and other Louisiana, Mississippi, Alabama and Florida shorelines could be affected within 30 days (1 to 21% conditional probability). The 60-day OSRA modeling (**Table 5**) predicts that shorelines between Matagorda County, Texas, and Levy County, Florida, have up to a 24% probability of contact within 60 days of a spill.

According to BOEM (2017a), should an oil spill occur and contact a beach area or other recreational resource, it could cause some disruption during the impact and cleanup phases of the spill. In the unlikely event that a spill occurs that is sufficiently large to affect large areas of the coast and, through public perception, have effects that reach beyond the damaged area, effects to recreation and tourism could be significant (BOEM, 2012a).

C.8.5 Land Use

Land use along the northern Gulf Coast is discussed by BOEM (2016b, 2017a). There are no routine or accidental IPFs potentially affecting land use. The project will use existing onshore support facilities in Louisiana. The land use at the existing shorebase sites is industrial. The project will not involve new construction or changes to existing land use and, therefore, will not have any impacts. Levels of boat and helicopter traffic as well as demand for goods and services, including scarce coastal resources, will represent a small fraction of the level of activity occurring at the shorebases.

A large oil spill is the only relevant IPF. A small fuel spill should not have any impacts on land use, as the response would be staged out of existing shorebases and facilities.

Impacts of a Large Oil Spill

The initial response for a large oil spill would be staged out of existing facilities, with no expected effects on land use. A large spill could have limited temporary impacts on land use along the coast if additional staging areas were needed. For example, during the *Deepwater Horizon* incident, temporary staging areas were established in Louisiana, Mississippi, Alabama, and Florida for spill response and cleanup efforts. In the event of a large spill in the project area, similar temporary staging areas could be needed. These areas would eventually return to their original use as the response is demobilized. It is not expected that a large oil spill and subsequent cleanup would substantially reduce available space in nearby landfills or decrease their usable life (BOEM, 2014).

An accidental oil spill is not likely to significantly affect land use and coastal infrastructure in the region, in part because an offshore spill would have a small probability of contacting onshore resources. BOEM (2016b) states that landfill capacity would probably not be an issue at any phase of an oil spill event or the long-term recovery. In the case of the *Deepwater Horizon* incident and response, the USEPA reported that existing landfills receiving oil spill waste had plenty of capacity to handle waste volumes; the wastes that were disposed of in landfills represented less than 7% of the total daily waste normally accepted at these landfills (USEPA, 2016).

C.8.6 Other Marine Uses

The project area is not located within any USCG-designated fairway or shipping lane or Military Warning Area. bp and its contractors intend to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. The shallow hazards survey identified existing seafloor infrastructure in the vicinity of the proposed pipeline corridor but no impacts on existing infrastructure are expected. No archaeologically significant sonar contacts were identified within a 2,000 ft (610 m) buffer of the proposed pipeline route (Fugro, 2019).

There are no IPFs from routine project activities that are likely to affect other marine uses of the project area. A large oil spill is the only relevant accident IPF. A small fuel spill would not have any impacts on other marine uses because spill response activities would be mainly within the project area and the duration would be brief.

Impacts of a Large Oil Spill

An accidental spill would be unlikely to significantly affect shipping or other marine uses. The block is not located within any USCG-designated fairway or shipping lane. In the event of a large spill requiring numerous response vessels, coordination would be required to manage the vessel traffic for safe operations. bp and its contractor intend to comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft.

In the event of a large spill requiring numerous vessels in the area, coordination would be required to ensure that no anchoring or seafloor-disturbing activities occur near the existing infrastructure.

C.9 Cumulative Impacts

For purposes of NEPA, cumulative impact is defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR § 1508.7). Any single activity or action may have a negligible impact(s) by itself, but when combined with impacts from other activities in the same area and/or time period, substantial impacts may result.

Prior Studies. Prior to the lease sales, BOEM and its predecessors prepared multisale EISs to analyze the environmental impact of activities that might occur in the multisale area. BOEM and its predecessors also analyzed the cumulative impacts of OCS exploration activities similar to those planned in this DOCD in several documents. The level and types of activities planned in bp’s DOCD are within the range of activities described and evaluated by BOEM (2012a,b, 2013, 2014, 2015, 2016a,b, 2017a). Past, present, and reasonably foreseeable activities were identified in the cumulative effects scenario of these documents, which are incorporated by reference. The proposed action will not result in any additional impacts beyond those evaluated in the multisale and Final EISs (BOEM, 2012a; 2013; 2014; 2015; 2016b; 2017a).

Description of Activities Reasonably Expected to Occur in the Vicinity of Project Area. Other exploration and development activities may occur in the vicinity of the project area. bp does not anticipate other projects in the vicinity of the project area beyond the types of projects analyzed in the lease sale and Supplemental EISs (BOEM, 2012a; 2013; 2014; 2015; 2016b; 2017a).

Cumulative Impacts of Activities in the Development Operations Coordination Document. The BOEM (2017a) Final EIS included a discussion of cumulative impacts, which analyzed the incremental environmental and socioeconomic impacts of the 10 proposed lease sales, in addition to all activities (including non-OCS activities) projected to occur from past, proposed, and future lease sales. The EISs considered exploration, delineation, and development wells; platform installation; service vessel trips; and oil spills. The EISs examined the potential cumulative effects on each specific resource for the entire Gulf of Mexico.

The level and type of activity proposed in bp's DOCD are within the range of activities described and evaluated in the recent lease sale EISs. The EIA incorporates and builds on these analyses by examining the potential impacts on physical, biological, and socioeconomic resources from the work planned in this DOCD, in conjunction with the other reasonably foreseeable activities expected to occur in the Gulf of Mexico. For all impacts, the incremental contribution of bp's proposed actions to the cumulative impacts analysis in these prior analyses are not expected to be significant.

C.9.1 Cumulative Impacts to Physical/Chemical Resources

The work planned in this DOCD is limited in geographic scope and the impacts on the physical/chemical environment will be correspondingly limited.

Air Quality. Emissions from pollutants into the atmosphere from activities are not projected to have significant effects on onshore air quality because of the distance from shore, the prevailing atmospheric conditions, emission rates and heights, and resulting pollutant concentrations. As BOEM found in the multisale EISs, the incremental contribution of activities similar to bp's proposed activities to the cumulative impacts is not significant and will not cause or contribute to a violation of NAAQS (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a). In addition, the cumulative contribution to visibility impairment is also very small. As mentioned in previous sections, projected emissions meet BOEM's exemption criteria and would not contribute to cumulative impacts on air quality.

Climate Change. CO_2 and CH_4 emissions from the project would constitute a negligible contribution to greenhouse gas emissions from all OCS activities. According to BOEM (2013), greenhouse gas emissions from all OCS oil and gas activities make up a very small portion of national CO_2 emissions, and BOEM does not believe that emissions directly attributable to OCS activities are a significant contributor to global greenhouse gas levels. Greenhouse gas emissions identified in this DOCD represent a negligible contribution to the total greenhouse gas emissions from reasonably foreseeable activities in the Gulf of Mexico area and would not significantly alter any of the climate change impacts evaluated in the previous EISs.

Water Quality. bp's project may result in some minor water quality impacts due to the NPDES-permitted discharge of treated sanitary and domestic wastes, deck drainage, desalination unit discharge, ballast water, bilge water, and non-contact cooling water. These effects are expected to be minor (localized to the area within a few hundred meters of the project vessel and temporary (lasting only hours longer than the disturbance or discharge). Any cumulative effects to water quality are expected to be negligible.

Archaeological Resources. No known shipwrecks or other archaeological artifacts were identified during the shallow hazards assessment (Fugro, 2019). The project area is well beyond the 197 ft (60 m) depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. Therefore, bps operations will have no cumulative impacts on historic shipwrecks or prehistoric archaeological resources.

New Information. New information included in the most recent Programmatic, Supplemental, and Final EISs (BOEM, 2012a, 2013, 2014, 2015, 2016a,b, 2017a) has been incorporated into the EIA, where applicable.

C.9.2 Cumulative Impacts to Biological Resources

The work planned in this DOCD is limited in geographic scope and duration, and the impacts on biological resources will be correspondingly limited.

Seafloor Habitats and Biota. Effects on seafloor habitats and from bottom disturbance associated with installation activities are expected to be minor and limited to a small area. A shallow hazards assessment did not identify any features that could support high-density deepwater benthic communities within a 2,000 ft (610 m) corridor of the proposed pipeline (Fugro, 2019).

Areas that may support high-density deepwater benthic communities will be avoided as required by NTL 2009-G40. Soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope, and the extent of benthic impacts during this project is insignificant regionally. As noted in the multisale EISs, the incremental contributions of activities similar to bp's proposed activities to the cumulative impacts is not determined to be significant (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a).

Threatened, Endangered, and Protected Species. Threatened, Endangered, and protected species that could occur in the project area include the sperm whale, Bryde's whale, oceanic whitetip shark, giant manta ray, and five species of sea turtles. Potential impact sources include lay vessel presence including noise and lights, marine debris, and support vessel and helicopter traffic. Potential effects for these species would be limited and temporary and would be reduced by bp's expected compliance with BOEM-required mitigation measures, including NTLs BSEE-2015-G013 and BOEM-2016-G01 and NMFS (2020a) Appendix B and C. No significant cumulative impacts are expected.

Coastal and Marine Birds. Birds may be exposed to contaminants, including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion. bp's expected compliance with NTL BSEE-2015-G013 will minimize the likelihood of debris-related impacts on birds. Support vessel and helicopter traffic may disturb some foraging and resting birds; however, it is likely that individual birds would experience, at most, only short-term behavioral disruption.

Due to the limited scope, timing, and geographic extent of the installation activities, collisions or other adverse effects are unlikely, and no significant cumulative impacts are expected.

Fisheries Resources. Exploration and production structures occur in the vicinity of the project area. The additional effect of the proposed installation activity would be negligible.

Coastal Habitats. Due to the distance of the project area from shore, routine activities are not expected to have any impacts on beaches and dunes, wetlands, seagrass beds, coastal wildlife refuges, wilderness areas, or any other managed or protected coastal area. The support bases are not in wildlife refuges or wilderness areas. Support operations, including the crew boat and supply boats, may have a minor incremental impact on coastal habitats. Over time with a large number of vessel trips, vessel wakes can erode shorelines along inlets, channels, and harbors. Impacts will be minimized by following the speed and wake restrictions in harbors and channels.

New Information. New information included in the most recent Programmatic, Supplemental, and Final EISs (BOEM, 2012a,b, 2013, 2014, 2015, 2016a,b, 2017a) has been incorporated into the EIA, where applicable.

C.9.3 Cumulative Impacts to Socioeconomic Resources

The work planned in this DOCD is limited in geographic scope and duration, and the impacts on socioeconomic resources will be correspondingly limited.

The multisale and Supplemental and Final EISs analyzed the cumulative impacts of oil and gas exploration and development in the project area, in combination with other impact-producing activities, on commercial fishing, recreational fishing, recreational resources, historical and archaeological resources, land use and coastal infrastructure, demographics, and environmental justice (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a). BOEM also analyzed the economic impact of oil and gas activities on the Gulf States, finding only minor impacts in most of Texas, Mississippi, Alabama, and Florida, more significant impacts in parts of Texas, and substantial impacts on Louisiana.

bp's proposed activities will have negligible cumulative impacts on socioeconomic resources. There are no IPFs associated with routine operations that are expected to affect public health and safety, employment and infrastructure, recreation and tourism, land use, or other marine uses. Due to the distance from shore, it is unlikely that any recreational fishing activity is occurring in the project area, and it is unlikely that any commercial fishing activity other than longlining occurs at or near the project area. The project will have negligible impacts on fishing activities.

New Information. New information included in the most recent Programmatic, Supplemental, and Final EISs (BOEM, 2012a,b, 2013, 2014, 2015, 2016a,b, 2017a) has been incorporated into the EIA, where applicable.

D. Environmental Hazards

D.1 Geologic Hazards

The shallow hazards assessment concluded that the proposed infrastructure installation locations appear suitable for the planned activities (Fugro, 2019). See DOCD Section 3 for supporting geological and geophysical information.

D.2 Severe Weather

Under most circumstances, weather is not expected to have any effect on the proposed activities. Extreme weather, including high winds, strong currents, and large waves, was considered in the design criteria for the lay vessel. High winds and limited visibility during a severe storm could disrupt communication and support activities (vessel and helicopter traffic) and make it necessary to suspend some activities for safety reasons until the storm or weather event passes. bp has several contingency plans in place to address unexpected conditions. In the event of severe weather, guidance as outlined in bp's and/or bp's installation contractor's site-specific Emergency Evacuation Plan, its site-specific hurricane preparation checklist, and the Gulf of Mexico Region Severe Weather Contingency Plan would be adhered to.

D.3 Currents and Waves

Metocean conditions such as sea states, wind speed, ocean currents, etc. will be continuously monitored. Under most circumstances, physical oceanographic conditions are not expected to have any effect on the proposed activities. Strong currents (e.g., caused by Loop Current eddies and intrusions) and large waves were considered in the design criteria for the lay vessel selected for this project. High waves during a severe storm could disrupt support activities (i.e., vessel and helicopter traffic), and risks to the program brought on by such conditions would be closely monitored and managed by the team managing the project. In some cases, it may be necessary to suspend some activities for safety reasons until the storm or weather event passes.

E. Alternatives

No formal alternatives were evaluated in the EIA for the proposed project. However, various technical and operational options, including the location of the pipeline and the selection of a lay vessel, were considered by bp. The activity being proposed is the result of a rigorous screening and right-scoping process. It was selected as the best design candidate to reduce risk and optimize deliverability, chosen from numerous options with varying installation locations, trajectories, construction designs, and installation strategies, amongst other variables.

F. Mitigation Measures

The proposed program includes numerous processes and actions that are intended to mitigate potential impact to the environment. The project is expected to comply with applicable federal, state, and local requirements concerning air pollutant emissions, discharges to water, and waste management. In addition, bp and its installation contractors intend to implement the following specific measures to prevent marine pollution:

- Proper job planning is an important overall mitigation measure. The fundamental concept and discussion in the pre-tour and pre-job safety meetings is the prevention of harm to people and the environment. Personnel are reminded daily to inspect work areas for safety issues as well as potential pollution issues;
- Per Safety and Environmental Management System (SEMS) requirements, the skills and knowledge of personnel are assessed prior to working offshore for bp;
- Equipment transferred to and from the lay vessel will be inspected to ensure pollution pans have been cleaned and to confirm that plugs have been installed prior to leaving the dock and prior to loading on the boat;
- Preventive maintenance of equipment, including visual inspection of hydraulic lines and reservoirs, will be conducted on a scheduled basis;

- Items deemed safety and environmentally critical are listed and managed on a schedule recommended by the manufacturer/operator;
- Waste generation and storage will be managed as per the bp Gulf of Mexico Waste Management procedures and any contractor's established waste management procedures. Wastes are expected to be categorized, packaged, labeled, stored, manifested, and shipped to an appropriately permitted disposal site;
- Drums will be stored in containment areas, and fuel vents will have containment boxes.
- Trash containers will be kept covered. Trash will be disposed of in a compactor and shipped to shore via a rig support vessel;
- Tank overflow, discharge overflow spill prevention fittings as well as quick disconnect hoses will be installed on hydrocarbon-based fluid hoses and liquid mud hoses to ensure isolation of any hose failures;
- On site spill kits are inspected regularly and re-stocked as needed
- Drills are conducted regularly, often engaging the incident management team onshore to measure the effectiveness and quality of processes deployed to address oil spill scenarios.
- Fuel hoses and SBM hoses will be changed based on the maintenance schedule of the drilling vessel.

G. Consultation

No persons beyond those cited as Preparers (**Section H.**, **Preparers**) or agencies were consulted regarding potential impacts associated with the proposed activities during the preparation of the EIA.

H. Preparers

The EIA was prepared for bp. Contributors included the following:

- David L Duke (Environment & Social Team Lead)

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Appendix E: Air Emissions Information – Form BOEM-0139

AIR EMISSIONS COMPUTATION FACTORS

COMPANY	BP Exploration & Production Inc.
AREA	Mississippi Canyon
BLOCK	520
LEASE	OCS-G 09821
FACILITY	Not Applicable
WELL	MC520 006
COMPANY CONTACT	Air Quality (Ramesh Gopal)/ Plans (Kathi Gamiotea)
TELEPHONE NO.	Air Quality (409-655-4418)/ Plans (346-640-6725)
REMARKS	Complete 1 wells, install lease term umbilical, jumpers, manifold and commission subsea infrastructure

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:		
YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2023	2	139
2024	2	126

AIR EMISSIONS COMPUTATION FACTORS

Fuel Usage Conversion Factors	Natural Gas Turbines				Natural Gas Engines		Diesel Recip. Engine		Diesel Turbines			
	SCF/hp-hr	9.524			SCF/hp-hr	7.143	GAL/hp-hr	0.0514	GAL/hp-hr	0.0514		

Equipment/Emission Factors	units	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	REF.	DATE	Reference Links
Natural Gas Turbine	g/hp-hr		0.0086	0.0086	0.0026	1.4515	0.0095	N/A	0.3719	N/A	AP42 3.1-1& 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
RECIP. 2 Cycle Lean Natural Gas	g/hp-hr		0.1293	0.1293	0.0020	6.5998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf https://cfpub.epa.gov/webfire/
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://cfpub.epa.gov/webfire/
Vessels – Propulsion	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (light smoke)	lbs/MMscf	2.10	2.10	2.10	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
Combustion Flare (medium smoke)	lbs/MMscf	10.50	10.50	10.50	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/tank						4.300				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Fugitives	lbs/hr/component						0.0005				API Study	12/93	https://www.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b623870125d
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Construction Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Survey Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Tractor	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
On-Ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day)	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels - Hovercraft Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	

Sulfur Content Source	Value	Units
Fuel Gas	3.38	ppm
Diesel Fuel	0.0015	% weight
Produced Gas (Flare)	3.38	ppm
Produced Oil (Liquid Flaring)	1	% weight

Density and Heat Value of Diesel Fuel		
Density	7.05	lbs/gal
Heat Value	19,300	Btu/lb

Heat Value of Natural Gas		
Heat Value	1,050	MMBtu/MMscf

Natural Gas Flare Parameters	Value	Units
VOC Content of Flare Gas	0.6816	lb VOC/lb-mol gas
Natural Gas Flare Efficiency	98	%

AIR EMISSIONS COMPUTATION FACTORS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Mississippi Canyon		520	OCS-G 09821	Not Applicable	MC520 006					Air Quality (Ramesh Gopal)/ Plans		Air Quality (409-655-4418)/ Plans		Complete 1 wells, install lease term umbilical, jumpers, manifold and commission subsea infrastructure										
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING - Black Hornet (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**																				
Main Engines: Hyundai Himsen 9H32/40 and 18H32/40V	VESSELS- Drilling - Propulsion Engine - Diesel		60354	3,104.97	34818.00	24	139	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	33.12	19.98	19.38	0.48	793.62	22.82	0.00	124.48	0.23
Egen: Cummins 1900 kW	Vessels – Drilling Prime Engine, Auxiliary		2458	126.45	3034.90	2	20	1.73	1.05	1.01	0.03	41.55	1.19	0.00	6.52	0.01	0.03	0.02	0.02	0.00	0.83	0.02	0.00	0.13	0.00
Temporary Large/ Small Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary		2500	128.62	3086.76	24	139	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.94	1.77	1.72	0.04	70.36	2.02	0.00	11.04	0.02
DRILLING: West Auriga Drillship (Substitution likely with similar vessel of same/lower horsepower)	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**9971** **36288**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3,357.47	36288.00	24	0	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E-Gen: 1 x Leroy Somer, 2145 hp	Vessels – Drilling Prime Engine, Auxiliary		2145	110.35	2648.44	2	0	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Small/Large Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary		2500	128.62	3086.76	24	0	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONSTRUCTION / SUBSEA INSTALLATION (Substitution likely with similar vessels of same/lower hourpower)																									
Construction: C-Constructor																									
Main Engines: 6 x Cat 3512C + 2 x Schottel SCD3030	VESSELS -Construction/Installation - Diesel		21726	1117.7158	26825.18	24	24	15.33	9.25	8.97	0.22	367.23	10.56	0.00	57.60	0.11	4.37	2.64	2.56	0.06	104.66	3.01	0.00	16.42	0.03
E-Gen: 1 x Cat C18, 425 kW	VESSELS – Prime Engine, Auxiliary		570	29.32	703.78	2	4	0.40	0.24	0.24	0.01	9.63	0.28	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.00
Small/Large Auxiliary Engines	VESSELS – Prime Engine, Auxiliary		2500	128.62	3086.76	24	24	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.50	0.30	0.29	0.01	12.04	0.35	0.00	1.89	0.00
2023	**Facility Total Emissions**							**112.89**	**68.11**	**66.06**	**1.64**	**2,704.69**	**77.77**	**0.01**	**424.22**	**0.79**	**40.97**	**24.72**	**23.98**	**0.60**	**981.55**	**28.22**	**0.00**	**153.95**	**0.29**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,277.72**			**2,277.72**	**2,277.72**	**2,277.72**		**56,865.60**	
	68.4																								
DRILLING	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	139	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	8.46	5.10	4.95	0.12	202.63	5.83	0.00	31.78	0.06
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	139	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	8.46	5.10	4.95	0.12	202.63	5.83	0.00	31.78	0.06
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	139	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	8.46	5.10	4.95	0.12	202.63	5.83	0.00	31.78	0.06
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONSTRUCTION / SUBSEA INSTALLATION	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	24	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.45	0.87	0.85	0.02	34.68	1.00	0.00	5.44	0.01
2023	**Non-Facility Total Emissions**							**35.56**	**21.45**	**20.81**	**0.52**	**851.90**	**24.49**	**0.00**	**133.62**	**0.25**	**26.82**	**16.18**	**15.70**	**0.39**	**642.57**	**18.48**	**0.00**	**100.79**	**0.19**

AIR EMISSIONS COMPUTATION FACTORS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Mississippi Canyon		520	OCS-G 09821	Not Applicable	MC520 006					Air Quality (Ramesh Gopal)/ Plans		Air Quality (409-655-4418)/ Plans (		Complete 1 wells, install lease term umbilical, jumpers, manifold and commission subsea infrastructure										
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING - Black Hornet (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)	**Average Daily Fuel Usage**				**13210**																				
	Maximum Daily Fuel Usage				**34818**																				
Main Engines: Hyundai Himsen 9H32/40 and 18H32/40V	VESSELS- Drilling - Propulsion Engine - Diesel		60354	3,104.97	34818.00	24	0	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Egen: Cummins 1900 kW	Vessels – Drilling Prime Engine, Auxiliary		2458	126.45	3034.90	2	0	1.73	1.05	1.01	0.03	41.55	1.19	0.00	6.52	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temporary Large/ Small Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary		2500	128.62	3086.76	24	0	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRILLING: West Auriga Drillship (Substitution likely with similar vessel of same/lower horsepower)	**Average Daily Fuel Usage**				**9971**																				
	Maximum Daily Fuel Usage				**36288**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3,357.47	36288.00	24	126	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	31.41	18.95	18.38	0.46	752.61	21.64	0.00	118.04	0.22
E-Gen: 1 x Leroy Somer, 2145 hp	Vessels – Drilling Prime Engine, Auxiliary		2145	110.35	2648.44	2	19	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.03	0.02	0.02	0.00	0.69	0.02	0.00	0.11	0.00
Small/Large Auxiliary Engines	Vessels – Drilling Prime Engine, Auxiliary		2500	128.62	3086.76	24	126	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.67	1.61	1.56	0.04	64.02	1.84	0.00	10.04	0.02
CONSTRUCTION / SUBSEA INSTALLATION (Substitution likely with similar vessels of same/lower hourpower)																									
Construction: C-Constructor																									
Main Engines: 6 x Cat 3512C + 2 x Schottel SCD3030	VESSELS -Construction/Installation - Diesel		21726	1117.7158	26825.18	24	20	15.33	9.25	8.97	0.22	367.23	10.56	0.00	57.60	0.11	3.68	2.22	2.15	0.05	88.13	2.53	0.00	13.82	0.03
E-Gen: 1 x Cat C18, 425 kW	VESSELS – Prime Engine, Auxiliary		570	29.32422	703.78	2	3	0.40	0.24	0.24	0.01	9.63	0.28	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Small/Large Auxiliary Engines	VESSELS – Prime Engine, Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
2024	**Facility Total Emissions**							**112.89**	**68.11**	**66.06**	**1.64**	**2,704.69**	**77.77**	**0.01**	**424.22**	**0.79**	**38.22**	**23.06**	**22.36**	**0.56**	**915.62**	**26.33**	**0.00**	**143.61**	**0.27**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,277.72**			**2,277.72**	**2,277.72**	**2,277.72**		**56,865.60**	
	68.4																								
DRILLING	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	0	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	126	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.70	4.64	4.50	0.11	184.37	5.30	0.00	28.92	0.05
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	126	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.70	4.64	4.50	0.11	184.37	5.30	0.00	28.92	0.05
	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	126	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.70	4.64	4.50	0.11	184.37	5.30	0.00	28.92	0.05
CONSTRUCTION / SUBSEA INSTALLATION	VESSELS- Offshore Support Vessel Diesel		7200	370.4112	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
2024	**Non-Facility Total Emissions**							**35.56**	**21.45**	**20.81**	**0.52**	**851.90**	**24.49**	**0.00**	**133.62**	**0.25**	**24.31**	**14.66**	**14.22**	**0.35**	**582.33**	**16.74**	**0.00**	**91.34**	**0.17**

AIR EMISSIONS COMPUTATION FACTORS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
BP Exploration & Production Inc	520	OCS-G 09821	Not Applicable	MC520 006		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2023	40.97	24.72	23.98	0.60	981.55	28.22	0.00	153.95	0.29
2024	38.22	23.06	22.36	0.56	915.62	26.33	0.00	143.61	0.27
Allowable	2277.72			2277.72	2277.72	2277.72		56865.60	

Appendix F: Coastal Zone Management Certifications (AL)

Lance R. LeFleur
Director

ADEM

Alabama Department of Environmental Management
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ▪ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

Kay Ivey
Governor

05/24/2021

BP Exploration & Production Inc.
Attn: Adalberto Garcia
501 Westlake Park Blvd.
Houston, Texas 77079

RE: ADEM Coastal Application Review Fee
OCS- G09821 Block- 520 Mississippi Canyon Area
BOEM Control No.: S-8048
Alabama Department of Environmental Management (ADEM) Tracking Code: ACAMP-**2021-324**

Dear BP Exploration & Production Inc.
Attn: Adalberto Garcia

Pursuant to the Alabama Department of Environmental Management Administrative Code 335-1-6, the Department is authorized to collect application fees. Before processing your above-referenced application, the Department must be in receipt of a **$24,480.00** fee. Fees may be submitted either by check or online with a credit card.

This is a non-refundable fee. Payment of this fee does not guarantee a favorable decision by the Department. Collection of this fee does not, in any way, imply that the proposed activities comply with the requirements of any other jurisdictional entity nor does it imply that the project can or will be approved by any other jurisdictional entity. **Be advised that additional fees may be assessed for other permit or certification actions, which may be required by the Department**.

If you have any questions regarding this matter, please contact me in the Mobile-Coastal office at (251) 304-1176 or Sarila.Mickle@adem.alabama.gov.

Sincerely,

Sarila Mickle
Mobile-Coastal Office
Field Operations Division

ADEM

Alabama Department of Environmental Management

INVOICE

ACAMP-**2021-324**

	FEE	TOTAL
Commercial and/or Residential Development		
Development greater than 5 acres and less than 25 acres	$9,025	
Development 25 acres or greater and less than 100 acres	$19,070	
Development 100 acres or greater	$25,920	
Groundwater extraction from a well having capacity of 50 gpm or more	$3,995	
Construction on Beaches and Dunes		
1 Single Family Dwelling or 1 Duplex	$1,330	
2 Single Family Dwellings or 2 Duplexes	$1,750	
Commercial (non- residential) structure, multi-unit residential structure having more than 2 units, or any other combination of living units not covered by a) or b) above	$17,765	
Hardened erosion control structures (retaining walls, seawalls, bulkheads, rip-rap, and similar structures)	$2,035	
Beach Nourishment Projects on Gulf Beaches		
Filling less than 1,000 square feet of State waterbottoms	$1,895	
Filling 1,000 to 100,000 square feet of State waterbottoms	$3,785	
Filling greater than 100,000 square feet of State waterbottoms	$6,985	
Projects Impacting Wetlands		
Dredging or filling of less than 1,000 square feet of wetlands	$2,125	
Dredging or filling of 1,000 square feet or more of wetlands	$4,235	
Pile-supported residential, multifamily, or commercial structures (does not include piers, walkways, gazebos)	$3,940	
Projects Impacting Water Bottoms		
Filling of less than 1,000 square feet of water bottom	$2,125	
Filling of 1,000 square feet or more of water bottom	$4,235	
Dredging of less than 10,000 cubic yards from water bottom	$2,125	
Dredging of 10,000 to 100,000 cubic yards from water bottom	$4,235	
Dredging of greater than 100,000 cubic yards from water bottom	$7,855	
Construction of coastal or inland marinas, canals, or creek relocation or modification	$4,235	
Raised creek crossing	$800	
Shoreline Stabilization of Non Gulf-Fronting Properties		
Shoreline stabilization less than 200 feet (bulkheads, rip-rap)	$800	
Shoreline stabilization greater than 200 feet (bulkheads, rip-rap)	$1,330	

Alabama Department of Environmental Management

INVOICE

ACAMP-**2021-324**

Groins, jetties, and other sediment catching structures	$1,680	
Pile-supported piers, docks, boardwalks, etc.	$800	
Siting, construction, and operation of energy facilities	$24,480	X
Mitigation Bank projects	$8,730	
State agency permits subject to review, not otherwise specified in Schedule B	$1,680	
Federal licenses or permits not specified in Schedule B	$1,680	
Certification for FERC permit or authorization	$6,550	
All other projects and/or consistency reviews not otherwise specified in Schedule B which are subject to ADEM's Division 8 regulations	$800	
Certification transfer or to change the name of the applicant only	$800	
Modifications and/or time extensions not requiring public notice	$800	
Modifications and/or time extensions requiring public notice	½ or $800	
Variance request (additive)	$3,275	
Total Fee Due:		**$24,480.00**

ADEM
Alabama Department of Environmental Management

INVOICE

ACAMP-**2021-324**

BP Exploration & Production Inc.
Attn: Adalberto Garcia
501 Westlake Park Blvd.
Houston, Texas 77079

Invoice Date:05/24/2021

ADEM Coastal Application Review Fee
ACAMP Number: ACAMP-**2021-324**

Total Due:	**$24,480.00**
Adjustment(s):	$0
Amount Paid:	$0
Balance Due:	**$24,480.00**

Instructions

If you are submitting payment via check or money order:

- The check should be made payable to "**ADEM**"
- Please include the reference "**ADEM Coastal Application Review Fee**- ACAMP-**2021-324**" on your check
- The ADEM copy of the invoice must be submitted with the check
- Please mail the check and the ADEM copy of the invoice to the address listed in bold below **within 30 days** of the date of this letter

If you are submitting payment via credit card online:

- Payment can be made at: http://adem.alabama.gov/moreInfo/epay.cnt
- You should select "General Invoice" as payment\permit type
- All applicable fields should be filled out and the online instructions followed
- Select code "5346- Coastal Area Permit" for payment type
- Please mail a copy of the credit card proof of payment and the ADEM copy of the invoice to the address listed in bold below **within 30 days** of the date of this letter

All fees and related invoices should be sent to the attention of the following:

ADEM Mobile-Coastal Office
Attn: Sarila Mickle
3664 Dauphin Street, Suite B
Mobile, AL 36608-1211

Please return payment for the total balance due. CASH payments WILL NOT be accepted. The ADEM copy of the invoice MUST be included with the payment to ensure proper credit.

Appendix G: Service Processing Fee

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Uncontrolled when printed or stored locally

Gamiotea, Kathi

From: notification@pay.gov
Sent: Thursday, October 13, 2022 6:02 PM
To: Gamiotea, Kathi
Subject: Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

An official email of the United States government

Your payment has been submitted to Pay.gov and the details are below. If you have any questions regarding this payment, please contact Brenda Dickerson at (703) 787-1617 or BseeFinanceAccountsReceivable@bsee.gov.

Application Name: BOEM Development/DOCD Plan - BD
Pay.gov Tracking ID: 27216TAL
Agency Tracking ID: 76304101393
Transaction Type: Sale
Transaction Date: 10/13/2022 07:01:39 PM EDT
Account Holder Name: Kathi Gamiotea
Transaction Amount: $4,238.00
Card Type: MasterCard
Card Number: ************0603

Region: Gulf of Mexico
Contact: Kathi Gamiotea (346) 640-6725
Company Name/No: BP Exploration & Production Inc, 02481
Lease Number(s): 09821
Area-Block: Mississippi Canyon MC, 520
Type-Wells: Supplemental Plan, 1

THIS IS AN AUTOMATED MESSAGE. PLEASE DO NOT REPLY.

Pay.gov is a program of the U.S. Department of the Treasury, Bureau of the Fiscal Service