July 14, 2025

UNITED STATES GOVERNMENT
MEMORANDUM

To: Public Information

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

Subject: Public Information copy of plan

Control # - Control N-10260

Type - Initial Development Operations Coordinations Document

Lease(s) - OCS-G08797 Block - 85 Mississippi Canyon Area
OCS-G35962 Block - 41 Mississippi Canyon Area

Operator - Anadarko Petroleum Corporation

Description – Drill, complete, and conduct a flowback on three new dumpflood water injection well A, AA & AAA

Rig Type - Not Found

Attached is a copy of the subject plan.

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

Henry Emembolu
Plan Coordinator

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

MISSISSIPPI CANYON BLOCK 41
OCS-G 35962

MISSISSIPPI CANYON BLOCK 85
OCS-G 08797

PUBLIC

RECORD OF CHANGE LOG

Submission Type	Date Sent to BOEM	Summary of Submission	Page Numbers
Initial	04/28/2025	Initial	All
Amendment	06/02/2025	Verify connection between the A, SS001 and 001 wells	4, 74, 80
Final Copy of Plan	06/05/2025	Complete Corrected Copy of DOCD Submittal	All
Record of Change Log	06/05/2025	Record of Change Log	1

PUBLIC

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

MISSISSIPPI CANYON BLOCK 41
OCS-G 35962

MISSISSIPPI CANYON BLOCK 85
OCS-G 08797

OFFSHORE, ALABAMA

Anadarko Petroleum Corporation
1201 Lake Robbins Drive
The Woodlands, Texas 77380
Contact: Teri Powell
Teri_Powell@oxy.com
(832) 636-1261

1 – Confidential PDF
1 – Public Copy PDF

April 2025

ANADARKO PETROLEUM CORPORATION
INITIAL DEVELOPMENT OPERATIONS
COORDINATION DOCUMENT
MISSISSIPPI CANYON BLOCKS 41 and 85
OCS-G 35962 and 08797

SECTION A
PLAN CONTENTS

(a) Plan Information Form

Under this Initial DOCD, Anadarko Petroleum Corporation (Anadarko) plans to:

- Drill, complete, and conduct a flowback on three new dumpflood water injection well locations: Mississippi Canyon (MC) 41 A, AA and AAA with surface locations in Mississippi Canyon (MC) 85.
- Well to be used for dumpflood water injection: Mississippi Canyon (MC) 41 #001 will be drilled and re-named to MC 41 SS001.
    - Dumpflood is a waterflooding technique where uncontrolled water production from a source aquifer flows to and is injected into a target reservoir; the process occurs downhole within the same wellbore.
- Conduct subsea infrastructure installation activities: see ***Section L*** for additional information.

Anadarko anticipates utilizing Location "A" to drill MC 41 #001, but any of the proposed well locations could be utilized. The well will be renamed to MC 41 SS001 upon initial completion and commencing water injection.

Enclosed as **Attachment A-1** is Form BOEM-137, OCS Plan Information Form.

(b) Location

Enclosed as **Attachment A-2** is a well location plat at a scale of 1" = 2,000' that depicts the surface location and water depth of the subsea well.

(c) Safety and Pollution Prevention Features

Safety features on the platform will include well control, pollution prevention, safe welding procedures, and blowout prevention equipment as described in Title 30 CFR Part 250, Subparts C, D, E, G and O; and as further clarified by BOEM Notices to Lessees, and applicable regulations of the Environmental Protection Agency and the U.S. Coast Guard. The appropriate life rafts, life jackets, ring buoys, etc., as prescribed by the U.S. Coast Guard, will be maintained on the facility.

Per NTL 2008-G04, Anadarko proposes additional measures for safety, pollution prevention, and early spill detection beyond those required by 30 CFR 250, as outlined in Anadarko's Regional Oil Spill Response Plan. These additional measures include:

- Shipboard Oil Pollution Emergency Plan
- Operations Manual
- Spill Prevention Control and Countermeasures Plan

Procedures for fuel transfers and well control programs are also detailed in the Regional Oil Spill Response Plan.

(d) Storage Tanks and Production Vessels

The proposed wells will be drilled and completed with either a DP drillship or DP semisubmersible unit. The storage tanks represented below reflect the largest tank capacities from MODU's under contract. Another MODU or vessel may be utilized during operations, but will have a total storage tank capacity equal to or less than the following:

Type of Facility	Type Of Storage Tank	Tank Capacity	Number Of Tanks	Total Capacity	Fluid Gravity (API)	Total Capacity of all Tanks for Rig Type
DP Drillship	Fuel Oil	5,514 bbls	2	11,028 bbls	No. 2 Diesel/ varies	**12 tanks total= 62,874 bbls**
	Hydrocarbons/Fuel Oil Storage Tank	12,458 bbls	2	24,916 bbls	No. 2 Diesel/ varies	
	Hydrocarbons/Fuel Oil Storage Tank	12,065 bbls	2	24,130 bbls	No. 2 Diesel/ varies	
	Fuel Oil Settling Tanks	640 bbls	2	1,280 bbls	No. 2 Diesel	
	Fuel Oil Service Tanks	480 bbls	3	1,440 bbls	No. 2 Diesel	
	Fuel Oil Emergency Generator Tank	80 bbls	1	80 bbls	No. 2 Diesel	
DP Semi	Hydrocarbon/Fuel Oil Hull Tanks	4,541 bbls	2	9,082 bbls	No. 2 Diesel/ varies	**7 tanks total= 16,689 bbls**
	Hydrocarbon/Fuel Oil Hull Tanks	3,392 bbls	2	6,784 bbls	No. 2 Diesel/ varies	
	Fuel Oil Deck Day Tank	629 bbls	1	629 bbls	No. 2 Diesel	
	Fuel Oil Deck Settling Tank	164 bbls	1	164 bbls	No. 2 Diesel	
	Fuel Oil Emergency Generator	30 bbls	1	30 bbls	No. 2 Diesel	

The proposed wells will also utilize a contracted ROV vessel or dynamically positioned (DP) construction vessel to conduct the subsea installation operations. Another vessel may be used during operations, but will have a total storage tank capacity equal to or less than the following:

Type of Facility	Type Of Storage Tank	Tank Capacity	Number Of Tanks	Total Capacity	Fluid Gravity (API)	Total Capacity of all Tanks for Facility Type
ROV Vessel	Fuel-Oil Strg Tank	4454.4 bbls	1	4454.4 bbls	No. 2 Diesel	16 tanks total= 17,614.3 bbls
	Fuel Oil Strg Tank	4061.3 bbls	1	4061.3 bbls	No. 2 Diesel	

Type of Facility	Type Of Storage Tank	Tank Capacity	Number Of Tanks	Total Capacity	Fluid Gravity (API)	Total Capacity of all Tanks for Facility Type
	Fuel Oil Strg Tank	3173.8 bbls	1	3173.8 bbls	No. 2 Diesel	
	Fuel Oil Strg Tank	3772.6 bbls	1	3772.6 bbls	No. 2 Diesel	
	Fuel Oil Strg Tank	717.7 bbls	1	717.7 bbls	No. 2 Diesel	
	Fuel Oil Day Tank	26.4 bbls	2	52.8 bbls	No. 2 Diesel	
	Settling Tank	183.0 bbls	3	549.0 bbls	No. 2 Diesel	
	Settling Tank	305.7 bbls	1	305.7 bbls	No. 2 Diesel	
	Service Tank	162.9 bbls	2	325.8 bbls	No. 2 Diesel	
	Overflow Tank	44.0 bbls	1	44.0 bbls	No. 2 Diesel	
	Overflow Tank	91.2 bbls	1	91.2 bbls	No. 2 Diesel	
	Drain Tank	66.0 bbls	1	66.0 bbls	No. 2 Diesel	

Type of Facility	Type Of Storage Tank	Tank Capacity	Number Of Tanks	Total Capacity	Fluid Gravity (Api)	Total Capacity of all Tanks for Facility Type
DP Construction Vessel	Fuel Oil Strg Tank	3458.7 bbls	2	6917.4 bbls	No. 2 Diesel	**27 tanks total= 28,583.1 bbls**
	Fuel Oil Strg Tank	3483.9 bbls	2	6967.8 bbls	No. 2 Diesel	
	Fuel Oil Strg Tank	1323 bbls	2	2646 bbls	No. 2 Diesel	
	Fuel Oil Strg Tank	907.2 bbls	2	1814.4 bbls	No. 2 Diesel	
	Fuel Oil Strg Tank	2230.2 bbls	2	4460.4 bbls	No. 2 Diesel	
	Overflow Tank	201.6 bbls	2	403.2 bbls	No. 2 Diesel	
	Day Tank and Settling Tank	793.8 bbls	2	1587.6 bbls	No. 2 Diesel	
	Day Tank and Settling Tank	743.4 bbls	2	1486.8 bbls	No. 2 Diesel	
	Drain Tank	182.7 bbls	2	365.4 bbls	No. 2 Diesel	
	Deck Drain Waste Oil	289.8 bbls	1	289.8 bbls		
	Dirty Oil	176.4 bbls	1	176.4 bbls		
	Renovated Oil	132.3 bbls	2	264.6 bbls	Lube Oil	
	Lube Oil Storage	485.1 bbls	2	970.2 bbls	Lube Oil	
	Hydraulic Oil Storage Tank	69.3 bbls	2	138.6 bbls	Hydraulic Oil	
	Dirty Hydraulic Oil Storage Tank	94.5 bbls	1	94.5 bbls	Hydraulic Oil	

Pollution Prevention Measures

Per NTL 2008-G04, Anadarko proposes additional measures for safety, pollution prevention, and early spill detection beyond those required by 30 CFR 250, as outlined in Anadarko's Regional Oil Spill Response Plan. These additional measures include:

- Shipboard Oil Pollution Emergency Plan
- Operations Manual
- Spill Prevention Control and Countermeasures Plan

Procedures for fuel transfers and well control programs are detailed in the Regional Oil Spill Response Plan.

The MC 41 #001 (SS001) injection well will be tied into Anadarko's Marlin TLP (VK 915-A) via a service/utility pipeline into the production flowpath for management of the tree bore pressure and for periodic testing of the subsea well valves. No production will be transported to the Marlin (VK 915-A) facility.

The facilities are designed, installed, and operated in accordance with current regulations, engineering documents incorporated by reference, and industry practice to ensure protection of personnel, environment, and the facilities. When necessary, maintenance or repairs that are necessary to prevent pollution of offshore waters shall be undertaken immediately.

The pollution prevention measures for the facility include installation of curbs, gutters, drip pans, and drains on deck areas to collect all contaminants and debris.

The facility is designed to produce oil and gas. All equipment, such as separators, tanks, and treaters, utilized for the handling of hydrocarbons are designed, installed, and operated to prevent pollution. Necessary maintenance or repair work needed to prevent pollution of offshore waters shall be performed immediately. Curbs, gutters, drip pans and drains are installed in deck areas in a manner necessary to collect all contaminants not authorized for discharge. Any unexpected oil drainage will be piped to an operated and maintained sump system which will automatically maintain the oil at a level sufficient to prevent discharge of oil into offshore waters. All gravity drains are equipped with a water trap or other means to prevent gas in the sump system from escaping through the drains. Sump piles will not be used as processing devices to treat or skim liquids but may be used to collect treated liquids from drip pans and deck drains and as a final trap for hydrocarbon liquid in the event of equipment upsets. There will be no disposal of equipment, cables, chains, containers, or other materials into offshore waters.

Supervisory and certain designated personnel on-board the facility is familiar with the effluent limitations and guidelines for overboard discharges into the receiving waters as outlined in the NPDES General Permit for the EPA Region IV.

Production safety equipment was designed, and is installed, used, maintained, and tested in a manner to assure the safety and protection of the human, marine, and coastal environments in accordance with 30 CFR 250 Subpart H. Anadarko will perform all installation and production operations in a safe and workmanlike manner, and will maintain all equipment in a safe condition, thereby ensuring the protection of lease and associated facilities, the health and safety of all persons, and the preservation and conservation of property and the environment. The appropriate life rafts, life jackets, ring buoys, etc., as prescribed by the U.S. Coast Guard, will be maintained on the facility.

Any platform production facilities shall be protected with a basic and ancillary surface system designed, analyzed, installed, tested, and maintained in operating condition in accordance with the provisions of API RP 14C, Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Platforms.

The Marlin TLP is a manned structure and will be identified and reported in accordance with the requirements of the U.S. Coast Guard and BOEM/BSEE. The unit is a floating production system of the spar design using a conventional mooring system. It is considered a floating facility and is inspected and constructed to the requirements of 46 CFR Parts 107 and 108 as directed by 33 CFR 143.120.

(e) Description of Previously Approved Lease Activities

Anadarko has previously approved well locations in Mississippi Canyon Block 85.

Approval was granted for the following well locations under the Supplemental EP (filed by FMOG) for Mississippi Canyon Block 85 (Plan Control No. S-7724) approved on April 30, 2015:

Well Location	Status of Well Location	Potential Future Operations
MC 85 “E”	Previously submitted well location cancelled by FMOG	N/A

There are no previously approved well locations that include:

- MC 41, OCS-G 35962

U.S. Department of the Interior
Bureau of Ocean Energy Management

OMB Control Number: 1010-0151
OMB Approval Expires: 6/30/2021

OCS PLAN INFORMATION FORM

General Information

Type of OCS Plan:		Exploration Plan (EP)	Development Operations Coordination Document (DOCD) X Initial DOCD
Company Name: Anadarko Petroleum Corporation		BOEM Operator Number: 00981	
Address:		Contact Person: Teri Powell	
1201 Lake Robbins Drive		Phone Number: 832-636-1261	
The Woodlands, TX 77380		E-Mail Address: Teri_Powell@oxy.com	
If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid: $5,565.00	Receipt No.	27NFNEHV

Project and Worst Case Discharge (WCD) Information

Lease(s): G35962, G08797	Area: MC	Block(s): 41,85	Project Name (If Applicable): King Dumpflood
Objective(s): x Oil, x Gas, Sulphur, Salt			Onshore Support Base(s): Fouchon, LA
Platform/Well Name: MC 41"A"	Total Volume of WCD: 33,146 BOPD		API Gravity: 32.4
Distance to Closest Land (Miles): 64 miles	Volume from uncontrolled blowout: 2,684,826 BOPD		

Have you previously provided information to verify the calculations and assumptions for your WCD?		Yes	x	No
If so, provide the Control Number of the EP or DOCD with which this information was provided	N/A			
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
See attached activity schedule			

Description of Drilling Rig

	Jackup	x	Drillship
	Gorilla Jackup		Platform rig
	Semisubmersible		Submersible
x	DP Semisubmersible		Other (Attach Description)
Drilling Rig Name (If Known):			

Description of Structure

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

Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
See following page			

King Dumpflood DOCD Proposed Activity Schedule MC 41, 85

PLAN - Proposed Activity	Proposed Vessel Type	Estimated Start Date	Estimated End Date	Max. Anticipated No. of Days
Drill, Complete, & Conduct Flowtest Well Location MC 41 A	MODU	10/1/2025	12/15/2025	75
Drill, Complete, & Conduct Flowtest Well Location MC 41 AA	MODU	5/1/2026	7/15/2026	75
Drill, Complete, & Conduct Flowtest Well Location MC 41 AAA	MODU	5/1/2027	7/15/2027	75
Total No. of Days				**225**

BOEM Form 137 Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)	Description
MC 41 SS001 Dumpflood Water Injection Well (surface location in MC 85)	Proposed MC 85 KDF Manifold	4.75"	1300'	KDF non-rigid service / utility jumper
Proposed MC 85 KDF Manifold	Existing D5 Subsea Pump, MC 85	6.625"	100'	KDF rigid flowline service / utility jumper

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC 41"A" (SS001)			Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No x	If this is an existing well or structure, list the Complex ID or API No.	N/A	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?					x	Yes	No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 33,146 BOPD	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid 32.4	

	Surface Location	**Bottom-Hole Location (For Wells)**		**Completion (For multiple completions, enter separate lines)**	
Lease No.	OCS G08797	OCS		OCS OCS	
Area Name	Mississippi Canyon				
Block No.	85				
Blockline Departures (in feet)	N/S Departure: F N L 4616.2	N/S Departure: F____ L		N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L	
	E/W Departure: F W L 837.12	E/W Departure: F____ L		E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L	
Lambert X-Y coordinates	X: 1,331,397.12	X:		X: X: X:	
	Y: 10,497,303.80	Y:		Y: Y: Y:	
Latitude/ Longitude	Latitude 28.922290188	Latitude		Latitude Latitude Latitude	
	Longitude -87.966271730	Longitude		Longitude Longitude Longitude	
Water Depth (Feet): 5179'		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 =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC 41"AA"	Previously reviewed under an approved EP or DOCD?		Yes	X	No	
Is this an existing well or structure?		Yes		No x	If this is an existing well or structure, list the Complex ID or API No.	N/A
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	x	Yes		No		

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 33,146 BOPD	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid 32.4

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G08797	OCS	OCS OCS
Area Name	Mississippi Canyon		
Block No.	85		
Blockline Departures (in feet)	N/S Departure: F N L 4616.2	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 937.12	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 1,331,497.12	X:	X: X: X:
	Y: 10,497,303.80	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28.922292431	Latitude	Latitude Latitude Latitude
	Longitude -87.965959077	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 5179'	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 =	

OCS PLAN INFORMATION FORM (CONTINUED)
Include one copy of this page for each proposed well/structure

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): MC 41"AAA"		Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?	Yes		No x	If this is an existing well or structure, list the Complex ID or API No.	N/A	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?			x	Yes		No

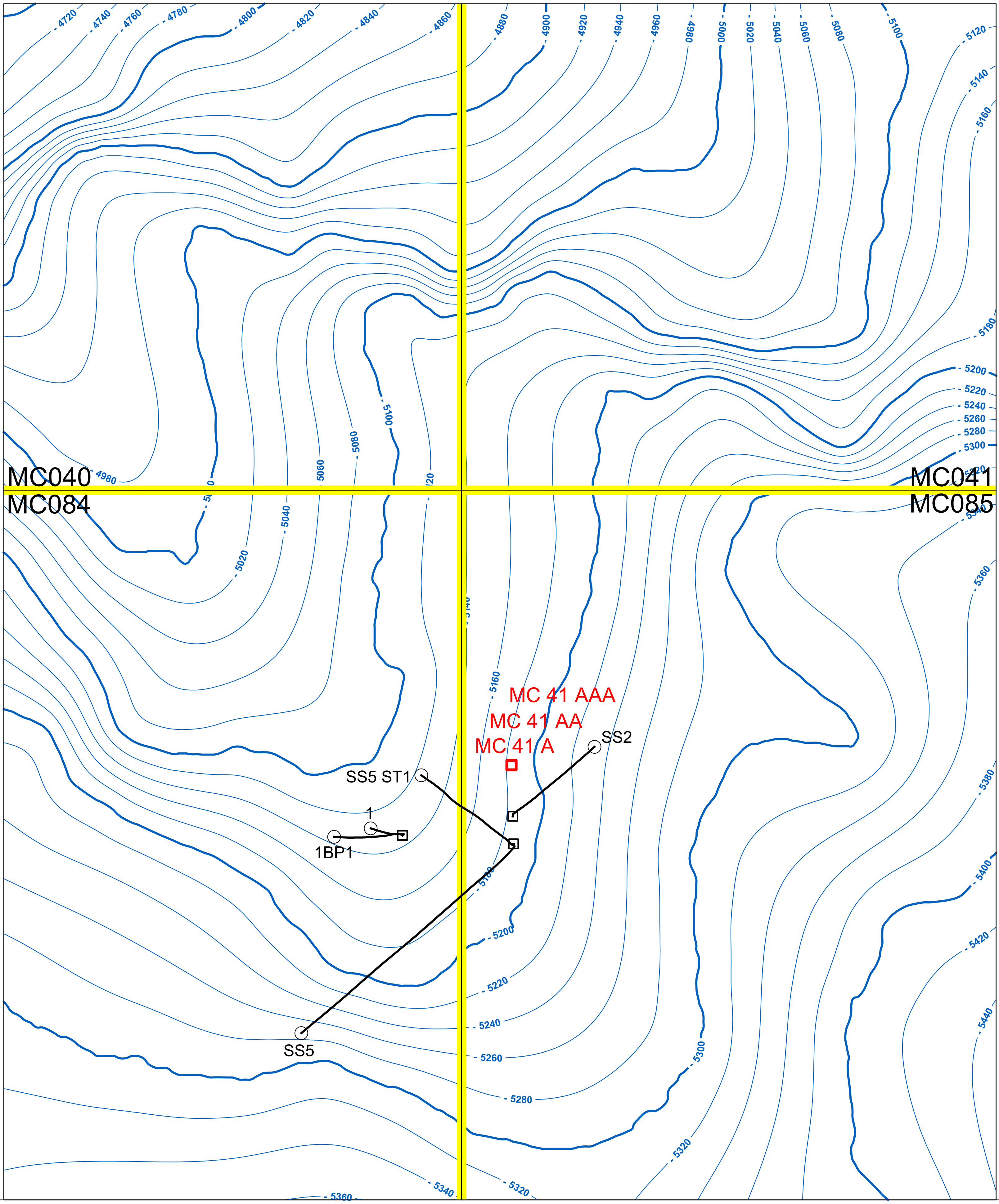
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 33,146 BOPD	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid 32.4	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G08797	OCS	OCS OCS
Area Name	Mississippi Canyon		
Block No.	85		
Blockline Departures (in feet)	N/S Departure: F N L 4616.2	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 737.12	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 1,331,297.12	X:	X: X: X:
	Y: 10,497,303.80	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 28.922287943	Latitude	Latitude Latitude Latitude
	Longitude -87.966584382	Longitude	Longitude Longitude Longitude

Water Depth (Feet): 5179'	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 =	



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FEET

NAD27 / BLM 16N (ftUS) (ESPG 32066)
Transverse Mercator
Clark 1866 spheroid
Natural origin: [87 00 00W, 0 00 00N]

Public Locations are listed on the following page.

N

Anadarko Petroleum Corporation

MC 41 A / AA / AAA
MC 41 OCS-G-35962 & MC 85 OCS-G-08797
Public Location and Bathymetry Map

Date: 08/27/2024 | Author: R. Bennett

MC 41 A / AA / AAA Public Locations

Well Name	Location	Footages		X (ft)	Y (ft)	Latitude	Longitude	Water Depth
MC 41 "A"	SHL MC 85	4616.2 FNL	837.12 FWL	1331397.12	10497303.80	28.922290188	-87.966271730	5179'
MC 41 "AA"	SHL MC 85	4616.2 FNL	937.12 FWL	1331497.12	10497303.80	28.922292431	-87.965959077	5179'
MC 41 "AAA"	SHL MC 85	4616.2 FNL	737.12 FWL	1331297.12	10497303.80	28.922287943	-87.966584382	5179'

SECTION B
GENERAL INFORMATION

(a) Applications and Permits

Prior to beginning development operations, the following applications will be submitted for approval.

Application/Permit	Issuing Agency	Status
Application Permit to Drill	BSEE	To be submitted
Surface Commingling Application	BSEE	To be submitted
Lease Term Pipeline Applications	BSEE	To be submitted
Enhanced Oil Recovery Application	BSEE	To be submitted
Deepwater Operations Plan	BOEM	To be submitted
Conservation Information Document	BOEM	To be submitted

(b) Drilling Fluids

Type of Drilling Fluid	Estimated Volume Per Well
Water-based (NaCl saturated, seawater, freshwater, barite**) for Pump and Dump	15,000 bbls per well*
Synthetic-based (internal olefin, ester)	14,000 bbls per well
Oil-based	N/A

******The actual volume of water-based drilling fluid ordered out will be an estimated 11,000 bbls/well of mud. Once on location this volume will be cut back and mixed with seawater to different desired mud weights which will increase the volume that is discharged at the seafloor. The estimated volume that will be discharged at the seafloor will be approximately 15,000 bbls/well. (Note: There will be 3 potential wells drilled, for a total of 45,000 bbls.)*
***The water-based drilling fluids used by Anadarko are not prohibited and meet the limitations set in Section B.1 of NPDES Permit GMG290000 for Drilling Fluids. The limitation set in the permit for cadmium and mercury in barite is confirmed through stock samples prior to discharge.*

(c) Production

The wells addressed in this plan will be used as dump flood water injection wells. Therefore, average and peak production volume information does not apply for this plan.

(d) Oil Characteristics

A table summarizing the chemical and physical characteristics of the oils that will be produced, handled, transported, or stored is required per NTL 2008-G04 when operators propose one of the following activities:

- Activities for which the State of Florida is an affected State
- Activities within the Protective Zones of the Flower Garden Banks and Stetson Bank.
- To install a surface facility located in water depths greater than 400 meters (1,312'), or a surface facility in any water depth that supports a subsea development in water depths greater than 400 meters (1,312').”

Anadarko does not propose any of these three activities under this plan, therefore the oil characteristics tables required by NTL 2008-G04 are not applicable.

(e) New or Unusual Technology

Anadarko does not propose to use any new or unusual technology to develop the wells proposed in this plan. Best available and safest technologies as referenced in 30 CFR 250 will be incorporated as standard operational procedure.

(f) Bonding Statement

The bond requirements for the activities and facilities proposed in this DOCD are satisfied by an area-wide bond furnished and maintained according to 30 CFR part 256, subpart I; NTL No. 2015-N04, "General Financial Assurance," and National NTL No. 2016-N01 "Requiring Additional Security".

(g) Oil Spill Financial Responsibility (OSFR)

Anadarko Petroleum Corporation (Company Number 00981) has demonstrated oil spill financial responsibility for the facilities proposed in this DOCD according to 30 CFR Part 254, and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities".

(h) Deepwater Well Control Statement

Anadarko Petroleum Corporation (Company Number 00981) has the financial capability to drill a relief well and conduct other emergency well control operations if required.

(i) Suspensions of Production

Should a suspension of production become necessary to hold this lease, an application will be submitted to BOEM in accordance with NTL 2000-G17.

(j) Blowout Scenario

Anadarko prepared the following blowout scenario pursuant to guidance provided in NTL No. 2015-N01.

Purpose

This information provides a generic blowout scenario, additional information regarding any potential oil spill, and the measures Anadarko will take to prevent a blowout and if necessary, promptly respond to manage a blowout scenario if one occurs. The following attachment is pursuant with 30 CFR 550.213(g), 30 CFR 550.219 and NTL 2015-N01.

Background

Anadarko prepared this blowout scenario pursuant to guidance provided in NTL No. 2015-N01. **MC 41 "A" is addressed in this blowout scenario since it is the proposed location with the overall highest potential worst-case discharge (WCD) for the plan area.** A similar approach would be taken in the event of a blowout from all wells proposed under this plan. **Based on NTL No. 2015-N01 guidance, the maximum hydrocarbon discharge from the objective sands is calculated to be 33,146 bopd.**

Information Requirements

The objectives are drilled utilizing a MODU rig with a marine riser and subsea BOP. A typical subsea wellhead system, conductor, surface and intermediate casing program will be used. A hydrocarbon influx occurs, followed by a well control event from the objective sands. The subsea BOP and marine riser fails and a blow-out at the seabed occurs. The WCD scenario assumes 12-1/4" open hole below 14" casing shoe to a 9-7/8" casing point (casing is not set). Exposed sands in the primary objective are the WCD scenario.

Estimated flow rate of the potential blowout:

Category	Initial
Type of Activity	Drilling
Facility Location (area/block)	MC 41 "A"
Facility Designation	*DP MODU*
Distance to Nearest Shoreline (miles)	64 miles
Uncontrolled blowout (volume per day)	33,146 bopd
Type of Fluid(s)	Crude oil

a) Potential for the well to bridge over

Mechanical collapse of the reservoirs in the open-hole section of the wellbore was not considered. During a worst-case discharge event, the open hole portion of the well will be exposed to a substantial underbalance condition. Due to the unconsolidated nature of the formations contributing flow and the relatively weak remaining exposed sediments, a significant quantity sand and heaving shale will enter the flowstream. The presence of sediments in the flowstream are excluded from Anadarko's discharge calculations and assumes no bridging will occur, however, bridging is likely to occur.

b) Likelihood and measures taken for surface and/or sub-sea intervention to stop the blowout

The likelihood of surface intervention to stop a blowout is high and is based on the following equipment specific to the MODU that has been contracted to do this drilling program:

- ROV Secondary BOP Control System: The BOP is confirmed to have a ROV Intervention Panel and circuits that have the following attributes:
    - o Hot stab is capable of closing one set of:
    - § Blind-Shear Rams – One Set
    - § Pipe Rams – One Set
    - § Unlatch the Lower Marine Riser Package
    - o ROV hot stab to be function tested in conjunction with the Stump test and were tested at the same rate and pressure as the pump installed on the ROV used by the rig.

  The panels may also be operated by an ROV from an independent supply boat in the event of a loss of rig scenario.

- Deadman / Autoshear function: The rig is equipped with an automated sequence that closes the blind shear rams in the event of any of the following scenarios:
    - o Inadvertent disconnect of the LMRP
    - o Loss of both hydraulic pressure and electrical supply from the surface BOP control system

  No human interface is required once these systems are armed.

c) Availability of a rig to drill a relief well

Per Mutual Aid agreements between E&P Operators in the Gulf of Mexico, Anadarko will select from the best rig option available in the Gulf of Mexico fleet if it is required for relief well work. A rig that could be used to drill a relief well is the *Noble BlackHawk* drillship, which is a drillship capable of drilling in 12,000' of water without any constraints. This rig is currently under contract to Anadarko Petroleum Corporation.

There are no nearby platforms from which to drill a relief well and it is not feasible to drill a relief well from land.

d) Rig constraints

A rig capable of drilling in 6,000' of water to a total depth of greater than 30,000' with a 15k stack is required for any relief well operations. The *Noble BlackHawk* is among the DP MODUs that meet these requirements.

e) Time taken to mobilize a rig and drill a relief well

An estimate of 7-21 days would be required to suspend operations on a deepwater GOM well and begin drilling the relief well. This assumes 0-14 days to suspend current operations on an existing well and 7 days to mobilize and be ready to spud the relief well. The estimated time to drill the relief well to a blowout originating from the target zones is

50-60 days for an estimated total of 57-81 days from time of blowout to completion of a relief well.

The maximum total volume during a blowout could potentially be **2,684,826 bbls** assuming 81 days for the maximum duration of a blowout, multiplied by the worst case daily uncontrolled blowout volume of 33,146 bopd.

f) Assumptions and calculations used in approved or proposed Oil Spill Response Plan

- The maximum total volume during a blowout could potentially be 61,752,024 bbls assuming 153 days for the maximum duration of a blowout, multiplied by the worst case daily uncontrolled blowout volume of 403,608 bbls. (GC 683 Location G, Plan Control No.: S-7623)
- The exploratory WCD in the Regional OSRP is 403,608 bopd. (API 28.9)

g) Measures taken to enhance ability to prevent a blowout

- **Well design**: Anadarko utilizes a systematic well design process for the planning and construction of a well operation. This process taps into the depth of experience Anadarko possesses in the Deepwater arena and involves a multi-team peer review of the well design, shallow hazards, and formation pressure hazards expected during drilling. This process minimizes the potential for an unplanned well control event that could lead to a blowout. This process will also include a Professional Engineer review and approval of the final casing design and cementing program.

A detailed pre-drill assessment of formation pressure provided by Anadarkoṡ Geologic/ Geophysics team along with pore pressure specialists allows for a mud program that provides an overbalanced mud weight for the safe drilling of the well. The pore pressure environment above the target sands in the proposed MC 41 #001 has been estimated considering nearby producing wells in nearby fields. The formation pressures may be measured during the well construction process to allow development of alternate plans during the well construction process if needed.

The well construction process also requires a systematic review and management acceptance of the start-up preparation work for the rig and crews and the third party technical audit work on the rig and the rig’s well control equipment. This measures the rig’s ability to handle an unplanned well control event and provide assurance that the rig can successfully mitigate a loss of well control event and prevent it from becoming a blowout scenario.

- **Barrier Philosophy:** For all well designs, Anadarko requires and uses a redundant barrier philosophy, that being two independent barriers for both internal and external flow paths in the final wellbore. It is also standard practice to conduct pressure testing, in accordance with applicable regulations, to confirm integrity on all relevant barriers. In addition, all intermediate and production casings returned to the subsea wellhead will be locked down before subsequent drilling continues.

- **BOP and Well Control Equipment:** The rig will have an 18-3/4" 15k psi BOP with primary and secondary BOP control systems. The BOP will have been completely recertified compliant to OEM specifications, by a qualified 3rd Party. Prior to commencement of operations, an independent third-party verification will be obtained that the BOP is designed for use with the specific equipment on the rig and this specific well design as required by 30 CFR §250.416(f).

- **BOP and Well Control Equipment Testing**: To ensure effectiveness of the BOP and well control equipment, a testing program will be conducted prior to installing the BOP and during the well operations at the GC 563 #002 well. This testing program will provide compliance with current federal regulations for pressure and function testing and will also provide periodic assurance on the performance of both primary and secondary BOP control systems including actual interface operations with the ROV and the ROV panel.

- **Well Control Training and Drills:** Anadarko requires that key nominated onshore and offshore positions including rig contractor personnel hold a WellCAP or equivalent well control training certificate, renewed every two years. Anadarko also monitors compliance of its personnel with applicable federal regulations, including 30 CFR Part 250, Sub-Part O (well control training).

A comprehensive program of well control drills will be conducted offshore to ensure readiness to identify and then manage a well control situation and thereby minimize the potential for a well control event to lead to a blowout scenario.

h) Arrangements for drilling a relief well

- Anadarko maintains a master agreement with 'Wild Well Control' for advice, management, engineering, well kick pre and post modeling and resource support for an unplanned loss of well control event. If a well control event occurs, Wild Well Control would be contacted and mobilized if required to support Anadarko's operational team both in the onshore and offshore locations.

- The conceptual relief well design is similar to the design of the MC 41 #001. This plan would allow multiple strings to be set as needed prior to intercept with the blowout well. A block wide shallow hazard assessment has been completed (and submitted) for MC 85. Site Clearance letters for multiple surface locations in MC 85 have been completed and deemed acceptable for drilling. Furthermore, the potential for high density chemo-synthetic communities in the study area are negligible. Depending on the nature of the blowout scenario, well geometry, and total depth required to intersect the blowout, previously submitted surface locations and/or additional surface locations would be submitted, and all reviewed to determine the most suitable location of the relief well. The conceptual well design is not anticipated to take over 2 days to finalize upon initialization.

- Anadarko’s policy is to carry adequate inventory in stock to drill a complete well(s) from surface to TD. Back-up long lead equipment equivalent to the original well design will be carried in stock to allow a rapid response. This includes a spare deepwater sub-sea wellhead system and the large OD casing (36”, 22”, 18”, 16”, 14”, 11 7/8”, and 9 7/8”) and connectors required for the first part of the well. Smaller OD casing is considered widely available on the ground in the GOM and would be resourced out of existing inventory or from suppliers as required.

- Existing service agreements are in place for support services including drilling fluids, casing running, cementing, ROV’s, solids control, mud logging, directional drilling, LWD/MWD, logging, boats and helicopters.

- Specialist services for range finding to drill the relief well in close proximity to the original wellbore at the reservoir depth will be provided through Vector Magnetics LLC. Sperry Drilling and Anadrill have in-house personnel to supplement Vector Magnetics under our existing directional drilling agreements should such support become necessary.

k) Blowout Scenario - Production Worst Case Discharge Scenario

The wells being drilled under this plan will be used for dumpflood water injection purposes only, therefore the production worst case discharge scenario does not apply in this case.

l) Chemical Products

Per NTL No. 2008-G04, information regarding chemical products is not required to accompany this plan.

SECTION C
GEOLOGICAL AND GEOPHYSICAL INFORMATION

(a) Geological Description

Discussions regarding geologic information are considered proprietary and have been omitted from this public copy of the Initial DOCD, along with the attachments.

(b) Structure Contour Maps

Current structure maps drawn to the top of each productive hydrocarbon sand showing the entire lease blocks, the surface location of each well and locations of geological cross-sections, are enclosed as **Attachment C-1.**

(c) Interpreted 2-D and/or 3-D Seismic Lines

Interpreted seismic lines are enclosed as **Attachment C-2.**

(d) Geological Structure Cross-Sections

Interpreted geological structure cross-sections showing the location, depth, and expected productive formations of each proposed well are enclosed as **Attachment C-3.**

(e) Shallow Hazards Report

A Shallow Hazards Report prepared by C&C Technologies Survey Services for Mississippi Canyon Blocks 84, 85 and 128 (July 2013, Project No. 130295) will be submitted with this Initial DOCD.

(f) Shallow Hazards Assessment

A Shallow Hazards Site Clearance Letter for proposed well Location(s) A, AA, and AAA in MC 85 is enclosed as **Attachment C-4.**

(g) High-resolution Seismic Lines

High resolution seismic lines are enclosed as **Attachment C-5.**

(h) Stratigraphic Column

A generalized stratigraphic column depicting the wells from the seafloor to total depth is included as **Attachment C-6.**

(i) Time Vs. Depth Tables

The proposed activities under this DOCD are not considered to be in areas where there is no well control. Therefore, a seismic travel time versus depth table is not required per NTL No. 2008-G04.

WELLSITE CLEARANCE REPORT
PROPOSED WELL MC41-A

BLOCK 85, MISSISSIPPI CANYON
GULF OF MEXICO

OCEANEERING®

Oceaneering Document Number:	229620-OII-RPT-WSC-001	Available Data	AUV & 3-D Seismic
Client Document Number:	N/A	Area	MC85
Client:	Anadarko Petroleum Company	Lease Number	OCS-G-10977

REVISION HISTORY

Rev	Reason For Issue	Author	Reviewed	Approved	Rev Date
A	Client Review	L. Valentine	J. Thompson	L. Samuel	08 Jan 2024
0	Final	L. Valentine	J. Thompson	L. Samuel	10 Jan 2024

Signature Box

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January 10, 2024

Occidental Petroleum
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Suite 160
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Re: Tophole Drilling Hazards and Wellsite Clearance of Proposed Well MC41-A, Mississippi Canyon

Attn: Rachael Bennett

Please find within this digital delivery revision 0 of files pertaining to the above-mentioned project. These include:

- PDF files of the wellsite clearance report, accompanying maps and figures, and the Tophole Prognosis diagram.

Oceaneering appreciates this opportunity to be of service. Please feel free to contact me, or Lynn Samuel (lbsamuel@oceaneering.com), if you need additional information or have any questions pertaining to the findings enclosed.

Leslie A. Valentine
Geoscientist
Email: lvalentine@oceaneering.com

OII Project 229620

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Sheet 6 of 6, Subsurface Features	Horizontal Scale: 1” = 1,000’

1.0 INTRODUCTION

Anadarko Petroleum Company contracted Oceaneering International, Inc. (OII) to prepare a wellsite clearance letter for the proposed location of Well MC41-A in Block 85, Mississippi Canyon Area of the Gulf of Mexico. The data used for this site clearance letter include high-resolution geophysical data collected by C & C Technologies' Autonomous Underwater Vehicles (***C-Surveyor II***™, ***C-Surveyor III***™, and ***C-Surveyor V***™) for BP America, Inc. (2006 and 2007) and for Freeport-McMoRan Oil and Gas (FMOG) in 2015. Additionally, 3-D seismic data volumes provided by FMOG in 2014 were used.

C & C Technologies (C & C; now OII) completed two AUV geohazards reports covering the vicinity of the proposed location for BP in 2006 and 2007 (C & C, 2006 and 2007). An archaeological assessment covering the area was completed in 2014 (C & C, 2014) for FMOG. An archaeological, engineering, and hazard assessment completed in 2015 for FMOG (C & C, 2015) also provides coverage near the proposed MC41-A location. This site clearance letter is based on findings provided within those reports.

This letter provides a tophole drilling prognosis and addresses seafloor conditions within a 2,000-foot radius centered at the proposed well MC41-A location. The depth limit of the investigation (DLI), based on previous interpretation, is coincidental with Horizon 6, approximately 3,539 feet below the mudline (BML).

This assessment and all enclosures presented with this letter comply with the Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) guidelines provided in Notice to Lessees (NTL) No. 2022-G01 (Shallow Hazards Program), NTL No. 2005-G07 (Archaeological Resource Surveys and Reports), and NTL No. 2009-G40 (Deepwater Benthic Communities). These NTLs are current due to the elimination of NTL expiration dates through NTL-2015-N02.

2.0 PROPOSED WELLSITE

Proposed Well MC41-A has a surface location in MC85 (OCS-G-08797) and a bottomhole location in MC41 (OCS-G-35962). Above the depth limit of investigation of 3,539 feet BML, the proposed well is presumed not to deviate. The coordinates and block calls for the proposed well MC41-A surface location are tabulated below:

Table 1: MC41-A Proposed Well Location

EASTING (Feet)	NORTHING (Feet)	LONGITUDE	LATITUDE	BLOCK CALLS (Feet)	
1,331,397.12	10,497,303.80	87°57'58.578" W	28°55'20.245" N	837.12 FWL	4,616.20 FNL

Two potential re-spud locations were provided by Anadarko. These re-spud locations are located 100 feet east and west of Proposed Well MC41-A. Due to the proximity of the re-spud locations to the proposed well, geologic conditions are expected to be approximately the same at all three well locations. The proposed surface re-spud locations are shown in the following table and on the accompanying maps.

Table 2: MC41-A Re-spud Well Locations

Re-spud Wells	EASTING (Feet)	NORTHING (Feet)	LONGITUDE	LATITUDE	BLOCK CALLS (Feet)	
AA	1,331,497.12	10,497,303.80	87°57'57.453" W	28°55'20.253" N	937.12 FWL	4,616.20 FNL
AAA	1,331,297.12	10,497,303.80	87°57'59.704" W	28°55'20.237" N	737.12 FWL	4,616.20 FNL

The geodetic datum used for this project is the North American Datum of 1927 (NAD27) with the Clarke 1866 Ellipsoid. The datum is projected using the Universal Transverse Mercator (UTM), Zone 16 North (16N) with a central meridian at 87°00'W, a false easting of 1,640,416.67 feet at the central meridian, and a false northing of 0.00 feet at 00°00'N. All coordinates given are presented in this projection within this letter and on the maps (Sheets 1 through 6). All grid units, as well as scales and measurements, are in U.S. Survey Feet.

The proposed well MC41-A surface location is displayed on the Color Shaded Bathymetry Map (Sheet 1), Seafloor Gradient Map (Sheet 2), Side Scan Sonar Mosaic Map (Sheet 3), Seafloor Amplitude Map (Sheet 4), Seafloor Features Map (Sheet 5), and Subsurface Features Map (Sheet 6). Sheets depicting seafloor data also display a 2,000-foot radius circle centered at the surface hole location.

3.0 AVAILABLE DATA AND METHODOLOGY

3.1 AUV DATA

AUV data were collected by C & C in May 2006 onboard the M/V ***Northern Resolution*** using the ***C-Surveyor II***™ AUV, in August and September 2007 onboard the M/V Moana Wave using the ***C-Surveyor III***™ AUV, and in April 2015 onboard the M/V Miss Ginger using the ***C-Surveyor V***™ AUV. The data types provided include multibeam bathymetric mapping, high-resolution side scan sonar imagery, and subbottom profiles collected at an altitude of 60 meters (~197 ft) above the seafloor. The AUV remote-sensing instruments on the ***C-Surveyor II***™ included the Simrad EM2000 Swath Bathymetric Mapping System and the EdgeTech High-Resolution Side Scan Sonar (120 kHz) and Subbottom Profiling System (2-8 kHz). The AUV remote-sensing instruments on the ***C-Surveyor III***™ included Simrad EM-2000 Swath Bathymetric Mapping System, an EdgeTech Dynamically Focused Dual-Frequency Side Scan Sonar (230 and 410 kHz), and an EdgeTech 216 FFSB Profiler (1-6 kHz). The AUV remote-sensing instruments on the ***C-Surveyor V***™ included he Simrad EM 2040 Multibeam Echosounder (200 kHz), an EdgeTech 2200-M Full Spectrum Chirp Dual Frequency Side Scan Sonar (120/410 kHz), an EdgeTech DW106 Chirp Subbottom Profiler (1.5–4.5 kHz), a 2G Robotics 3-D Laser Profiler System, and a camera.

The 2006 AUV survey consisted of four longitudinal lines along each proposed umbilical route. These lines consist of one centerline (Line Nos. 101, 106, and 110) with three offset lines running along the centerline (Line Nos. 102-105, 107-109, and 111-113). Additional short offset lines were added to both routes for proposed minor route deviations, additional coverage around existing well and platform locations, and in the vicinity of a seafloor channel. Two additional lines were also run near the southern end of the In-field Umbilical route to tie in existing soil boring locations with the pumping station locations. The 2007 AUV survey grid consisted of 50 north-south primary survey lines with 200-meter (656-foot) line spacing (Lines BPUSAUV07KS-0101 through BPUSAUV07KS-0150). Ten east-west lines tied the survey grid together (Lines BPUSAUV07KS-0201 through BPUSAUV07KS-0210). The 2015 survey grid consisted of one centerline (Line 102); one 50-meter offset line (Line 103), and five winglines (Lines 101, 104–107). Tie lines (Lines 202–208) were surveyed approximately every 10,000 feet along the route. Five lines (Lines 1001-1005) were surveyed for AUV navigation accuracy check at the VK915 Well SS-3 location. Camera and laser data were acquired at proposed pipeline crossings. At each location a set of 5 camera lines (Lines CAM 101–105, 201–205, 301–305, 401–405, and 501–505) run parallel to the proposed route at approximately 2-meter line spacing. Camera and laser data were not utilized for this assessment.

The survey grids provided overlapping coverage for the side scan sonar and multibeam echosounder and representative coverage for the subbottom profiler over most of the area surrounding the proposed well. There are two small coverage gaps in the side scan sonar data approximately 1,700 feet northwest (~100,000 ft^2 in size) and 1,800 feet northeast (~60,000 ft^2 in size) of the Proposed Well MC41-A (Sheets 3 and 5). These gaps do not adversely affect the overall interpretation of the proposed wellsite. However, these areas should be avoided when conducting seafloor-disturbing activities.

3.2 3-D SEISMIC DATA

The 3-D seismic volume used for this site clearance assessment was provided by FMOG in SEG-Y format. The dataset was processed at a 2-millisecond sample rate and was interpreted by C & C to a record length of approximately 4,000 feet BML (C & C, 2014). The inlines of the 3D data volume are oriented northwest to southeast while the crosslines are oriented southwest to northeast. The inlines and crosslines are both spaced at 41.01-foot (12.5-meter) intervals and are depicted on Sheets 5 and 6.

The 3-D seismic data are zero-phase, and the seafloor reflector is represented by a strong, positive-amplitude peak flanked by troughs with absolute amplitude values of less than one-half of the peak value. The seismic data +provided adequate screening of the regional seafloor and shallow geologic conditions and large-scale geohazards.

Spectral whitening was performed to amplify the higher frequencies in order to meet the content requirement of 60 hertz at 50% power requirement of NTL 2022-G01 (C & C, 2014). Figure 1 is a representative power spectrum of the data at the proposed well location showing that the seismic data have the frequency content necessary for analysis of amplitude anomalies for shallow gas.

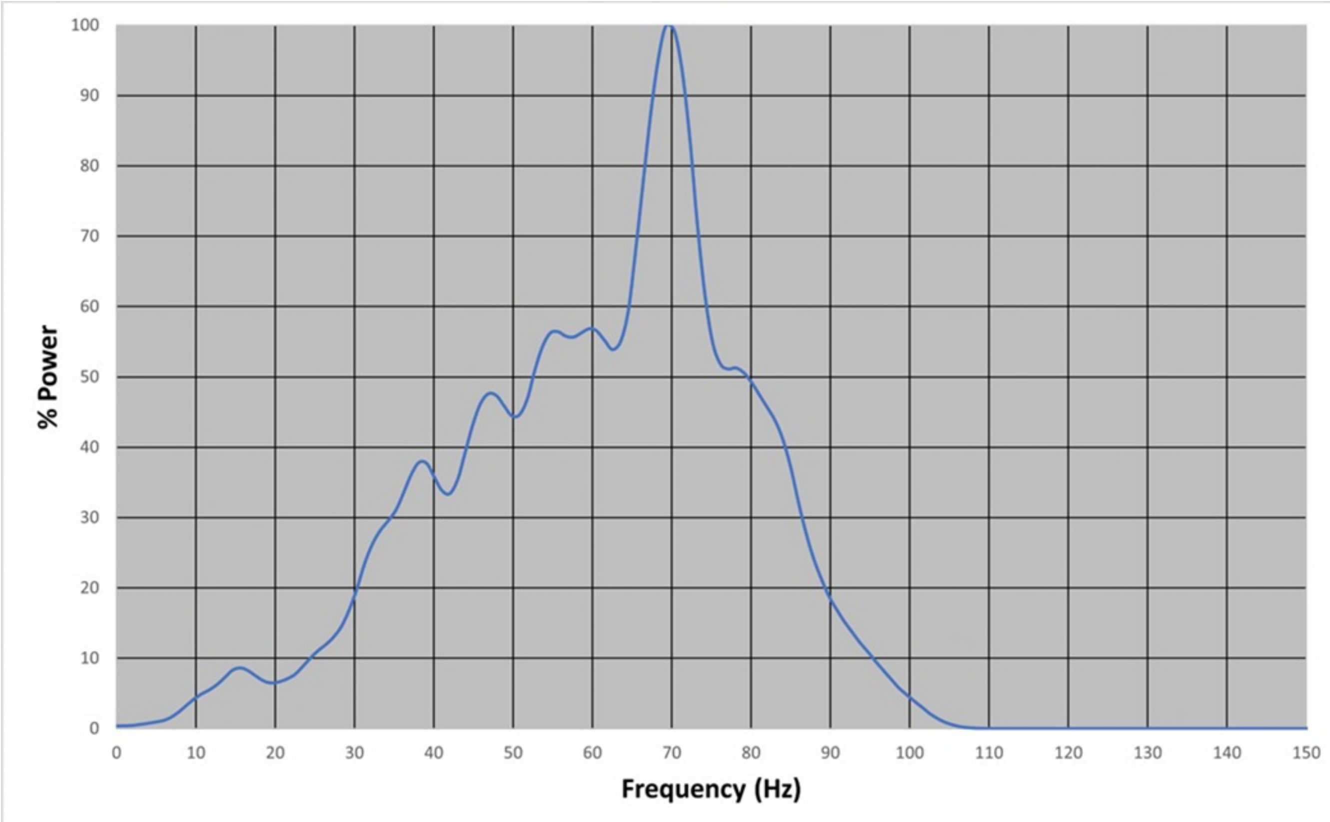


Figure 1. Power spectrum at Proposed Well MC41-A.

4.0 SEAFLOOR CHARACTERISTICS

The water depth at the proposed MC41-A surface location is -5,179 feet mean sea level (MSL). Within a 2,000-foot radius around the proposed well, the seafloor depth ranges from -5,103 feet MSL in the west to -5,253 feet MSL in the east (Sheet 1). The seafloor at and around the proposed well is slightly undulating and slopes to the southeast at a gradient of 4.3° at the proposed well location (Sheet 2).

4.1 SEAFLOOR SEDIMENT AND HAZARDS

The seafloor exhibits generally low side scan sonar reflectivity and low to moderate backscatter intensity within 2,000 ft of the proposed well, suggesting the seafloor sediments are finely textured (Figure 2; Sheet 3). MBES backscatter coverage extends ~1,150 ft to the north of the Proposed Well MC41-A (Figure 2). Two areas of moderate- to high-intensity backscatter intensity located south and west-southwest of the proposed well are interpreted as well cuttings associated with nearby existing wells (Figure 2; Sheet 5). There are no seafloor faults, seafloor amplitude anomalies, or any other seafloor features that may have adverse effects on drilling operations (Sheet 4 and Sheet 5).

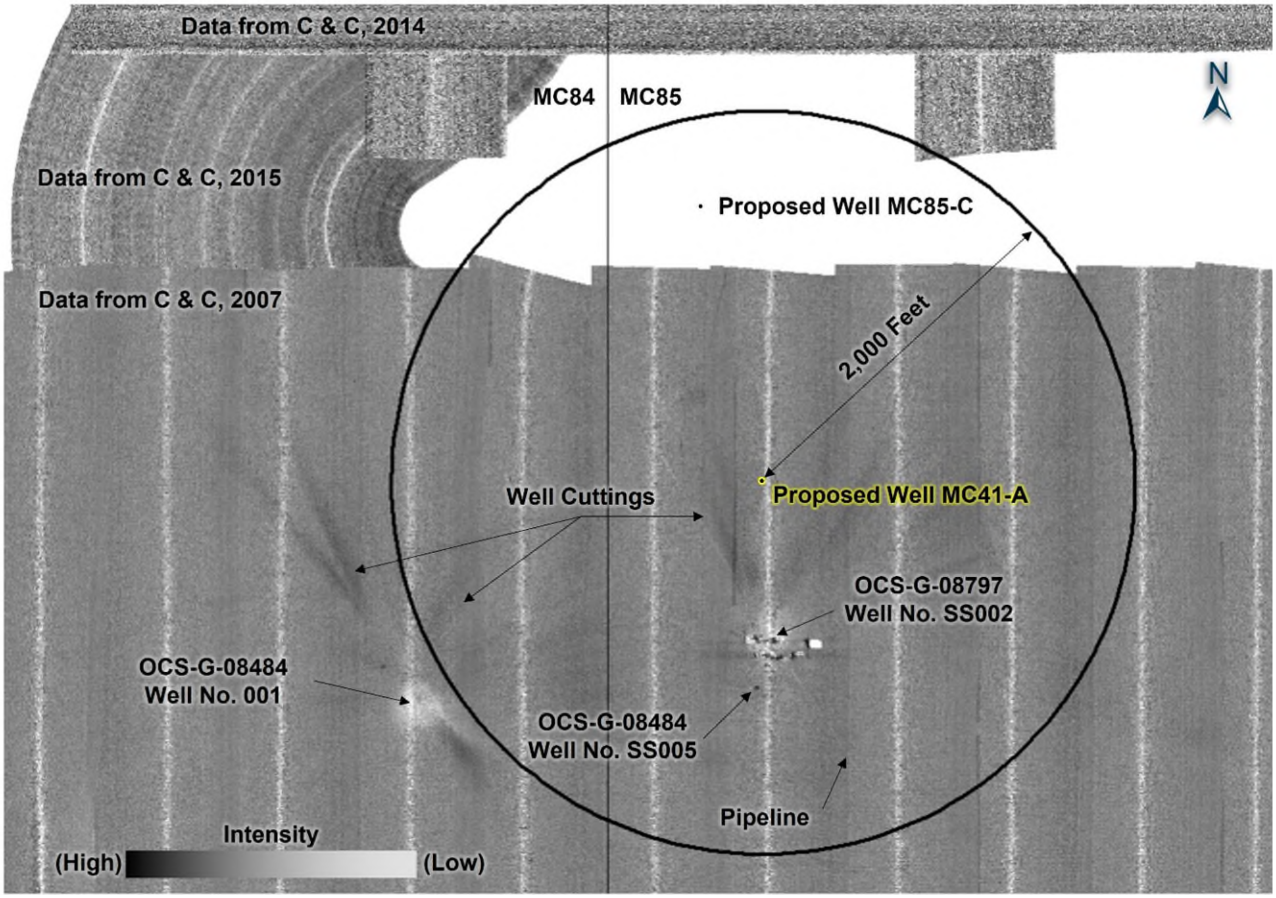


Figure 2. Multibeam backscatter of Proposed Well MC41-A.

4.2 POTENTIAL DEEPWATER BENTHIC COMMUNITIES

The assessment of the AUV and 3-D seismic datasets did not identify any potential high-density deepwater benthic communities habitats within the 2,000-foot radius (Sheet 3 and Sheet 4). Therefore, potential impact to deepwater benthic communities during drilling operations is considered negligible.

4.3 MAN-MADE FEATURES

The review of AUV data, OII's proprietary database, and BOEM/BSEE public databases revealed the following infrastructure within 2,000 feet of the proposed well location (Table 3; Sheet 5).

Table 3: Infrastructure within 2,000 feet of Proposed Well Location MC41-A.

INFRASTRUCTURE	DETAILS
Wells	OCS-G-08797 Well No. SS002 OCS-G-08484 Well No. SS005
Umbilicals	S-13388 Anadarko 4" S-13884 Anadarko 2" S-14091 Anadarko 4" S-16085 Anadarko 6" S-16086 Anadarko 5" S-19420 Anadarko 4" S-20205 Anadarko 4" S-20206 Anadarko 4"
Pipelines	S-13386 Anadarko 8" S-13387 Anadarko 12" Casing S-14089 Anadarko 6" S-14090 Anadarko 10" Casing S-19726 Anadarko 1"
Other	KPCU SUTA 1, KPCU SUTA 2, King P&C SUTA, SDU-1, EO DA-B, EO DA-A, King West extension SUTA, Injection Chemical Skid, King SUTA (OOS), Main umbilical SUTA, King PM 1 pump, mattresses, KW5 PLET, Isolation Valve Sled, King In-Line Sled, KSSP D5 Main SUTA, KSSP D5 Infield SUTA

Two active wells are located within 2,000 feet of the proposed wellsite. OCS-G-08797 Well No. SS002 is 858 feet south of the Proposed Well MC41-A, and OCS-G-08484 Well No. SS005 is 1,322 feet south of the Proposed Well MC41-A. There are well cuttings on the seafloor associated with the existing wells (Sheet 5). The nearest pipeline, S-16086 Anadarko 5", lies 320 feet southwest of the proposed location (Sheet 5).

There are 14 sonar contacts identified within 2,000 feet of the proposed well location (Sheet 3). All contacts (B1 through B5, D1, D3, D4, and E19 through E24) are interpreted to be modern debris and were not assigned a specific avoidance distance in the archaeological assessments (C & C, 2007, 2014, 2015).

5.0 SUBSURFACE GEOHAZARDS AND STRATIGRAPHY

AUV chirp subbottom profiles and 3-D seismic data were used to assess subsurface geology. Six stratigraphic units (Unit A to Unit F), each consisting of one or more distinctive sequences, were interpreted at the proposed well location (Figure 6, Figure 7, and Figure 8).

The criteria for determining the potential for encountering shallow gas, shallow water flow, and gas hydrates for each interpreted unit are defined in sections 5.1, 5.2, and 5.3, respectively.

5.1 SHALLOW GAS

Free-phase hydrocarbon gas can accumulate in shallow sediments, usually associated with highly porous sands. Shallow gas can be biogenic or thermogenic in nature. Biogenic gas accumulations are primarily generated in situ from decaying organic matter and tend to be relatively small in volume and low in gas concentration. Thermogenic gas commonly migrates from depth along faults and fractures or through porous sediments, and accumulations can cover significant geographic areas and can present a much greater hazard than biogenic gas.

Penetrating shallow gas accumulations while drilling can result in well bore problems and loss of formation integrity. Some ROV observations of shallow water flows have indicated the possible presence of gas in association with a shallow water flow event.

Anomalously high, negative amplitudes indicative of shallow gas are often observed along faults or at structural high points. Gas anomalies may appear as flat spots in dipping strata or may exhibit geophysical attributes such as phase reversal and velocity anomalies such as velocity pull-down. Seismic amplitude anomalies are mapped on a unit-by-unit basis to assess the potential risk of gas and are displayed on the Subsurface Features Map (Sheet 6). Stratigraphy, structural settings, and connectivity may also be considered. Figure 3 presents the criteria used to determine the potential for gas hydrates for each interpreted unit at a proposed wellbore.

Negligible	No amplitude anomalies or other gas indicators present.
Low	Generally indicated by increased amplitude (2–3× background level) and phase reversal. This may also include diffuse areas of gas blanking.
Moderate	Generally indicated by high amplitude (3–4× background level) and phase reversal.
High	Generally indicated by the highest amplitudes (in excess of 4× background level), phase reversal, and a combination of other attributes indicative of the presence of gas, particularly velocity pull-down and masking of underlying sediments. Stratigraphic and structural settings may also be considered.

Figure 3. Geologic and seismic characteristics to determine potential for shallow gas.

5.2 SHALLOW WATER FLOW

Shallow Water Flow (SWF) sands are rapidly deposited, unconsolidated sands which lie below a seal such as a clay layer. This seal prevents dewatering and compaction after deposition, resulting in overpressure, which rises with increasing overburden. Shallow water flow sands have been encountered in the tophole sections of various wells drilled throughout deepwater Gulf of Mexico. Areas with the highest potential for SWF in the Gulf of Mexico are thought to extend from the western Mississippi Canyon Area to northeastern Green Canyon Area (Ostermeier et al., 2002). Buried intraslope fans, canyons, and channels in water depths greater than 1,900 feet are considered to have the highest risk for SWF, although shallow water flows have been documented in water depths as shallow as 500 feet.

Without appropriate planning, these water flows can be difficult to control during drilling because of the shallow depths and the low fracture strengths of the sands. The borehole can erode at locations of these water-bearing sands and threaten the well integrity. In extreme cases, the well can be damaged or lost.

Assessing shallow water flow potential based on 3-D seismic data is generally a qualitative procedure. Channels with obvious sand-prone intervals and sealing or infilled clays are considered to have the highest potential, though some shallow water flow intervals occur with no evidence of flow potential on seismic profiles. Several factors may contribute to shallow water flows, including: (1) high porosity and permeability, (2) presence of a sand-prone aquifer, (3) a mechanism to pressurize, and (4) seal. Characteristics for determining the potential for a shallow water flow are presented in Figure 4.

Negligible	No indication of shallow sandy formations and the interval does not correlate with any known shallow water flow units or events.
Low	Indication of shallow sandy formations however, the interval does not correlate to any known shallow water flow unit or event.
Moderate	Indications of rapidly-deposited shallow sandy formation(s) with overlying clay-rich sediments within a depth of burial significant for overpressured conditions. The interval does not correlate with any known shallow water flow units or events.
High	Indications of rapidly-deposited shallow sandy formation(s) with overlying clay-rich sediments within a depth of burial significant for overpressured conditions. The interval correlates to nearby wells where shallow water flow has occurred and/or are located within a known shallow water flow unit.

Figure 4. Geologic characteristics to determine potential for shallow water flow.

5.3 GAS HYDRATES

Gas hydrates are an ice crystalline form of gas hydrocarbons in deepwater marine environments where the conditions of pressure and temperature are favorable. The gas hydrate stability zone (GHSZ) is the depth interval between the seafloor and the point where the hydrate is no longer stable in form and is determined by the local thermal gradient.

The heat generated by drilling may cause gas hydrate to dissociate, resulting in well bore problems similar to those caused by encountering free-phase gas. Some ROV observations of shallow water flows have indicated the possible presence of hydrates in association with a shallow water flow event. Figure 5 presents the criteria used to determine the potential for gas hydrates for each interpreted unit at a proposed wellbore.

The acoustic impedance contrast caused by the hydrate and free gas trapped at the base of the hydrate stability zone can appear on seismic profiles as a bottom-simulating reflector (BSR), which can often crosscut the general seismic stratigraphy. If there is no BSR identified, a calculation can be used to determine the maximum depth of the GHSZ (Maekawa et al.,1995). This calculation does not take into account local geologic conditions that increase the geothermal gradient, such as shallow buried salt, which can cause the base of gas hydrate stability zone to be shallower than the calculated GHSZ base.

Negligible	No bottom simulating reflector is identified within the area, and interval is below the base of gas hydrate stability zone.
Low	No bottom simulating reflector identified within the area, but the interval is above the base of gas hydrate stability zone.
Moderate	A bottom simulating reflector is identified within the surrounding study area but not at or near the proposed well location. The interval is above the base of gas hydrate stability zone.
High	A bottom simulating reflector is evident at or near the proposed well location and the interval is above the base of gas hydrate stability zone.

Figure 5. Geologic and seismic characteristics to determine potential for gas hydrates.

5.4 GENERAL GEOHAZARD POTENTIAL AT PROPOSED WELL

Proposed Well MC41-A was assessed for potential hazards between the seafloor and Horizon 6. This assessment assumes open-hole conditions and does not take into account engineering controls. Please note that this assessment addresses only the ***potential*** for encountering a geohazard event and does not include the ***severity*** of the possible event.

Shallow Gas

Few amplitude anomalies indicative of shallow gas were identified in the vicinity of the proposed well (Sheet 6). However, elevated amplitudes that did not meet the cutoff for anomalies in previous studies were noted, particularly in Unit D. Faults observed in the shallow section are generally not deep-seated and may not provide a migration pathway for thermogenic gas. Potentially porous, sand-prone sediments that may serve as a reservoir for shallow gas accumulations were identified in the area.

Shallow Water Flow

The proposed well location is over 25 miles outside the interpreted bounds of the nearest known SWF unit, the Blue unit. The closest reported SWF occurred ~10 miles to the southeast of MC41-A in Desoto Canyon (DC) 177. This event occurred in the center of DC177 at a depth of 1,915 feet BML. This SWF was categorized as a low severity flow and well integrity was maintained. Although sediments appear similar, there is no stratigraphic continuity between proposed well MC41-A and the SWF location in DC177.

Gas Hydrates

No BSR was identified in the seismic data near the proposed MC41-A location. The base of the GHSZ was calculated at 1,630 ft BML.

6.0 TOPHOLE ASSESSMENT

Unit A (Seafloor to Horizon 1)

Unit A (Figure 6, Figure 7, Figure 8, and Figure 9) consists of predominantly low- to moderate-amplitude, parallel, continuous reflectors. This unit is interpreted to be composed of hemipelagic clay, laid down as a drape deposit, interbedded with fine-grained turbidites and some sands. Unit A is 122 ft thick at the proposed wellsite (Figure 9).

There are no amplitude anomalies within 500 feet, and the likelihood of encountering shallow gas within this unit is interpreted to be negligible at the proposed well location (Figure 9).

Due to the shallow depth of burial, sediments in this unit have a negligible potential for SWF (Figure 9).

Unit A is above the GHSZ base. The potential for encountering gas hydrates at the proposed well location is interpreted to be low (Figure 9).

Unit B (Horizon 1 to Horizon 2)

Unit B (Figure 6, Figure 7, Figure 8, and Figure 9) consists of low- to moderate-amplitude, parallel, continuous reflectors overlying low- to-moderate amplitude, semi-continuous, chaotic reflectors. The upper and lower portions of Unit B are separated by a moderate- to high-amplitude, semi-continuous reflector indicative of a possible sheet sand, which covers the majority of the study area (Figure 7 and Figure 8). The upper portion of Unit B is likely composed of hemipelagic clay, laid down as a drape deposit, while the bottom portion of the unit is interpreted as thick, interbedded, clay-prone MTDs. At the Proposed Well MC41-A location, the upper portion of the unit is 101 feet thick and occurs between 122 feet and 223 feet BML (-5,301 feet to -5,402 feet MSL), and lower portion of the unit is 97 ft thick and occurs between 223 feet and 320 feet BML (-5,402 feet to -5,499 feet MSL; Figure 9).

There are no amplitude anomalies within 500 feet, and the likelihood of encountering shallow gas within this unit is interpreted to be negligible at the proposed well location (Figure 9).

Due to the shallow depth of burial, sediments in this unit have a negligible potential for SWF (Figure 9).

Unit B is above the GHSZ base. The potential for encountering gas hydrates at the proposed well location is interpreted to be low (Figure 9).

Unit C (Horizon 2 to Horizon 3)

Unit C (Figure 7, Figure 8, and Figure 9) consists of low- to moderate-amplitude, parallel, continuous reflectors. Unit C is interpreted as primarily fine-grained stratified deposits at the proposed well. The unit is 204 feet thick at the Proposed Well MC41-A location and occurs between 320 feet and 524 feet BML (-5,499 feet and -5,703 feet MSL; Figure 9).

There are no amplitude anomalies within 500 feet; therefore, the well is assigned a negligible potential for shallow gas (Figure 9).

No apparent sands are interpreted at the proposed location; therefore, the well is assigned a negligible potential for SWF (Figure 9).

Unit C is above the GHSZ base. The potential for encountering gas hydrates at the proposed well location is interpreted to be low (Figure 9).

Unit D (Horizon 3 to Horizon 4)

Unit D (Figure 7, Figure 8, and Figure 9) consists of low-amplitude, parallel reflectors overlying variable-amplitude, chaotic, semi-continuous to discontinuous reflectors. The sediments in the upper portion of Unit D are interpreted as fine-grained stratified deposits, while the sediments in the lower portion of the unit are interpreted as clay-prone MTDs overlain by a sheet sand. At the Proposed Well MC41-A location, the upper part of the unit is 296 feet thick and will be encountered between 524 feet and 820 feet BML (-5,703 feet and -5,999 feet MSL); the lower part of the unit is 416 feet thick and occurs between 820 feet and 1,236 feet BML (-5,999 feet and -6,415 feet MSL; Figure 9).

While previous studies did not identify any amplitude anomalies within 500 feet of the proposed well, amplitude anomalies indicative of gas migrating from depth were identified throughout the lower portion of Unit D; therefore, the majority of Unit D is assigned a low potential for encountering shallow gas (Figure 9). A small elevated amplitude with phase reversal that did not meet the cutoff for amplitude anomalies in the previous study was noted 85 feet to the southwest from the proposed well in Unit D near Horizon 4 (Figure 7 and Figure 9). Because phase reversal is a common indication of hydrocarbon accumulation and given the sand-prone nature of the sediments in the lower portion of Unit D, Unit D is assigned a moderate potential for encountering shallow gas from 1,169 to 1,236 BML (-6,347 to -6,415 MSL; Figure 9).

Possible sands are interpreted in the MTDs in the lower portion of Unit D. The proposed well is assigned a negligible potential for SWF in the upper portion (524 feet to 820 feet BML; -5,703 feet to -5,999 feet MSL) and a low potential for SWF in the lower portion (820 feet to 1,236 feet BML; -5,999 feet to -6,415 feet MSL; Figure 9).

Unit D is above the GHSZ base and the potential for encountering gas hydrates at the proposed well location is interpreted to be low (Figure 9).

Unit E (Horizon 4 to Horizon 5)

Unit E (Figure 7, Figure 8, and Figure 9) consists of low- to moderate-amplitude, semi-continuous reflectors. At the Proposed Well MC41-A location, the unit is 479 feet thick and occurs between 1,236 feet and 1,715 feet BML (-6,415 feet to -6,894 feet MSL; Figure 9). The sediments in Unit E are interpreted as clay-prone MTDs that may contain some sand.

There are no amplitude anomalies within 500 feet; therefore, there is a negligible potential for encountering shallow gas (Figure 9).

A low SWF potential is assessed for Unit E due to the possible presence of sands within the MTDs (Figure 9).

The majority of Unit E is above the GHSZ base and the potential for encountering gas hydrates at the proposed well location is interpreted to be low from 1,236 feet to 1,630 feet BML (-6,415 feet to -6,809 feet MSL). Below this, the potential for encountering gas hydrates is interpreted to be negligible.

Unit F (Horizon 5 to Horizon 6/DLI)

Unit F (Figure 7, Figure 8, and Figure 9) consists of moderate-amplitude, semi-continuous, sub-parallel reflectors. The sediments in Unit F are interpreted as clay-prone MTDs with interbedded sands. At the Proposed Well MC41-A location, the unit is 1,824 feet thick and occurs between 1,715 feet and 3,539 feet BML (-6,894 feet to -8,718 feet MSL; Figure 9).

There are no amplitude anomalies within 500 feet; therefore, there is a negligible potential for encountering shallow gas (Figure 9).

The presence of MTDs with interbedded sand content results in a low potential for SWF (Figure 9).

Unit F is below the GHSZ base; therefore, the potential for encountering gas hydrates at the proposed well location is interpreted to be negligible (Figure 9).

Faults

The proposed vertical wellbore will not encounter any faults in the shallow section (Figure 9).

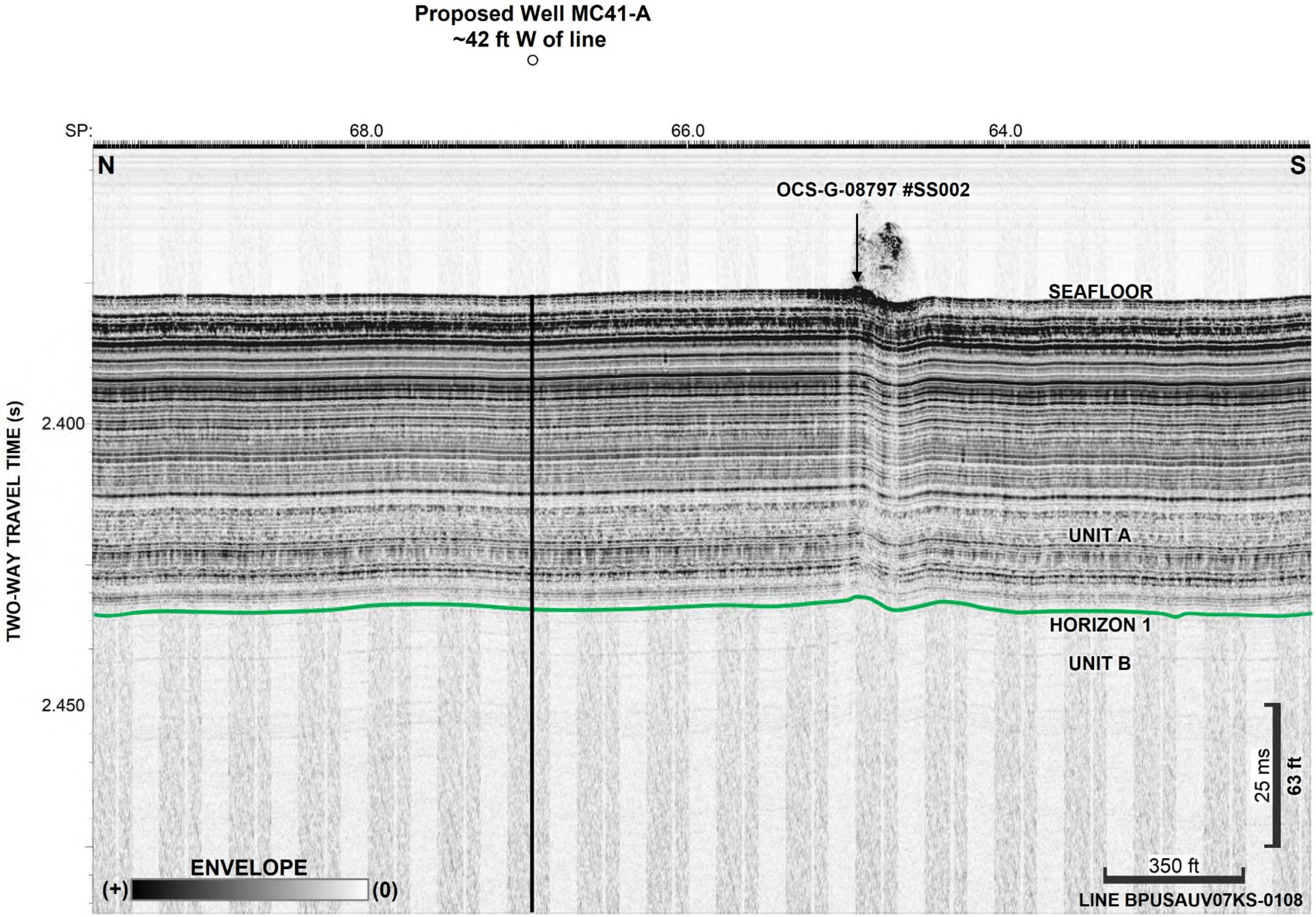


Figure 6. Portion of SBP Line BPUSAUV07KS-0108 showing high-resolution shallow stratigraphy at Proposed Well MC41-A.

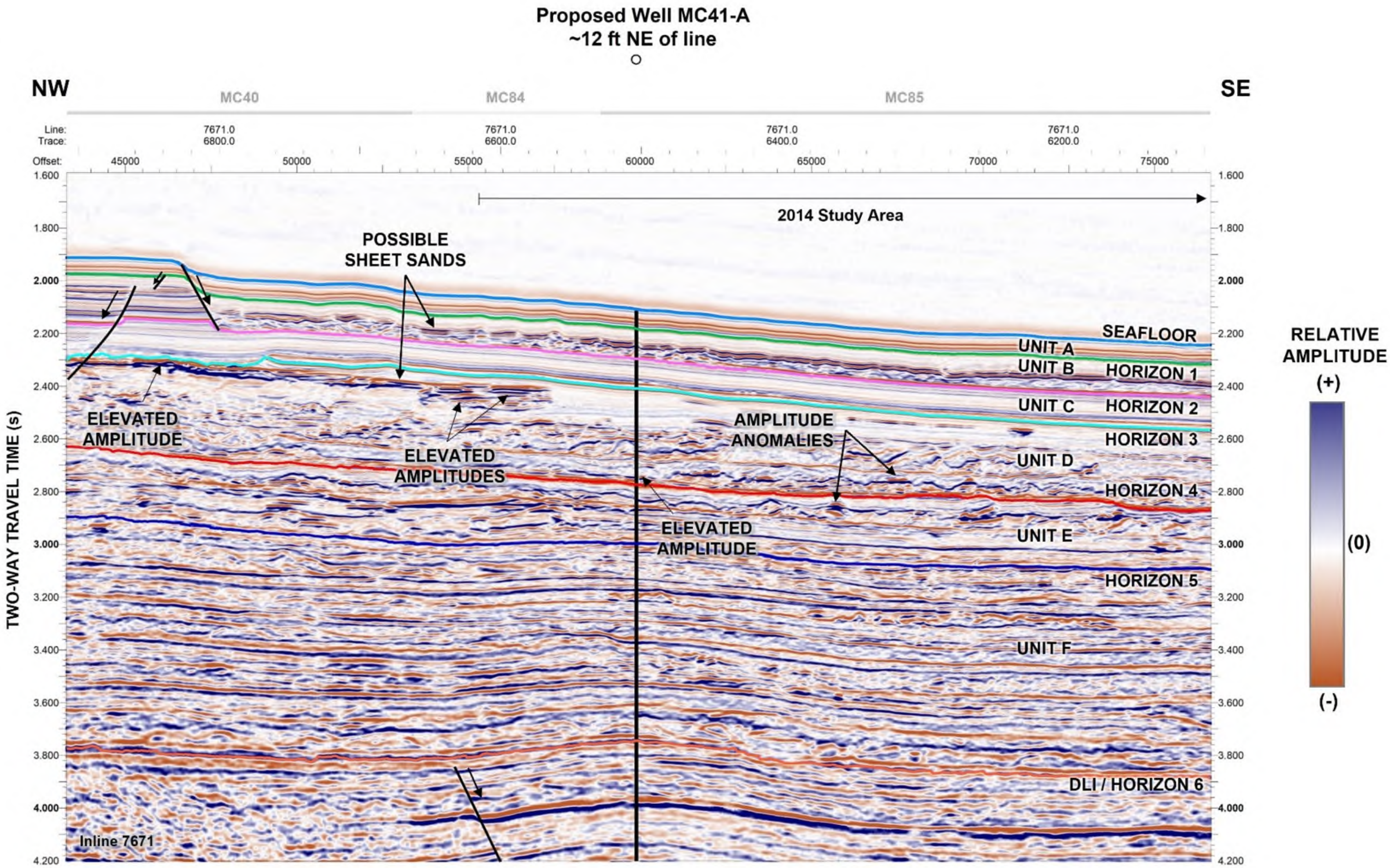


Figure 7. Portion of 3-D seismic inline 7671 near Proposed Well MC41-A.

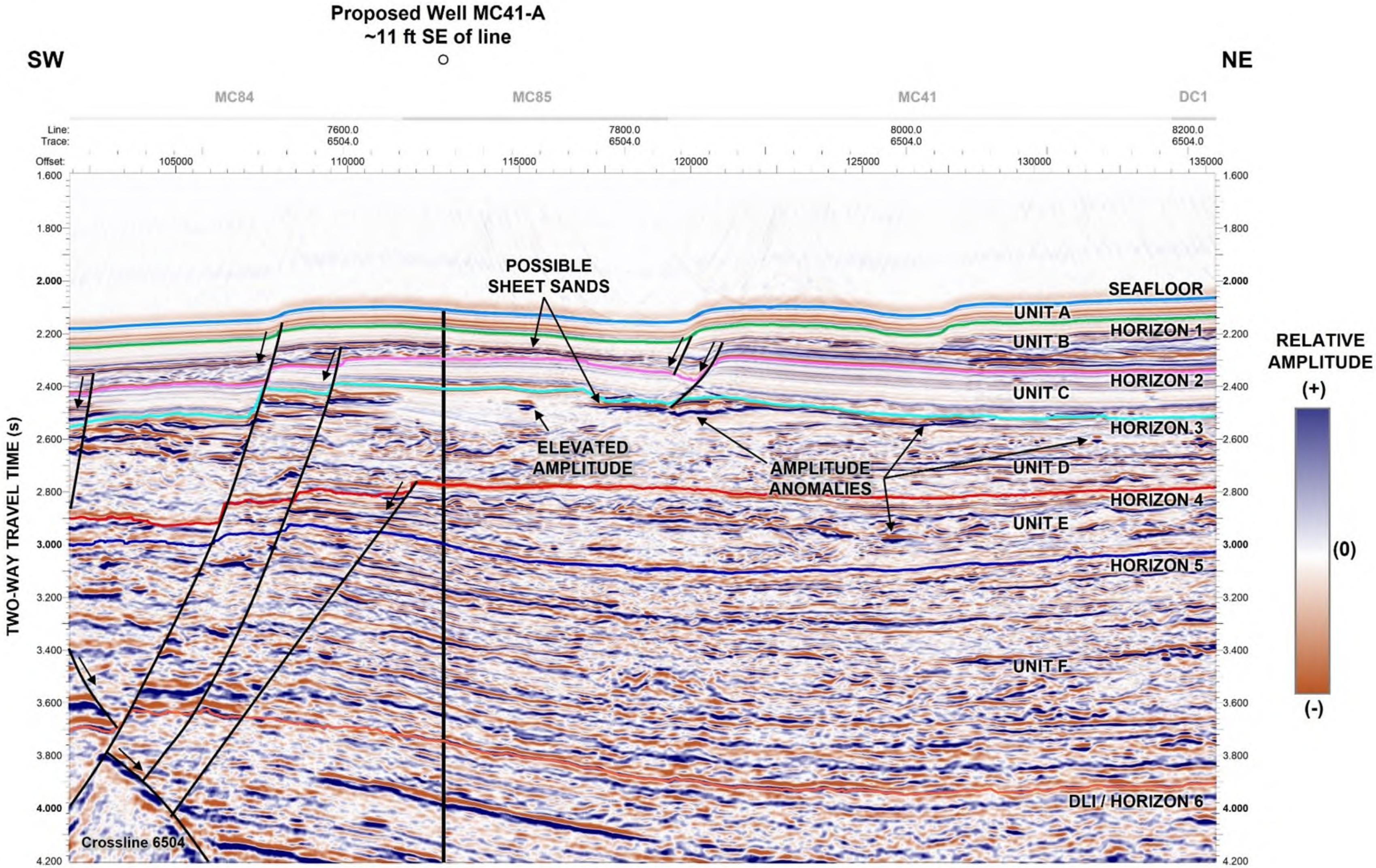


Figure 8. Portion of 3-D seismic crossline 6504 near Proposed Well MC41-A.

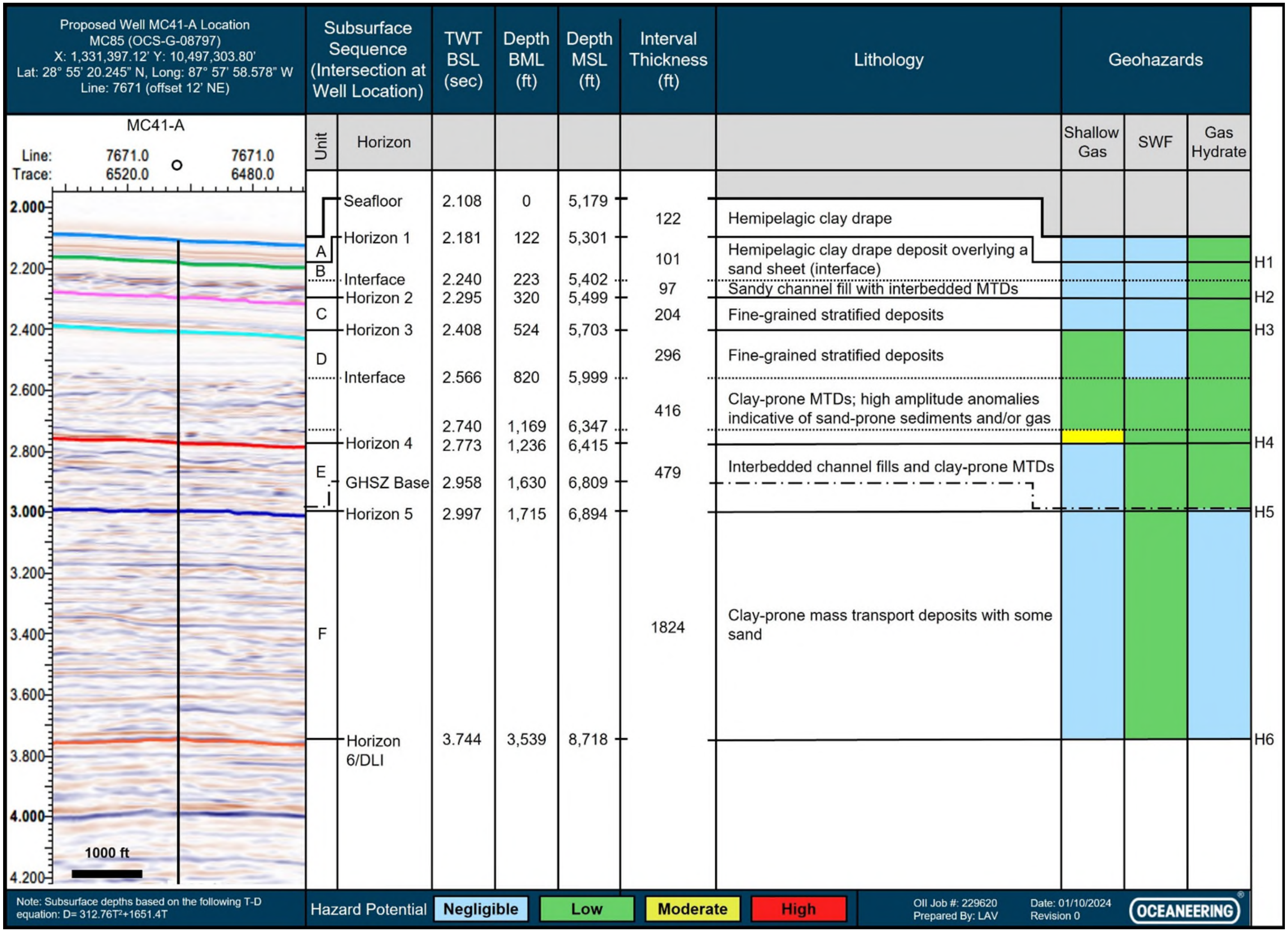


Figure 9. Tophole Prognosis for Proposed Well MC41-A.

7.0 CONCLUSIONS AND RECOMMENDATIONS

- The water depth at the Proposed Well MC41-A surface location is -5,179 feet MSL. The proposed wellsite is in an area of slightly undulating seafloor with a gradient of 4.3° to the southeast. No significant seafloor features that could interfere with drilling activities occur within 2,000 feet of the proposed wellsite.

- The low side scan sonar reflectivity and low backscatter intensity indicate fine-textured seafloor sediments within a 2,000-foot radius. There are no seafloor faults or any other seafloor features that may have adverse effects on drilling operations within 2,000 feet of the proposed wellsite.

- There are two small coverage gaps in the side scan sonar data approximately 1,700 feet northwest (~100,000 ft^2 in size) and 1,800 feet northeast (~60,000 ft^2 in size) of the Proposed Well MC41-A. These areas should be avoided when conducting seafloor-disturbing activities.

- The review of AUV and 3-D seismic data did not identify any potential high-density deepwater benthic communities habitats within a 2,000-foot radius. Therefore, the potential impact to deepwater benthic communities during drilling operation is considered negligible.

- Two active wells, multiple pipelines, and 14 sonar contacts interpreted to be modern debris are located within 2,000 feet of the proposed wellsite. The two wells are both over 600 feet south of the Proposed Well MC41-A. The nearest pipeline lies approximately 320 feet southwest of the proposed well. The sonar contacts are interpreted to be modern debris and were not assigned a specific avoidance distance in the archaeological assessments. These features are not anticipated to have an adverse effect on drilling operations; however, caution should be used when operating near any man-made features.

- No amplitude anomalies were identified within 500 feet of the proposed well in previous studies. However, an elevated amplitude with phase reversal was noted approximately 85 feet southwest of the proposed well near the base of Unit D. A low potential for shallow gas was assessed in Unit D from 524 to 1,170 feet BML (-5,703 to -6,348 feet MSL) a moderate potential was assessed from1,170 to 1,236 feet BML (-6,348 to -6,415 feet MSL). Units A, B, C, E, and F all have negligible potential for shallow gas.

- Above the depth limit of investigation (Horizon 6), the proposed well will not penetrate any faults or subsurface features that may have adverse effects to the drilling operations.

- Unit A, Unit B, Unit C, and the upper portion of Unit D have negligible potential for SWF. The sandy intervals and depth for overpressured conditions in the remainder of the bore (lower section Unit D through Unit F) exhibit a low potential for SWF. Closely monitoring the wellhead is recommended during connections and flow checks for SWF.

- There was no indication of gas hydrates, associated geologic features, or BSRs at the proposed wellsite. The interpreted depth of the gas hydrate stability zone base is 1,630 feet BML, within Unit E.

8.0 REFERENCES

Bureau of Ocean Energy Management, and Bureau of Safety and Environmental Enforcement, 2005. "Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases in the Outer Continental Shelf, Gulf of Mexico OCS Region: Archaeological Resource Surveys and Reports", U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico NTL No. 2005-G07.

Bureau of Ocean Energy Management, and Bureau of Safety and Environmental Enforcement, 2010. "Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases and Pipeline Right-of-Way Holders in the Outer Continental Shelf, Gulf of Mexico OCS Region: Deepwater Benthic Communities", U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico NTL No. 2009-G40.

Bureau of Ocean Energy Management, 2015. "Notice to Lessees and Operators of Federal Oil and Gas Leases in the Outer Continental Shelf, Gulf of Mexico OCS Region: Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance", U.S. Department of the Interior, Gulf of Mexico NTL No. 2015-N02.

Bureau of Ocean Energy Management, 2022. "Notice to Lessees and Operators of Federal Oil and Gas, and Sulphur Leases in the Gulf of Mexico Outer Continental Shelf (OCS) Region", U.S. Department of the Interior, Gulf of Mexico NTL No. 2022-G01.

C & C Technologies, 2006. “Archaeological, Engineering, and Hazard Study, Proposed ‘King’ Pump Main 6.89” Umbilical Block 85, Mississippi Canyon Area to Block 915, Viosca Knoll Area and Proposed ‘King’ Pump In-field 5.62” Umbilical Block 129 to 85, Mississippi Canyon Area”.

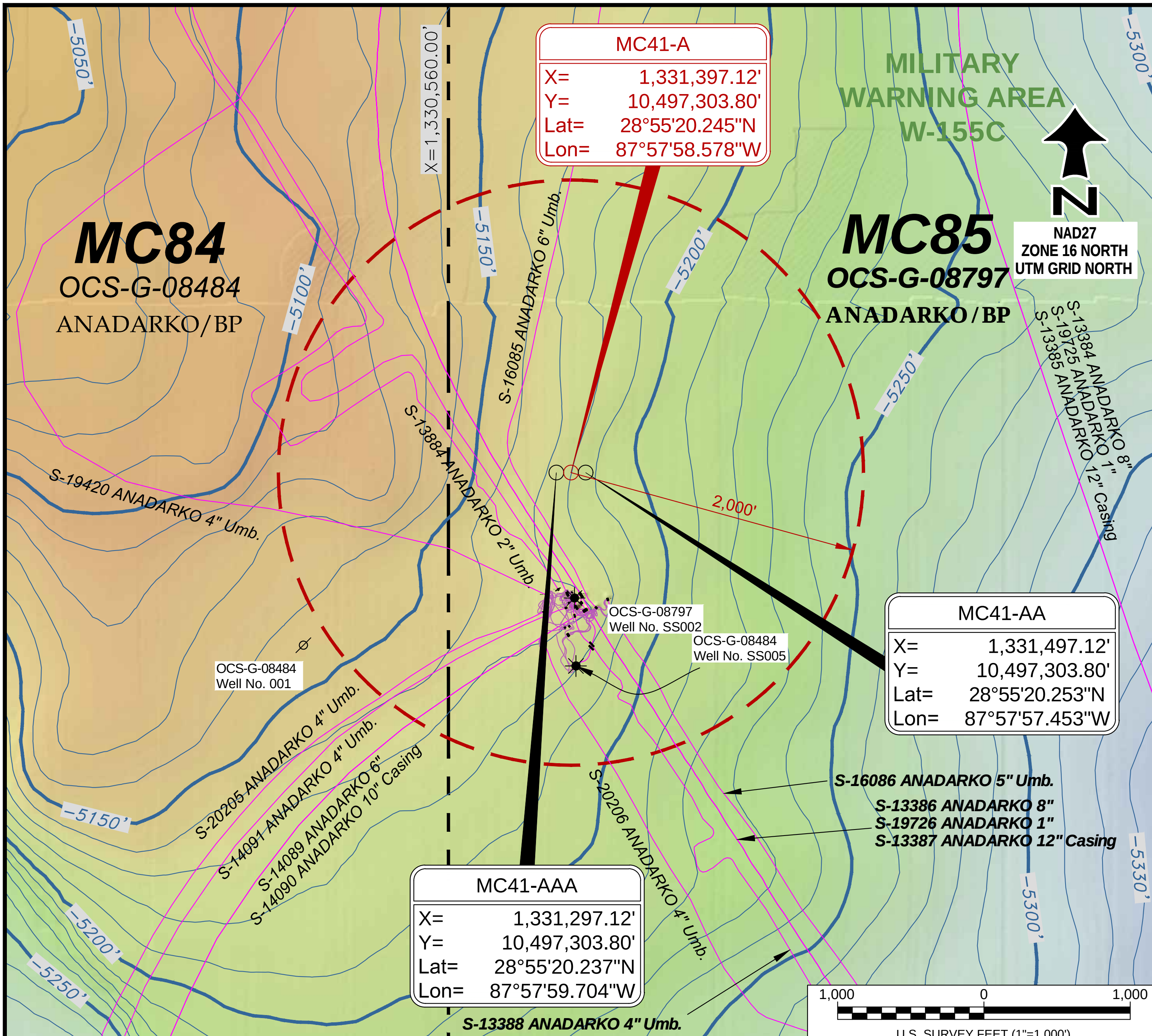
C & C Technologies, 2007. “Archaeological and Hazard Study, Blocks 85 and 129, Mississippi Canyon Area, Blocks 45 and 89, Desoto Canyon Area”.

C & C Technologies, 2014. “Archaeological Assessment Report, Blocks 85, 129, and Vicinity”.

C & C Technologies, 2015. “Archaeological Engineering & Hazard Study for Proposed 4-inch Power and Communication Umbilical Route Block 915, Viosca Knoll Area to Block 85, Mississippi Canyon Area, Gulf of Mexico”.

Maekawa, T., Itoh, S., Sakata, S., Igarai, S.I., and Imai N., 1995. Pressure and temperature conditions for methane hydrate dissociation in sodium chloride solutions: Higashi, Japan, Geochemical Journal, v. 29.

Ostermeier, R.M., Pelletier, J.H., Winker, J.W., Nicholson, F.H., Rambow, F.H., and Cowan, K.M., 2002. Dealing with shallow-water flow in the deepwater Gulf of Mexico: Houston, Texas, The Leading Edge.



-5200'

Bathymetric contours (in feet)

Contour interval = 10 feet

Vertical datum = Mean Sea Level

-5330' -5040'

Anadarko Petroleum Corporation

PROPOSED WELL MC41-A
COLOR SHADED BATHYMETRY
Block 85 (OCS-G-08797)
Mississippi Canyon Area

PREPARED BY: OCEANEERING®

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JOB: 229620	DRW: D. Pierrottie	DATE: January 10, 2024	
CKD: A. Mayet	APP: L. Samuel	SHEET 1 of 6	REV. 0
DOC: 229620-OII-DRW-CLR-001-01			

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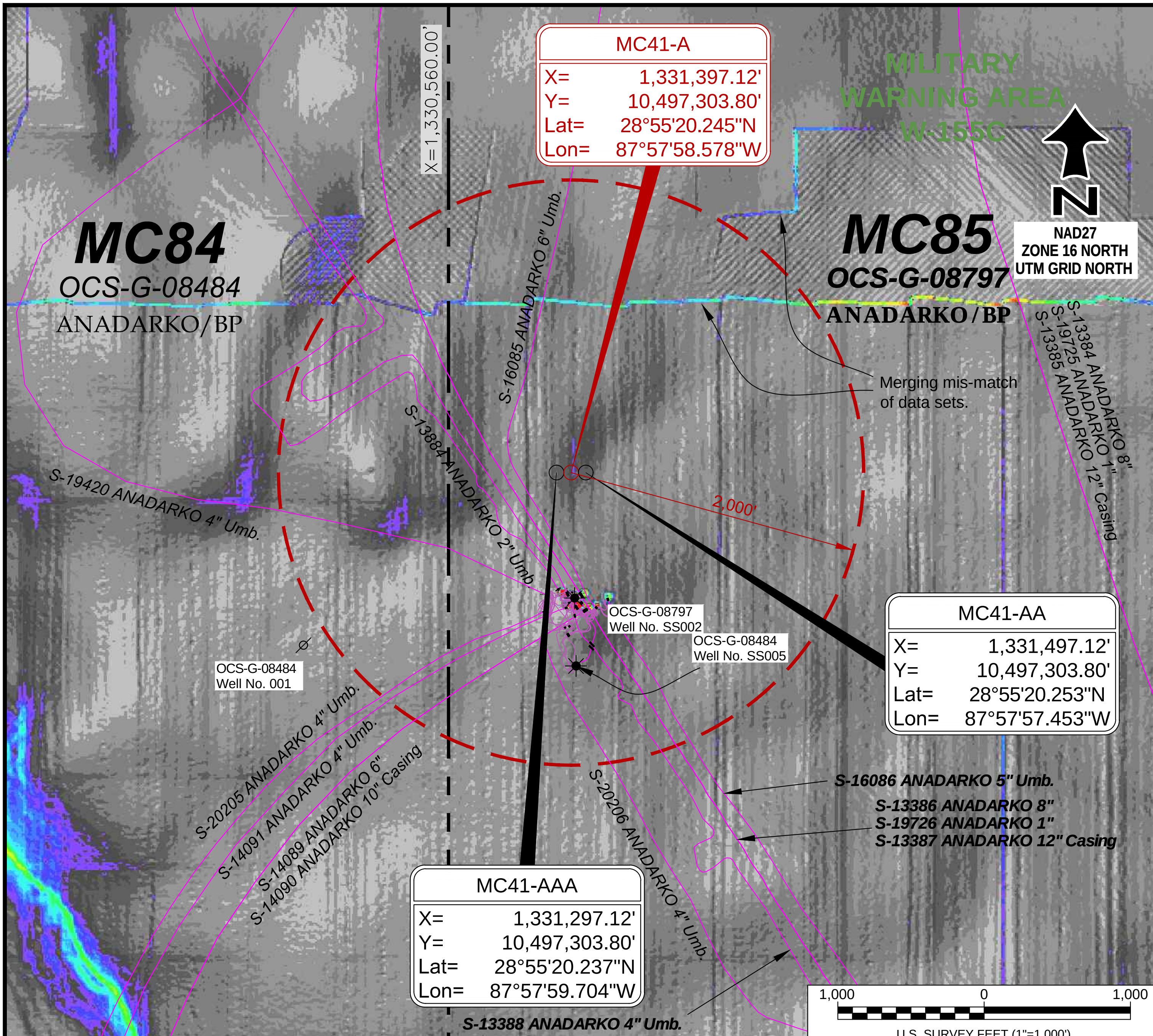
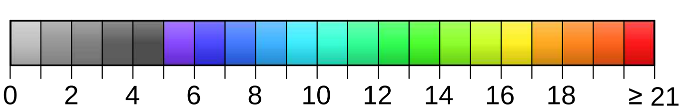


GRADIENT

Gradient is the first order derivative of the multibeam data.



Slope in degrees

Anadarko Petroleum Corporation

PROPOSED WELL MC41-A

SEAFLOOR GRADIENT

Block 85 (OCS-G-08797)

Mississippi Canyon Area

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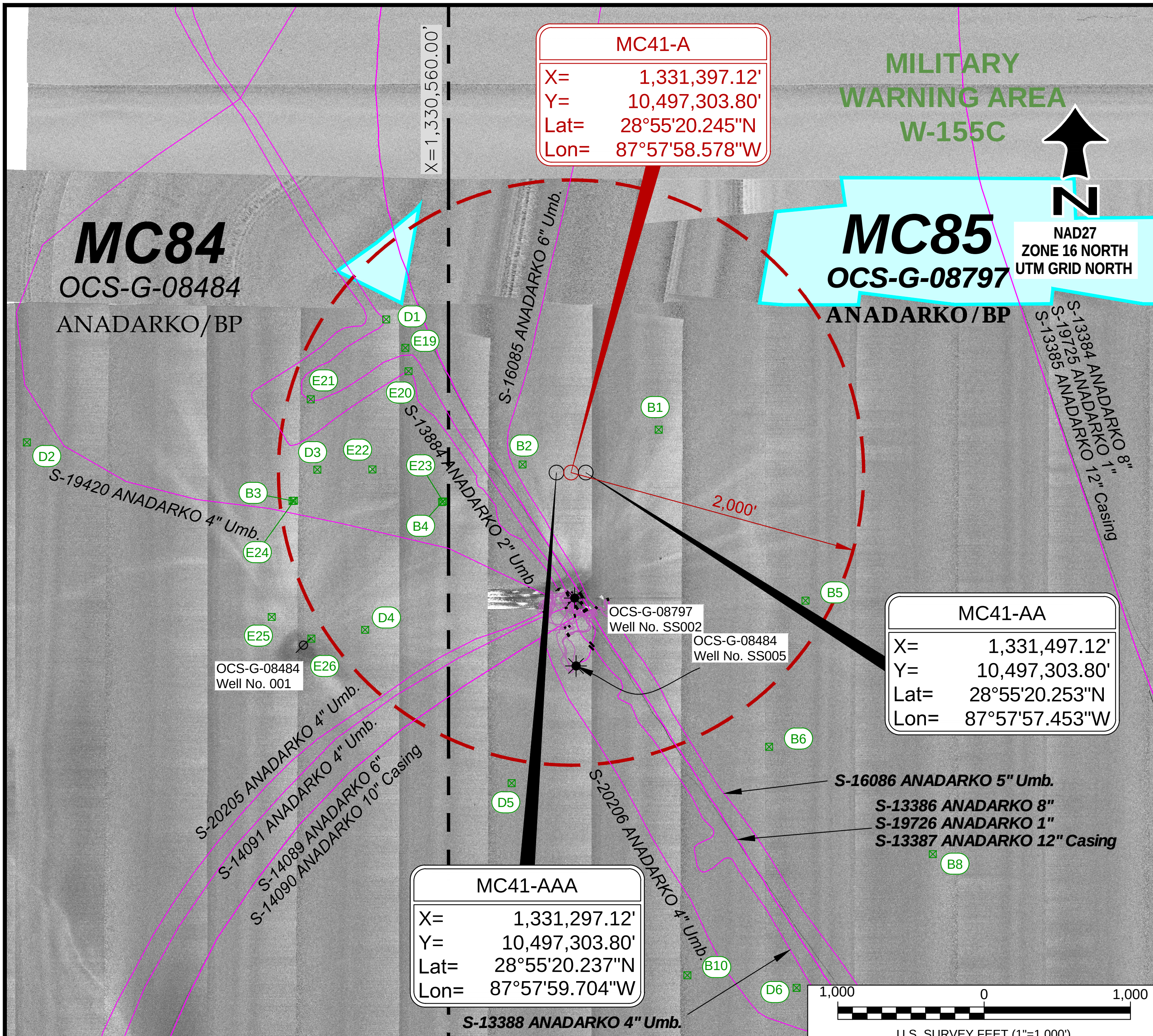

SONAR MOSAIC

Dark returns represent higher seafloor reflectivity.

Sonar coverage gap - seafloor-disturbance exclusion zone

B1 Sonar contact & reference number - see report for details

SONAR CONTACTS

NUM.	DIMENSIONS	X COORDINATE	Y COORDINATE
B1	10.0'x3.0'x0.0'	1,331,997'	10,497,597'
B2	7.0'x3.0'x0.0'	1,331,066'	10,497,359'
B3	10.0'x3.0'x0.0'	1,329,494'	10,497,111'
B4	10.0'x3.0'x0.0'	1,330,516'	10,497,103'
B5	7.0'x10.0'x0.0'	1,333,000'	10,496,429'
B6	10.0'x3.0'x0.0'	1,332,751'	10,495,430'
B8	7.0'x7.0'x0.0'	1,333,870'	10,494,696'
B10	3.0'x3.0'x0.0'	1,332,192'	10,493,868'
D1	14.9'x6.1'x0.0'	1,330,134'	10,498,351'
D2	8.1'x1.0'x1.2'	1,327,678'	10,497,511'
D3	19.7'x10.8'x0.0'	1,329,663'	10,497,324'

NUM.	DIMENSIONS	X COORDINATE	Y COORDINATE
D4	15.8'x4.5'x0.0'	1,329,990'	10,496,229'
D5	6.9'x4.0'x0.0'	1,330,992'	10,495,181'
D6	11.1'x6.0'x1.4'	1,332,939'	10,493,782'
E19	4.1'x2.3'x0.0'	1,330,265'	10,498,156'
E20	4.1'x1.4'x0.0'	1,330,286'	10,497,997'
E21	6.3'x4.1'x0.0'	1,329,618'	10,497,804'
E22	20.6'x10.3'x5.8'	1,330,040'	10,497,326'
E23	4.2'x4.2'x4.1'	1,330,524'	10,497,107'
E24	4.3'x5.3'x0.0'	1,329,504'	10,497,112'
E25	8.4'x5.3'x0.0'	1,329,352'	10,496,317'
E26	5.3'x3.1'x0.0'	1,329,623'	10,496,169'

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PROPOSED WELL MC41-A
SIDE SCAN SONAR MOSAIC
Block 85 (OCS-G-08797)
Mississippi Canyon Area

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CKD: A. Mayet	APP: L. Samuel	SHEET 3 of 6
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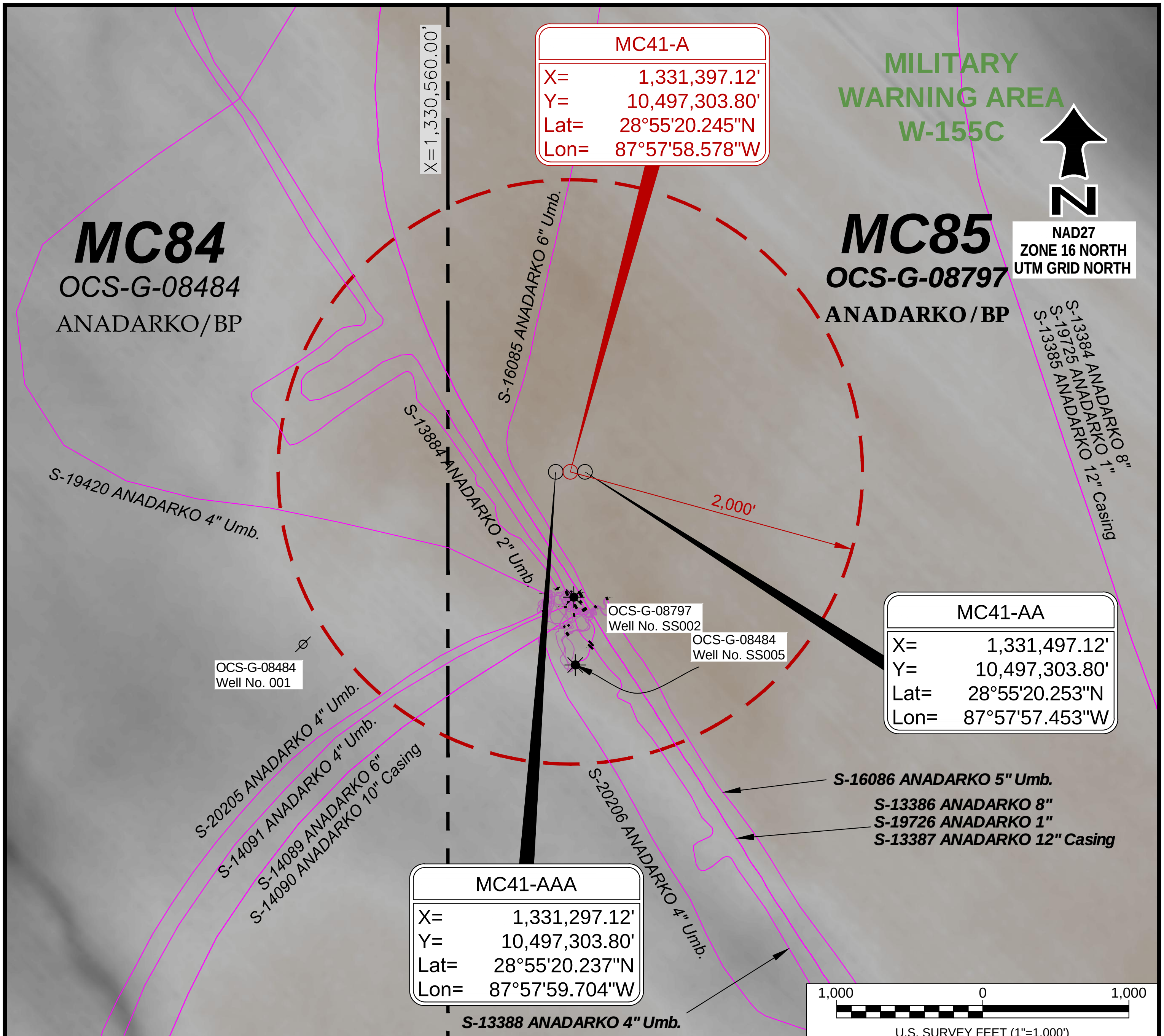
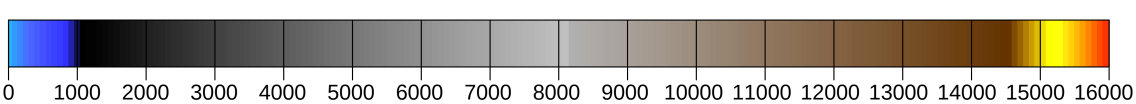


RELATIVE AMPLITUDE



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PROPOSED WELL MC41-A
SEAFLOOR AMPLITUDE
Block 85 (OCS-G-08797)
Mississippi Canyon Area

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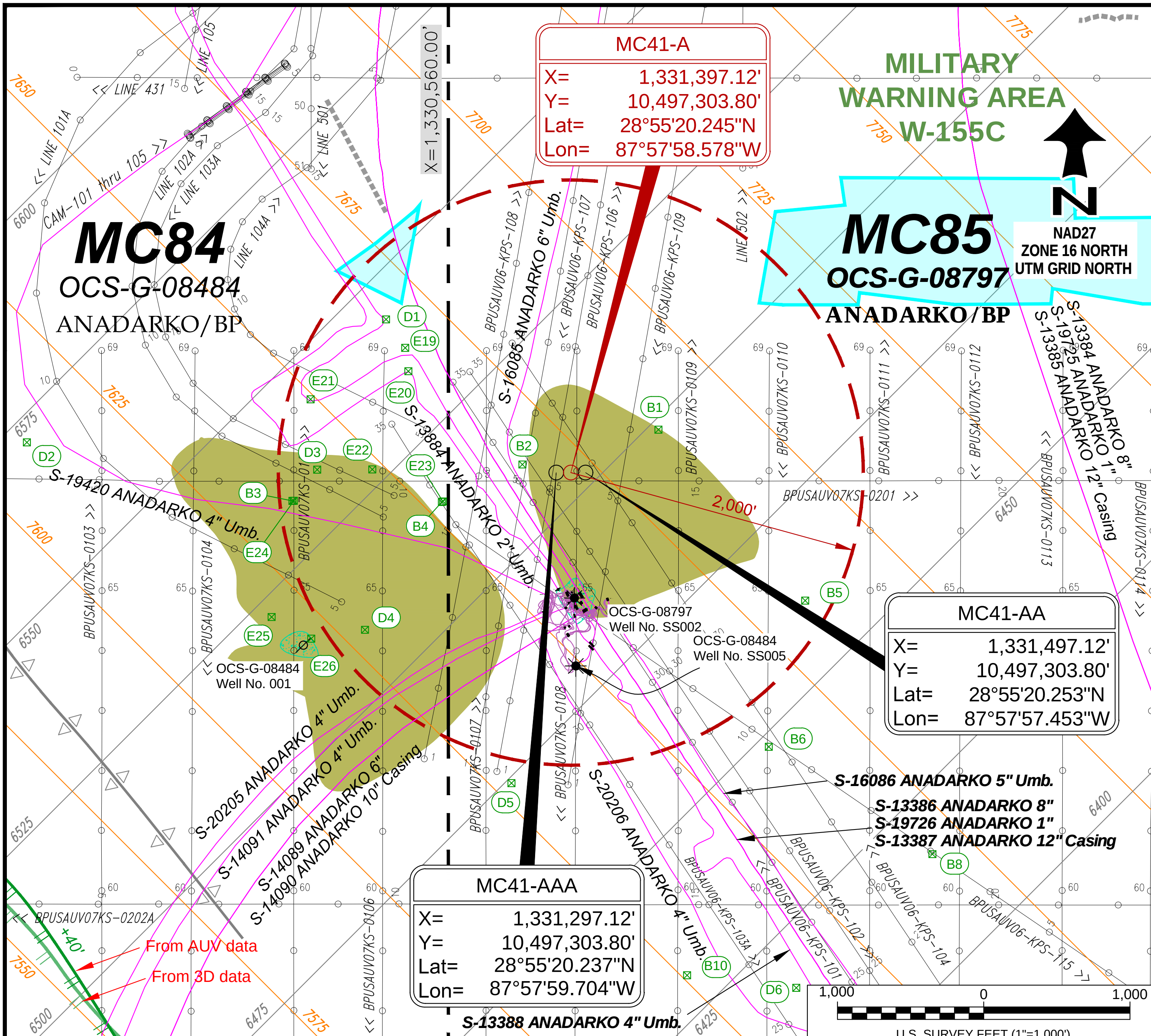

	Seafloor surface location of existing well		Seafloor surface location of permanently abandoned well		Existing pipeline, umbilical, or groundbed	10 << LINE 101	AUV navigation trackline with name, direction run, fix, and fix number
7660	Inline and inline number for 3D seismic data - Spacing = 12.5 meters (41.01 feet)	6500	Crossline and crossline number for 3D seismic data - Spacing = 12.5 meters (41.01 feet)	B1	Sonar contact & reference number - see Sheeet 3 and report for details		Sonar coverage gap - seafloor-disturbance exclusion zone
	Drag scar		Well cuttings and/or drilling mud		Disturbed seafloor sediment	+40'	Fault scarp with seafloor displacement (hachures on downthrown side)
	Seafloor ridge						

Anadarko Petroleum Corporation

PROPOSED WELL MC41-A
SEAFLOOR FEATURES
Block 85 (OCS-G-08797)
Mississippi Canyon Area

PREPARED BY: OCEANEERING®

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JOB: 229620	DRW: D. Pierrottie	DATE: January 10, 2024
CKD: A. Mayet	APP: L. Samuel	SHEET 5 of 6 — REV. 0
DOC: 229620-OII-DRW-CLR-001-05		

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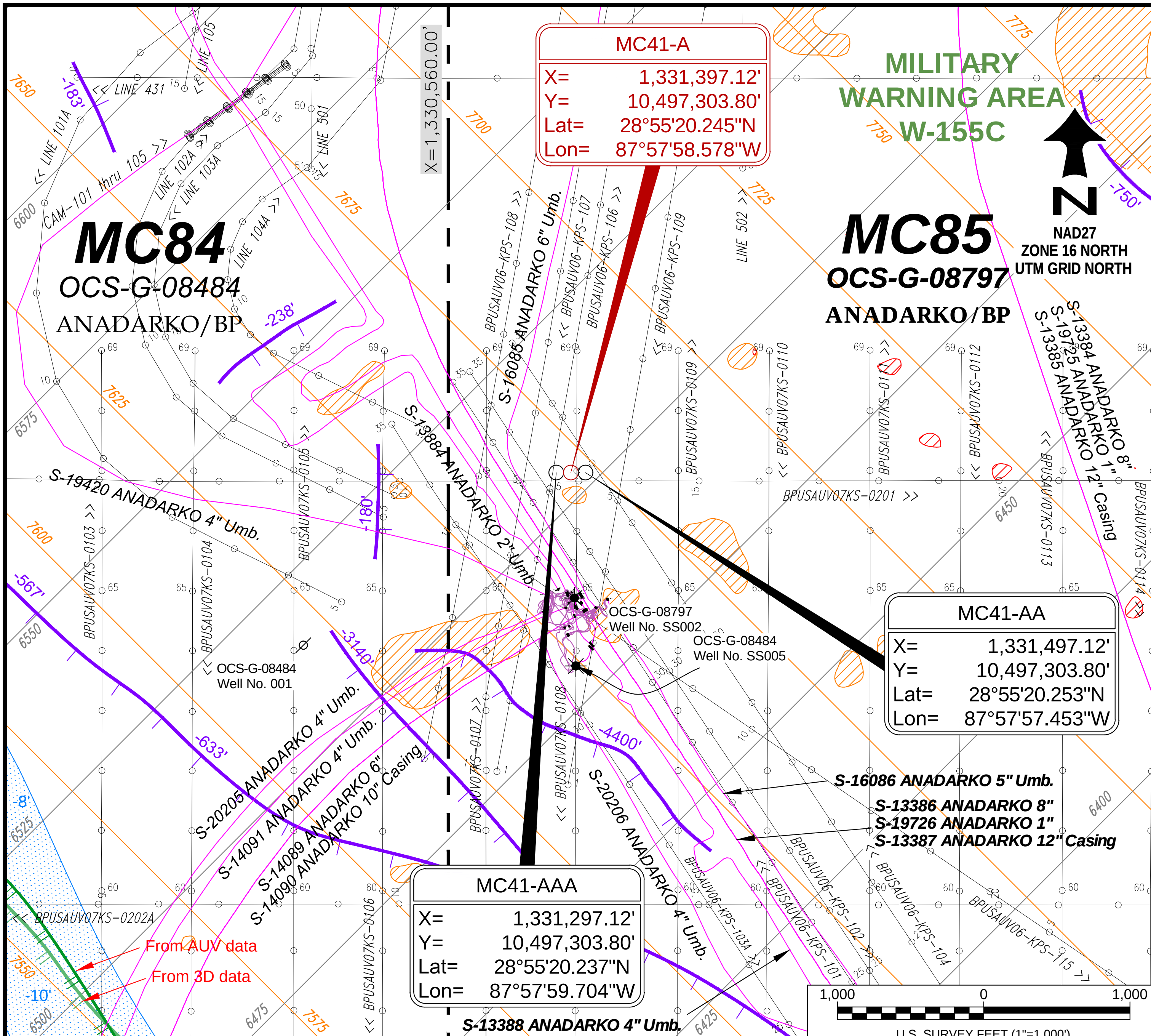

✶	Seafloor surface location of existing well	⌀	Seafloor surface location of permanently abandoned well		Existing pipeline, umbilical, or groundbed	10 / << LINE 101	AUV navigation trackline with name, direction run, fix, and fix number
7660	Inline and inline number for 3D seismic data - Spacing = 12.5 meters (41.01 feet)	6500	Crossline and crossline number for 3D seismic data - Spacing = 12.5 meters (41.01 feet)		Fault scarp (hachures on downthrown side)	-180'	Normal fault with depth of burial (hachures on downthrown side)
-8'	Fifth generation mass movement deposits with depth below seafloor		Amplitude anomaly within Unit B (2.102 to 2.652 sec/BSL) 15-1,080' BML		Amplitude anomaly within Unit D (2.329 to 3.152 sec/BSL) 539-2,934' BML		

Anadarko Petroleum Corporation

PROPOSED WELL MC41-A
SUBSURFACE FEATURES
Block 85 (OCS-G-08797)
Mississippi Canyon Area

PREPARED BY: OCEANEERING®

OCEANEERING INTERNATIONAL, INC.
202 STANTON STREET
BROUSSARD, LA 70518
(337) 210-0000

JOB: 229620	DRW: D. Pierrottie	DATE: January 10, 2024	
CKD: A. Mayet	APP: L. Samuel	SHEET 6 of 6	REV. 0
DOC: 229620-OII-DRW-CLR-001-06			

SIZE: 8.5" X 11" DATE: 01/10/2024 TIME: 16:27 FILENAME: Z:\229620\ACAD\229620-OII-DRW-CLR-001.DWG

SECTION D
HYDROGEN SULFIDE INFORMATION

Concentration

Anadarko anticipates encountering 0 ppm H_2S during the proposed operations.

Classification

In accordance with Title 30 CFR 250.490(c), Anadarko requests that the area of proposed operations be classified by the BOEM as H_2S absent.

The basis for this determination is the evaluation of the OCS-G 08484 SS005 ST01 well and OCS-G 08797 SS002 well which drilled in Mississippi Canyon (MC) Block 84, and MC Block 85.

- The OCS-G 08484 SS005 ST01 well is located approximately 1300 feet to the south of proposed Well Locations A/AA/AAA. It is the nearest well in MC Block 84 to the proposed locations producing from the objective sand.
- The OCS-G 08797 SS002 well is located approximately 850 feet to the south of proposed Well Locations A/AA/AAA. It is the nearest well in MC Block 85 to the proposed locations producing from the objective sand.

H2S Contingency Plan

An H_2S Contingency Plan is not required for the activities proposed in this plan.

Modeling Report

Modeling reports are not required for the activities proposed in this plan.

SECTION E
MINERAL RESOURCE CONSERVATION INFORMATION

(a) Technology and Reservoir Engineering Practices and Procedures

Anadarko does not plan to use enhanced recovery methods for the development of these blocks. The reservoirs are pressure supported by natural water drive and standard production will afford efficient reserve recovery.

(b) Technology and Recovery Practices and Procedures

The wells will be completed as conventional completions. As applicable, the wells will be frac packed/gravel packed to maximize recovery.

(c) Reservoir Development

The wells will be monitored for performance and assessed for reservoir depletion to ensure recovery. Additional development drilling will be considered to ensure maximum recovery.

SECTION F
BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

(a) Chemosynthetic Communities Report

The seafloor disturbing activities proposed in this plan are in approximately 5,179' of water. The wells will be drilled with a DP drillship or DP semi-submersible drilling unit.

Maps

Maps prepared using 3-D seismic data to depict bathymetry, seafloor and shallow geological features, and surface location of the proposed wells are included in **Sections A and C.**

Chemosynthetic information for the proposed lease term pipeline will be submitted with the pipeline application.

Analysis

Features or areas that could support high-density chemosynthetic communities are not located within 2,000' of each proposed muds and cuttings discharge location.

Features or areas that could support high-density chemosynthetic communities are not located within 250' of any seafloor disturbances. Please refer to site clearance letters included in **Section C** for summary statements for each well.

(b) Topographic Features Map

The proposed activities are not within 1,000' of a no-activity zone or within the 3-mile radius zone of an identified topographic feature. Therefore, no map is required per NTL No. 2008-G04.

(c) Topographic Features Statement (Shunting)

Anadarko does not plan to drill more than two wells from the same surface location within the Protective Zone of an identified topographic feature. Therefore, the topographic features statement required by NTL No. 2008-G04 is not applicable.

(d) Live Bottoms (Pinnacle Trend) Map

The activities proposed in this plan are not within 200' of any pinnacle trend feature with vertical relief equal to or greater than 8'. Therefore, no map is required per NTL No. 2008-G04.

(e) Live Bottoms (Low Relief) Map

The activities proposed in this plan are not within 100' of any live bottom low relief features. Therefore, no map is required per NTL No. 2008-G04.

(f) Potentially Sensitive Biological Features

The activities proposed in this plan are not within 200' of any potentially sensitive biological features. Therefore, no map is required per NTL No. 2008-G04.

(g) Threatened and Endangered Species Information

Under Section 7 of the Endangered Species Act (ESA) all federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat. In accordance with the 30 CFR 250, Subpart B, effective May 14, 2007, and further outlined in Notice to Lessees (NTL) 2008-G04, lessees/operators are required to address site-specific information on the presence of federally listed threatened or endangered species and critical habitat designated under the ESA and marine mammals protected under the Marine Mammal Protection Act (MMPA) in the area of proposed activities under this plan.

Currently there are no designated critical habitats for the listed species in the Gulf of Mexico Outer Continental Shelf; however, it is possible that one or more of these species could be seen in the area of our operations.

Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast.

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Marine Mammals					
Rice's whale	***Balaenoptera ricei***	E	X	--	None
Sperm whale	***Physeter macrocephalus***	E	X	--	None
West Indian manatee	***Trichechus manatus***[1]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	***Caretta caretta***	T,E[2]	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

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
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)
Black-capped Petrel	*Pterodroma hasitata*	E	X	--	None
Rufa Red Knot	*Calidris canutus rufa*	T	--	X	None
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
Pillar coral	***Dendrogyra cylindrus***	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	***Mycetophyllia ferox***	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	***Orbicella annularis***	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Mountainous star coral	***Orbicella faveolata***	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Boulder star coral	***Orbicella franksi***	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
Panama City crayfish	***Procambarus econfinae***	T	--	X	South-central Bay County, Florida
Queen conch	*Aliger gigas*	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	***Peromyscus polionotus***	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. 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. On 30 March 2017, the USFWS announced the West Indian manatee, including the Florida manatee subspecies, was reclassified as Threatened.

2. The loggerhead turtle is composed of nine distinct population segments (DPS). The only DPS that may occur in the project area (Northwest Atlantic DPS) is listed as threatened (76 *Federal Register* [FR] 58868; 22 September 2011).

The Environmental Impact Analysis in **Section P** of this plan further discusses potential impacts and mitigation measures related to threatened and endangered species.

(h) Archaeological Report

Mississippi Canyon Block 85 has been determined to be located in an area where historic shipwrecks may exist. In accordance with NTL No. 2005-G07, "Archaeological Resource Surveys and Reports," and NTL No. 2011-JOINT-G01, "Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports," an archaeological resource survey report, prepared by C&C Technologies Survey Services (October 2014, Project No. 141022) will be included in this Initial DOCD submittal.

(i) Air and Water Quality Information

This DOCD does not propose activities for which the State of Florida is an affected State. Therefore, the discussion required per NTL 2008-G04 is not applicable to this DOCD.

(j) Socioeconomic Information

The activities proposed in this plan are not located offshore Florida. Therefore, socioeconomic information required per NTL 2008-G04 is not applicable to this DOCD.

SECTION G
WASTE AND DISCHARGE INFORMATION

The following estimates were prepared utilizing Anadarko's experience with similar operations. Estimated maximum discharge rates anticipated during drilling and completion operations are reflected below. Projected amounts may vary during operations. Total amounts reflected under sections (a) and (b) assume drilling and completing 3 wells will take a total of 225 days (75 days/ well). Total amounts reflected under sections (c) and (d) assume subsea installation and commissioning activities on 3 wells will take a total of 108 days (36 days/well).

(a) Projected Generated Wastes – Drilling and Completion Operations

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Synthetic-based drilling fluids	Synthetic-based drilling muds	14,000 bbls/well	Re-use and/or transport to shore in DOT approved containers to an approved waste disposal facility, such as in Fourchon, Louisiana, and on to base/transfer station. If recycled, returned to vendor (Bariod or MI).
Cuttings wetted with synthetic-based fluids	Cuttings coated with synthetic drilling muds/fluids, including drilled out cement	2,500 bbls/well	Treat and discharge overboard. ***Note, an estimated 5-10% of cuttings may be transported to shore in tanks and/or cutting boxes and on to the base/transfer station if oil remains.**
Water-based drilling fluids	Water based drilling muds (NaCl saturated, seawater, freshwater, barite**)	15,000 bbls/well*	Discharge overboard or at seafloor
Cuttings wetted with water-based fluids	Cuttings coated with water-based drilling muds/fluids	2,500 bbls/well 0 bbls/well	Discharge at overboard Discharge at seafloor
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene* Diesel*	749.25 bbls total 186.75 bbls total 3750.75 bbls total 150 bbls total/year	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base. ***An estimated 5-10% of product total volume used during ops is sent back to shore for disposal. Volume shown reflects volume to be disposed of.***
Completion/Recompletion Fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	3,000 bbls/well	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base.
Non-pollutant completion fluids	Low density uninhibited completion brines	5,000 bbls/well	Discharge overboard

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	3,000 bbls/well	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base.
Trash and debris	Refuse generated during operations	375 bbls total	Transport to shore in disposal bags by vessel to shorebase for pickup by municipal operations.
Sanitary Wastes	Treated human body waste	1,125,000 gals total	Chlorinate and discharge overboard.
Domestic Waste	Gray water	1,125,000 gals total	Chlorinate and discharge overboard.
Deck drainage	Platform washings and rainwater	787,500 bbls total	Treat for oil and grease and discharge overboard
Subsea production control fluid	Subsea production control fluid for actuating valves	35 bbls/well during commissioning and start-up. 12 bbls/well/year average during normal operations	Discharge at seafloor
Produced water	Formation water	9,000 bbls total	Treat through flotation unit and discharge overboard
Desalinization Unit	Seawater	78,750 bbls total	Discharge overboard
Wash water	Drill/water (fresh)	11,250 bbls total	Discharge overboard
Blowout preventer fluid	Blend (3% Stack Magic & Filtered Fresh Water)	29,732 gals total	Discharge at seafloor
Ballast water	Seawater	47,650 m3/year	Discharge overboard
Bilge water	Seawater	71,325 bbls total	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	Nitrified cement slurry	350 bbls per well	Discharge at seafloor
Fire water	Seawater	137,142 bbls/day/well	Discharge overboard
Cooling water	Seawater	137,142 bbls/day/well	Discharge overboard

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Produced Sand	Oil-contaminated formation Sand	50 bbls/well/year	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Newpark (injection disposal facility) or USLL (landfarm).
Used oil	Excess oil from engines	806 bbls total	Transport in DOT approved containers to shore for recycling.

**The actual volume of water-based drilling fluid ordered out will be an estimated 11,000 bbls/caisson of mud. Once on location this volume will be cut back and mixed with seawater to different desired mud weights which will increase the volume that is discharged at the seafloor. The estimated volume that will be discharged at the seafloor will be approximately 15,000 bbls/well. (Note: There will be 3 potential wells drilled, for a total of 45,000 bbls.)*
***The water-based drilling fluids used by Anadarko are not prohibited and meet the limitations set in Section B.1 of NPDES Permit GMG290000 for Drilling Fluids. The limitation set in the permit for cadmium and mercury in barite is confirmed through stock samples prior to discharge.*

(b) Projected Ocean Discharges – Drilling and Completions Operations

Type of Waste	Total Amount to be Discharged	Discharge Rate	Discharge Method
Sanitary Wastes	1,125,000 gals total	97 bbls / well daily	Chlorinate and discharge overboard
Domestic waste	1,125,000 gals total	180 bbls well/day	Chlorinate and discharge overboard
Deck drainage	787,500 bbls total	2.5 bbls/well/day	Treat for oil and grease and discharge overboard
Desalinization Unit	78,750 bbls total	100 bbls/well/day	Discharge overboard
Wash water	11,250 bbls total	50 bbs/well/day	Discharge overboard
Blowout preventer fluid	29,732 gals total	925 gals/week/well; Vents on a weekly basis	Discharge at seafloor
Ballast water	47,650 m3/year	Not continuous	Discharge overboard
Bilge water	71,325 bbls total	10.5 bbls/day	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	1,050 bbls total	20 bbls/min.	Discharge at seafloor
Fire water	30,856,950 bbls total	137,142 bbls/day	Discharge overboard
Cooling water	30,856,950 bbls total	137,142 bbls/day	Discharge overboard
Cuttings wetted with Water-based fluids	7,500 bbls total	2,500 bbls/well	Discharge at seafloor
Water-based drilling fluids	45,000 bbls total	15,000 bbls/well*	Discharge at seafloor or overboard

Type of Waste	Total Amount to be Discharged	Discharge Rate	Discharge Method
Cuttings wetted with Synthetic-based fluids	7,500 bbls total	2,500 bbls/well	Treated and discharge overboard **Note, an estimated 5-10% of cuttings may be transported to shore in tanks and/or cutting boxes and on to the base/transfer station if oil remains.*
Subsea production control fluid	35 bbls/well during commissioning and start-up. 12 bbl/well/ average during normal operations	5 bbl/well/day during commissioning and start-up (3 wells @ 7 days each = 21 days total). 1 bbl/ well/month average during normal operations	Discharge at seafloor
Produced Water	9,000 bbls	3,000 bbls/well/day	Treat through flotation unit and discharge overboard
Non-pollutant completion fluids	15,000 bbls	101 bbl/hour	Discharge overboard

The actual volume of water-based drilling fluid ordered out will be an estimated 11,000 bbls/caisson of mud. Once on location this volume will be cut back and mixed with seawater to different desired mud weights which will increase the volume that is discharged at the seafloor. The estimated volume that will be discharged at the seafloor will be approximately 15,000 bbls/well. (Note: There will be 3 potential wells drilled, for a total of 45,000 bbls.)

(c) Projected Generated Wastes – Subsea Installation Operations and Production

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Synthetic-based drilling fluids	Synthetic-based drilling muds	N/A	Re-use and/or transport to shore in DOT approved containers to an approved waste disposal facility, such as in Fourchon, Louisiana, and on to base/transfer station. If recycled, returned to vendor (Bariod or MI).
Cuttings wetted with synthetic-based fluids	Cuttings coated with synthetic drilling muds/fluids, including drilled out cement	N/A	Treated and discharge overboard. **Note, an estimated 5-10% of cuttings may be transported to shore in tanks and/or cutting boxes and on to the base/transfer station if oil remains.*
Water-based drilling fluids	Water based drilling muds (NaCl saturated, seawater, freshwater, barite)	N/A	Discharge overboard or at seafloor
Cuttings wetted with water-based fluids	Cuttings coated with water-based drilling muds/fluids	N/A	Discharge overboard

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene* Diesel*	506.16 bbls total 126.16 bbls total 2533.84 bbls total 200 bbls total/year	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base. ***An estimated 5-10% of product total volume used during ops is sent back to shore for disposal. Volume shown reflects volume to be disposed of.***
Completion/Recompletion Fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	3,000 bbls/well	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base.
Non-pollutant completion fluids	Low density uninhibited completion brines	5,000 bbls/well	Discharge overboard
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	3,000 bbls/well	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base.
Trash and debris	Refuse generated during operations	180 lbs total	Transport to shore in disposal bags by vessel to shorebase for pickup by municipal operations.
Sanitary Wastes	Treated human body waste	540,000 bbls total	Chlorinate and discharge overboard.
Domestic Waste	Gray water	540,000 bbls total	Chlorinate and discharge overboard.
Deck drainage	Platform washings and rainwater	378,000 bbls total	Treat for oil and grease and discharge overboard
Subsea production control fluid	Subsea production control fluid for actuating valves	35 bbls/well during commissioning and start-up. 12 bbls/well/year average during normal operations	Discharge at seafloor
Produced water	Formation water	N/A	Treat through flotation unit and discharge overboard
Desalinization Unit	Seawater	37,800 bbls total	Discharge overboard
Wash water	Drill/water (fresh)	5,400 bbls total	Discharge overboard
Blowout preventer fluid	Blend (3% Stack Magic & Filtered Fresh Water)	N/A	Discharge at seafloor

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Ballast water	Seawater	47,650 m3/year	Discharge overboard
Bilge water	Seawater	34,236 bbls total	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	Nitrified cement slurry	N/A	Discharge at seafloor
Fire water	Seawater	137,142 bbls/day/well	Discharge overboard
Cooling water	Seawater	137,142 bbls/day/well	Discharge overboard
Produced Sand	Oil-contaminated formation Sand	N/A	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Newpark (injection disposal facility) or USLL (landfarm).
Used oil	Excess oil from engines	387 bbls total	Transport in DOT approved containers to shore for recycling.

(d) Projected Ocean Discharges – Subsea Installation Operations and Production

Type of Waste	Total Amount to be Discharged	Discharge Rate	Discharge Method
Sanitary Wastes	540,000 gals total	25 gals per person daily	Chlorinate and discharge overboard
Domestic waste	540,000 gals total	25 gals per person daily	Chlorinate and discharge overboard
Deck drainage	378,000 bbls total	350 bbls/day/caisson	Treat for oil and grease and discharge overboard
Desalinization Unit	37,800 bbls total	100 bbls/caisson/day	Discharge overboard
Wash water	5,400 bbls total	50 bbs/caisson/day	Discharge overboard
Blowout preventer fluid	N/A	N/A	Discharge at seafloor
Ballast water	47,650 m3/year	Not continuous	Discharge overboard
Bilge water	34,236 bbls total	317 bbls/day/caisson	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	N/A	N/A	Discharge at seafloor
Fire water	14,811,336 bbls total	137,142 bbls/day	Discharge overboard
Cooling water	14,840,496 bbls total	137,142 bbls/day	Discharge overboard
Cuttings wetted with Water-based fluids	N/A	1,000 bbls/hr. max	Discharge overboard

Type of Waste	Total Amount to be Discharged	Discharge Rate	Discharge Method
Water-based drilling fluids	N/A	1,000 bbls/hr. max	Discharge at seafloor or overboard
Cuttings wetted with Synthetic-based fluids	N/A	N/A	Treated and discharge overboard **Note, an estimated 5-10% of cuttings may be transported to shore in tanks and/or cutting boxes and on to the base/transfer station if oil remains*.
Subsea production control fluid	35 bbls/caisson during commissioning and start-up. 12 bbl/caisson average during normal operations	5 bbl/caisson/day during commissioning and start-up (3 wells @ 7 days each = 21 days total). 1 bbl/ well/month average during normal operations	Discharge at seafloor
Produced Water	N/A	3,000 bbls/caisson/day	Treat through flotation unit and discharge overboard
Non-pollutant completion fluids	N/A	101 bbl/hour	Discharge overboard

(e) Modeling Report

The proposed activities under this plan do not meet the U.S. Environmental Protection Agency requirements for an individual NPDES permit. Therefore, modeling report requirements per NTL No. 2008-G04 is not applicable to this DOCD.

SECTION H
AIR EMISSIONS INFORMATION

(a) Screening Questions

Screen Procedures for DOCD's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development 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 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 from shore?		X
Are your proposed development and production activities located within 200 kilometers of the Breton Wilderness Area?		X

*Facility located in VK 915 (OCS-G 06894)

(b) Air Emissions Spreadsheets

Air emission worksheets have been prepared utilizing the maximum horsepower rating from an Anadarko contracted DP Vessel. A different vessel may be utilized, but the horsepower rating, average engine load, and air emissions will be equal to, or less than, the calculated plan emission amounts shown on the following pages. Air Emission Spreadsheets have been prepared and are enclosed as **Attachment H-1.**

(c) Summary Information

Mississippi Canyon 85 Surface Location Activities:

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Anadarko Petroleum Corporation	41 & 85	OCS-G 35962 &		MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface l		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2025	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
2026	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
2027	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
Allowable	2,231.10			2231.10	2231.10	2231.10		56086.99	

The air emission calculations were calculated by:

Teri Powell
Regulatory Consultant
(832) 636-1261
Teri_Powell@oxy.com

OMB Control No. 1010-0151
OMB Approval Expires: 08/31/2023

COMPANY	Anadarko Petroleum Corporation
AREA	Mississippi Canyon (MC)
BLOCK	41 & 85
LEASE	OCS-G 35962 & OCS-G 08797
FACILITY	
WELL	MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface locations in MC 85)
COMPANY CONTACT	Teri Powell
TELEPHONE NO.	832-636-1261
REMARKS	Drilling, completion & flowback ops = 75 days/well (225 days total). Install new service/utility pipeline, subsea manifold, flowline jumper, subsea construction actvities and commissioning = 36 days/well (108 days total for 3 wells). NOTE: Well life production emissions not included since the well(s) will be used for dumpflood water injection purposes. The wells will tie into the Marlin TLP located in VK Block 915 only for management of the tree bore pressure and for periodic testing of the subsea well valves. No production will be transported to the facility.

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 https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.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://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	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
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	
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 CALCULATIONS - 1st YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
Anadarko Petroleum Corporation	Mississippi Canyon (MC)		41 & 85	OCS-G 35962 &		MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface locations in MC	Teri Powell	832-636-1261	Drilling, completion & flowback ops = 75 days/well (225 days total). Install new service/utility pipeline, subsea manifold, flowline jumper, subsea construction actvities and commissioning =

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	VESSELS- Drilling - Propulsion Engine - Diesel		64370	3311.57902	79477.90	24	75	45.41	27.40	26.58	0.66	1088.03	31.28	0.00	170.65	0.32	40.87	24.66	23.92	0.59	979.22	28.15	0.00	153.59	0.29
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			250000		24	2	0.53	0.53	0.53	0.14	17.85	8.98	--	81.38	--	0.01	0.01	0.01	0.00	0.43	0.22	--	1.95	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		**kW**			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2025	**Facility Total Emissions**							**45.94**	**27.92**	**27.10**	**0.80**	**1,105.88**	**#DIV/0!**	**0.00**	**252.03**	**0.32**	**40.88**	**24.67**	**23.93**	**0.60**	**979.65**	**28.37**	**0.00**	**155.54**	**0.29**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,231.10**			**2,231.10**	**2,231.10**	**2,231.10**		**56,086.99**	
	67.0																								
DRILLING	VESSELS - Crew Diesel (3 trips/week)		10551	542.806747	13027.36	24	25	7.44	4.49	4.36	0.11	178.34	5.13	0.00	27.97	0.05	2.23	1.35	1.31	0.03	53.50	1.54	0.00	8.39	0.02
	VESSELS - Supply Diesel (2 trips/week)		12363	636.026899	15264.65	24	38	8.72	5.26	5.10	0.13	208.97	6.01	0.00	32.78	0.06	3.92	2.37	2.30	0.06	94.04	2.70	0.00	14.75	0.03
	VESSELS - Supply Diesel (Flowback Vessel)		12,217	628.515783	15084.38	24	4	8.62	5.20	5.04	0.13	206.50	5.94	0.00	32.39	0.06	0.41	0.25	0.24	0.01	9.91	0.28	0.00	1.55	0.00
	VESSELS - Supply (2) Diesel (Support Vessel)		27493	1414.40488	33945.72	24	3	19.40	11.70	11.35	0.28	464.71	13.36	0.00	72.89	0.14	0.70	0.42	0.41	0.01	16.73	0.48	0.00	2.62	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		45000	2315.07	55561.68	24	0	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBSEA SUPPLY/SUPPORT	VESSELS - Light Construction Vessel (LCV)		22000	1131.812	27163.49	24	36	15.52	9.36	9.08	0.23	371.86	10.69	0.00	58.33	0.11	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
	VESSELS - Supply Diesel (1)		15000	771.690001	18520.56	24	12	10.58	6.38	6.19	0.15	253.54	7.29	0.00	39.77	0.07	1.52	0.92	0.89	0.02	36.51	1.05	0.00	5.73	0.01
	VESSELS - Supply Diesel (2)		15000	771.690001	18520.56	24	18	10.58	6.38	6.19	0.15	253.54	7.29	0.00	39.77	0.07	2.29	1.38	1.34	0.03	54.76	1.57	0.00	8.59	0.02
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		**kW**			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	**Non-Facility Total Emissions**							**112.61**	**67.94**	**65.90**	**1.64**	**2,698.08**	**77.58**	**0.01**	**423.19**	**0.79**	**17.78**	**10.73**	**10.41**	**0.26**	**426.10**	**12.25**	**0.00**	**66.83**	**0.12**

AIR EMISSIONS CALCULATIONS - 2nd YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS
Anadarko Petroleum Corporation	Mississippi Canyon (MC)		41 & 85	OCS-G 35962 &		MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface locations in MC	Teri Powell	832-636-1261	Drilling, completion & flowback ops = 75 days/well (225 days total). Install new service/utility pipeline, subsea manifold, flowline jumper, subsea construction actvities and commissioning =

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	VESSELS- Drilling - Propulsion Engine - Diesel		64370	3311.57902	79477.90	24	75	45.41	27.40	26.58	0.66	1088.03	31.28	0.00	170.65	0.32	40.87	24.66	23.92	0.59	979.22	28.15	0.00	153.59	0.29
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			250000		24	2	0.53	0.53	0.53	0.14	17.85	8.98	--	81.38	--	0.01	0.01	0.01	0.00	0.43	0.22	--	1.95	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		**kW**			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2026	**Facility Total Emissions**							**45.94**	**27.92**	**27.10**	**0.80**	**1,105.88**	**#DIV/0!**	**0.00**	**252.03**	**0.32**	**40.88**	**24.67**	**23.93**	**0.60**	**979.65**	**28.37**	**0.00**	**155.54**	**0.29**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,231.10**			**2,231.10**	**2,231.10**	**2,231.10**		**56,086.99**	
	67.0																								
DRILLING	VESSELS - Crew Diesel (3 trips/week)		10551	542.806747	13027.36	24	25	7.44	4.49	4.36	0.11	178.34	5.13	0.00	27.97	0.05	2.23	1.35	1.31	0.03	53.50	1.54	0.00	8.39	0.02
	VESSELS - Supply Diesel (2 trips/week)		12363	636.026899	15264.65	24	38	8.72	5.26	5.10	0.13	208.97	6.01	0.00	32.78	0.06	3.92	2.37	2.30	0.06	94.04	2.70	0.00	14.75	0.03
0	VESSELS - Supply Diesel (Flowback Vessel)		12,217	628.515783	15084.38	24	4	8.62	5.20	5.04	0.13	206.50	5.94	0.00	32.39	0.06	0.41	0.25	0.24	0.01	9.91	0.28	0.00	1.55	0.00
	VESSELS - Supply (2) Diesel (Support Vessel)		27493	1414.40488	33945.72	24	3	19.40	11.70	11.35	0.28	464.71	13.36	0.00	72.89	0.14	0.70	0.42	0.41	0.01	16.73	0.48	0.00	2.62	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		45000	2315.07	55561.68	24	0	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBSEA INSTALLATION SUPPLY/SUPPORT	VESSELS - Light Construction Vessel (LCV)		22000	1131.812	27163.49	24	36	15.52	9.36	9.08	0.23	371.86	10.69	0.00	58.33	0.11	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
	VESSELS - Supply Diesel (1)		12363	636.026899	15264.65	24	12	8.72	5.26	5.10	0.13	208.97	6.01	0.00	32.78	0.06	1.26	0.76	0.74	0.02	30.09	0.87	0.00	4.72	0.01
	VESSELS - Supply Diesel (2)		10800	555.616801	13334.80	24	18	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	1.65	0.99	0.96	0.02	39.43	1.13	0.00	6.18	0.01
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		**kW**			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	**Non-Facility Total Emissions**							**107.79**	**65.03**	**63.08**	**1.57**	**2,582.51**	**74.25**	**0.01**	**405.06**	**0.75**	**16.88**	**10.18**	**9.88**	**0.25**	**404.34**	**11.63**	**0.00**	**63.42**	**0.12**

AIR EMISSIONS CALCULATIONS -3rd YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Anadarko Petroleum Corporation	Mississippi Canyon (MC)		41 & 85	OCS-G 35962 &		MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface locations in MC					Teri Powell		832-636-1261		Drilling, completion & flowback ops = 75 days/well (225 days total). Install new service/utility pipeline, subsea manifold, flowline jumper, subsea construction actvities and commissioning =										
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	VESSELS- Drilling - Propulsion Engine - Diesel		64370	3311.57902	79477.90	24	75	45.41	27.40	26.58	0.66	1088.03	31.28	0.00	170.65	0.32	40.87	24.66	23.92	0.59	979.22	28.15	0.00	153.59	0.29
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			250000		24	2	0.53	0.53	0.53	0.14	17.85	8.98	--	81.38	--	0.01	0.01	0.01	0.00	0.43	0.22	--	1.95	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		**kW**			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2027	**Facility Total Emissions**							**45.94**	**27.92**	**27.10**	**0.80**	**1,105.88**	**#DIV/0!**	**0.00**	**252.03**	**0.32**	**40.88**	**24.67**	**23.93**	**0.60**	**979.65**	**28.37**	**0.00**	**155.54**	**0.29**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**2,231.10**			**2,231.10**	**2,231.10**	**2,231.10**		**56,086.99**	
	67.0																								
DRILLING	VESSELS - Crew Diesel (3 trips/week)		10551	542.806747	13027.36	24	25	7.44	4.49	4.36	0.11	178.34	5.13	0.00	27.97	0.05	2.23	1.35	1.31	0.03	53.50	1.54	0.00	8.39	0.02
	VESSELS - Supply Diesel (2 trips/week)		12363	636.026899	15264.65	24	38	8.72	5.26	5.10	0.13	208.97	6.01	0.00	32.78	0.06	3.92	2.37	2.30	0.06	94.04	2.70	0.00	14.75	0.03
0	VESSELS - Supply Diesel (Flowback Vessel)		12,217	628.515783	15084.38	24	4	8.62	5.20	5.04	0.13	206.50	5.94	0.00	32.39	0.06	0.41	0.25	0.24	0.01	9.91	0.28	0.00	1.55	0.00
	VESSELS - Supply (2) Diesel (Support Vessel)		27493	1414.40488	33945.72	24	3	19.40	11.70	11.35	0.28	464.71	13.36	0.00	72.89	0.14	0.70	0.42	0.41	0.01	16.73	0.48	0.00	2.62	0.00
PIPELINE	VESSELS - Support Diesel, Laying		45000	2315.07	55561.68	24	0	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBSEA INSTALLATION	VESSELS - Light Construction Vessel (LCV)		22000	1131.812	27163.49	24	36	15.52	9.36	9.08	0.23	371.86	10.69	0.00	58.33	0.11	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
SUPPLY/SUPPORT	VESSELS - Supply Diesel (1)		12363	636.026899	15264.65	24	12	8.72	5.26	5.10	0.13	208.97	6.01	0.00	32.78	0.06	1.26	0.76	0.74	0.02	30.09	0.87	0.00	4.72	0.01
	VESSELS - Supply Diesel (2)		10800	555.616801	13334.80	24	18	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	1.65	0.99	0.96	0.02	39.43	1.13	0.00	6.18	0.01
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		**kW**			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	**Non-Facility Total Emissions**							**107.79**	**65.03**	**63.08**	**1.57**	**2,582.51**	**74.25**	**0.01**	**405.06**	**0.75**	**16.88**	**10.18**	**9.88**	**0.25**	**404.34**	**11.63**	**0.00**	**63.42**	**0.12**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Anadarko Petroleum Corporation	41 & 85	OCS-G 35962 &		MC 41 "A" (#SS001), and MC 41 "AA", and MC 41 "AAA" ; (all wells have surface		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2025	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
2026	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
2027	40.88	24.67	23.93	0.60	979.65	28.37	0.00	155.54	0.29
Allowable	2,231.10			2231.10	2231.10	2231.10		56086.99	

SECTION I
OIL SPILL INFORMATION

(a) Oil Spill Response Planning

(i) OSRP Information

All the proposed activities and facilities in this DOCD are covered by the Regional Oil Spill Response Plan (OSRP) approved in August 2015 for Anadarko Petroleum Corporation and its subsidiary Anadarko US Offshore LLC. (Company Numbers 00981 and 02219 respectively) in accordance with 30 CFR Part 254. The 2023 OSRP biennial update was deemed in-compliance in June 2023 and the August 2023 revisions were approved in October 2023.

(ii) Spill Response Sites

Primary Response Equipment Location(s)	Preplanned Staging Location(s)
Houma, Louisiana	Fourchon, Louisiana
Harvey, Louisiana	Harvey, Louisiana
Venice, Louisiana	Venice, Louisiana
Lake Charles, Louisiana	Cameron, Louisiana
Galveston, Texas	Galveston, Texas

(iii) OSRO Information

Anadarko maintains a contract with Clean Gulf Associates (CGA) for spill response equipment. Various equipment locations are staged throughout the Gulf of Mexico. CGA equipment can be referenced on their website: http://www.cleangulfassoc.com/. Personnel would be obtained from the Marine Spill Response Corporation's (MSRC) STARS network, including a supervisor to operate the equipment.

In addition, Anadarko has a contract with the Marine Spill Response Corporation (MSRC) for spill response equipment. MSRC stages equipment throughout the Gulf of Mexico and has recently completed a large expansion of its resources, with particular focus on deepwater. The expansion is known as "Deep Blue". MSRC capabilities and a complete equipment listing is available on-line at: http://www.msrc.org/.

Anadarko is also a member of the Marine Well Containment Company (MWCC), which provides access to containment response capabilities and includes subsea dispersant injection equipment.

(iv) Worst-Case Scenario Determination

Category	Regional OSRP (S-7623)	DOCD Drilling	Regional OSRP	DOCD Production
Type of Activity	Exploratory	Exploratory	Production	Injection/Waterflood*
Facility Location (area/block)	GC 683	MC 41	GC 680	MC 41
Facility Designation	GC 683 G	Location A (#001)	Platform A	Well #001 (SS001)
Distance to Nearest Shoreline	120 miles	64 miles	120 Miles	64 miles
Storage Tanks (total)	N/A	N/A	5,735 bbls	N/A
Flowlines (on facility)	N/A	N/A	1,892 bbls	N/A
Lease Term Pipelines	N/A	N/A	11,682 bbls	N/A
Uncontrolled Blowout	403,608 bopd	33,146 bopd	47,380 bopd	N/A
Total Volume	403,608 bopd	33,146 bopd	66,689 bopd	N/A
Type of Oil(s)	Oil	Oil	Oil	Water
Gravity	28.9°	32.4°	30°	N/A

*No previously approved DOCD's for MC 85 or 41, therefore no production WCD has been included for these blocks.

Anadarko has determined that the worst-case scenario from the activities proposed in this Initial DOCD do not supersede the worst-case scenario for the OSRP drilling or production WCD.

Since Anadarko has the capability to respond to the worst-case spill scenario included in our Regional OSRP approved in August 2015, and the 2023 biennial update that was deemed in-compliance in June 2023 and the August 2023 revisions that were approved in October 2023, I hereby certify that Anadarko Petroleum Corporation 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 our DOCD.

(b) Worst-Case Discharge Volume Assumptions

Well Objectives

The proposed Mississippi Canyon (MC) Block 41 (OCS G-35962) A well, located on the southwestern side of MC 41, is designed to test for injection the M66 and M63 Middle Miocene aged stratigraphic targets. These sands dip to the north away from an extensional horst and graben fault system to the south. The estimated Worst-Case Discharge (WCD) for this well is 33,146 BOPD from the M66, UM90, and M63 sands.

(c) Oil Spill Response Discussion

For the purpose of NEPA analysis, the largest spill volume originating from the proposed activity would be an uncontrolled blowout of the well during drilling operations at 33,146 BOPD with an API gravity of 32.4°. A discussion of the blowout scenario from this proposed activity is included within this Initial DOCD under **Section B.**

Land Segment and Resource Identification Modeling

Trajectory of a spill and the probability of it impacting a land segment have been projected utilizing information in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central Gulf of Mexico. Additional information may be referenced in the "Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities" (OCS Report MMS 2004-026), using the average conditional probability for 3, 10 and 30 day impacts.

Mississippi Canyon is located within Launch Area C57. According to the BOEM OSRAM, the trajectory indicates a 21% probability of potential impact to the shoreline in Plaquemines Parish, Louisiana. The results are shown in **Table I-2.**

Plaquemines Parish is identified as the most probable potential impacted parish or county within the Gulf of Mexico for this operation. Plaquemines Parish includes Barataria Bay, the Mississippi River Delta, Breton Sound and the affiliated islands and bays. This region is an extremely sensitive habitat and serves as a migratory, breeding, feeding and nursery habitat for numerous species of wildlife. Beaches in this area vary in grain particle size and can be classified as fine sand, shell or perched shell beaches. Sandy and muddy tidal flats are also abundant.

Response

Anadarko will make every effort to respond to the worst-case discharge as effectively as possible. Response equipment available to respond to the worst-case discharge and the estimated time of a spill response from oil spill detection to equipment deployment on-site is included in **Table I-3.** The table estimates individual times needed for procurement, load out, travel time to the site and deployment. In the event of an actual incident equipment and times can vary.

For the purpose of response scenario discussion, an uncontrolled blowout of the well would be considered the largest potential spill volume at 33,146 BOPD. An ADIOS weathering model was run based on a similar type of oil expected to be produced from this well. Based on this information, approximately 23% (7,624 bbls) of the initial volume would be evaporated/ dispersed within 24 hours.

If approved and appropriate, 8 sorties (9,600 gallons) from two of the DC-3 aircrafts and 4 sorties (8,000 gallons) from the Basler aircraft could provide a daily dispersant capability of 7,540 bbls. The C-130 also has dispersant capability.

If the conditions are appropriate, and the necessary approvals and permits have been obtained, in-situ burning may be utilized. Based on in-situ burn operations during Deepwater Horizon, approximately 5% (1,657 bbls) of the total initial worst case discharge could be burned.

Although unlikely in a spill lasting thirty (30) days, potential shoreline impact in Plaquemines Parish, Louisiana could occur depending on environmental conditions (wind, currents and temperature) at the time of an incident. Nearshore response may include the use of shoreline boom on beach areas, or protection/sorbent boom on vegetated areas. Surveillance and real time trajectories would aide in determining the most appropriate strategies to respond to a spill.

Table I.3 provides an example of offshore and nearshore equipment, response times, and personnel to respond to a spill of 25,522 bbls, which is the estimated amount that would remain considering natural evaporation/dispersion at 24 hours. This amount could be further reduced through the application of aerial and subsea dispersants, and in-situ burning provided such applications/actions were approved.

Anadarko's contingency plan for dealing with this worst-case discharge would be to activate its Spill Management Team and equipment resources as described in its Gulf of Mexico Regional Oil Spill Response Plan (OSRP) and provide continuous support for the duration of the event. Response resources are activated and supplemented according to need. These resources would remain engaged in the response until the incident is deemed complete or until released by Unified Command.

Anadarko is a member of the Marine Well Containment Company (MWCC), which provides access to containment response capabilities and includes subsea dispersant injection equipment. In the event of a blowout, Anadarko may:

1. Evacuate personnel, if necessary. Deploy emergency responders in an effort to preserve human life, if necessary.

2. Assess the damage and attempt to stop the flow at the source, if safe to do so, to reduce the amount of oil discharged.

3. Notify agencies.

4. Assess the amount of oil that has been spilled and calculate additional potential of oil flow. A continuous aerial surveillance program would be used to assess the growth of the slick and the volume of oil on the water. Observations of the size of the slick on the water, combined with observations at the source, would be used to provide a constant update. Additional potential to release fuel from the remaining tanks onboard the drilling rig would be determined by marine surveyors. Operations and Unified Command would continue to assess the adequacy of response equipment capacities based on this continually updated mass balance.

5. Convene the Spill Management Team (SMT). Organize Unified Command and establish objectives and priorities.

6. Monitor the oil spill with aerial surveillance and obtain trajectories. If oil is seaward bound, going away from land, discuss additional strategies with Unified Command.

7. If oil is moving in the direction of a shoreline and weather conditions are favorable, request approval to utilize dispersants.

   a. Prior to commencing application operations, conduct an on-site survey in consultation with natural resource specialists to determine if any threatened or endangered species are present in the projected application area or otherwise at risk from dispersant application.

   b. Upon approval, mobilize one Basler aircraft, two DC-3 aircrafts and one C-130 with surveillance aircraft and spotter. Rotate aircraft, spraying the leading edge of the spill and working back to the source. Monitor/sample for effectiveness (USCG SMART Team). Truck additional dispersants from CGA or MSRC stockpile if necessary.

   c. Dispersants are most effective when applied as soon after discharge as possible, since weathering of the oil decreases dispersant effectiveness. The estimated window of opportunity for most effective use of dispersants is within 48-72 hours post-release. The oil may still be dispersible after 72 hours on the water surface, but the effectiveness of dispersant use would likely be diminished after the oil has been on the water for more than three days. Ultimately, the USCG SMART monitoring protocol will be used to determine whether or not dispersant operations are effective.

   d. Once the CGA HOSS barge is on location and in the skimming mode, dispersants would only be used if required and approved.

8. Deploy offshore mechanical oil containment and recovery equipment. Attempt to recover as much oil at sea as possible, utilizing:

   a. The CGA HOSS barge, will be positioned in a stationary mode, will be situated down-wind and down-current from location for long-duration, high-volume skimming. Based on average travel times, the HOSS barge could be on location within approximately 48 hours of the release. The de-rated skimming capacity of the HOSS barge is 76,285 bbls per day. However, only the oil encountered by a skimmer can be recovered. In order to maximize oil encounter rate, boom will be deployed in a V-configuration in front of the HOSS barge to funnel oil to the skimmers. If necessary, temporary barges can be activated to support continuous skimming operations. (These barges arrive on-site at approximately the same time as the HOSS barge.) For an on-going release, multiple barges are deployed to provide for continuous off-loading of skimmer storage vessels and shuttling of recovered oil to an onshore waste handling facility. Sufficient barges are available to provide enough temporary storage for continuous recovery operations.

b. CGA's Fast Response Vessels (FRV) would arrive on-scene between approximately 11.5-18.5 hours of the initial release. These skimmers operate downstream of the HOSS barge and are used to recover pockets and streamers of oil that may move past the large stationary skimmer. The FRV's has approximately 249 barrels of on-board storage. Approval will be requested to decant water after gravity separation, through a hose forward of the skimmer, to optimize temporary storage capacity. Auto boom will be utilized to concentrate oil so that it is thick enough to be skimmed.

9. Dispersants, Fast Response Vessels (FRV), Oil Spill Response Vessels (OSRV or R/V) would typically work daylight hours only. The HOSS barge can operate continuously, including night operations. Available technology will be considered such as remote sensing devices that will enable 24-hour surveillance, trajectories, and planning. All response vessels are designed to be able to remain offshore continuously throughout the response. Even if sea conditions prohibit effective skimming, these resources would remain offshore until skimming operations could be commenced again. Safety would remain the first priority.

10. Prepare site-specific Waste Management Plan, Site Safety Plan, Decontamination Plans, Communications and Medical Plans.

11. If oil becomes a threat to any shoreline, data from the aerial surveillance, weather reports, and trajectories would be used to direct onshore teams to deploy protection/containment boom with reference to Area Contingency Plans and in coordination with State and Federal On-Scene Coordinators.
    a. Implement pre-designated strategies.
    b. Identify resources at risk in spill vicinity.
    c. Develop/implement appropriate protection tactics.

12. Establish site-specific Wildlife Rescue and Rehabilitation Plan.

The following types of additional support may be required for a blowout lasting 120 days.

- Additional Oil Spill Removal Organization (OSRO) personnel to relieve equipment operators
- Vessels for supporting offshore operations
- Field safety personnel
- Continued surveillance and monitoring of oil movement
- Helicopter, video cameras
- Infra-red (night time spill tracking) capabilities, X-band radar
- Barge to transport recovered oil from offshore skimming system, and temporary storage barges to onshore disposal sites that are identified in Area Contingency Plans (ACP)
- Logistics needed to support equipment:
    - Staging areas
    - Parts, trailers, and mechanics to maintain skimmers and boom
    - Fueling facilities
    - Decontamination stations

  - Dispersant stockpile transported from Houston to Houma or other potential command post locations
  - Communications equipment and technicians
- Logistics needed to support responder personnel
  - Medical aid stations
  - Safety personnel
  - Food
  - Berthing
  - Additional clothing/safety supplies
  - Decontamination stations

Louisiana CZM Containment Response Information

Anadarko has the capability to respond and contain, to the maximum extent practicable as defined in 30 CFR 254.6 and 30 CFR 250.26(d)(1), to the estimated worst case discharge (WCD) associated with the proposed activity within 30 days. Deployment time for surface containment equipment is subject to availability and location, weather conditions, potential security zones around the spill site, and site/well specific assessment data. Personnel safety is always first and foremost. Refer to further details on equipment and timing provided in **Section I–Oil Spill Information** and **Table I-3** of the DOCD.

There will be no new or unusual technology deployed that has not been previously deployed for Gulf of Mexico oil spill prevention, control, and/or cleanup.

Table I-1

Worst Case Discharge Calculation
(Based on Blowout during Drilling Operations–Overall Highest WCD)

Calculations for Uncontrolled Blowout> 10 miles from shore:		**MC 41, 85**
i.	Type of Oil (crude, condensate, diesel)	Crude
ii.	API Gravity	32.4˚
iii.	DOCD Location Used for WCD	MC 41 “A” Well #001 (SS001)
iv.	Largest Anticipated WCD Rate during blowout	33,146 BOPD
v.	**WCD Total for Production Operations for MC 85 (> 10 miles from shore):**	**33,146 BOPD**

Table I-2

Trajectory by Land Segment

Following are the average conditional probabilities (expressed as percent chance) that an oil spill starting at a particular launch area will contact a land segment as included in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico. This information can be found on the BOEM website using 3/10/30 day potential impact, as applicable. The results are listed below.

Area/Block	OCS-G	Launch Area	Land Segment and/or Resource	Conditional Probability (%)		
				3 days	10 days	30 days
MC 41, 85	G35962, G08797	C57				
Drill, Complete, Test and Install Subsea Trees (64 miles from shore)		Central Planning Area	Cameron, LA	--	--	1
			Vermilion, LA	--	--	1
			Terrebonne, LA	--	1	2
			Lafourche, LA	--	1	2
			Plaquemines, LA	**4**	**14**	**21**
			St. Bernard, LA	--	**1**	**3**
			Hancock & Harrison, MS	--	--	1
			Jackson, MS	--	--	1
			Mobile, AL	--	--	1
			Baldwin, AL	--	--	1
			Escambia, FL	--	--	1
			Okaloosa, FL	--	--	1
			Walton, FL	--	--	1
			Bay, FL	--	--	1

Table I-3

WCD Scenario Production Activities – Based on a single well uncontrolled blowout (64 miles from shore)
MC 41 "A", Well #001
33,146 BOPD (initial volume)
25,522 BOPD (after evaporation/dispersion)
API Gravity 32.4º

Offshore Equipment from Spill Detection to Equipment Deployment Response Time: MC 41 "A", Well #001

Dispersants/Surveillance

Dispersant/Surveillance	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI							
Basler 67T	2000	2	Houma	2	2	0.8	4.8
DC 3	1200	2	Houma	2	2	1.1	5.1
DC 3	1200	2	Houma	2	2	1.1	5.1
Aero Commander	NA	2	Houma	2	2	0.8	4.8
MSRC							
C-130 Spray AC	3,250	2	Melbourne, FL	4	0	1.9	5.9

Offshore Response

Offshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
HOSS Barge	76285	4000	3 Tugs	12	Harvey	6	0	12	26.9	2	46.9
95' FRV	22885	249	NA	6	Venice	2	0	3	7.5	1	13.5
95' FRV	22885	249	NA	6	Leeville	2	0	2	6.5	1	11.5
95' FRV	22885	249	NA	6	Galveston	2	0	2	13.5	1	18.5
95' FRV	22885	249	NA	6	Vermilion	2	0	3	9.3	1	15.3
Boom Barge (CGA-3000 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville	8	0	4	18.5	2	32.5
Kirby Offshore (available through contract with CGA)											
RO Barge	NA	80000+	1 Tug	6	Venice	34	0	6	19	1	60
RO Barge	NA	80000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	100000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	100000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	100000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	110000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	130000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	140000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	150000+	1 Tug	6	Venice	34	0	6	17.5	1	60
RO Barge	NA	160000+	1 Tug	6	Venice	34	0	6	17.5	1	60

Offshore Response

Offshore Equipment No Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
MSRC											
Louisiana Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Fort Jackson	2	0	4	10	1	17
MSRC 401 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	45000	3 Tugs + 1-2 Support Vessels	9	Fort Jackson	4	0	6	18	1	29
Mississippi Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Pascagoula	2	0	2	19	1	25
MSRC 402 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40300	3 Tugs + 1-2 Support Vessels	9	Pascagoula	4	0	3	34	1	42
S.T. Benz Responder 1 LFF 100 Brush *2,640' 67" Curtain Pressure Boom*	18086	4000	1-2 Support Vessels	10	Grand Isle	3	0	1	10.5	1	14.5
Gulf Coast Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Lake Charles	2	0	4	16	1	23
Texas Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Galveston	2	0	1	19	1	23
MSRC 570 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	56900	3 Tugs + 1-2 Support Vessels	9	Galveston	4	0	2	34	1	41
Southern Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Ingleside	2	0	2	27	1	32
MSRC 403 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40300	3 Tugs + 1-2 Support Vessels	9	Ingleside	4	0	3	47	1	55
MSRC 360 Offshore Barge 1 Crucial Disk 88/30 *1,320' 67" Curtain Pressure Boom*	11122	36000	3 Tugs + 1-2 Support Vessels	9	Tampa	4	0	3	63	1	71
Florida Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	1-2 Support Vessels	10	Miami	2	0	1	54	1	58

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
T&T Marine (Available through contract with CGA)											
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Galveston	4	12	11.8	11	2	40.8
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Harvey	4	12	2.7	11	2	31.7
Koseq Skimming Arms (10) Lamor brush	228850	60000	10 OSV	60	Galveston	24	24	11.8	11	2	72.8
Koseq Skimming Arms (6) Lamor brush	137310	36000	6 OSV	36	Harvey	24	24	2.7	11	2	63.7
Koseq Skimming Arms (6) MariFlex 150 HF	108978	36000	6 OSV	36	Harvey	24	24	2.7	11	2	63.7
CGA											
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Vermilion	2	6	4.5	11	1	24.5
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Galveston	2	6	11.8	11	1	31.8
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Aransas Pass	2	6	16.5	11	1	36.5
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice	2	6	5	11	1	25
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville	2	6	2	11	1	22
MSRC											
Crucial Disk 56/30 Skimmer (1)	5671	500	1 Utility	5	Ingleside	1	2	17	11	1	32
Stress I Skimmer (1)	15840	500	1 Utility	5	Ingleside	1	2	17	11	1	32
Crucial Disk 88/30 Skimmer (1)	11122	500	1 Utility	9	Galveston	1	2	12	11	1	27
Stress I Skimmer (1)	15840	500	1 Utility	5	Galveston	1	2	12	11	1	27
Stress I Skimmer (2)	31680	1000	2 Utility	10	Lake Charles	1	2	7	11	1	22

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
MSRC											
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	400	1 PSV + 1-2 Support Vessels	9	Lake Charles	1	2	7	11	1	22
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	400	1 PSV + 1-2 Support Vessels	9	Lake Charles	1	2	7	11	1	22
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	400	1 PSV + 1-2 Support Vessels	9	Lake Charles	1	2	7	11	1	22
Transrec 350 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	10567	400	1 PSV + 1-2 Support Vessels	9	Lake Charles	1	2	7	11	1	22
Transrec 350 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	10567	400	1 PSV + 1-2 Support Vessels	9	Lake Charles	1	2	7	11	1	22
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	400	1 PSV + 1-2 Support Vessels	9	Houma	1	2	2	11	1	17
Crucial Disk 56/30 Skimmer (1)	5671	400	1 Utility	5	Belle Chasse	1	2	3	11	1	18
Stress I Skimmer (1)	15840	500	1 Utility	5	Fort Jackson	1	2	5	11	1	20
Crucial Disk 88/30 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	11122	400	1 PSV + 1-2 Support Vessels	9	Fort Jackson	1	2	5	11	1	20
Crucial Disk 88/30 Skimmer (1) *1,320' 67" Curtain Pressure Boom*	11122	400	1 PSV + 1-2 Support Vessels	9	Fort Jackson	1	2	5	11	1	20
Crucial Disk 88/30 Skimmer (1)	11122	500	1 Utility	9	Pascagoula	1	2	6	11	1	21
Stress I Skimmer (1)	15840	500	1 Utility	5	Pascagoula	1	2	6	11	1	21
Stress II Skimmer (1)	3017	400	1 Utility	5	Pascagoula	1	2	6	11	1	21
Stress I Skimmer (1)	15840	400	1 Utility	5	Tampa	1	2	22	11	1	37
Crucial Disk 56/30 Skimmer (1)	5671	400	1 Utility	5	Tampa	1	2	22	11	1	37
Stress I Skimmer (1)	15840	400	1 Utility	5	Miami	1	2	28	11	1	43

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey	0	24	3	11	6	44
MSRC											
67" Curtain Pressure Boom (53570')	NA	NA	14*	7	Houston	1	2	11	11	1	26
1000' Fire Resistant Boom	NA	NA	3*	6	Galveston	1	4	12	11	6	34
16000' Fire Resistant Boom	NA	NA	3*	6	Houston	1	4	11	11	6	33
2000' Hydro Fire Boom	NA	NA	8*	8	Lake Charles	1	4	7	11	6	29

** Utility Boats, Crew Boats, Supply Boats, or Fishing Vessels*

Nearshore Equipment from Spill Detection to Equipment Deployment Response Time: MC 41 "A", Well #001

Nearshore Response – Cameron Parish

Nearshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
Mid-Ship SWS	22885	249	NA	4	Galveston	2	0	N/A	48	1	51
Trinity SWS	21500	249	NA	4	Galveston	2	0	N/A	48	1	51
Trinity SWS	21500	249	NA	4	Vermilion	2	0	N/A	48	1	51
46' FRV	15257	65	NA	4	Aransas Pass	2	0	2	16	1	21
46' FRV	15257	65	NA	4	Vermilion	2	0	2	2.5	1	7.5
MSRC											
MSRC Quick Strike 2 LORI Brush Pack	5000	50	NA	6	Lake Charles	2	0	1	3	1	7
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2607	NA	23000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2608	NA	23000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2609	NA	23000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 5001	NA	47000	1 Tug	6	Amelia	26	0	6	15	1	48

Staging Area: Cameron

Nearshore and Inland Skimmers With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
SWS Egmopol	1810	100	NA	3	Galveston	2	2	5	2	1	12
SWS Marco	3588	20	NA	3	Vermilion	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Vermilion	4	12	2	2	2	22
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Galveston	4	12	5	2	2	25
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Vermilion	2	2	2	2	1	9
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermilion	2	2	2	2	1	9
MSRC											
30 ft. Kvichak *Marco I Skimmer*	3588	24	NA	2	Ingleside	1	1	10	2	1	15
30 ft. Kvichak *Marco I Skimmer*	3588	24	NA	2	Galveston	1	1	3.6	2	1	8.6
Walosep 4 Skimmer (1)	3017	400	1 Utility	5	Galveston	1	1	3.6	2	1	8.6
Queensboro Skimmer (1)	905	400	1 Utility	4	Galveston	1	1	3.6	2	1	8.6
Queensboro Skimmer (5)	4525	2000	5 Utility	20	Lake Charles	1	1	1.5	2	1	6.5
AardVac Skimmer (1)	3840	400	1 Utility	4	Lake Charles	1	1	1.5	2	1	6.5

Shoreline Protection – Cameron Parish

Staging Area: Cameron

Shoreline Protection Boom	VOO	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
ES&H (available through MSA)									
14,000' 18" Boom	6 Crew	12	LaPlace, LA	.5	.5	6	2	4	13
16,000' 18" Boom	6 Crew	12	Lake Charles, LA	.5	.5	2	2	4	9
100' 18" Boom	1 Crew	2	Morgan City, LA	.5	.5	6	2	1	10
1,000' 18" Boom	1 Crew	2	Fourchon, LA	.5	.5	7	2	1	11

Wildlife Response	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass	2	2	9.5	1	2	16.5
Bird Scare Guns (48)	NA	NA	NA	2	Vermilion	2	2	2	1	2	9

Nearshore Response – Plaquemines Parish

Nearshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
Mid-Ship SWS	22885	249	NA	4	Leeville	2	0	N/A	48	1	51
Mid-Ship SWS	22885	249	NA	4	Venice	2	0	N/A	48	1	51
Trinity SWS	21500	249	NA	4	Vermilion	2	0	N/A	48	1	51
Trinity SWS	21500	249	NA	4	Leeville	2	0	N/A	48	1	51
46' FRV	15257	65	NA	4	Leeville	2	0	2	6	1	11
46' FRV	15257	65	NA	4	Venice	2	0	2	2	1	7
MSRC											
MSRC Lightning 2 LORI Brush Pack	5000	50	NA	6	Tampa	2	0	1	20	1	24
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2604	NA	20000	1 Tug	6	Amelia	25	0	6	16	1	48
CTCo 2605	NA	20000	1 Tug	6	Amelia	25	0	6	16	1	48
CTCo 2606	NA	20000	1 Tug	6	Amelia	25	0	6	16	1	48
Kirby Offshore (available through contract with CGA)											
RO Barge	NA	100000+	1 Tug	6	Venice	48	0	4	7	1	60

Staging Area: Venice

Nearshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
					CGA						
SWS Egmopol	1810	100	NA	3	Leeville	2	2	4.5	2	1	11.5
SWS Marco	3588	34	NA	3	Leeville	2	2	4.5	2	1	11.5
SWS Marco	3588	34	NA	3	Venice	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Harvey	4	12	2	2	2	22
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey	2	2	2	2	1	9
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey	2	2	2	2	1	9
					MSRC						
30 ft. Kvichak *Marco I Skimmer*	3588	24	NA	2	Belle Chasse	1	1	2	2	1	7
30 ft. Kvichak *Marco I Skimmer*	3588	24	NA	2	Pascagoula	1	1	5.5	2	1	10.5
Queensboro Skimmer (1)	905	400	1 Utility	4	Belle Chasse	1	1	2	2	1	7
AardVac Skimmer (1)	3840	400	1 Utility	4	Pascagoula	1	1	5.5	2	1	10.5
WP 1 Skimmer (1)	3017	400	1 Utility	4	Pascagoula	1	1	5.5	2	1	10.5
Queensboro Skimmer (1)	905	400	1 Utility	4	Pascagoula	1	1	5.5	2	1	10.5
WP 1 Skimmer (1)	3017	400	1 Utility	4	Tampa	1	1	21	2	1	26
AardVac Skimmer (2)	7680	800	2 Utility	8	Miami	1	1	27	2	1	32
WP 1 Skimmer (1)	3017	400	1 Utility	4	Miami	1	1	27	2	1	32

Shoreline Protection – Plaquemines Parish

Staging Area: Venice

Shoreline Protection Boom	VOO	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment Site	Hrs to Deploy	Total Hrs
AMPOL (available through MSA)									
34,050' 18" Boom	13 Crew	26	New Iberia, LA	2	2	6	2	12	24
12,850' 18" Boom	7 Crew	14	Chalmette, LA	2	2	2.5	2	6	14.5
900' 18" Boom	1 Crew	2	Morgan City, LA	2	2	4.5	2	2	12.5
3,200' 18" Boom	2 Crew	4	Venice, LA	2	2	0	2	2	8
12,750' 18" Boom	7 Crew	14	Port Arthur, TX	2	2	10	2	6	22
OMI Environmental (available through MSA)									
14,000' 18" Boom	6 Crew	12	Belle Chasse, LA	1	1	2	2	3	9
2,000' 18" Boom	1 Crew	2	Galliano, LA	1	1	4	2	3	11
1,800' 18" Boom	1 Crew	2	Gonzalez, LA	1	1	4	2	3	11
11,800' 18" Boom	5 Crew	10	Harvey, LA	1	1	2	2	3	9
2,000' 18" Boom	2 Crew	4	Houma, LA	1	1	4	2	3	11
2,400' 18" Boom	2 Crew	4	Morgan City, LA	1	1	5	2	3	12
3,800' 18" Boom	2 Crew	4	New Iberia, LA	1	1	6	2	3	13
2,300' 18" Boom	2 Crew	4	Port Allen, LA	1	1	5	2	3	12
1,500' 18" Boom	1 Crew	2	Venice, LA	1	1	0	2	3	7
19,000' 18" Boom	6 Crew	12	Deer Park, TX	1	1	12	2	3	19
11,000' 18" Boom	5 Crew	10	La Marque, TX	1	1	13	2	3	20
20,000' 18" Boom	6 Crew	12	Port Arthur, TX	1	1	10	2	3	17

**Some equipment may be used offshore up to approximately 25 miles from shore*

Wildlife Response	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
Wildlife Support Trailer	NA	NA	NA	2	Harvey	2	2	2	1	2	9
Bird Scare Guns (24)	NA	NA	NA	2	Harvey	2	2	2	1	2	9
Bird Scare Guns (12)	NA	NA	NA	2	Galveston	2	2	13	1	2	20
Bird Scare Guns (24)	NA	NA	NA	2	Leeville	2	2	4.5	1	2	11.5

Response Asset	Total
Offshore EDRC (bbls)	1,147,682
Offshore Recovered Oil Storage (bbls)	1,548,996+
Nearshore / Shallow Water EDRC (bbls)	294,320
Nearshore / Shallow Water Recovered Oil Storage (bbls)	310,437+

Operational Limitations of Response Equipment

- HOSS Barge–8' seas
- Fast Response Vessel (FRV)–8' seas
- Oil Spill Response Vessel (OSRV and R/V)–4' seas
- Boom–3' seas, 20 knot winds
- Dispersants–winds more than 25 knots, visibility less than 3 nautical miles or ceiling less than 1,000'

SECTION J
ENVIRONMENTAL MONITORING INFORMATION

(a) Monitoring Systems

Anadarko Petroleum Corporation will monitor loop currents per NTL 2018-G01.

Anadarko subscribes to WeatherOps which provides real-time weather conditions such as tropical depressions, storms and/or hurricanes entering the Gulf.

(b) Incidental Takes

Anadarko will utilize a contracted rig to perform the operations proposed under this plan. The following information utilizes specs from the *Noble BlackHawk* drillship; however, a different rig (DP drillship or DP-semi) may be utilized during operations. There are no anchors, ropes, or chains associated with the operations proposed in this plan, this includes the drillship, supply boats and crew boats.

The *Noble BlackHawk* has a typical moon pool that is used in all deepwater Dynamic Positioned Drillships and Semi-submersibles. The moon pool is located in the center of the rig with a rectangular opening measuring 73' x 42'. The moon pool's purpose is to allow access to the water to drill, complete and workover wells. This also allows access to run the Blowout Preventer (BOP) to latch-up to the well for well control in the event of an emergency. There is no closing mechanism for the moon pool as it is always open to the sea. In normal operating mode, the draft of the vessel is 36'.

In the unlikely scenario that, marine life becomes entrapped and/or entangled by equipment in the Moonpool, or by other rig equipment, the following mitigations will be exercised to protect marine life:

- Provide a dedicated crew member to survey the moonpool area for marine life while moving any equipment in or out of the moonpool area.
- Operations will cease, when safe to do so, if marine life that may be endangered is detected in the moonpool area and will not resume until the area is free and clear.
- Monitor video from the three cameras that is focused on the moonpool area.
- If endangered marine life is detected within a close proximity of the proposed operations, a live video feed can stream real-time footage for additional coverage.
- In most cases, if marine life is entrapped or entangled, someone can be safely lowered into the moonpool to free it.

Although marine mammals may be seen in the area, Anadarko does not believe that its operations proposed under this Initial DOCD will result in the harassment, capture, collection or killing of any marine mammals covered by the Marine Mammal Protection Act.

Anadarko will operate in accordance with applicable regulations, including:

- NTL No. 2016-G02 “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program”
- BSEE NTL No. 2015-G03 “Marine Trash and Debris Awareness and Elimination”
- JOINT NTL No. 2016-G01 “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”, and
- National Marine Fisheries Service Biological Opinion issued on March 13, 2020:
    - Appendix A: Seismic Survey Mitigation and Protected Species Observer Protocols
    - Appendix B: Marine Trash and Debris Awareness and Elimination Survey Protocols
    - Appendix C: Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols
    - Appendix J: Sea Turtle Handling and Resuscitation Guidelines

(c) Environmental Mitigation Measures

The Environmental Impact Analysis in **Section P** of this plan further discusses potential impacts and mitigation measures related to threatened and endangered species.

This DOCD does not propose activities for which the State of Florida is an affected state. Therefore, the discussion required per NTL 2008-G04 is not applicable to this DOCD.

Onshore Support Vessels

For vessel transit the most practical, direct route from each proposed shore base, as permitted by weather and traffic conditions, will be utilized. Anadarko does not anticipate that these routes will transit within the Rice’s whale core area for the operations covered under this plan as designated by the March 13, 2020, National Marine Fisheries Service (NMFS) programmatic Biological Opinion (BiOp). In the event vessel routes change, BSEE/BOEM will be contacted 15 days in advance.

SECTION K
LEASE STIPULATIONS INFORMATION

Mississippi Canyon Block 41 (Lease Sale #247) and Mississippi Canyon Block 85 (Lease Sale #110):

Military Warning Area Stipulation:
Mississippi Canyon 41 and 85 are located within Military Warning Area W-155C. Anadarko will contact the Fleet Area Control and Surveillance, NAS Pensacola, Florida in order to coordinate and control the electromagnetic emissions during these proposed operations as needed.

Protected Species Stipulation:
This stipulation requires operators to collect and remove flotsam resulting from their activities; to post signs detailing why release of debris must be eliminated; watch for protected marine mammals and see turtles (includes speed and distance parameters if mammals or turtles are sited); report sightings and locations of dead or injured marine mammals or turtles and if the operators activities are responsible remain available to assist in the recovery and comply with applicable mitigation measures when conducting seismic operations.

All activities will be conducted in accordance with BOEM NTL No. 2016-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting) and BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination)

Protection of Archaeological Resources:
Mississippi Canyon Block 85 has been determined to be located in an area where archaeological resources may exist. In accordance with NTL 2005-G07, "Archaeological Surveys and Reports," and NTL 2001-JOINT-G01, "Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports," an archaeological survey report was submitted for Mississippi Canyon Block 85 with EP (Control No. S-7638) approved June 11, 2014.

SECTION L
RELATED FACILITIES AND OPERATIONS INFORMATION

(a) Related OCS Facilities and Operations

Under this Initial DOCD Anadarko Petroleum Corporation (Anadarko) plans to drill and complete three new dumpflood water injection subsea wells (MC 41 A, AA, AAA) with surface locations in Mississippi Canyon Block 85 (OCS-G 08797) and tied into the existing Marlin King Field Development, then brought online. The King Field is located in MC 84 Unit Number 754396002 and is tied back to the existing Marlin TLP in VK Block 915 via existing subsea pipelines and risers.

Dumpflood is a waterflooding technique where uncontrolled water production from a source aquifer flows to and is injected into a target reservoir; the process occurs downhole within the same wellbore. The King dumpflood well will use the natural flow of water from a water aquafer in one zone to another reservoir for enhanced oil recovery (EOR).

The new King dumpflood (KDF) water injection well will be equipped with a subsea wellhead and subsea tree and will be tied into an existing King production pipeline via a new service/ utility pipeline consisting of a 1300-foot-long non-rigid jumper (multi-tube encased), subsea manifold and a 100-foot-long rigid flowline jumper. The purpose of the service / utility pipeline is to tie the injection well into the production flowpath for management of the tree bore pressure and for the periodic testing of the subsea well valves.

A new Hydraulic Distribution Module (HDM) and steel tube flying leads (STFL) will provide hydraulic controls and chemicals to the well. A new Electric-Optic Distribution Assembly (EODA), two new subsea router modules (SRM-A and B), electric flying leads (EFL) and Fiberoptic Flying Leads (FOFL) will provide electrical power and fiberoptic cables to the new dumpflood well for control and communications. The new HDM will be tied into the existing Subsea Umbilical Termination Unit (SUTA) on the King Pump Main Umbilical. The EODA will be tied into the existing SUTA on the KPCU umbilical.

Two (2) new lease term pipeline segments are proposed as described above.

The new subsea structures proposed are:

- KDF Manifold
- KDF HDM
- KDF EODA
- KDF SRM-A
- KDF SRM-B

The dumpflood water injection will increase production on the Marlin facility, but not beyond its original capacity. Production will continue to flow through the existing King pipelines and risers and existing pipeline boarding shut down valves, which close within 45 seconds.

There are no modifications required to the Marlin TLP to accommodate the activities proposed in this plan.

(b) Transportation System

Oil and gas from the Marlin TLP in VK 915 departs the facility via the existing export pipelines. The gas will depart the platform via the existing 14-inch gas export pipeline (Segment No. 11766) operated by Anadarko to Platform P in Main Pass Block 260 with ultimate delivery into the Destin Pipeline Operations System.

The liquid hydrocarbons will depart the TLP via the existing 10-inch oil export pipeline (Segment No. 11765) operated by Anadarko and will be transported to Platform A in Main Pass Block 225 for ultimate delivery to the Main Pass Oil Gathering (MPOG) Pipeline.

No new or expanded onshore processing plants are proposed. No changes to the transportation system are proposed as a part of this plan.

(c) Produced Liquid Hydrocarbons Transportation Vessels

No produced liquid hydrocarbons are anticipated to be transported by means other than a pipeline for the activities proposed as a part of this plan.

(d) Decommissioning Information

Subsequent to applicable lease expirations, abandonment activities will be conducted in accordance with all state and federal regulations.

SECTION M
SUPPORT VESSELS AND AIRCRAFT INFORMATION

(a) General

Drilling/Completion Support Vessels:

Type	Max. Total Fuel Tank Storage Capacity	Max. No. in Area at any Time	Trip Frequency or Duration
Supply Vessel	336,227 gallons	1	2 trips/week
Helicopter	735.3 gallons	1	10 trips/week
Crew Vessel Support Vessel Flowback Vessel	70,000 gallons 450,698 gallons 302,500 gallons	1 1 1	3 trips/week 3 days total/well 4 days total/well

Lease Term Pipeline Installation Support Vessels:

Type	Max. Total Fuel Tank Storage Capacity	Max. No. in Area at any Time	Trip Frequency or Duration
Work/ Supply Vessel	70,000 gallons	1	4 trips/week
Helicopter	735.3 gallons	1	10 trips/week
Light Construction Vessel #1 (LCV)	241,408 gallons	1	36 days; 3 wells equal 108 days total

(b) Diesel Oil Supply Vessels

Fuel for the DP Construction Vessel will be transported via a supply vessel as follows:

a. Size of fuel supply vessel:	230'
b. Carrying capacity of fuel supply vessel:	336,227 gallons
c. Frequency that fuel supply vessel will visit the facilities:	twice per week
d. Routes the fuel supply vessel will use to travel between the onshore support base and proposed facility:	Shortest route from shore-base to block

(c) Produced Liquid Hydrocarbons Transportation Vessels

Produced liquid hydrocarbons from future flow tests on wells in **Mississippi Canyon 85 and 41** will be transported by 1-2 flowback vessel(s). Anadarko anticipates flaring a max volume of 12 MMSCF/well total during the 48-hour flow test period.

Transport Method	Vessel Capacity (estimated)	Average Volume to be Loaded (per vessel)	No. of Transfers (Yearly Average)
Flowback/Crew Vessel	3,000 – 10,000 bbls	3,000 – 10,000 bopd	1-2/well
Flowback Barge	50,000 – 130,000 bbls	15,000 – 30,000 bopd	1/well

(d) Solid and Liquid Wastes Transportation – Drilling & Completion Operations

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Synthetic-based drilling fluid or mud	Synthetic-based drilling muds	42,000 bbls	14,000 bbls/year/well	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	7,500 bbls	2,500 bbls/year/well **An estimated 5-10% of cuttings may be transported to shore*	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco – Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol *Xylene** *Diesel**	749.25 bbls 86.75 bbls 3750.75 bbls 150 bbls total/year	3.33 bbls/day 0.83 bbls/day 16.67 bbls/day 50 bbls/well/year	Transport in DOT approved containers	• LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA	• Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Completion/ Recompletion fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station	• Landfarm • Injection well
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Managment - Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	375 bbls	50/bbls/month/ well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Managment - Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Excess oil from engines	806 bbls	430 bbls/120 days/well	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill
Produced Sand	Oil-contaminated formation sand	150 bbls/ year	50 bbls/ well/year	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill

NOTE: ***Total amount assumes drilling, completion & conduct flowbacks on 3 wells with 225 days Total No. of Days (75 days/ well)***

- **Solid and Liquid Wastes Transportation – Subsea Installation Ops and Production**

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Synthetic-based drilling fluid or mud	Synthetic-based drilling muds	N/A	N/A	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	N/A	N/A	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco – Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol *Xylene** *Diesel**	359.64 bbls 89.64 bbls 1800.36 bbls 150 bbls total/year	3.33 bbls/day 0.83 bbls/day 16.67 bbls/day 50 bbls/well/year	Transport in DOT approved containers	• LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA	• Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Completion/ Recompletion fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station	• Landfarm • Injection well

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	180 bbls	50 bbls/month/ well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management – Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Excess oil from engines	387 bbls	430 bbls/120 days/well	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill
Produced Sand	Oil-contaminated formation sand	150 bbls/ year	50 bbls/ well/year	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill

NOTE: ***Total amount assumes drilling, completion & conduct flowbacks on 3 wells with 225 days Total No. of Days (75 days/ well***

(e) Vicinity Map

A vicinity map is included in this section as **Attachment M-1.**

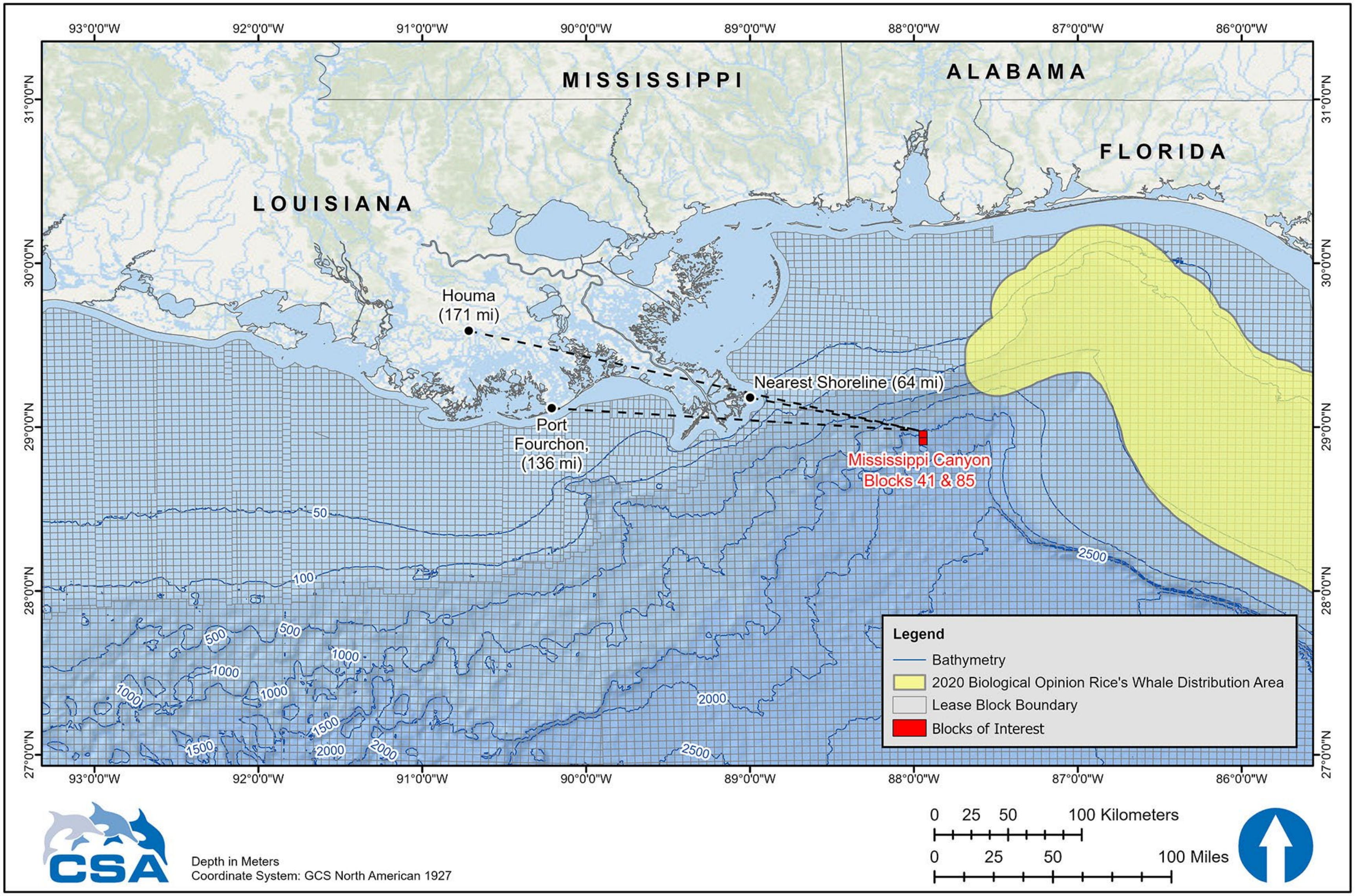

Figure 1. Location of Mississippi Canyon Blocks 41 and 85 relative to the Louisiana shoreline, the Rice's whale habitat area, and offshore bathymetric contours.

SECTION N
ONSHORE SUPPORT FACILITIES INFORMATION

(a) General

Per NTL No. 2008-G04, the following tables reflect the onshore facilities Anadarko may utilize to provide supplies and service support for the activities proposed in this DOCD.

Name	Primary Location	Existing/New/Modified
Anadarko Service Base	Fourchon, Louisiana	Existing
Anadarko Service Base (Helicopter Base)	Houma, Louisiana	Existing

Name	*Alternate Locations	Existing/New/Modified
Anadarko Service Base	Galveston, TX	Existing
Anadarko Service Base	Cameron, LA	Existing
Anadarko Service Base	Lake Charles, LA	Existing
Anadarko Service Base	Houma, LA	Existing

*In the unlikely event Anadarko's primary service base cannot be utilized Anadarko will exercise the use of an alternate service base during operations.
**Helicopter base only.

(b) Support Base

No support base construction or expansion is planned for these activities.

(c) Waste Disposal

Disposed wastes describe those wastes generated by the proposed activity that are disposed of by means other than by release into the water of the GOM at the site where they are generated. These wastes can be disposed of by offsite release, injection, encapsulation, or placement at either onshore or offshore permitted locations for the purposes of returning them back to the environment.

(d) Solid and Liquid Waste Transportation – Drilling & Completion Operations

(d) Solid and Liquid Wastes Transportation – Drilling & Completion Operations

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Synthetic-based drilling fluid or mud	Synthetic-based drilling muds	42,000 bbls	14,000 bbls/year/well	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	7,500 bbls	2,500 bbls/year/well **An estimated 5-10% of cuttings may be transported to shore*	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco – Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol *Xylene** *Diesel**	749.25 bbls 186.75 bbls 3750.75 bbls 150 bbls total/year	3.33 bbls/day 0.83 bbls/day 16.67 bbls/day 50 bbls/well/year	Transport in DOT approved containers	• LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA	• Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Completion/ Recompletion fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station	• Landfarm • Injection well
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management – Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	375 bbls	50/bbls/month/ well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel

					Waste Management – Lake Charles, LA	blending, or incineration
Used oil	Excess oil from engines	806 bbls	430 bbls/120 days/well	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill
Produced Sand	Oil-contaminated formation sand	150 bbls/ year	50 bbls/ well/year	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Gold Meadow, LA	• Landfill • Landfill

NOTE: ***Total amount assumes drilling, completion & conduct flowbacks on 3 wells with 225 days Total No. of Days (75 days/ well***

(e) Solid and Liquid Wastes Transportation – Subsea Installation Ops and Production

Type of Waste	Composition	Total Projected Amount	Rate	Transport Method	Name/Location of Facility	Disposal Method
Synthetic-based drilling fluid or mud	Synthetic-based drilling muds	N/A	N/A	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco – Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	N/A	N/A	Re-use and/or transport to shore in DOT approved containers.	• Baroid or MI Swaco – Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fouchon Transfer Station	• Recycle or Reuse • Landfarm • Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol *Xylene**	359.64 bbls 89.64 bbls 1800.36 bbls	3.33 bbls/day 0.83 bbls/day 16.67 bbls/day	Transport in DOT approved containers	• LEI – Hammond, LA • Chemical Waste Management	• Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse,

	*Diesel**	200 bbls total/year	50 bbls/well/year		- Lake Charles, LA	solvent recovery, fuel blending, or incineration
Completion/ Recompletion fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station	• Landfarm • Injection well
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	9,000 bbls	3,000 bbls/well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management – Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	180 bbls	50 bbls/month/ well	Transport in DOT approved containers	• Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management – Lake Charles, LA	• Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Excess oil from engines	387 bbls	430 bbls/120 days/well	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA	• Landfill • Landfill
Produced Sand	Oil-contaminated formation sand	150 bbls/ year	50 bbls/ well/year	Transport in DOT approved containers	• Republic Services – LaRose, LA • Total Waste Solutions – Gold Meadow, LA	• Landfill • Landfill

NOTE: ***Total amount assumes drilling, completion & conduct flowbacks on 3 wells with 225 days Total No. of Days (75 days/ well***

SECTION O
COASTAL ZONE MANAGEMENT ACT INFORMATION

Consistency reviews from Texas, Louisiana and Alabama Coastal Zone Management offices are enclosed.

STATE OF LOUISIANA

CONSISTENCY CERTIFICATION FOR

INITIAL DEVELOPMENT OPERATIONS COORDINATION PLAN

MISSISSIPPI CANYON BLOCK 41
OCS-G 35962

MISSISSIPPI CANYON BLOCK 85
OCS-G 08797

The proposed activities described in detail in this OCS Plan comply with Louisiana's approved Coastal Zone Management Program(s) and will be conducted in a manner consistent with such Program(s).

Anadarko Petroleum Corporation

DocuSigned by:
Teri Powell
CC8D5F8E38CF441...

Teri Powell, Certifying Official
April 2025

TEXAS COASTAL MANAGEMENT PROGRAM

The following is an evaluation that includes findings relating the coastal effects of the proposed activities and associated facilities to the relevant enforceable policies of the Texas' Coastal Management Program (TCMP), Title 31, Part 16, Chapter 501, Subchapter B*:*

(Category 2)
Construction, Operation & Maintenance of Oil & Gas Exploration & Production Facilities

No operations are proposed in or near any critical areas. The proposed activities are explorative in nature, so no facility construction is proposed. The proposed activities are located approximately 220 miles from the Texas shoreline; therefore we expect no adverse impacts to CNRAs or beach access and use rights of the public. All activities shall be conducted in a manner that minimizes significant impacts to coastal resources. No adverse effects to Texas' coastal area are expected in association with the proposed activities.

(Category 3)
Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities

No discharge of wastewater or disposal of waste from the proposed activities will occur in the Texas' coastal zone; therefore no impact to Texas' coastal waters is expected.

(Category 4)
Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities

No construction of solid waste facilities or expansion of existing facilities in the coastal zone are proposed in the attached plan, therefore, no adverse effects on any features of Texas' coastal cone are expected.

(Category 5)
Prevention, Response, and Remediation of Oil Spills

The proposed activities will be covered under an approved Regional Oil Spill Response Plan. The plan is in place, practiced, and updated as necessary. The best practical techniques shall be utilized to prevent the release of pollutants or toxic substances into the environment. All involved vessels and facilities are designed to be capable of prompt response and adequate removal of accidental discharges of oil. In addition, the proposed activities are 220 miles from shore; therefore no damages to natural resources are expected as the result of an unauthorized discharge of oil into coastal waters.

(Category 6)
Discharge of Municipal and Industrial Waste Water to Coastal Waters

No discharges from the proposed activities will occur in coastal waters. The proposed activities are 220 miles from shore; therefore there will be no effect on coastal waters.

(Category 8)
Development in Critical Areas

None of the proposed activities will occur in a critical area; therefore no effects to Texas' coastal zone are expected. The activity will not jeopardize the continued existence of species listed as endangered or threatened, and will not result in likelihood of the destruction or adverse modification of a habitat determined to be a critical habitat under the Endangered Species Act. The activity will not cause or contribute to violation of any applicable surface water quality standards. The activity will not violate any requirement imposed to protect a marine sanctuary.

(Category 9)
Construction of Waterfront Facilities and Other Structures on Submerged lands

No waterfront facilities or other structures are proposed on submerged lands in the Texas coastal zone, therefore the proposed activities are not expected to have any adverse impacts on submerged lands.

(Category 10)
Dredging and Dredged Material Disposal and Placement

No dredging or disposal/placement of dredged material is proposed; therefore no adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, or Gulf beaches are expected.

(Category 11)
Construction in the Beach / Dune System

The proposed activities do not include any construction projects in critical dune areas or areas adjacent to or on Gulf beaches, therefore, no impact to Texas' beach or dune systems are expected.

(Category 15)
Alteration of Coastal Historic Areas

The proposed activities do not include any alteration or disturbance of a coastal historic area; therefore, no impacts are expected to adversely affect any historical, architectural, or archaeological site in Texas' coastal zone.

(Category 16)
Transportation

The proposed activities do not include any transportation construction projects within the coastal zone; therefore, no impacts to Texas' coastal zone are expected.

(Category 17)
Emission of Air Pollutants

The proposed activities shall be carried out in conformance with applicable air quality laws, standards, and regulations. Emissions from the proposed activities are not expected to have significant impacts on onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline. The proposed activities will occur approximately 220 miles from shore and will be within the exemption limits set by BOEM, therefore, no impacts to Texas' coastal zone is expected.

(Category 18)
Appropriations of Water

The proposed activities do not include the impoundment or diversion of state water, therefore, no impacts to Texas' coastal zone is expected.

(Category 20)
Marine Fishery Management

The proposed activities are located approximately 220 miles from shore and are not expected to have any effect on marine fishery management or fishery migratory patterns within waters in the coastal zone of Texas.

(Category 22)
Administrative Policies

The necessary information for applicable agencies to make an informed decision on the proposed activities has been provided In conclusion, all activities shall be consistent with Texas' coastal management program and shall comply with all relevant rules and regulations. No activities are planned within any critical areas. Activities will be carried out avoiding unnecessary conflicts with other uses of the vicinity.

STATE OF TEXAS

CONSISTENCY CERTIFICATION FOR

INITIAL DEVELOPMENT OPERATIONS COORDINATION PLAN

MISSISSIPPI CANYON BLOCK 41
OCS-G 35962

MISSISSIPPI CANYON BLOCK 85
OCS-G 08797

The proposed activities described in detail in this OCS Plan comply with Texas's approved Coastal Zone Management Program(s) and will be conducted in a manner consistent with such Program(s).

Anadarko Petroleum Corporation

DocuSigned by:
Teri Powell
CC8D5F8E38CF441...

Teri Powell, Certifying Official
April 2025

ALABAMA COASTAL ZONE MANAGEMENT
CONSISTENCY CERTIFICATION
DOCD – MISSISSIPPI CANYON BLOCKS 41 and 85

The OCS related oil and gas development activities having potential impact on the Alabama Coastal Zone are based on the location of the proposed facilities, access to those sites, best practical techniques for operations and production equipment, guidelines for the prevention of adverse environmental effects, effective environmental protection, emergency plans and contingency plans. Alabama policies have been addressed below or are cross referenced to the appropriate sections of the plan:

Topic	Cross Reference	Comments
Coastal Resource Use Policies		
Coastal Development		Dock and port facilities in LA will be used. There will be no new construction, dredging, or filling in Alabama state waters. There will be no new commercial development or capital improvements in Alabama's coastal zone, nor will there be any employment effects.
Mineral Resource Exploration and Extraction		Proposed exploration operations will take place approximately 94 miles from Alabama's shore.
Commercial Fishing	Section P	
Hazard Management	Section C	A Shallow Hazards Report has been prepared and previously submitted to BOEM in order to identify and assess the seafloor and shallow geologic conditions in this block(s).
Shoreline Erosion	Section P	Proposed exploration operations will take place approximately 94 miles from Alabama's shore.
Recreation	Section P	
Transportation	Section M, N, P	
Natural Resource Protection Policies		
Biological Productivity	Section P	
Water Quality	Section P	
Water Resources	Section P	
Air Quality	Section P	
Wetlands and Submerged Grassbeds	Section P	
Beach and Dune Protection	Section P	
Wildlife Habitat Protection	Section P	
Endangered Species	Section P	
Cultural Resources Protection	Section P	Mississippi Canyon Block 85 is located in an area where historic shipwrecks may exist. The archaeological report covering Mississippi Canyon Blocks 85 is included with this DOCD submittal. No areas in Mississippi Canyon Block 85 is recommended for investigation or avoidance on the basis of archaeological potential.

STATE OF ALABAMA

CONSISTENCY CERTIFICATION FOR

INITIAL DEVELOPMENT OPERATIONS COORDINATION PLAN

MISSISSIPPI CANYON BLOCK 41
OCS-G 35962

MISSISSIPPI CANYON BLOCK 85
OCS-G 08797

The proposed activities described in detail in this OCS Plan comply with Alabama's approved Coastal Zone Management Program(s) and will be conducted in a manner consistent with such Program(s).

Anadarko Petroleum Corporation

DocuSigned by:
Teri Powell
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Teri Powell, Certifying Official
April 2025

SECTION P
ENVIRONMENTAL IMPACT ANALYSIS

Environmental Impact Analysis

for a
INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
for
Mississippi Canyon Blocks 41 and 85 (OCS-G 35962 and OCS-G 08797)

Offshore Alabama
Gulf of Mexico

April 2025

Prepared for:

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Environmental Impact Analysis for an Initial Development Operations Coordination Document for Mississippi Canyon Blocks 41 and 85 (OCS-G 35962 and 08797)

Offshore Alabama

Gulf of Mexico

DOCUMENT NO. CSA-Anadarko-FL-25-4186-01-REP-01-002

Internal review process					
Version	Date	Description	Prepared by:	Reviewed by:	Approved by:
INT-01	04/09/2025	Initial draft for science review	J. O'del	J. Tiggelaar	J. O'del
INT-02	04/10/2025	TE review	J. O'del	K. Metzger	J. O'del

Client deliverable			
Version	Date	Description	Project Manager Approval
001	04/11/2025	Client deliverable	J. Tiggelaar
002	04/25/2025	Client revised deliverable	J. Tiggelaar

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(Continued)

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Acronyms and Abbreviations

µPa	micropascal
ac	acre
Anadarko	Anadarko Petroleum Corporation
bbl	barrel
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
CGA	Clean Gulf Associates
CO	carbon monoxide
dB	decibel
DOCD	Development Operations Coordination Document
DP	dynamically positioned
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*
GPS	global positioning system
H_2S	hydrogen sulfide
ha	hectare
HAPC	Habitat Area of Particular Concern
IPF	impact-producing factor
km	kilometer
LCV	light construction vessel
m	meter
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Mississippi Canyon
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MSRC	Marine Spill Response Corporation
MSV	multi-service vessel
MWCC	Marine Well Containment Company
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OSRA	Oil Spill Risk Analysis
OSRP	Regional Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbons
PBR	Potential Biological Removal
PM	particulate matter
PTS	permanent threshold shift
re	referenced to
ROV	remotely operated vehicle
SEL_{24h}	sound exposure level over 24 hours
SEMS	Safety and Environmental Management system
SO_x	sulfur oxides
SL	source level
SPL	root-mean-square sound pressure level
TTS	temporary threshold shift
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCD	worst-case discharge

Introduction

Anadarko Petroleum Corporation (Anadarko) is submitting an Initial Development Operations Coordination Document (DOCD) for Mississippi Canyon (MC) Blocks 41 and 85. Under this DOCD, Anadarko proposes to drill and complete up to three dumpflood water injection wells (well locations A, AA, and AAA) and fit the wells with subsea wellheads. The DOCD also covers flowback operations, installation of subsea infrastructure and commencing injection in the MC 41 #001 dumpflood well. The Environmental Impact Analysis (EIA) provides information on potential environmental impacts of Anadarko's proposed activities.

The project area is approximately 64 mi (103 km) from the nearest shoreline (Louisiana), 136 mi (219 km) from the onshore support base at Port Fourchon, Louisiana, and 171 mi (276 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the location of the proposed wellsites is approximately 5,179 ft (1,579 m). A dynamically positioned (DP) drilling rig will be used for drilling and completion activities. The proposed activities are anticipated to take approximately 75 days per well. A light construction vessel (LCV) will be used for subsea installation and commissioning activities.

The EIA for this DOCD was prepared for submittal to the Bureau of Ocean Energy Management (BOEM) in accordance with applicable regulations, including Title 30 Code of Federal Regulations (CFR) § 550.242 and § 550.561. The EIA is a project-and site-specific analysis of the potential environmental impacts of Anadarko's planned activities. The EIA complies with guidance provided in existing Notices to Lessees and Operators (NTLs) issued by BOEM and its predecessors, Minerals Management Service (MMS) and Bureau of Ocean Energy Management, Regulation and Enforcement, including NTLs 2008-G04 (extended by 2015-N02) and 2015-N01. Potential impacts have been analyzed at a broader level in in the 2024–2029 Programmatic Environmental Impact Statement (EIS) for the OCS Oil and Gas Leasing Program (BOEM, 2023a)[1] and in multisale EISs for the Western and Central Gulf of America Planning Areas (BOEM, 2012a,b; 2013; 2014; 2015; 2016b; 2017; 2023b). The most recent multisale EIS contains updated environmental baseline information in light of the *Deepwater Horizon* incident and addresses potential impacts of a catastrophic spill (BOEM, 2017a). The NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico assesses impacts and requires additional mitigation measures for protected species (NMFS, 2020a). The analyses and relevant information from those documents are incorporated in the EIA by reference.

All the proposed activities and facilities in this DOCD are covered by the Regional Oil Spill Response Plan (OSRP) approved in August 2015 for Anadarko Petroleum Corporation and its subsidiary Anadarko US Offshore LLC. (Company Numbers 00981 and 02219, respectively) in accordance with 30 CFR Part 254. The 2023 OSRP biennial update was deemed in-compliance in June 2023 and the August 2023 revisions were approved in October 2023.

[1] The National OCS oil and gas leasing program Final Programmatic EIS was ordered to be rescinded by Executive Order 3418, issued 3 February 2025. As of early April 2025, the EIS has yet to be formally rescinded.

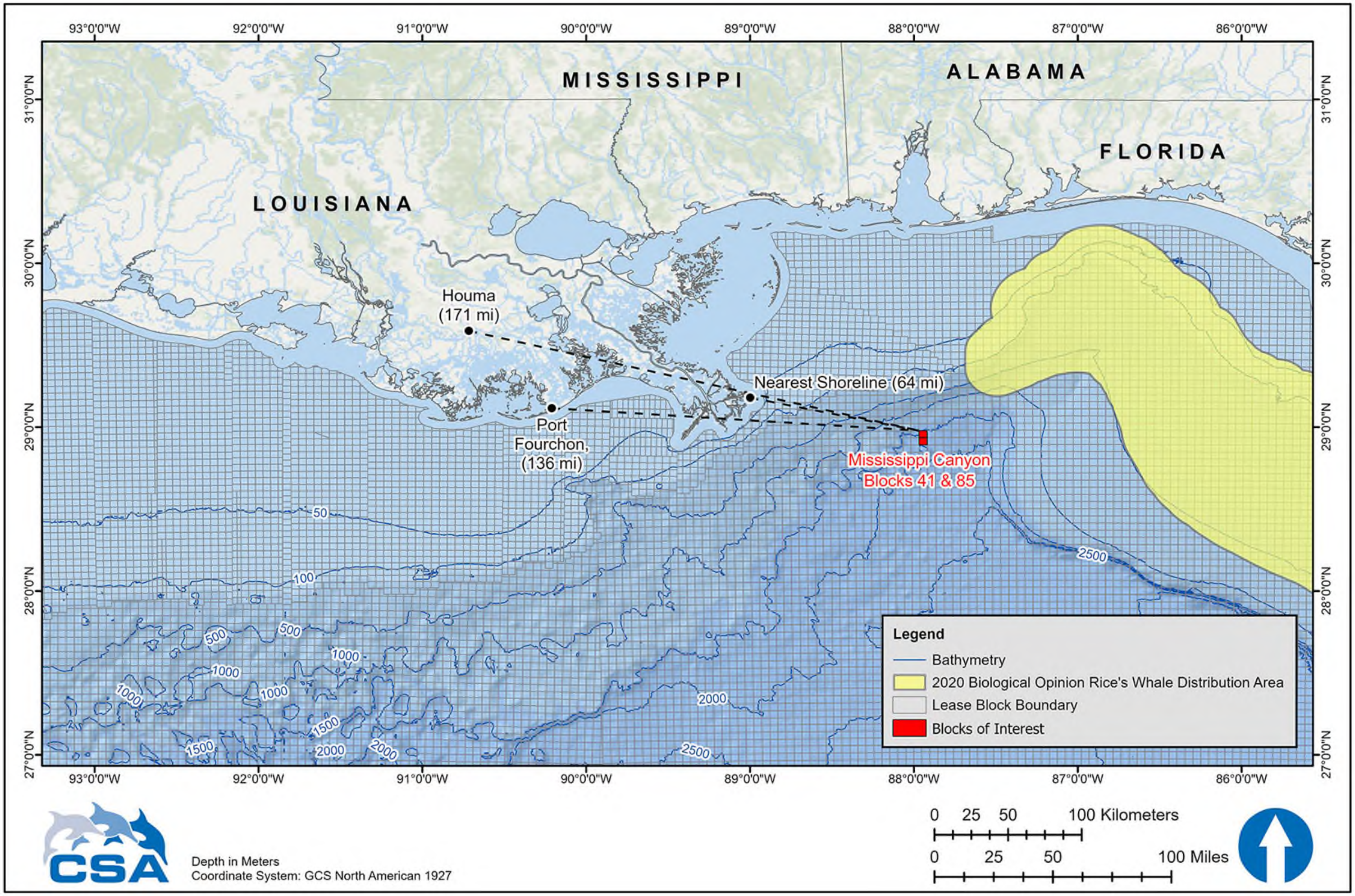

Figure 1. Location of Mississippi Canyon Blocks 41 and 85 relative to the Louisiana shoreline, the Rice's whale habitat area, and offshore bathymetric contours.

The OSRP details Anadarko's plan to rapidly and effectively manage oil spills that may result from drilling and production operations. Anadarko has designed its spill response program based on a regional capability of response to spills ranging from small operational spills to a worst-case discharge (WCD) from a well blowout. Anadarko's spill response program meets the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. The OSRP also includes information regarding Anadarko's regional oil spill organization and dedicated response assets, potential spill risks, and local environmental sensitivities. It describes personnel and equipment mobilization, incident management team organization, and an overview of actions to be taken and notifications necessary in the event of a spill.

The EIA is organized into **Sections A** through **I** corresponding to the information required by NTLs 2008-G04 and 2015-N01. The main impact-related discussions are in **Section A** (Impact-Producing Factors) and **Section C** (Impact Analysis). **Table 1** lists and summarizes the NTLs applicable to the EIA.

Table 1. Notices to Lessees and Operators (NTLs) applicable to the Environmental Impact Analysis (EIA).

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 5 May 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 movement to avoid colliding with 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 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with this NTL.
BOEM-2016-G02 or Appendix A (NMFS, 2020a)	Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program	Summarizes seismic survey mitigation measures, updates regulatory citations, and provides clarification on how the measures identified in the NTL will be used by BOEM, BSEE, and operators in order to comply with the Endangered Species Act and the Marine Mammals Protection Act. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with this NTL.

Table 1. (Continued).

NTL	Title	Summary
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 instructional placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process.
BOEM 2015-N02	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 BOEM 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 and Blowout Scenarios	Provides guidance regarding information required in worst-case discharge 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 BSEE website.
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 worst-case discharge scenarios to ensure capability to respond to oil spills 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 blowout preventers (BOPs) or surface BOPs 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* [FR] 63346). Informs operators that the BOEM will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to respond promptly to a blowout or other loss of well control.

Table 1. (Continued).

NTL	Title	Summary
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 (e.g., topographic features, pinnacles, low relief live bottom areas, other potentially sensitive biological features) when conducting OCS operations in water depths less than 984 ft (300 m) in the Gulf of Mexico.
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on information requirements for OCS plans, including EIA requirements and information regarding compliance with the provisions of the Endangered Species Act and Marine Mammal Protection Act.
2008-N05	Guidelines for Oil Spill Financial Responsibility for Covered Facilities	Provides clarification and guidance to operators/lessees on policies for submitting required Oil Spill Financial Responsibility documents to the Gulf of Mexico OCS Region as required under 30 CFR Part 253.
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 9 October 2019 and to rescind NTL 2011-JOINT-G01.

A. Impact-Producing Factors

Based on the description of Anadarko's proposed activities, a series of impact-producing factors (IPFs) have been identified and presented in **Table 2**. **Table 2** provides a matrix of environmental resources that may be affected in the left column and sources of impacts (i.e., IPFs) associated with the proposed project across the top. **Table 2**, adapted from Form BOEM-0142, has been 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 of the 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 (**Table 2**). Where there may be an effect, an impact analysis by resource is provided in **Section C**. Potential IPFs for the proposed activities are listed below and briefly discussed in the following sections:

- Drilling rig presence, marine sound, 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)
- Accidents

A.1 Drilling Rig Presence, Marine Sound, and Lights

A DP semisubmersible rig or a DP drillship will be used for the proposed drilling, completion, and flowback activities. 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 vessel is precisely monitored while thrusters, positioned at various locations about vessel, are activated to maintain position. This allows operations at sea in areas where mooring or anchoring may not be best suited or feasible. Consequently, there will be no anchoring during this project. The selected vessel is expected to be on site for an estimated 75 days per well for drilling, completion, and flowback activities. 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 vessels in the ocean, working and safety lighting, and underwater sound produced during operations.

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

Environmental Resources	IPFs									
	Drilling Rig Presence (incl. sound & 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**	--	--	--	--	--	**X**(6)	**X**(6)
Water quality	--	--	--	**X**	--	--	--	--	**X**(6)	**X**(6)
Seafloor Habitats and Biota										
Soft bottom benthic communities	--	**X**	--	**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 (Threatened)	--	--	--	--	--	--	--	**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)
Black-capped Petrel	**X**	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Rufa Red Knot	**--**	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
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)

Table 2. (Continued).

Environmental Resources	IPFs									
	Drilling Rig Presence (incl. sound & 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
Florida salt marsh vole (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Panama City crayfish (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Threatened coral	--	--	--	--	--	--	--	--	--	**X**(6)
Queen conch	--	--	--	--	--	--	--	--	--	**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 refer to table footnotes.
X = potential impact; dash (--) = no impact or negligible impact.

Table 2 Footnotes and Applicability to this Program:

*Footnotes are numbered to correspond to entries in **Table 2**; applicability to each case is noted by a bullet point following the footnote.*

(1) *Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well, rig site, or any anchors will be on the seafloor within the following:*
   (a) *4-mile zone of 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 (152 m) from any no-activity zone; or*
   (d) *Proximity of any submarine bank (152-m [500-ft] buffer zone) with relief greater than 7 ft (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 or near any marine sanctuary, topographic feature, submarine bank, or no-activity zone.

(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 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 BOEM as being in water depths 400 m or greater.*
   - No impacts on high-density deepwater benthic communities are anticipated. There are no features indicative of seafloor hard bottom that could support high-density chemosynthetic communities or coral within 2,000 ft (610 m) of the location of the proposed activities (Oceaneering, 2024).

(5) *Exploration or production activities where Hydrogen Sulfide (H_2S) concentrations greater than 500 ppm might be encountered.*
   - Mississippi Canyon Blocks 41 and 85 are classified as H_2S absent.

(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 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 your 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 to archaeological resources are expected. The project area is well beyond the 60-m depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. Mississippi Canyon Block 40 is in an area designated as having a high potential for the presence of archaeological resources. An archaeological survey report will be submitted to BOEM prior to commencement of drilling activities.

(8) *All activities that you determine might have an adverse effect on Endangered or Threatened marine mammals or sea turtles or their critical habitats.*
   - IPFs that may affect marine mammals, sea turtles, or their critical habitats include drilling rig presence, 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.

During the presence of the drilling rig in the project location, there may be an occasion where equipment is suspended in the water column. 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.

The physical presence of a drilling rig in the ocean can attract and potentially impact pelagic marine resources, as discussed in **Section C.5.1**. Offshore vessels maintain exterior lighting for working at night and for navigational and aviation safety in accordance with applicable federal safety regulations. This artificial lighting may also attract and directly or indirectly impact natural resources. Drilling operations produce underwater sounds that may impact certain marine resources. Sources of drilling-related sounds include, for example, DP thrusters and seabed mounted active acoustics (such as ultra-short baseline systems) for positioning. Of the aforementioned sources, only DP thruster activity is expected to produce sound at levels which could result in potential impacts on marine life.

The proposed activities can be expected to produce noise associated with propulsion machinery that transmits directly to the water during station keeping and maintenance operations. Additional sound and vibration are transmitted through the hull to the water from auxiliary machinery, such as generators, pumps, and compressors onboard the drilling rig (Richardson et al., 1995). The noise levels produced by DP vessels for station-keeping are largely dependent on the level of thruster activity required to keep position and, therefore, vary based on local ocean currents, sea and weather conditions, and operational requirements. Representative source levels (SLs), expressed as root-mean-square sound pressure levels (SPL), for vessels in DP activities range from 184 to 190 decibels (dB) referenced to (re) 1 micropascal (µPa) m, with primary amplitudes at frequencies below 600 Hz (Blackwell and Greene Jr., 2003; McKenna et al., 2012; Kyhn et al., 2014). Estimated SLs from a drillship or semisubmersible using thrusters can reach approximately 188 dB re 1 µPa m (Nedwell and Howell, 2004). Nedwell and Edwards (2004) reported that the majority of noise from a semi-submersible drilling rig occurred below 600 Hz, and the SPLs increased by 10 to 20 dB when drilling was active. Within the low-frequency range (<600 Hz), measured SPLs were shown to be greatly influenced by the drilling rig for up to 2 km; but at distances beyond 5 km, the drilling rig did not contribute significantly to the overall SPLs in that frequency range.

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). SLs 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, SLs generated from drillships during drilling and in the absence of thrusters can be expected to range from 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).

A.2 Physical Disturbance to the Seafloor

In water depths of 1,969 ft (600 m) or greater, DP drilling rigs disturb only a very small area of the seafloor around the wellbore. 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

Offshore air pollutant emissions will result from drilling rig operations as well as support vessels (both supply and crew vessels) and helicopter transits. These emissions occur mainly from combustion of diesel and aviation fuel (Jet A). The combustion of fuels occurs in diesel-powered generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with emissions from internal combustion engines are suspended particulate matter ($PM_{2.5}$ and PM_{10}), sulfur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) (Reşitoğlu et al., 2015), as well as ammonia (NH_3) and lead (Pb) per NTL BOEM 2020-G01.

The Air Quality Emissions Report (see DOCD Section G) prepared in accordance with BOEM requirements demonstrates that the projected emissions are below exemption levels set by the applicable regulations in 30 CFR 550.303. Based on this and the distance from shore, it can be concluded that the emissions will not substantially affect the air quality of the onshore area for any of the criteria pollutants. No further analysis or control measures are required.

A.4 Effluent Discharges

The discharges will include treated sanitary and domestic wastes, deck drainage, desalination unit brine, non-pollutant completion fluids, uncontaminated ballast and bilge water, wash water, non-contact cooling water, blowout preventer fluid, cuttings wetted with water-based drilling fluids, water-based drilling fluids, cuttings wetted with synthetic-based fluids, and fire water. All offshore discharges will be in accordance with requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit No. GMG2900006 issued by the U.S. Environmental Protection Agency (USEPA), including permit compliance terms, discharge volumes, discharge rates, and associated monitoring requirements.

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. The drilling rig ultimately selected for this project will be in compliance with all applicable cooling water intake structure design requirements, monitoring, and limitations.

A.6 Onshore Waste Disposal

Wastes generated during the proposed activities are tabulated in DOCD Section F. A total of approximately 50 barrel(s) (bbl) per month per well of trash and debris will be generated over the life of the project. Trash will be transported to shore in disposal bags for final disposal by municipal operators in accordance with applicable regulations. Other wastes transported to shore for re-use, recycling, or disposal include synthetic-based drilling fluids, cutting wetted with synthetic-based drilling fluids, chemical product waste (well treatment fluids), completion fluids, workover fluids, and used oil. All wastes will be transported to shore in containers approved by the U.S. Department of Transportation for re-use, recycling, or disposal in accordance with applicable regulations.

A.7 Marine Debris

Anadarko will 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, and USEPA, U.S. Coast Guard (USCG), Bureau of Safety and Environmental Enforcement (BSEE), and BOEM regulations. These regulations include prohibitions and compliance requirements regarding the deliberate discharging of containers and other similar materials (e.g., trash, 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 (e.g., trash, 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, 2020a).

In addition to the regulations in 30 CFR 250, BSEE issued NTL BSEE-2015-G03 which instructs operators to exercise caution in handling and disposal of small items and packaging materials, requires posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly training and certification process for marine trash and debris awareness. Compliance with these requirements is expected to result in either no or negligible impacts from this factor.

A.8 Support Vessel and Helicopter Traffic

Anadarko will use existing shorebase facilities in 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. IPFs associated with support vessel and helicopter traffic include their physical presence and operational noise.

A.8.1 Physical Presence

The drilling phase of the project will be supported by supply vessels making an estimated two round trips per week and crew vessels making an estimated three round trips per week. The subsea infrastructure installation portion of the project will be supported by a pipelay vessel, present for 40 total days total, and two LCVs, one present in the project area for 101 days total and the second in the project area for 10 days total.

NMFS (2020a) 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 strikes. The probability of a vessel strike 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 strikes, 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) and the amended appendices in 2021 (NMFS, 2021) replaces compliance with the NTL. The vessels will typically move to the project area via the most direct route from the shorebase.

A helicopter will make approximately 10 round trips per week between the project area and the heliport during both drilling operations and subsea infrastructure installation operations. 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).

A.8.2 Noise

Offshore support 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). Tones typically dominate 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, and propulsion; other sources include engine noise, flow noise from water dragging along the hull, and bubbles breaking in the vessel's wake (Richardson et al., 1995). The intensity of noise from support vessels is roughly related to ship size, weight, and speed. Broadband SLs for smaller boats (a category that include supply and other service vessels) expressed as SPL are in the range of 150 to 180 dB re 1 µPa m (Richardson et al., 1995; Hildebrand, 2009; McKenna et al., 2012).

Dominant tones in noise spectra from helicopters are below 500 Hz with SLs, expressed as SPL, of approximately 149 to 151 dB re 1 µPa m (for a Bell 212 helicopter) (Richardson et al., 1995). Levels of noise received underwater 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). Received level diminishes with increasing receiver depth when an aircraft is directly overhead, but may be stronger at midwater than at shallow depths when an aircraft is not directly overhead (Richardson et al., 1995). Penetration of aircraft noise below the sea surface is greatest directly below the aircraft. Aircraft noise 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). Because of the relatively high expected airspeeds during transits and these physical variables, aircraft-related noise (including both airborne and underwater noise) is expected to be very brief in duration.

A.9 Accidents

The accidents addressed in the EIA focuses on the following two potential types:

- 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, which is an oil spill resulting from an uncontrolled blowout.

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

EISs published by BOEM (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a) analyzed three types of accidents relevant to operations that could lead to potential impacts to the marine environment: loss of well control, vessel collision, and chemical spills. These types of accidents, along with a hydrogen sulfide (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, and/or water. Loss of well control includes incidents from the very minor up to the most serious well control incidents, while blowouts are considered to be a subset of more serious incidents with greater risk of oil spill or human injury (BOEM, 2016a, 2017a). Loss of well control may result in the release of drilling fluid and/or loss of oil. Not all loss of well control events result in blowouts (BOEM, 2012a). In addition to the potential release of gas, condensate, oil, sand, and/or water, the loss of well control can also resuspend and disperse bottom sediments (BOEM, 2012a, 2017a). BOEM (2016a) noted that most OCS blowouts have resulted in the release of gas.

Anadarko has a robust system in place to prevent loss of well control. Measures to prevent a blowout, reduce the likelihood of a blowout, and conduct effective and early intervention in the event of a blowout are described in the NTL 2015-N01 package submitted with this DOCD, as required by BOEM (as discussed in **Section A.9.1**). The potential for a loss of well control event will be minimized by adhering to the requirements of applicable regulations and NTL 2010-N10, which specifies additional safety measures for OCS activities.

Vessel Collisions. BSEE data show that there were 207 OCS-related collisions between 2007 and 2023 (BSEE, 2024a). 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 during 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 Lease 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. As summarized by BOEM (2017a), vessel collisions occasionally occur during routine operations. Some of these collisions have caused spills of diesel fuel or chemicals. Anadarko will comply with all applicable USCG and BOEM safety requirements to minimize the potential for vessel collisions.

Dropped Objects. Objects dropped overboard the DP drilling rig or support vessels 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. Anadarko and its contractors intend to comply with all BOEM and BSEE safety requirements to minimize the potential for objects dropped overboard.

Chemical Spills. Chemicals are stored and used for pipeline hydrostatic testing, leak and pressure testing of subsea equipment and during well completion operations. The relative quantities of their use is reflected in the largest volumes spilled (BOEM, 2017b), with completion, workover, and treatment fluids comprising 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 1 bbl. Potentially spilled fluids include Transaqua HT, monoethylene glycol 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).

H_2S Release. MC 41 and 85 are classified as H_2S absent.

A.9.1 Small Fuel Spill

Spill Size. According to the analysis by BOEM (2017b), 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 response actions, it is expected that impacts from a small spill would be minimal (BOEM, 2016a).

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. Due to its light density, diesel will not sink to the seafloor. Diesel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high amounts of suspended solids (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico. Diesel fuel is readily and completely degraded by naturally occurring microbes (National Oceanic and Atmospheric Administration [NOAA], 2023a).

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).

For purposes of the EIA, the fate of a small diesel fuel spill of 3 bbl was estimated using WebGNOME, a publicly available oil spill trajectory and fate model developed by NOAA's Office of Response and Restoration (NOAA, 2022a) 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 over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2022a). The area of the sea surface with diesel fuel on it during this 24-hour period would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

The WebGNOME 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 64 mi (103 km) from the nearest shoreline (Louisiana). Slicks 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). Because of the distance from shore of these potential spills on the OCS and their lack of persistence, it is unlikely that a 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. A discussion of Anadarko's response efforts if a spill were to occur during operational activities is provided in DOCD Section H.

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 Anadarko's Regional OSRP, which meets the requirements contained in 30 CFR 254.

A.9.2 Large Oil Spill (Worst-Case Discharge)

Spill Size. The WCD scenario for this project is defined as an uncontrollable oil discharge from the subsea wellbore resulting from a blowout incident. The scenario assumes that the wellhead fails mechanically, and a blowout occurs at the seafloor. The WCD volume for the well under this plan is 33,146 bbl per day. The maximum total volume during a blowout could potentially be 2,684,826 bbl, assuming 81 days for the maximum duration of a blowout, multiplied by the worst-case daily uncontrolled blowout volume of 33,146 bbl per day.

Blowout Scenario. Anadarko prepared this blowout scenario pursuant to guidance provided in NTL No. 2015-N01. It is expected it could take up to 81 days to complete drilling a relief well.

Spill Probability. Holland (1997) estimated a probability of 0.0021 for a deep drilling blowout during exploration drilling based on U.S. Gulf of Mexico data. The International Association of Oil & Gas Producers (2010) conducted an analysis and estimated a blowout frequency of 0.0017 per exploratory well for non-North Sea locations. BOEM updated OCS spill frequencies (bbl spilled per bbl produced) to include the Deepwater Horizon incident. According to ABS Consulting Inc. (2016), the spill rate for spills >1,000 bbl dropped to 0.22 spills per billion barrels produced. According to the ABSG Consulting, Inc. (2018) analysis, the baseline risk of loss of well control spill >10,000 bbl on the OCS is estimated to be once every 27.5 years.

Spill Trajectory. The fate of a large oil spill in the project area would depend on meteorological and oceanographic conditions at the time of and during the spill. 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 trajectory. The OSRA report by Ji et al. (2004) provides conditional contact probabilities for shoreline segments in the Gulf of Mexico.

The project area is located within Launch Area 57 and the results are presented in **Table 3**. The model predicts a 1% to 21% conditional probability of shoreline contact within 30 days of a spill from Cameron Parish, Louisiana to Bay County, Florida (**Table 3**). Counties with a conditional probability for shoreline contact of <0.5% for 3, 10, and 30 days are not shown in **Table 3**.

Table 3. Conditional probabilities of a spill in the lease area contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004).

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
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 lease 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 each 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, located in the Central Planning Area and is presented in **Table 4**.

Table 4. 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	--	--	--	--	--	--	--	--	--	--	--	--
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 shoreline contacts within 60 days range from Matagorda County, Texas, to Levy County, Florida. Based on statewide contact probabilities within 60 days, Alabama and Louisiana have the highest likelihood of contact during all four seasons, with Louisiana having higher probabilities in summer (35%), fall (36%), and winter (33%) and Alabama having higher probabilities in spring (37%). The model predicts a 1% to 2% probability of a spill contacting Texas shorelines during summer, fall, and winter, and a 15% to 22% probability of a spill contacting Mississippi shorelines during all four seasons. Florida shorelines are predicted to be contacted in any season with a probability up to 26% in spring. Based on the 60-day trajectories, counties or parishes with a 10% or greater contact probability during any season include Plaquemines and St. Bernard parishes in Louisiana, Jackson County, Mississippi, Mobile and Baldwin counties, Alabama, and Escambia County, Florida (**Table 4**).

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.

Weathering. In the event of a diesel fuel spill, it is expected that weathering and evaporation will occur quickly. The constituents of diesel fuel are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. NOAA has reported that diesel fuel is readily and completely degraded by naturally occurring microbes (NOAA, 2023a).

Weathering decreases the concentration of oil 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 a slick on the water surface. For example, the light, paraffinic crude oil spilled during the *Deepwater Horizon* incident lost approximately 55 wt. % to evaporation during the first 3 to 5 days while floating on the sea surface (Daling et al., 2014). 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 (National Research Council, 2003a). Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface (Prince, 2014).

Spill Response. Anadarko's Regional OSRP was approved in August 2015 for Anadarko Petroleum Corporation and its subsidiary Anadarko US Offshore LLC. (Company Numbers 00981 and 02219, respectively) in accordance with 30 CFR Part 254. The 2023 OSRP biennial update was deemed in-compliance in June 2023 and the August 2023 revisions were approved in October 2023.

The OSRP provides a detailed plan that enables Anadarko to respond rapidly and effectively manage response efforts for oil spills that may result from drilling and production operations. The OSRP contains detailed information on "Quick Response" procedures, including:

- responsibilities of all Anadarko and contract personnel to report any observed discharge from known or unknown sources;
- procedures to locate and determine the size of a discharge; and
- contact information for alerting the spill management team, complete with names, phone numbers, and locations.

In the event of a large oil spill up to and including a WCD, Anadarko has access to surface and subsea response/containment capabilities that could be implemented through various organizations under contract. Anadarko's primary spill response equipment provider is Clean Gulf Associates (CGA).

CGA has skimming vessels capable of operating in shallow waters, nearshore areas, and offshore areas. These vessels have oleophilic brush pack skimming systems operating in troughs built into the hulls; below-deck storage; and marine electronics packages including marine, aircraft, and company-frequency radios, radar, moving map plotters, GPS, satellite phones, and depth finders. CGA also offers Fast Response Systems staged throughout the Gulf of Mexico available for offshore use.

The CGA high-volume open sea skimmer (HOSS) barge consists of a skimming system built into an oil recovery barge. There are 1,000-bbl recovered oil storage tanks built into the hull where oil can be separated and offloaded. Skimming operations are conducted from the control room overlooking the skimmer deck. The estimated daily recovery capacity for the HOSS barge is approximately 43,000 bbl of surface oil. CGA has recently acquired Koseq skimming arms and Aqua Guard skimmers to enhance its readiness. In addition, an x-band radar/infrared tracking system has been installed on the HOSS barge. Additional CGA equipment can be referenced online at http://www.cleangulfassoc.com/equipment.

Anadarko also has a contract with the Marine Spill Response Corporation (MSRC) for additional spill response equipment. MSRC has a dedicated fleet for the Atlantic/Gulf of Mexico region and additional available equipment staged throughout the U.S. MSRC equipment staged throughout the Gulf of Mexico includes oil spill response vessels, fast response vessels, oil spill response barges, platform supply vessels, and shallow water barges. Various equipment is outfitted with x-band radar and infrared technology for detecting surface oil. Additional MSRC capabilities and a complete equipment listing are available online at http://www.msrc.org/.

Anadarko is a member of the Marine Well Containment Company (MWCC). In the event of an incident, MWCC can provide a 15,000-psi single ram capping stack and dispersant injection capability. MWCC can install and operate the interim containment system, including subsea flowlines, manifolds, and risers. The interim system is engineered to be used in depths up to 10,000 ft (3,048 m) and has the capacity to contain 60,000 bbl of liquid per day (and 120 million standard cubic feet of gas per day) with potential for expansion.

Additionally, MWCC offers its members access to equipment, instruments, and supplies for marine environmental sampling and monitoring in the event of an oil spill in the Gulf of Mexico. Members have access to a mobile Laboratory Container, Operations Container, and Launch and Recovery System that enable water sampling and monitoring to water depths of 9,843 ft (3,000 m). The two 8 ft × 20 ft (2.4 m × 6.1 m) containers have been certified for offshore use by Det Norske Veritas and the American Bureau of Shipping. The Launch and Recovery System is a combined winch, A-frame, and 9,843 ft (3,000 m) long cable, customized for the instruments in the containers.

The containers are designed to enable rapid mobilization of necessary equipment to an incident site, including redundant systems to avoid downtime and supplies for sample handling and storage. Once deployed on a suitable vessel, the mobile containers then act as workspaces for scientists and operations personnel. See DOCD Section H for a detailed description of Anadarko's site-specific spill response measures for the plan.

B. Affected Environment

The project area is approximately 64 mi (103 km) from the nearest shoreline (Louisiana), 136 mi (219 km) from the onshore support base at Port Fourchon, Louisiana, and 171 mi (276 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the location of the proposed activities is approximately 5,179 ft (1,579 m) (**Figure 2**). The seafloor in the vicinity of the proposed activities exhibited low side scan sonar reflectivity and low to moderate backscatter, indicating the sediments are likely fine-grained (Oceaneering, 2024).

A detailed description of the regional affected environment, 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 is provided in recent EISs (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a). These regional descriptions are applicable to MC 41 and 85 and remain valid and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource, including site-specific and new information if available, are presented in **Section C**.

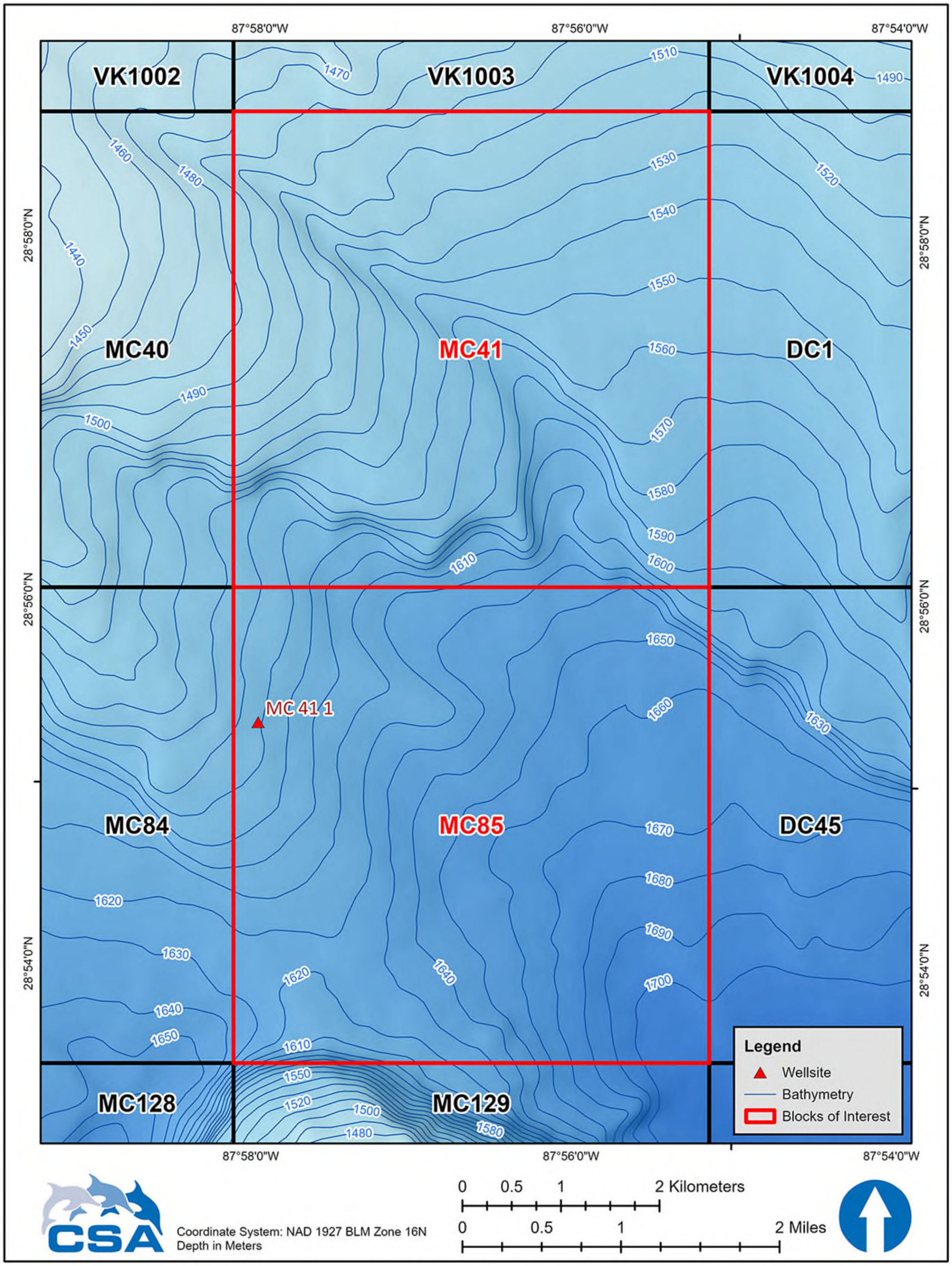

Figure 2. Bathymetric map of the project area showing the surface hole location of the proposed primary wellsite.

C. Impact Analysis

This section analyzes the potential direct and indirect impacts of routine activities and accidents. Impacts have been analyzed extensively in lease sale EISs for the Central and Western Gulf of Mexico Planning Areas (BOEM, 2013, 2014, 2015, 2016a,b, 2017a) and the information in these documents is incorporated by reference. This section is organized by the environmental resources identified in **Table 2** and addresses each IPF potentially affecting the resource.

C.1 Physical/Chemical Environment

C.1.1 Air Quality

There are no site-specific air quality data for the project area due to the distance from shore. Because of the distance from shore-based pollution sources and the minimal and highly dispersed sources offshore, air quality at the wellsite 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 of coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012a). As of March 2025, Mississippi, Alabama, and Florida Panhandle coastal counties are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2025). St. Bernard Parish in Louisiana is a nonattainment area 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 October 2018 from a nonattainment area to maintenance status for lead based on the 2008 Standard (USEPA, 2024). One coastal metropolitan area in Texas (Houston-Galveston-Brazoria) is a nonattainment area for 8-hour ozone (2015 Standard). Hillsborough County, Florida was reclassified in 2019 from a nonattainment area to maintenance status for sulfur dioxide based on the 2010 standard (USEPA, 2025).

As noted previously, based on calculations made pursuant to applicable regulations, emissions from the project activities are not expected to be substantial. 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 likely to affect air quality. Offshore air pollutant emissions result primarily from the drilling and well completion operations and service vessels. These emissions occur mainly from combustion or burning of diesel and Jet A aircraft fuel. The combustion of fuels occurs primarily in generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with OCS activities are suspended $PM_{2.5}$ and PM_{10}, ammonia, lead, SO_x, NO_x, VOCs, and CO. 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. The incremental contribution to cumulative impacts from activities in Anadarko's proposed activities is not substantial and is not expected to cause or contribute to a violation of NAAQS.

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 and are not expected to substantially alter or exceed any of the climate change impacts evaluated in the Programmatic EIS (BOEM, 2016a). Carbon dioxide and methane 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 carbon dioxide 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.

As noted in the lease sale EIS (BOEM, 2017a), emissions of air pollutants from routine activities in the Central Gulf of Mexico Planning Area are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, emission rates, and the distance of these emissions from the coastline. The Air Quality Emissions Report (see DOCD Section G) indicates that the projected project emissions are below exemption levels set by the applicable regulations in 30 CFR 550.303. Based on this and the distance from shore, it can be concluded that the emissions will not substantially affect the air quality of the onshore area for any of the criteria pollutants.

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 Class I air quality area. BOEM is required to notify the National Park Service and U.S. Fish and Wildlife Service (USFWS) if emissions from proposed projects may affect the Breton Class I area. Additional review and mitigation measures may be required for sources within 186 mi (300 km) of the Breton Class I area that exceed emission limits agreed upon by the administering agencies (National Park Service, 2010). The project area is approximately 76 mi (122 km) from the Breton Wilderness Area. Anadarko intends to comply with all BOEM requirements regarding air emissions.

There are three Class I air quality areas on the west coast of Florida: St. Marks National Wildlife Refuge in Wakulla County, Florida, Chassahowitzka National Wildlife Refuge in Hernando County, Florida, and Everglades National Park in Monroe, Miami-Dade, and Collier counties, Florida. The project area is approximately 220 mi (354 km) from the closest Florida Class I air quality area (St. Marks National Wildlife Refuge Class I Air Quality Area). Anadarko will 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). The probability of a small spill would be minimized by Anadarko's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to reduce the potential impacts. DOCD Section H includes a detailed discussion of the spill response measures that would be employed. Given the open ocean location of the project area, the extent and duration of air quality impacts from a small spill would not be significant.

A small fuel spill would affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The WebGNOME model (see Section A.9.1) indicates that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2022a). 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 should not affect coastal air 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 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 could potentially affect air quality by introducing VOCs into the atmosphere through evaporation. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Additional air quality impacts could occur if response measures included *in situ* burning of floating oil. Burning would generate a plume of black smoke 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, including the USEPA.

Because of the project area's location (64 mi [103 km]) from the nearest shoreline, most air quality impacts would occur in offshore waters with minimal chance to affect onshore air quality.

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 homogeneous with respect to 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 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 2,000 ft (610 m) of the proposed wellsite in the site clearance letter (Oceaneering, 2024).

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

Treated sanitary and domestic wastes, including those from support vessels, may have a transient effect on water quality in the immediate vicinity of the discharge. Treated sanitary and domestic 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. All NPDES permit limitations and requirements as well as USCG regulations (as applicable) are expected to be met during proposed activities; therefore, little or no impact on water quality from the overboard releases of treated sanitary and domestic wastes 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 of the drilling rig will flow overboard without treatment. However, rainwater that falls on the drilling rig deck and other areas such as chemical storage areas and places where equipment is exposed 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; subsea production control fluid, produced water, non-pollutant completion fluids; 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 quality.

Support vessels will discharge treated sanitary and domestic wastes. These are not expected to have a substantial impact on water quality in the vicinity of the discharges. Support vessel discharges are expected to be in accordance with USCG and the MARPOL 73/78 Annex V requirements and, as applicable, the NPDES Vessel General Permit, and therefore are not expected to cause substantial 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). The probability of a small spill would be minimized by Anadarko's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to potentially help mitigate and reduce the impacts. DOCD Section H provides details on spill response measures in addition to the summary information provided in the EIA.

The water-soluble fractions of diesel are dominated by two- and three-ringed PAHs, which are moderately volatile (National Research Council, 2003a). The molecular weight of diesel fuel constituents is light to intermediate and can be readily degraded by aerobic microbial oxidation. Diesel fuel 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 fuel 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 fuel 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, 2023a). It is possible for the diesel fuel that is dispersed by wave action to form droplets that are small enough to be kept in suspension and be moved by the currents.

Diesel fuel dispersed in the water column can adhere to suspended sediments but this generally occurs only in coastal areas with high levels of suspended solid (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 of the spill 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 (NOAA, 2022a) (see **Section A.9.1**). The sea surface area covered with a very thin layer of diesel fuel would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel fuel are readily and completely degraded by naturally occurring microbes (NOAA, 2023a). 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.

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).

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 release and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of released hydrocarbons. Weathering processes that affect spilled oil on the sea include adsorption (sedimentation), biodegradation, dispersion, dissolution, emulsification, evaporation, and photo oxidation. Most crude oil blends will emulsify quickly when spilled, creating a stable mousse that presents a more persistent cleanup and removal challenge (NOAA, 2024a).

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, ethane) and the microbial response to a deepwater oil suggest that 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).

Due to the project area being located approximately 64 mi (103 km) from the nearest shoreline (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. Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days).

C.2 Seafloor Habitats and Biota

The water depth at the proposed activities is approximately 5,179 (1,579 m). According to BOEM (2016a), 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. The site clearance letter did note the potential presence of deepwater benthic communities within 2,000 ft (610 m) of the proposed wellsites (Oceaneering, 2024). The IPFs with potential impacts listed in **Table 2** are discussed below.

C.2.1 Soft Bottom Benthic Communities

There is no site-specific benthic community data from the project area. However, data from the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Wei, 2006; Rowe and Kennicutt, 2009; Wei et al., 2010; Carvalho et al., 2013) can be used to describe typical baseline benthic communities in the area. **Table 5** summarizes data collected at two stations in water depths similar to those in the proposed project area.

Table 5. Baseline benthic community data from stations near the project area in similar depths sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (Adapted from: Wei, 2006; Rowe and Kennicutt, 2009).

Station	Water Depth (m)	Density		
		Meiofauna (>63 µm; individuals m^{-2})	Macroinfauna (>300 mm; individuals m^{-2})	Megafauna (>1 cm; individuals ha^{-1})
S36	1,825	799,963	4,481	359
S37	2,381	291,179	2,192	1,451

Meiofaunal and megafaunal abundances from Rowe and Kennicutt (2009); macroinfaunal abundance from Wei (2006); m = meter; ha = hectare.

Densities of meiofauna (animals passing through a 0.5-mm sieve but retained on a 0.062-mm sieve) at stations in the vicinity of the project area ranged from approximately 291,000 to 800,000 individuals m^{-2} (**Table 5**) (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant meiofaunal groups, accounting for about 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the meager primary production in surface waters of the Gulf of Mexico continental slope (Wei, 2006). Densities decrease exponentially with water depth. Based on an extrapolation equation presented by Wei (2006), macroinfaunal densities in the water depth of the project area are expected to be approximately 2,110 individuals m^{-2}.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods. 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 are divided into eastern and western subzones. The project area is in Zone 1 that consists of stations on the upper Texas-Louisiana Slope, the west flank of the upper Mississippi Fan, the head of Mississippi Canyon, and the upper West Florida Terrace. The most abundant species in this zone were the polychaetes *Litocorsa antennata*, *Prionospio cirrifera*, and *Aricidea suecica*; the amphipod *Ampelisca mississippina*; and the bivalve *Heterodonta* spp. (Wei, 2006).

The megafaunal density at nearby stations in the vicinity of the project area ranged between 359 to 1,451 individuals ha^{-1}. Common megafauna included motile groups such as echinoderms, cnidarians (sessile sea anemones, pens and whips), decapod crustaceans, and demersal fish (Rowe and Kennicutt, 2009).

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

IPFs that potentially may affect benthic communities are physical disturbance to the seafloor and potential effects from large oil spill resulting from a well blowout at the seafloor. A small fuel spill would not affect benthic communities because the diesel fuel is expected to float and dissipate on the sea surface.

Impacts of Physical Disturbance to the Seafloor

In water depths such as those in the project area, DP drilling rigs disturb the seafloor only around the location where equipment will be placed on the seafloor.

The areal extent of these impacts 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 to be localized and will not likely have a substantial impact on soft bottom benthic communities in the region.

Impacts of a Large Oil Spill

The most likely effects of a subsea blowout on benthic communities would be within a few hundred meters of the wellsite. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 984-ft (300-m) radius. While coarse sediments (sands) would probably settle at a rapid rate within 1,312 ft (400 m) 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 3,600 ft (1,100 m), extending at least 22 mi (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). Noirungsee et al. (2020) observed that pressure has a significant influence on deep-sea sediment microbial communities with the addition of dispersant and oil with dispersants being shown to have an inhibitory effect on hydrocarbon degraders. Thus, the dispersant persistence due to hydrostatic pressure could further limit microbial oil biodegradation (Noirungsee et al., 2020).

C.2.2 High-Density Deepwater Benthic Communities

As defined by NTL 2009-G40, high-density deepwater benthic communities are features or areas that could support high-density chemosynthetic communities, including deepwater coral-dominated 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 (Brooke and Schroeder, 2007; CSA International, 2007; Brooks et al., 2012). In the Gulf of Mexico, deepwater coral communities occur almost exclusively on exposed authigenic carbonate rock created by a biogeochemical (microbial) process.

In water depths such as those encountered in the project area, DP drilling rigs disturb the seafloor only the location where equipment will be placed on the seafloor.

The site clearance letter did not identify features that could support high-density deepwater benthic communities within 2,000 ft (610 m) of the proposed wellsites (Oceaneering, 2024). The nearest confirmed high-density deepwater benthic community is located in Viosca Knoll Block 826, approximately 14 mi (22 km) from the project area. Due to the distance from the project area, it is unlikely that these communities will be affected by routine operations.

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 in the close vicinity of the proposed activities.

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 984 ft (300 m) of the wellhead (BOEM, 2012a, 2013). 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 3,600 ft (1,100 m), extending at least 22 mi (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 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 area 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 located approximately 94 mi (151 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to designated topographic features.

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 upward onto the continental shelf edge where the designated Topographic Features are located.

C.2.4 Pinnacle Trend Area Live Bottoms

The project area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined by NTL 2009-G39, the nearest Pinnacle Stipulation Block is located approximately 19 mi (31 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to Pinnacle Trend Area Live Bottoms due to the distance from the project area.

Given the distance from the project area, it is possible that pinnacle trend live bottom areas would be affected by an accidental spill. However, 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 could occur but 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 upward onto the continental shelf edge where the Pinnacle Trend Area Live Bottoms are located.

C.2.5 Eastern Gulf Live Bottoms

The project area is not covered by the Live Bottom (Low-Relief) Stipulation, which applies to seagrass communities and low-relief hard bottom reef within the Eastern Gulf of Mexico Planning Area leases in water depths of 328 ft (100 m) or less and portions of Pensacola and Destin Dome Area blocks in the Central Gulf of Mexico Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined by NTL 2009-G39, is located approximately 29 mi (47 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to eastern Gulf 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 upward 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 Endangered Species Act (ESA). In addition, it includes all marine mammal species in the region, which are protected under the Marine Mammal Protection Act (MMPA).

Endangered or Threatened species that may occur in the project area and/or along the northern Gulf Coast are listed in **Table 6**. The table also indicates the location of critical habitat (if designated 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. The NMFS has jurisdiction for ESA-listed marine mammals (cetaceans), sea turtles, and fishes in the Gulf of Mexico. The USFWS has jurisdiction for ESA-listed birds, the West Indian manatee (*Trichechus manatus*), and sea turtles while on their nesting beaches.

Table 6. Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast. Adapted from: U.S. Fish and Wildlife Service (2020) and National and Oceanic Atmospheric Administration 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*	E	X	--	None
Sperm whale	*Physeter macrocephalus*	E	X	--	None
West Indian manatee	*Trichechus manatus*[1]	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T,E[2]	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)
Black-capped Petrel	*Pterodroma hasitata*	E	X	--	None
Rufa Red Knot	*Calidris canutus rufa*	T	--	X	None
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

Table 6. (Continued).

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Project Area	Coastal	
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	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	*Mycetophyllia ferox*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	*Orbicella annularis*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Mountainous star coral	*Orbicella faveolata*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Boulder star coral	*Orbicella franksi*	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, Navassa Island, East and West Flower Garden Banks, Rankin Bright Bank, Geyer Bank, and McGrail Bank
Panama City crayfish	*Procambarus econfinae*	T	--	X	South-central Bay County, Florida
Queen conch	*Aliger gigas*	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	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. 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. On 30 March 2017, the USFWS announced the West Indian manatee, including the Florida manatee subspecies, was reclassified as Threatened.

2. The loggerhead turtle is composed of nine distinct population segments (DPS). The only DPS that may occur in the project area (Northwest Atlantic DPS) is listed as Threatened (76 Federal Register [*FR*] 58868; 22 September 2011).

Coastal Endangered or Threatened species that may occur along the northern Gulf Coast include the West Indian manatee, Piping Plover (*Charadrius melodus*), Rufa Red Knot (*Calidris canutus rufa),* Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*), Panama City crayfish (*Procambarus econfinae*), Whooping Crane (*Grus americana*), Gulf sturgeon (*Acipenser oxyrinchus desotoi*), smalltooth sawfish (*Pristis pectinata*), Queen conch (*Aliger gigas*) and four subspecies of beach mouse. Critical habitat has been designated for all of these species (except the Florida salt marsh vole, Rufa Red Knot, and Queen conch) as indicated in **Table 6** and discussed in individual sections.

The sperm whale (*Physeter macrocephalus*), the Rice's whale (*Balaenoptera ricei*), five species of sea turtles, the oceanic whitetip shark (*Carcharhinus longimanus*) and the Black-capped Petrel (*Pteredroma hasitata*) are the only Endangered or Threatened species likely to occur in or near 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 11 August 2014, NMFS has designated certain marine areas as critical habitat for the Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle (see **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, green turtle, or the sperm whale. Five Endangered mysticetes (blue whale [*Balaenoptera musculus]*, fin whale [*B. physalus]*, humpback whale [*Megaptera novaeangliae]*, North Atlantic right whale [*Eubalaena glacialis]*, and sei whale [*B. borealis]*) have been reported in 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., 2022) nor in the most recent BOEM multisale EIS (BOEM, 2017a); therefore, they are not considered further in the EIA.

The Rice's whale (*B. 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 (*B. 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 a resident in the Gulf of Mexico. 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). However, recent work by Soldevilla et al. (2022) suggests the range may be broader than previously thought (see **Section C.3.2**). 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 (*A. cervicornis*), lobed star coral (*Orbicella annularis*), mountainous star coral (*O. faveolata*), boulder star coral (*O. franksi*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*). None of these species are expected to be present in the project area (**Section C.3.18**). These corals are shallow water, zooxanthellate species (containing symbiotic photosynthetic zooxanthellae which contribute to their nutritional needs) and will not present in the deepwater project area (see **Section C.3.18**). Critical habitat for lobed star coral, mountainous star coral, boulder star coral, rough cactus coral, and pillar coral was designated by NMFS in August 2023 (**Table 6**; 88 FR 54026).

There are no other Threatened or Endangered species in the Gulf of Mexico that are likely to be adversely affected by either routine or accidental events. The IPFs with potential impacts listed in **Table 2** are discussed below.

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; a species description is presented in the recovery plan for this species (NMFS, 2010). Gulf of Mexico sperm whales are classified as an endangered species and a "strategic stock" (defined as a stock that may have unsustainable human-caused impacts) by NOAA Fisheries (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 (PBR) 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 are defined as "any factor that could represent an impediment to recovery." Current threats to sperm whale populations worldwide include fisheries interactions, anthropogenic marine sound, 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).

In 2013, NMFS conducted a status review to consider designating the Gulf of Mexico population of the sperm whale as a DPS under the ESA but concluded that the designation of a Gulf of Mexico DPS for sperm whales was not warranted (78 *FR* 6801032).

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 throughout the year (Davis et al., 2000). Results of a multi-year tracking study show female sperm whales are typically concentrated along the upper continental slope between the 656- and 3,280-ft (200- and 1,000-m) 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 MMS-funded Sperm Whale Seismic Study of mixed-sex groups comprising adult females with 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). In these mitigation surveys, sperm whales were the most common large cetacean encountered. The Sperm Whale Seismic Study results 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 may potentially affect sperm whales include drilling rig 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 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. 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 non-lethally 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 discussed further.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Noise from routine drilling activities (see **Section A.1**) 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 can include temporary displacement or cessation of feeding, resting, or social interactions (NMFS, 2009a; Gomez et al., 2016; Southall et al., 2021). Additionally, behavioral changes resulting from auditory masking 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 sperm whale calls in the Gulf of Mexico (Azzara et al., 2013).

NMFS (2024a) lists sperm whales in the same functional hearing group (i.e., high-frequency cetaceans) as most dolphins and other toothed whales (i.e., odontocetes), with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, vessel-related noise is likely to be audible to sperm whales. Sperm whales may possess better hearing at lower frequencies than some of the other mid-frequency cetacean species, although not as low as many baleen whale species that primarily produce sounds between 12 Hz and 28 kHz (Wartzok and Ketten, 1999; Southall et al., 2019). Generally, most of the acoustic energy produced by sperm whale vocalizations is present at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with SLs, expressed as SPL, up to 236 dB re1 µPa m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the proposed operations, sperm whales would avoid the proposed operations area, and noise levels that could cause auditory injury would not be encountered. Noise associated with proposed vessel operations may cause behavioral disturbance effects to sperm whales. Observations of behavioral responses of marine mammals to anthropogenic sounds, in general, involve short-term behavioral responses, which included the cessation of feeding, resting, or social interactions (NMFS, 2009a; Southall et al., 2021). 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).

The acoustic criteria (NMFS, 2024a) are based on received sound level accumulations that equate to the onset of auditory threshold shifts in marine mammals. For high-frequency cetaceans exposed to a non-impulsive source, permanent threshold shifts (PTS) are estimated to occur when the animal has received a sound exposure level over 24 hours (SEL_{24h}) of 201 dB re 1 μPa^2 s. Similarly, temporary threshold shifts (TTS) are estimated to occur when the animal has received an SEL_{24h} of 181 dB re 1 μPa^2 s. Due to the transient nature of sperm whales and the stationary nature of drilling activities, it is not expected that any sperm whales will remain within the ensonified area for a full 24-hour period to receive a SEL_{24h} necessary for the onset of PTS or TTS.

There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar marine sound sources (HDR [Athens AL], 2022). Drilling-related marine sound associated with this project will contribute to increases in the ambient marine sound environment of the Gulf of Mexico, but it is not expected in amplitudes sufficient to result in auditory injuries to sperm whales. The proposed activities may cause disturbance effects, primarily avoidance or temporary displacement from the project area. Drilling rig lighting and presence are not identified as IPFs for sperm whales (NMFS, 2007; BOEM, 2016a, 2017a).

Impacts of Support Vessel and Helicopter Traffic

NMFS has found that support vessel traffic has the potential to disturb sperm whales, and there is also a risk of vessel strikes, which are identified as a threat in the recovery plan for this species (NMFS, 2010). To reduce the potential for vessel strikes, BOEM issued BOEM-2016-G01. This NTL recommends that vessel operators and crews receive protected species identification training. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a, 2021) replaces compliance with the NTL. Vessel operators are required to maintain a vigilant watch for and report sightings of any injured or dead protected species. In addition, when whales are sighted, vessel operators and crews are required to maintain a distance of 328 ft (100 m) or greater from the sighted animal whenever possible (NMFS, 2020a, 2021). Vessel operators are required to reduce vessel speed to 10 knots or less, if safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel. Compliance with these mitigation measures is expected to minimize the likelihood of vessel strikes as well as reduce the chance for disturbing sperm whales.

NMFS (2020a, 2021) analyzed the potential for vessel strikes and harassment of sperm whales. With implementation of the mitigation measures in NTL BOEM-2016-G01, 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 substantial effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the population level. With implementation of the vessel strike avoidance measures requirement to maintain a distance of 328 ft (100 m) from sperm whales, the NMFS (2020a, 2021) 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 PBR level for the Gulf of Mexico stock of sperm whales is 2.0 (Hayes et al., 2021). 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 substantial 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 800 ft (245 m). A reaction to the initial pass of the aircraft was observed during 3 of 24 (12%) sightings. All three responses 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.

While flying offshore in the Gulf of Mexico, support helicopters maintain altitudes above 700 ft (213 m) 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 responses are possible (Smultea et al., 2008), NMFS (2020a, 2021) 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, 2021) and BOEM (2017a, 2023b). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the Marine Mammal Commission (MMC) (2011) with discussions germane to the Gulf of Mexico populations concerning composition and fate of petroleum and spill-treating agents in the marine environment, aspects of cetacean ecology, and physiological and toxic effects of oil on cetaceans. For this DOCD, there are no unique site-specific issues with respect to spill impacts on these animals that were not analyzed in the previous documents.

The probability of a fuel spill will be minimized by Anadarko's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Anadarko'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 of the spill 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, 2022a). 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 Anadarko's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP will mitigate and lessen the potential for impacts on sperm whales. Given the open ocean location of the project area and the expected brief duration of a small spill, potential impacts to sperm whales are expected to be minimal.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals, including sperm whales, are discussed by NMFS (2020a, 2021) and BOEM (2017a, 2023b). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the MMC (2011). For this DOCD, 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 sound, 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 sound 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, 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 oil from a large spill contacting sperm whales, it is expected that impacts resulting in the injury or death of individual sperm whales would be adverse. 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. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for striking or disturbing these animals.

C.3.2 Rice's Whale (Endangered)

A 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 became effective 22 October 2021.

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.

The Rice's whale is the only year-round resident baleen whale in the northern Gulf of Mexico with the population estimated to be fewer than 100 individuals (NOAA, 2022b; NOAA Fisheries, 2024). NOAA, in partnership with Scripps Institution of Oceanography and Florida International University, created the Gulf of Mexico Rice's Whale Trophic Ecology Project to develop a comprehensive ecological understanding of the newly identified species (NOAA Fisheries, 2024). The group is working on building a photo-identification catalog, conducting animal telemetry, biological sampling, and understanding their prey/distribution. Through animal telemetry, they have identified that Rice's whales make foraging dives during the day near the seafloor.

The Rice's whale is sighted most frequently in the waters over DeSoto Canyon between the 328- and 3,280-ft (100- and 1,000-m) isobaths (Rosel et al., 2016; Hayes et al., 2021). 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. Soldevilla et al. (2022) identified new variants of long-moan calls along the northwestern Gulf of Mexico shelf break that were determined to share distinctive features with typical eastern Gulf of Mexico long-moan calls. A genetically confirmed sighting of a Rice's whale individual offshore Corpus Christi, Texas in 2017, along with the newly identified long-moan calls in the northwestern Gulf of Mexico, indicate that Rice's whales may occur in a broader range in the Gulf of Mexico than previously known and this broader range should be considered when designating critical habitat.

Kiszka et al. (2023) studied the drivers of resource selection by Rice's whales in relation to prey availability and energy density. The study indicated that Rice's whales are selective predators consuming schooling prey with the highest energy content (i.e., silver rag [*Ariomma bondi*]). The silver rag is found at a depth range of 25 to 640 m (82 to 2,100 ft) primarily over muddy bottoms on the OCS, although juveniles can be within the surficial waters (Smithsonian Tropical Research Institute, 2015). Therefore, it is unlikely that Rice's whales would occur in the project area. However, support vessels transiting through the 25 to 640 m (82 to 2,100 ft) water depths could encounter a Rice's whale.

Although it is unlikely that the Rice's whales would occur in the project area, IPFs that could affect the Rice's whales include drilling rig 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. 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, 2021) stated marine debris as an IPF, compliance with BSEE NTL 2015-G03 and NMFS (2020a, 2021) Appendix B will minimize the potential for marine debris-related impacts on Rice's whales. NMFS (2020a, 2021) estimated one sublethal take and no lethal takes of Rice's whale (Bryde's whales at the time of publication) 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 discussed further.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

NMFS (2024a) lists Rice's whales in the functional hearing group of low-frequency cetaceans (baleen whales), with an estimated hearing sensitivity from 7 Hz to 36 kHz. 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 activities is relatively weak in intensity, and an individual animal's noise exposure would be transient. 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. SLs associated with drilling activities are relatively weak in intensity, and an individual animal's noise exposure would be transient.

It is expected that, due to the relatively stationary nature of the drilling operations, Rice's 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 individual Rice's whales. NMFS (2024a) recommends criteria that are used to determine behavioral disturbance thresholds for marine mammals and are applied equally across all hearing groups. Received SPL of 120 dB re 1 µPa from a non-impulsive, continuous source is 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 SPL of 120 dB re 1 µPa does not alone equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur that, more importantly, may not result in biologically significant responses (Southall et al., 2016, 2021; Ellison et al., 2012).

For low-frequency cetaceans, specifically the Rice's whale, PTS and TTS onset from non-impulsive sources are estimated to occur at SEL_{24h} of 197 dB re 1 μPa^2 s and 177 re 1 μPa^2 s, respectively. However, due to transient nature of Rice's whales and the relatively stationary nature of drilling activities, it is not expected that any Rice's whales will remain within the ensonified area for a full 24-hour period to receive an SEL_{24h} sufficient for the onset of auditory threshold shifts. Drilling-related noise associated with this project may contribute to increases in the ambient noise environment of the region but are not expected to cause noise-related impacts to Rice's whales.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb Rice's whales and creates the potential for vessel strikes. Kiszka et al. (2023) indicated through Bayesian stable isotope mixing models that Rice's whales primarily feed on silver rag found between 25 and 640 m water depths. However, it is unlikely support vessels will encounter Rice's whale given that they are primarily found over DeSoto Canyon between the 100 m (328 ft) and 1,000 m (3,280 ft) isobaths (Rosel et al., 2016; Hayes et al., 2021).

To reduce the potential for vessel strikes, 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. Compliance with this NTL will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing Rice's whales.

Helicopter traffic also has the potential to disturb Rice's whales and based on studies of cetacean responses to sound, the observed responses 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 observed 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 328 ft (100 m) of marine mammals (NMFS, 2020a, 2021).

The current PBR level for the Gulf of Mexico stock of Rice's whale is 0.1 (Hayes et al., 2021). Mortality of a single Rice's whale would constitute a significant impact to the species. However, it is unlikely that Rice's whales will 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. Compliance with these mitigation measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing Rice's whales. Due to the brief potential for disturbance and the low density of Rice's whales 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 Anadarko'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 brief duration of a small spill, any impacts are expected to be minimal.

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 (NOAA, 2022a). 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 occurrence 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, 2023b), NMFS (2020a, 2021), 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 strikes, 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 striking 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 (0.1). The core distribution area for Rice's whales is within the eastern Gulf of Mexico OCS Planning Area. Consequently, the probability of spilled oil from a project-related well blowout reaching Rice's whales is low.

C.3.3 West Indian Manatee (Threatened)

Most of the Gulf of Mexico manatee population is located in peninsular Florida, but manatees have been seen as far west as Texas during the summer (USFWS, 2001a). A species description is presented in the West Indian manatee recovery plan (USFWS, 2001a). Critical habitat for the West Indian manatee has been designated in southwest Florida.

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 been seen on rare occasions in deepwater areas during 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 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, as the project area is approximately 64 mi (103 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. Compliance with BSEE NTL 2015-G03 is intended to minimize the potential for marine debris-related impacts on manatees.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb manatees, and there is also a risk of vessel strikes, which are identified as a threat in the recovery plan for this species (USFWS, 2001a). Manatees are expected to be limited to 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 strikes, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessel operators and that vessels slow down or stop their vessel to avoid striking protected species. 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.

NTL 2016-G01 was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a) replaces compliance with the NTL. Vessel strike avoidance measures described in NMFS (2020a) and in an amendment published in April 2021 (NMFS, 2021) for marine mammals and other aquatic protected species will also provide protections for manatees. Specifically, all vessels must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 164 ft (50 m) from all “other aquatic protected species” including sea turtles, with an exception made for those animals that approach the vessel.

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 and site clearance trawling).

Compliance with these mitigation measures will minimize the likelihood of vessel collisions as well as reduce the chance for disturbing manatees during daylight hours. The current PBR level for the Florida subspecies of West Indian 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 has the potential to disturb manatees and Rathbun (1988) reported that manatees were disturbed more by low-flying 66 to 252 ft (20 to 160 m) helicopters than by fixed-wing aircraft. 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) over populated areas and sensitive habitats such as wildlife refuges and park properties. In addition, guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2017a; NMFS, 2020a, 2021). This helicopter traffic mitigation measure will minimize the potential for disturbing manatees. 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 of manatee habitats. Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days). This range does not include areas of manatee critical habitat in southwest Florida.

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, 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 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, changing 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 strikes, 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 striking or disturbing these animals, and therefore no significant impacts are expected.

In the event of oil from a large spill enters areas inhabited by manatees, it is expected that impacts resulting in the injury or death of individual manatees could be significant at the population level. 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 Gulf of Mexico and therefore large groups are unlikely to be affected by a large spill. 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 marine mammals that may be found in the Gulf of Mexico, including dwarf and pygmy sperm whales (*Kogia sima* and *K. breviceps*, respectively), 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 (*Stenella attenuata*), spinner dolphin (*S. longirostris*), and Clymene dolphin (*. clymene*). A brief summary is presented below, and additional information on these groups is presented by BOEM (2017a).

Dwarf and pygmy sperm whales. At sea, it is difficult to differentiate dwarf sperm whales from pygmy sperm whales, 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; Hayes et al., 2019, 2020, 2022). Either species could occur in the project area.

Beaked whales. Four species of beaked whales are known to occur in the Gulf of Mexico: Blainville's beaked whale (*Mesoplodon densirostris*), Sowerby's beaked whale (*M. bidens*), Gervais' beaked whale (*M. 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 3,281 ft (1,000 m) over lower slope and abyssal landscapes (Davis et al., 2000; HIdebrand et al., 2015). Any of these species could occur in the project area (Hayes et al., 2022).

Delphinids. Fourteen species of delphinids are known from the Gulf of Mexico, including Atlantic spotted dolphin (*Stenella frontalis*), bottlenose dolphin (*Tursiops truncatus*), Clymene dolphin, false killer whale (*Pseudorca crassidens*), Fraser's dolphin (*Lagenodelphis hosei*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), pantropical spotted dolphin, pygmy killer whale (*Feresa attenuata*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), spinner dolphin, and striped dolphin (*Stenella coeruleoalba*). Any of these species could occur in the project area (Hayes et al., 2022).

The bottlenose dolphin 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 32 geographically distinct population units, or stocks, for management purposes by NMFS (Hayes et al., 2019, 2020, 2022).

IPFs that potentially may affect non-endangered marine mammals include drilling rig 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 Rig Presence, Marine Sound, and Lights

The presence of the drilling rig 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 noise that might otherwise be avoided. Despite the attraction of offshore vessels as food sources for non-endangered marine mammals, construction and support vessel presence and lighting are not considered as IPFs for marine mammals (BOEM, 2017a).

Noise from drilling activities has the potential to disturb marine mammals. As discussed in **Section A.1,** noise impacts would be expected at greater distances when DP thrusters are in use than with vessel noise alone and are dependent on variables relating to sea state conditions, thruster type and usage. Three functional hearing groups are represented in the 20 non-endangered cetaceans found in the Gulf of Mexico. Eighteen of the 20 odontocete species are considered to be in the high-frequency functional hearing group and two species (*Kogia* spp.) are in the very high-frequency functional hearing group, (NMFS, 2024). Thruster noise will affect each group differently depending on the frequency bandwidths produced by operations. Generally, noise produced by vessels on DP is dominated by frequencies below 10 kHz. Thus, DP sound sources are out of the audible range for the high-frequency group.

NMFS (2024) presents criteria that are used to determine auditory injury thresholds for marine mammals. For high-frequency cetaceans exposed to a non-impulsive source (like drilling operations), the onset of PTS is estimated to occur when the mammal has received an SEL_{24h} of 201 dB re 1 μPa^2 s. Similarly, the onset of TTS is estimated to occur when the mammal has received an SEL_{24h} of 181 dB re 1 μPa^2 s. For very high-frequency cetaceans exposed to a non-impulsive source, the onset of PTS is estimated to occur when the mammal has received an SEL_{24h} of 181 dB re 1 μPa^2 s, and the onset of TTS is estimated to occur when the mammal has received an SEL_{24h} of 161 dB re 1 μPa^2 s (NMFS, 2024).

Due to the short propagation distance of above-thresholds noise levels, the transient nature of marine mammals and the stationary nature of drilling activities, it is not expected that any marine mammals will receive exposure levels sufficient for the onset of auditory threshold shifts. Behavioral disturbance thresholds have not been updated in the most recent acoustic guidance (NMFS, 2024a) and therefore, revert to thresholds established and published by NMFS in 70 FR 1871 and summarized in NMFS (2024b). Received SPL of 120 dB re 1 µPa from a non-impulsive, continuous source is considered to be the lowest sound level that elicit a behavioral reaction in some marine mammal species. The SPL 120 dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar sources (HDR [Athens AL], 2022). Marine mammal species in the northern Gulf of Mexico have been exposed to noise from anthropogenic sources for a long period of time and over large geographic areas and likely do not represent a naïve population with regard to sound (National Research Council, 2003b). Due to the limited scope, timing, and geographic extent of drilling activities, this project would represent a small, temporary contribution to the overall noise regime, and any short-term behavioral impacts are not expected to be biologically significant to marine mammal populations. Drilling rig lighting and presence are not identified as IPFs for marine mammals by BOEM (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 strikes. Data concerning the frequency of vessel strikes are presented by BOEM (2012a). To reduce the potential for vessel strikes, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessels operators and that vessels slow down or stop to avoid striking protected species. 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 328 ft (100 m) for toothed whales and 1,640 ft (500 m) for baleen whales or greater when sighted and 164 ft (50 m) 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. 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. Use of these measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

Helicopter traffic has the potential to disturb marine mammals (Würsig et al., 1998) but relatively high-altitude flying is conducted to minimize the potential for disturbances. While flying offshore, helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. In addition, guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2012a; 2016a). Maintaining these altitudes during helicopter operations will minimize the potential for disturbing marine mammals, and no substantial impacts are expected (BOEM, 2017a; NMFS, 2020a).

The current PBR level for several non-endangered cetacean species in the Gulf of Mexico are less than three individuals (e.g., rough-toothed dolphin = undetermined, Clymene dolphin = 2.5, Fraser's dolphin = 1.0, killer whale = 1.5, pygmy and false killer whales = 2.8, dwarf and pygmy sperm whales = 2.5) (Hayes et al., 2022). Mortality of individuals equal to or in excess of their

PBR level would constitute a significant impact at a population level to the local (Gulf of Mexico) stocks of these species.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a, 2015, 2016b, 2023b). Oil impacts on marine mammals in general are discussed by Geraci and St. Aubin (1990). For this DOCD, 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 Anadarko's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to lessen the potential for impacts on marine mammals. DOCD Section H provides details on spill response measures, and those measures are summarized in the EIA. 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. 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). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. A small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (**Section A.9.1**). Therefore, 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 (2017a, 2023b). For this DOCD, 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, marine sound, 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. Complications of the above may lead to dysfunction of immune and reproductive systems (De Guise et al., 2017), physiological stress, declining physical condition, and death. Indirect impacts could include stress from the activities and noise of response vessels and aircraft. Behavioral responses can include displacement of animals from prime habitat (McDonald et al., 2017), disruption of social structure, change in prey availability and foraging distribution or patterns, change in reproductive behavior/productivity, and change in movement patterns or migration (MMC, 2011).

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic and remediation activities (e.g., use of dispersants, 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 strikes, entanglement or other injury, or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for striking or disturbing these animals, and therefore no substantial impacts are expected. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020a, 2021) replaces compliance with the NTL. 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).

In the event of a large spill, it is expected that impacts resulting in the injury or death of individual marine mammals could be significant at the population level depending on the level of oiling and the species affected. 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 = undetermined, Clymene dolphin = 2.5, Fraser's dolphin = 1.0, killer whale = 1.5, pygmy and false killer whales = 2.8, dwarf and pygmy sperm whales = 2.5) (Hayes et al., 2022), mortality of individuals equal to or in excess of their PBR level would constitute a significant impact at the population level 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, Kemp's ridley, and hawksbill turtles. As of 6 May 2016, the entire North Atlantic DPS of the green turtle is listed as Threatened (81 *FR* 20057). The DPS of loggerhead turtles that occurs in the Gulf of Mexico is listed as Threatened.

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, 2014a). 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 mi (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 epipelagic existence after being removed from reefs during rough weather. Rafts of *Sargassum* spp. 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, 2014a).

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 85 mi (137 km) from the project area. The project area is located approximately 46 mi (74 km) from the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 3**).

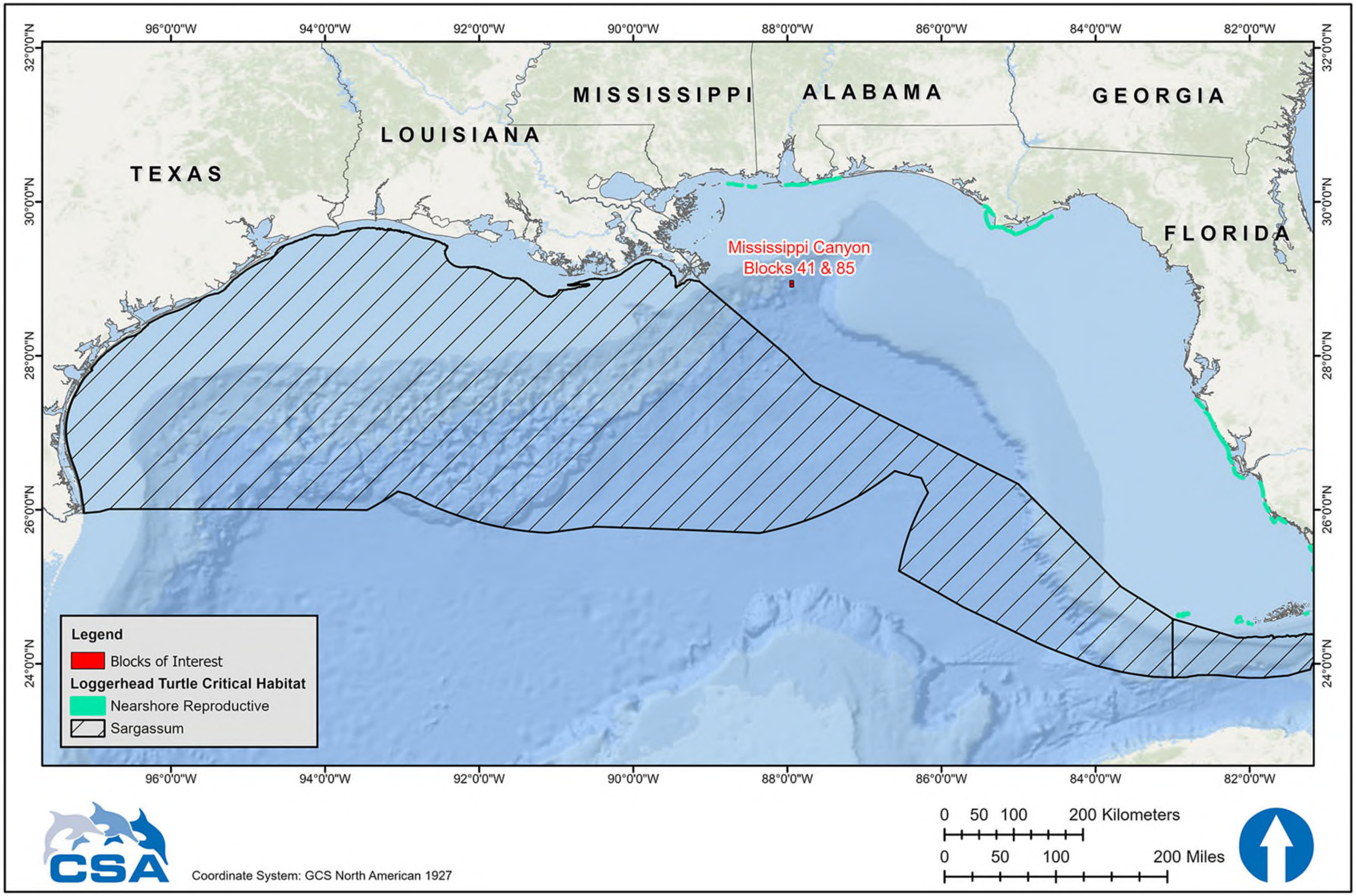

Figure 3. Location of loggerhead turtle designated *Sargassum* critical habitat and nearshore reproductive habitat in relation to the project area.

Leatherbacks are the species most likely to be present near the project area, as they are the most pelagic of the sea turtles and 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* rafts 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.

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

- Loggerhead turtles – loggerhead turtles nest in substantial numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, nd-a) 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, nd-b; nd-c).
- Kemp's ridley turtles – the critically endangered Kemp's ridley turtle nests almost exclusively on a 16-mile (26-km) stretch of coastline near Rancho Nuevo in the Mexican state of Tamaulipas (NMFS et al., 2011). A much smaller population nests in Padre Island National Seashore, Texas, mostly as a result of reintroduction efforts (NMFS et al., 2011). A total of 340 Kemp's ridley turtle nests were counted on Texas beaches in 2024 (Turtle Island Restoration Network, 2024). This is an increase from 2023 and 2022, when a total of 256 Kemp's ridley turtle nests were counted on Texas beaches in 2023 and a total of 284 Kemp's ridley turtle nests were counted during the 2022 nesting season (Turtle Island Restoration Network, 2024). 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 United States.
- 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 the beaches of the Yucatán Peninsula (USFWS, 2016a).

IPFs that could potentially affect sea turtles include drilling rig 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 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-G013 (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 discussed further in the EIA.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by sea turtles (Samuel et al., 2005; Popper et al., 2014). Potential impacts may include behavioral disruption and temporary or permanent displacement from the area near the sound source.

Sea turtles can hear low- to mid-frequency sounds and they appear to hear best between 200 and 750 Hz; they 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) uses acoustic threshold criteria for non-impulsive sources for sea turtles from Finneran et al. (2017) which recommend an SEL_{24h} threshold of 200 dB re 1 μPa^2 s for the onset of TTS and an SEL_{24h} of 220 dB re 1 μPa^2 s for PTS. The behavioral threshold used is from Blackstock et al. (2018) which identified the sea turtle underwater acoustic SPL behavioral threshold as 175 dB re 1 μPa. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997) and thus may be more susceptible to impacts from sounds produced during routine drilling activities. However, given the estimated SLs produced by drilling activities (**Section A.2**), and the required 24-hour accumulation period for SEL_{24h} levels to be realized it is unlikely acoustic injury will occur. Any impacts would likely be limited to short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope and short duration of drilling activities, 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. Based on the moon pool entrapment cases of sea turtles reported and successful rescues and releases that have occurred, NMFS (2020a) estimated approximately one sea turtle will be sub-lethally entrapped in a moon pool 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 strikes. Data show that vessel traffic is one cause of sea turtle mortality in the Gulf of Mexico (Lutcavage et al., 1997; NMFS, 2020a). 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 strikes, BOEM issued NTL BOEM-2016-G01, which addresses a) protected species identification training; b) vessel operators and crews' observational vigilance and protected species collision avoidance; and c) reporting of 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. 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 [2020a] Appendix C). When sea turtles are sighted, vessel operators and crews are required to maintain a distance of 164 ft (50 m) or greater whenever possible. Compliance with these mitigation measures is expected to minimize the likelihood of vessel strikes during periods of daylight and during sea and weather conditions that permit sighting of turtles on the sea surface (NMFS, 2020a).

Noise generated from support helicopter traffic has the potential to disturb sea turtles, but relatively high-altitude flying is conducted to minimize the potential for disturbances. 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 substantial impacts are expected (NMFS, 2020a; BOEM, 2012a).

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by NMFS (2020a) and BOEM (2017a, 2023b). 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 Anadarko's preventative measures during fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to minimize potential impacts on sea turtles. DOCD Section H provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and the potential for impacts to occur would be minimal.

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 noise of response vessels and aircraft (NMFS, 2020b). 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, 2022a). 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 due to the distance from the nearest shoreline. Loggerhead turtle nesting beaches and nearshore reproductive habitat designated as critical habitat are located in Mississippi, Alabama, and the Florida Panhandle, at least 85 mi (137 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 and degradation.

<u>Loggerhead Critical Habitat – *Sargassum*</u>. The project area is located 46 mi (74 km) from the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 3**). Given this distance, it is unlikely that fuel would drift into *Sargassum* critical habitat. If fuel did contact the *Sargassum* habitat, juvenile sea turtles come into contact with or ingest diesel fuel, 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, substantial 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 (e.g., vessel traffic, marine sound, dispersant use). 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 marine 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 food availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (NOAA, 2021; NMFS, 2020b). In the unlikely event of a spill that reached *Sargassum* critical habitat, implementation of the Anadarko OSRP is expected to minimize the potential for these types of impacts on sea turtles. DOCD Section H provides further details on spill response measures.

Studies of oil effects on loggerhead turtles in a controlled setting (NOAA, 2021; Lutcavage et al., 1995) 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).

<u>Loggerhead Critical Habitat – Nesting Beaches</u>. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2020a). 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).

Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days). The nearest nearshore reproductive critical habitat for the loggerhead turtle is located approximately 85 mi (137 km) from the project area (**Figure 3**) and is predicted by the 60-day OSRA model to have 3 to 14% conditional probability of contact within 60 days of a spill.

Loggerhead Critical Habitat – *Sargassum*. The project area is located 46 mi (74 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, 2014a). Because of the large area covered by the designated *Sargassum* critical habitat for loggerhead turtles, a large spill could result in a substantial part of the *Sargassum* critical habitat in the northern Gulf of Mexico being oiled. For example, the 2010 *Deepwater Horizon* spill affected approximately one-third of the *Sargassum* habitat in the northern Gulf of Mexico (BOEM, 2014). It is unlikely that the entire 40,662,810 ha (100,480,000 ac) of *Sargassum* critical habitat would be affected by a large spill. Because *Sargassum* spp. is a floating, pelagic species, it would only be affected by impacts that occur near the surface.

The effects of oiling on *Sargassum* spp. vary with spill severity, but moderate to heavy oiling that could occur during a large spill could cause complete mortality to *Sargassum* 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 effects, including a reduction in 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. has a yearly seasonal cycle of growth and a yearly cycle of migration 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 a short time (BOEM, 2017a).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sea turtles and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 to reduce the potential for striking or disturbing sea turtles therefore no significant impacts are expected.

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 a historical decline 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 (BirdLife 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, nd-a).

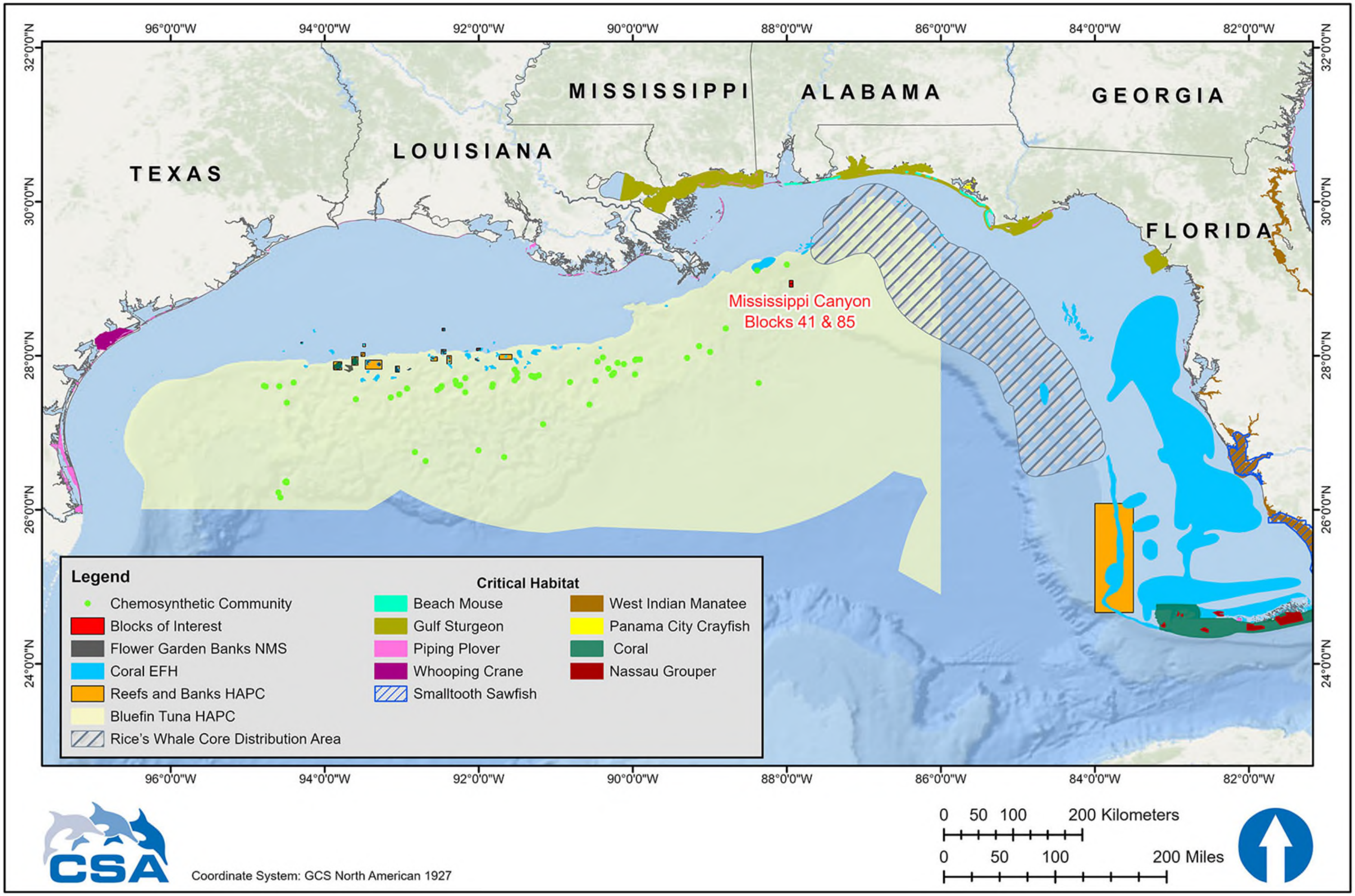

Figure 4. Location of selected environmental features in relation to the project area. EFH = Essential Fish Habitat; HAPC = Habitat of Particular Concern, NMS = National Marine Sanctuary.

A large oil spill is the only IPF that potentially may affect Piping Plovers. There are no IPFs associated with routine project activities that could affect these birds. 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**). Noise from helicopters would be unlikely to substantially affect Piping Plover populations, because it is assumed that helicopters will maintain an altitude of 1,000 ft (305 m) over unpopulated areas or across coastlines.

Impacts of a Large Oil Spill

The project area is approximately 70 mi (113 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 4**). Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days).

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 that could disturb or potentially destroy nests. Anadarko has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP. Deaths of numerous Piping Plovers from a large spill or spill response activities could be significant at the species level.

C.3.7 Whooping Crane (Endangered)

The Whooping Crane is a large omnivorous wading bird listed as an Endangered species. Three wild populations live in North America (National Wildlife Federation, 2016). One population overwinters 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, with an estimated population of 536 individuals at Aransas NWR during the 2022 to 2023 winter (USFWS, 2023a), a slight decrease of an estimated 543 individuals counted in the 2021 to 2022 winter survey. 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. 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 9,000 ha (22,240 ac) of salt flats on Aransas NWR and adjacent islands comprise the principal wintering grounds of the Whooping Crane. Aransas NWR is designated as critical habitat for the species.

A large oil spill is the only IPF that potentially may affect Whooping Cranes. A small fuel spill in the project area would be unlikely to affect Whooping Cranes, due to the distance of the project area 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 to natural dispersion and degradation.

Impacts of a Large Oil Spill

A large oil spill is unlikely to affect Whooping Cranes as the project area is approximately 518 mi (834 km) from the Aransas NWR, which is the nearest designated critical habitat. The 60-day OSRA model (**Table 4**) predicts that there is a <0.5% chance of oil contacting Whooping Crane critical habitat in Calhoun or Aransas counties, Texas, 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. Due to low population numbers, deaths of individual Whooping Cranes would likely be significant at the species level. In the event of a spill, Anadarko would work with the applicable state and federal agencies to prevent impacts on Whooping Cranes. Anadarko 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 Black-capped Petrel

The Black-capped Petrel is a pelagic seabird that solely nests on Hispaniola that was listed as Endangered under the ESA in 2024. The species travels long distances to forage on fish, squid, crustaceans, and *Sargassum* (Simons et al., 2013) and have occasionally been sighted in the northern Gulf of Mexico. While the Gulf of Mexico is not their primary foraging grounds, the most recent species status review (USFWS, 2023b) reported 11 sightings in the Gulf of Mexico in 2017-2018 during surveys as part of the Gulf of Mexico Marine Assessment Program for Protected Species. Overall, the population of Black-capped Petrels is declining, largely due to deforestation and urbanization on Hispaniola. Exact population numbers are unknown due to the difficulty in obtaining accurate counts and their nocturnal nature, but BirdLife International (2018) estimated a total of 1,000 to 2,000 mature individuals and an overall population of 2,000 to 4,000 individuals.

IPFs that potentially may affect the Black-capped Petrel include drilling rig and presence, marine sound, 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. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Marine birds that frequent offshore oil and gas operations may be exposed to contaminants including air pollutants and routine discharges, but substantial impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to collide with offshore structures, resulting in injury and/or death (Wiese et al., 2001; Russell, 2005). Black-capped Petrels may be attracted to lights on the drilling rig, which could increase the risk of a collision.

Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in offshore vessel collisions appear to be similar. In some cases, birds simply do not see a part of the structure until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most species (Russell, 2005). Due to the limited scope and short duration of drilling activities described in this DOCD and the low density of Black-capped Petrels in the Gulf of Mexico, no significant impacts are expected.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to substantially disturb Black-capped Petrels in open, offshore waters. Schwemmer et al. (2011) showed that several marine bird species 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 individuals would experience, at most, only short-term behavioral disruption, and the impact would not be significant on Black-capped Petrels.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds in general are discussed by BOEM (2017). For this DOCD, there are no unique site-specific issues with respect to spill impacts on Black-capped Petrels.

The probability of a fuel spill is expected to be minimized by bp's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of bp's ROSRP is expected to reduce the potential for impacts on Black-capped Petrels. DOCD Appendix G provides details on spill response measures. Given the open ocean location of the project area and the expected short duration of a small fuel spill, the potential exposure period for Black-capped Petrels would be 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 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, 2022a). 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.

Black-capped Petrels exposed to fuel 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. Due to 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

Black-capped Petrels, the small area affected, and the brief duration of the surface slick, minimal if any impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine and pelagic birds in general are discussed by BOEM (2017). For this DOCD, there are no unique site-specific issues with respect to spill impacts on Black-capped Petrels.

Black-capped Petrels could be exposed to oil from a spill at the project area; the number of individuals that could be affected in open, offshore waters would depend on the extent and persistence of the oil slick and the number of Black-capped Petrels in the area.

Following the *Deepwater Horizon* incident in 2010, no Black-capped Petrels were reported as oiled or recovered dead (USFWS, 2023b), but decomposition would likely have made positive identification difficult (Haney et al., 2014). 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 (USFWS, 2023ba). Other indirect impacts would also likely occur after a large oil spill, such as a reduction in suitable foraging habitat and the decline in population of prey species (USFWS, 2023b).

Overall, a large oil spill could cause significant impacts on Black-capped Petrel populations if there were numerous individuals in the area of the spill. However, due to the low number of individuals thought to frequent the northern Gulf of Mexico, significant impacts on this species from a large spill is considered unlikely.

C.3.9 Rufa Red Knot

The Rufa Red Knot is a small to medium-sized migratory shorebird that transits each year between breeding grounds in Canada to wintering grounds in the southeast U.S., Caribbean, and along the Gulf of Mexico coast (USFWS, 2020). Listed as Threatened under the ESA in 2015, their primary habitat during the winter along the Gulf of Mexico is in the Laguna Madre estuary system in Mexico and Texas.

The primary threats that are faced by Rufa Red Knots include habitat loss, reduced food availability, and alterations of their migratory timing and patterns due to climate and weather conditions (USFWS, 2020). Precise population numbers are difficult to assess, but USFWS estimated in 2023 that the global population was approximately 42,000 individuals (The Wildlife Society, 2023). Critical habitat was proposed by USFWS in 2023 which includes numerous areas along the U.S. Gulf of Mexico coastline.

IPFs that potentially may affect the Rufa Red Knots include support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Drilling rig presence, marine sound, and lights, and effluent discharges are not expected to have a substantial impact because this species typically is not found in offshore waters and instead is more coastal in nature. The IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to substantially disturb Rufa Red Knots in offshore waters where they are not common or in nearshore industrial areas near the shorebase. Schwemmer et al. (2011) showed that several marine bird species 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 individuals would experience, at most, only short-term behavioral disruption, and the impact would not be significant.

Impacts of a Small Fuel Spill

Potential spill impacts on coastal birds in general are discussed by BOEM (2017). For this DOCD, there are no unique site-specific issues with respect to spill impacts on Rufa Red Knots.

The probability of a fuel spill is expected to be minimized by bp's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of bp's ROSRP is expected to reduce the potential for impacts on Black-capped Petrels. DOCD Appendix G provides details on spill response measures. Given Rufa Red Knots are mostly found in coastal areas and the expected short duration of a small fuel spill, the potential exposure period for Rufa Red Knots would be brief.

A small fuel spill in coastal 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 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, 2022a). 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.

Rufa Red Knots exposed to fuel 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. Due to 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. It is not expected that a small fuel spill would substantially affect Rufa Red Knot populations.

Impacts of a Large Oil Spill

Potential spill impacts on coastal birds in general are discussed by BOEM (2017). For this DOCD, there are no unique site-specific issues with respect to spill impacts on Rufa Red Knots.

Rufa Red Knots could be exposed to oil from a spill at the project area that travels into coastal area; the number of individuals that could be affected would depend on the extent and persistence of the oil slick and the number of Rufa Red Knots in the area, which is largely seasonally based.

Following the *Deepwater Horizon* incident in 2010, only a single Rufa Red Knot was reported as oiled (USFWS, 2020), but decomposition would likely have made positive identification difficult (Haney et al., 2014). Exposure of marine and coastal 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, 2018a). Other indirect impacts would also likely occur after a large oil spill, such as a reduction in suitable foraging habitat and the decline in population of prey species (USFWS, 2023b).

Overall, a large oil spill could cause significant impacts on Rufa Red Knot populations if there were numerous individuals in the area of the spill or in coastal areas that became oiled.

C.3.10 Oceanic Whitetip Shark (Threatened)

The oceanic whitetip shark was listed as Threatened under the ESA on 30 January 2018 (effective 30 March 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; Young and Carlson, 2020). However, based on reported oceanic whitetip shark catches in several major longline 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).

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 (2025) 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 drilling rig presence, marine sound, and lights, and a large oil spill. Though NMFS (2020a, 2021) 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. Therefore, no significant impacts are expected from small diesel fuel spills and they are not discussed further.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by sharks 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 detected 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). The scientific understanding of shark sound production and behavior is in its infancy. Smooth-hound shark (*Mustelus lenticulatus*) was recently found to produce sounds, which is the first evidence of shark sound production in the scientific literature (Nieder et al., 2025). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high SPLs, 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, is largely unknown. A study by Cave and Kajiura (2018) reported that when exposed to 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, impacts to the functioning of the mechanosensory lateral line system, 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.3.11 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 Fisheries, 2024a). The giant manta ray became listed as Threatened under the ESA in 2018.

Commercial fishing is the primary threat to giant manta rays (NOAA, 2024b). The species is targeted and also 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) (NOAA Fisheries, 2024a; Marshall et al., 2020). Stewart et al. (2018) recently reported 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 impact giant manta rays include drilling rig presence, marine sound, and lights, and a large oil spill. Though NMFS (2020a, 2021) 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. Therefore, no substantial impacts are expected from a small diesel fuel spill.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by elasmobranchs including the Threatened 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 [*Leucoraja erinacea*]) (Casper et al., 2003; Casper and Mann, 2006). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). The scientific understanding of skate and ray (Batoidea) is in its infancy.

Only recently has evidence been presented for active sound production in skates and rays, and only in three species (Almagro and Barría, 2024; Barroil et al., 2024; Fetterplace et al., 2022). However, because of the limited propagation distances of high SPLs, 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. 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, impacts to the functioning of the mechanosensory lateral line system, or by ingestion of oiled plankton. Giant manta rays typically feed in shallow waters of less than 33 ft (10 m) depth (NOAA Fisheries, 2024a). Because of this shallow water feeding behavior, giant manta rays would be more likely to be impacted by floating oil than other species which most typically reside at depth.

In the event of a large oil spill, due to the distance between the project area and the Flower Garden Banks (250 miles [402 km]), 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.3.12 Gulf Sturgeon (Threatened)

The Gulf sturgeon 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 Mississippi River to Charlotte Harbor, Florida (Wakeford, 2001). This range has contracted to encompass major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida. Populations have been depleted or even extirpated throughout this 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**). A species description is 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 strikes to Gulf sturgeon would be unlikely based on the location of the shorebase and that NMFS (2020a, 2021) 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 (87 miles [140 km]) and the shorebase being in Port Fourchon, Louisiana, impacts from vessel strikes due to project activities will likely be negligible.

Impacts of a Large Oil Spill

Potential spill impacts on Gulf sturgeon are discussed by NMFS (2020a) and BOEM (2012a, 2017a). For this DOCD, there are no unique site-specific issues with respect to this species.

The project area is approximately 87 mi (140 km) from the nearest Gulf sturgeon critical habitat. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a 1% conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 10 days of a spill and 1% to 3% conditional probability within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project areas has up to a 14% 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, or impaired mechanosensory lateral line system function. 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, 2021). If oil contacted Gulf sturgeon habitat, deaths of individual fish could be significant at the species level.

C.3.13 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, 2023b). 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 subjected 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, 2023b). 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, the Florida Keys, Bermuda, the Yucatán Peninsula, and the Caribbean, including the U.S. Virgin Islands and Puerto Rico in water depths up to 426 ft (130 m) (NOAA, 2023b). 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 oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

Given the distance between the well sites and Nassau grouper habitat in the Florida Keys (Monroe County, Florida), a large oil spill is unlikely to reach that habitat. A spill would be unlikely to contact 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 and the Banks. While on the surface, oil would not be expected to contact subsurface fish.

In the unlikely event that an oil slick should reach Nassau grouper habitat, oil droplets or oiled sediment particles could come into contact with Nassau grouper present on the reefs. Potential impacts include the direct ingestion of oil which could cover their gill filaments or gill rakers, ingestion of oiled prey, the absorption of dissolved petroleum products through the gills, or impaired mechanosensory lateral line system function. Due to low population numbers, deaths of individual fish could be significant at the species level.

C.3.14 Smalltooth Sawfish (Endangered)

The smalltooth sawfish, named due to 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, 2024b). 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, 2009b).

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, 2018b), 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 373 mi (600 km) from the nearest smalltooth sawfish critical habitat in Charlotte County, Florida. Based on the 30-day OSRA modeling (**Table 3**), 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 4**) predicts a

<0.5% probability of shoreline contact within 60 days of a spill between to coastal areas containing smalltooth sawfish critical habitat.

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 to 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 as well as impaired olfactory function or impaired mechanosensory lateral line system function. 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. Due to low population numbers, deaths of individual fish could be substantial at the species level.

C.3.15 Beach Mice (Endangered)

Four subspecies of endangered beach mouse occur on the barrier islands of Alabama and the Florida Panhandle. They are 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; **Figure 4** shows the critical habitat combined for all four subspecies. One additional species of beach mouse in habiting 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. There 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 beach mice are discussed by BOEM (2017a, 2023b). 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 86 mi (138 km) from the project area. The 30-day OSRA results (**Table 3**) predicts a 1% conditional probability of oil contact with beach mouse critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has a 1% to 18% 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.3.16 Florida Salt Marsh Vole (Endangered)

The Florida salt marsh vole 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-d). 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

The habitat of the Florida salt marsh vole, in Levy and Dixie counties, Florida, is approximately 288 mi (463 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a <0.5% conditional probability of contacting any coastal areas containing Florida salt marsh voles within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has a 1% conditional probability of contacting any coastal areas containing Florida salt marsh vole habitat within 60 days of a spill.

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.3.17 Panama City Crayfish

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 areas 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

The Panama City crayfish critical habitat in Bay County, Florida is approximately 156 miles (251 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a 1% conditional probability of contacting any coastal areas containing Panama City crayfish critical habitat within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has a up to a 3% 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). 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.3.18 Threatened and Endangered Coral Species

There are six Threatened coral species (elkhorn coral, staghorn coral, lobed star coral, mountainous star coral, boulder star coral, and rough cactus coral), and one Endangered coral species (pillar coral) known to occur in the northern Gulf of Mexico. 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 with a widespread distribution 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 only known from the Florida Keys and Dry Tortugas (Florida Fish and Wildlife Conservation Commission, nd-e). 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.

A species description of elkhorn coral is presented in the recovery plan for the species (NMFS, 2015).

NMFS has designated 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 per 88 FR 54026 and became effective in September 2023. 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 (**Figure 4**).

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 4**), a large oil spill would be unlikely (<0.5% probability) to reach elkhorn or staghorn 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, and the difference in water depth between the project area and the Banks. 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 could 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 250 mi [402 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 an oil slick 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. Sublethal effects could be long-lasting and affect the resilience of coral colonies to natural disturbances (e.g., elevated water temperature, 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 substantial impacts on Threatened or Endangered coral species are expected.

C.3.19 Queen Conch (Threatened)

The Queen conch is a large gastropod that occurs throughout the Caribbean Sea, Gulf of Mexico, and Bermuda which was listed as Threatened under the ESA in 2024 (NOAA, 2024b). The species is slow moving and found in a variety of habitats including seagrass beds, sands flats, algal beds, and rubble areas up to 30 meters in water depth. Larval conch feed primarily on phytoplankton, while juvenile and adults feed on a mix of seagrass and macroalgae (Stoner and Appeldoorn, 2022). Overall, the population of Queen conch is declining, largely due to overfishing and illegal fishing practices. Exact population numbers are unknown due to the difficulty in obtaining accurate counts. The majority of available density estimates suggest that conch populations are below minimum thresholds necessary to maintain or increase populations (Horn et al., 2022).

There are no IPFs associated with routine project activities that could affect Queen conch. A small fuel spill would not likely affect Queen conch because the fuel would float and dissipate on the sea surface. A large oil spill is the only relevant IPF.

Impacts of a Large Oil Spill

A large oil spill in the project area could potentially reach Queen conch habitat and affect the substrate. These effects would be of particular concern where the species occurs in shallower waters. There is some information available on the effects of oil spills on seagrass meadows and other marine gastropods, but little information available on the direct effects of oil on Queen conch (Horn et al., 2022). In the event of a large oil spill, due to the low density of individual Queen conch thought to occur in the Gulf of Mexico, any population level impacts are considered unlikely.

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; 1983; Davis and Fargion, 1996; Davis et al., 2000). Seabirds spend much of their lives offshore over the open ocean, except during breeding season when they nest along the coast (on the mainland and on barrier islands). In addition, other birds 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 due to the distance from shore. For a discussion of shorebirds and coastal nesting 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) which reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in deepwater areas of the Gulf of Mexico. 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 in the Gulf (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 [*T. maximus*], Bridled Terns [*Onychoprion anaethetus*]) (Davis et al., 2000).

Common marine bird species include Wilson's Storm-Petrel (*Oceanites oceanicus*), Magnificent Frigatebird, Northern Gannet (*Morus bassanus*), Masked Booby (*Sula dactylatra*), Brown Booby (*S. leucogaster*), Cory's Shearwater (*Calonectris diomedea*), Greater Shearwater (*Puffinus gravis*), and Audubon's Shearwater (*P. 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 1.6 birds km^{-2}.

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.

IPFs that potentially may affect marine birds include drilling rig 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 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 Rig Presence, Marine Sound, and Lights

Marine birds that frequent offshore vessels may be exposed to contaminants including air pollutants and routine discharges, but substantial impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to strike offshore structures, resulting in injury and/or death (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 rig collisions appear to be similar. In some cases, migrants simply do not see a part of the rig until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most trans-Gulf migrant species, and most of the migrants that stop over on rigs probably benefit from their stay, particularly in spring (Russell, 2005). 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.

A study in the North Sea indicated that rig lighting causes circling behavior in various birds, especially on cloudy nights. The study suggests that 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 mi (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, it was 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, collisions, or other adverse effects are highly localized (considering the single structure) and may affect individual birds during migration periods. Therefore, these potential impacts are not expected to affect marine birds at the population or species level and are not expected to be 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 marine bird species 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, and the impact would not be significant.

Impacts of a Small Fuel Spill

Potential spill impacts on marine birds are discussed by BOEM (2017a). For this DOCD, 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 Anadarko's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to reduce the potential for impacts on marine birds. DOCD Section H provides details on spill response measures. 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 likely be brief.

A small fuel spill in offshore waters could 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 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, 2022a). 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.

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. Due to 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 pelagic birds would be expected.

Impacts of a Large Oil Spill

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

Pelagic seabirds could be exposed to oil from a spill at the project area. Davis et al. (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater (>200 m) Gulf of Mexico. Haney et al. (2014) estimated that seabird densities over the open ocean were approximately 1.6 birds km^{-2}. The number of pelagic 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 provides 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 included several pelagic species such as the Northern Gannet, Magnificent Frigatebird, and Masked Booby (USFWS, 2011). The Northern Gannet was 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, 2016). In the event of large-scale oiling, significant impacts at the species level are not expected due to the non-Endangered status of most species of marine birds.

C.4.2 Coastal Birds

Threatened and Endangered bird species (Piping Plover and Whooping Crane) have been discussed previously in **Sections C.3.6** and **C.3.7**. The western Gulf of Mexico (in the US Exclusive Economic Zone [EEZ] from Texas to Mississippi) is a known wintering area for the Threatened Rufa Red Knot (*Calidris canutus rufa*) (USFWS, nd-b). Various species of non-endangered 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 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 (Burger, 2017).

The Brown Pelican (*Pelecanus occidentalis*) was delisted from Federal Endangered status in 2009 (USFWS, 2016b). However, this species remains listed as Endangered by Mississippi (Mississippi Natural Heritage Program, 2018). The Brown Pelican was delisted as a species of special concern by the State of Florida in 2017 and Louisiana in 2020 (Louisiana Wildlife & Fisheries, 2020). 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, indicate that Brown Pelicans do not occur in deep offshore waters (Fritts and Reynolds, 1981; Davis and Fargion, 1996; Davis et al., 2000).

The 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 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 (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. A small fuel spill in the project area would be unlikely to affect shorebirds or coastal nesting birds, as the project area is 64 mi (103 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-G03 is expected to 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 among individuals (Rodgers and Schwikert, 2002; Schwemmer et al., 2011). 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 watercrafts and 75 to 190 ft (23 to 58 m) for outboard-powered boats (Rodgers and Schwikert, 2002). Support vessels will not approach nesting or breeding areas on the shoreline, so disturbances to nesting birds, eggs, and chicks is not expected. Vessel operators are expected to use designated navigation channels and comply with posted speed and wake restrictions while transiting sensitive inland waterways. Due to the limited scope and short duration of drilling 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 are highly dependent on the type of aircraft, the bird species, the activities that the animals were previously engaged in, and previous exposures to overflights (Efroymson et al., 2003). Helicopters seem to cause the most intense responses over other human disturbances (Bélanger and Bédard, 1989). The Federal Aviation Administration recommends (Advisory Circular No. 91-36D) that pilots maintain a minimum altitude of 2,000 ft (610 m) when flying over marine sound-sensitive areas such as parks, forests, primitive areas, wilderness areas, National Seashores, or National Wildlife Refuges, and maintain flight paths to reduce aircraft marine sound in these marine sound-sensitive areas. The 2,000 ft (610 m) altitude minimum is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied by Efroymson et al. (2000). It is assumed that adherence to these guidelines would reduce potential behavioral disturbances (such as temporary displacement or avoidance behavior) of individual birds in coastal and inshore areas. The potential impacts from helicopter traffic are not expected to be significant to coastal bird populations or species in the project area.

Impacts of Large Oil Spill

Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of up to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda, Texas to Levy County, Florida (up to 24% conditional probability within 60 days).

Coastal birds can be exposed to oil as they float on the water surface, dive during foraging, or wade in oiled coastal waters. 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 (*Pelecanus erythrorhynchos*) 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).

Coastal fishing birds of prey such as bald eagles, ospreys, etc. may also be at risk from direct and indirect impacts from spilled oil. These species often capture 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). Recent ichthyological work has been shedding light on the mobility of ichthyological larvae: for example, work from Shiroza et al. (2021) has demonstrated that bluefin tuna larvae (*Thunnus thynnus*), even <10 mm standard length, have mobility substantial enough that they are able to pursue prey, thus violating the classic assumption that fish larvae are planktonic. Scientific understanding of larval mobility could potentially change impact assessments, as larvae may be more capable at avoiding certain impacts than previously expected. However, larval mobility is still being understood across fish species, including other fishes that occur in this area.

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 general domination by relatively few families and species. This was confirmed by Wang et al. (2021), who found that in a survey of the northern Gulf of Mexico the larval assemblage was dominated by just three deep-sea finfish families. IPFs that potentially may affect pelagic communities and ichthyoplankton include drilling rig presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

The drilling rig, 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 (*Coryphaena* spp.), 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). The FAD effect could possibly enhance the feeding of epipelagic predators by attracting and concentrating smaller fish species. Drilling noise could potentially cause masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). 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. All fishes can also detect particle motion from substrate-borne vibration, but the scientific understanding of detection thresholds and behavioral responses from particle motion is in its infancy and there are currently no accepted thresholds available (Hawkins et al., 2021). Popper et al. (2014) estimated SPL threshold levels of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and 158 dB re 1 µPa over a 12-hour period for onset temporary auditory threshold shifts. However, no consistent behavioral thresholds for fish for non-impulsive noise have been established (Hawkins and Popper, 2014), and the current accepted threshold for behavioral disturbances in fish is an SPL of 150 dB re 1 µPa for impulsive sources from the Fisheries Hydroacoustic Working Group (2008). 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 drilling rig may provide metapopulation benefits for the fishes that typically utilize hard bottom habitats (Galaiduk et al., 2024). Fish aggregation is likely to occur to some degree due to the presence of the drilling rig, 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_{24h} 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 drilling operations) are expected to be far less injurious than impulsive noise. Because of the periodic and transient nature of ichthyoplankton (many larval fish are known to undertake diel migrations), they are not expected to remain within the ensonified area for a full 24-hour period to realize SEL_{24h} necessary to result in injury, and no impacts to these life stages are expected.

Impacts of Effluent Discharges

Treated sanitary and domestic wastes may have a slight 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 be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Deck drainage may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. Deck drainage from contaminated 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 be diluted 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, fire water, subsea production control fluid, produced water, non-pollutant completion fluids, and ballast water, are expected to be diluted rapidly and have little or no impact on pelagic communities.

Impacts of Water Intake

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). Phytoplankton, zooplankton, and ichthyoplankton already experience high levels of natural mortality from normal ecosystem processes. Given this, and 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 (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 Anadarko's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to mitigate the potential for impacts on pelagic communities, including ichthyoplankton. DOCD Section H provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill will be brief and the potential for impacts to occur would be minimal.

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 dissipate naturally within 24 hours (NOAA, 2022a). 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 phytoplankton, zooplankton, 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 and ichthyoplankton.

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2017a). A large oil spill could affect water column biota including phytoplankton, zooplankton, ichthyoplankton, and nekton. A large spill that persisted for weeks or months would be more likely to affect these communities. While adult and juvenile fishes may actively avoid a large spill, eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes are especially vulnerable to oiling because they inhabit the upper layers of the water column, have slow mobility, and will die if exposed to certain toxic fractions of spilled oil. Impacts potentially would be 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 shelf concentrations peak (BOEM, 2016b).

C.5.2 Essential Fish Habitat

Essential Fish Habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or 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 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 (Gulf of Mexico Fishery Management Council, 2005). The EFH for most of these Gulf of Mexico Fishery Management

Council 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 on the Texas-Louisiana OCS located approximately 20 mi (32 km) from the project area (**Figure 4**).

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 7** lists the highly migratory fish species and their life stages with EFH at or near the project area.

Table 7. Migratory fish species with designated Essential Fish Habitat (EFH) at or near the project area, including life stage(s) potentially present (Adapted from National Marine Fisheries Service [NMFS], 2009c).

Common Name	Scientific Name	Life Stage(s) Potentially Present Within or Near the Project Area
Atlantic bluefin tuna	*Thunnus thynnus*	Spawning, eggs, larvae
Bigeye Thresher Shark	*Alopias superciliosus*	All
Bigeye Tuna	*Thunnnus obesus*	Juveniles
Blue marlin	*Makaira nigricans*	All
Bull shark	*Carcharhinus leucas*	Juveniles, adults
Dusky shark	*Carcharhinus obscurus*	Juveniles, adults
Longbill spearfish	*Tetrapturus pfluegeri*	All
Longfin mako shark	*Isurus paucus*	All
Oceanic whitetip shark	*Carcharhinus longimanus*	All
Sailfish	*Istiophorus albicans*	Spawning, eggs, larvae, adults
Scalloped hammerhead shark	*Sphyrna lewini*	Juveniles, adults
Shortfin mako shark	*Isurus oxyrinchus*	All
Silky shark	*Carcharhinus falciformis*	All
Skipjack tuna	*Katsuwonus pelamis*	All
Swordfish	*Xiphias gladius*	All
Tiger shark	*Galeocerdo cuvier*	Juveniles, adults
Whale shark	*Rhincodon typus*	All
White marlin	*Tetrapturus albidus*	Juveniles, adults
Yellowfin tuna	*Thunnus albacares*	All

Research indicates the central and western Gulf of Mexico may be important spawning habitat for the western stock of Atlantic bluefin tuna (*Thunnus thynnus*), and NMFS (2009c) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, (**Figure 4**). The areal extent of the HAPC is approximately 300,000 km^2 (115,831 mi^2).

This HAPC is the spawning area for the western stock of bluefin tuna (NOAA, 2024c). Bluefin tuna comprise a major commercial and recreational fishery throughout the United States and the Gulf region (NMFS, 2009c). Over 1,000 metric tons (MT) of bluefin tuna were commercially landed in 2024 (NOAA, 2024d). Ex-vessel commercial landings have been over $12 million in a year, with the recreational fishery landing an additional 4 million lbs (NOAA, 2024c).

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, 2009c). 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 (Gulf of Mexico Fishery Management Council, 2005). One of the most substantial 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. The Highly Migratory Species Fisheries Management Plan was amended in 2009 to update EFH and HAPC to include the Atlantic bluefin tuna spawning area (NMFS, 2009c).

NTLs 2009-G39 and 2009-G40 provide guidance and clarification of the regulations with respect to 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 to protect corals and coral reefs have been identified by the Gulf of Mexico Fishery Management Council (2005). These include the Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and several individual reefs and banks of the northwestern Gulf of Mexico. Visoca Knoll (VK_ 826 is the HAPC located nearest to the project area (approximately 11 mi [17 km]). VK 826 is known for its coral diversity, particularly in stony (scleractinians) and black corals (antipatharians) and its well-studied deepwater reefs (GMFMC and NMFS, 2018). VK 826 is protected from the use of bottom-tending gear (commercial fishing gear contacting the bottom) except for fishers that are fishing for royal red shrimp (*Pleoticus robustus*), whom are allowed to leave gear in the water as long as the gear is not contacting the corals (GMFMC and NMFS, 2018). This exemption is due to the length of royal red shrimping nets, which make hauling them out of the water quickly a challenge, and that there is little royal red shrimping activity in VK 286 (GMFMC and NMFS, 2018).

IPFs that potentially may affect EFH include drilling rig presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill).

Impacts of Drilling Rig Presence, Marine Sound, and Lights

The drilling rig, as a floating structure in the deepwater environment, will act as a FAD with most pronounced effects on epipelagic fishes that include species with EFH designation (Holland, 1990; Higashi, 1994; Relini et al., 1994; Gates et al., 2017). The FAD effect would likely attract and concentrate smaller fish species and thus enhance feeding of epipelagic predators.

Drilling rig 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 related to activities 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, including some species with EFH designation, that provide some hearing (pressure detection) function. Popper et al. (2014) estimated SPL threshold levels of 170 dB re 1 µPa over a 48-hour period for onset of recoverable injury and SPL of 158 dB re 1 µPa over a 12-hour period for onset temporary auditory threshold shifts. No consistent behavioral thresholds for fish for non-impulsive noise have been established (Hawkins and Popper, 2014), and the current accepted threshold for behavioral disturbances in fish is an SPL of 150 dB re 1 µPa for impulsive sources from the Fisheries Hydroacoustic Working Group (2008). However, bluefin tuna have been found to change schooling behavior in response to noise from both small and large vessels (Sarà et al., 2007). Any schools may lose their shape, while individual tuna may spend more time near the surface (Sarà et al., 2007). These changes in swimming behavior would take more energy due to decreased swimming efficiency and require tuna to catch more prey to make up this energy loss. However, because the drilling rig is a temporary structure, any impacts on EFH for managed species are considered minor.

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 brine, subsea production control fluid, produced water, non-pollutant completion fluids, uncontaminated cooling water, fire water, and ballast water. Impacts on water quality have been discussed previously. No detectable impacts on EFH for managed species are expected from these discharges. It is unlikely that effluent discharges would reach or affect the deepwater corals of VK 826.

Impacts of Water Intake

As noted previously, cooling water intake will cause entrainment and impingement of plankton, including fish eggs and larvae (ichthyoplankton). This would likely include the eggs and larvae of bluefin tuna, especially between April and June when spawning occurs (NMFS, 2009c). However, due to the limited scope and short duration of drilling activities, and naturally high mortality of ichthyoplankton, including bluefin tuna eggs and larvae (NMFS, 2009c), any short-term impacts on EFH for highly migratory pelagic fishes are not expected to be biologically substantial. The recent lease sale EIS (BOEM, 2017a) discusses cooling water discharge. Water with an elevated temperature may accumulate around the discharge pipe. This warmer water should be diluted rapidly to ambient temperature levels within 328 ft (100 m) of the discharge pipe to reduce impacts. Any impacts to pelagic species would be 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 Anadarko's preventative measures during routine operations, including fuel transfer procedures. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to help diminish the potential for impacts on EFH. DOCD Section H provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and the potential for impacts to EFH minimal.

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, 2022a). 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 at various life stages. A spill would produce short-term impact on water quality in the HAPC for spawning bluefin tuna. The areal extent of impact from a small fuel spill would represent a negligible portion of the HAPC.

A small fuel spill would not likely affect EFH for corals and coral reefs, the nearest EFH being VK 826 located approximately 11 mi (17 km) from the project area. A small fuel spill would float and dissipate on the sea surface and would not contact the deepwater corals for which the VK 826 EFH was designated.

Impacts of a Large Oil Spill

Potential spill impacts on EFH are discussed by BOEM (2017a, 2023b). 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 in the subsurface as well. Given the extent of EFH designations in the Gulf of Mexico (Gulf of Mexico Fishery Management Council, 2005; NMFS, 2009c), some impact from a large spill 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, particularly bluefin tuna, 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 Atlantic bluefin tuna (NMFS, 2009c). A large spill could temporarily degrade the HAPC due to increased hydrocarbon concentrations in the water column, with the potential for lethal or sublethal impacts on spawning tuna and their eggs and larvae. 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, 2009c). The *Deepwater Horizon* incident, which occurred in the Mississippi Canyon has been estimated to overlap with the spawning of <10% of young tuna in the area (Muhling et al., 2012; Hazen et al., 2016). The exact risk of an oil spill on spawning tuna, eggs, and larvae is sensitive to water temperature, sea surface height, bathymetry, and timing of spill, as spawning peaks from mid-April to mid-May (Hazen et al., 2016). Although these are small numbers affected, Hazen et al. (2016) noted that an oil spill, dependent on the timing of the spill, could over time have a greater effect due to anticipated phenological shifts in spawning secondary to climate change.

The VK 826 corals located 11 mi (17 km) from the project area are designated as EFH under the corals and coral reefs management plan (Gulf of Mexico Fishery Management Council, 2005). 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

The project area has been determined to be an area where historic shipwrecks may exist. The archaeological assessment by C&C Technologies (2014) noted 16 unidentified sonar contacts, including one representing a potential historic shipwreck. The contact was confirmed by BP American as a shipwreck in 2007. However, the wreck is not located within 2,000 ft (610 m) of the proposed activities. Anadarko will abide by the applicable requirements of NTL 2005-G07 and 30 CFR 550.194(c), which stipulate that work be stopped at the project site if any previously undetected archaeological resource is discovered after work has begun until appropriate surveys and evaluations have been completed.

As there are no known shipwreck sites within 2,000 ft (610 m) of the proposed project activities, there are no routine IPFs that are likely to affect shipwrecks. The only IPF of relevance to shipwrecks is a large oil spill as listed in **Table 2** are discussed below. A small fuel spill would not affect shipwrecks because the fuel would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

The 2017-2022 Lease Sale EIS (BOEM, 2017a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 984-ft (300-m) radius. Because there are no historic shipwrecks within a 984-ft (300-m) radius of the proposed wellsite, this impact would not be relevant. Should there be any indication that potential shipwreck sites could be affected, in accordance with NTL 2005-G07, Anadarko will immediately halt 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. Following a shipwreck discovery, all operations within 1,000 ft (305 m) of the site would cease until the Regional Supervisor provides instructions on steps to take to protect the site and assess the potential historic significance.

Beyond this 1,000 ft (305 m) 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 mi (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. Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (4 to 21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two

Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days).

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

The water depth at the location of the proposed activities (5,179 ft [1,579 m]) is well beyond the 197-ft (60-m) depth contour used by BOEM as the seaward extent for potential prehistoric archaeological sites 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 984-ft (300-m) 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). Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days).

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 of organic materials in a site (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., destroying fragile artifacts, disturbing the provenance of artifacts and site features).

C.7 Coastal Habitats and Protected Areas

Coastal habitats in the northeastern Gulf of Mexico that may be affected by oil and gas activities are described by BOEM (2017a). Coastal habitats inshore of the project area include barrier beaches and dunes, wetlands, oyster reefs, and submerged seagrass beds. Generally, most of the northeastern Gulf is fringed by barrier beaches, with wetlands, oyster reefs and/or submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

Due to the distance from shore, the only IPF associated with routine activities in the project area that potentially may 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 from the support bases at Port Fourchon and Houma, Louisiana that are not in wildlife refuges or wilderness areas. Potential impacts of support vessel traffic are addressed briefly below.

The only other IPF of relevance for coastal habitats and protected areas is an accidental large oil spill. A small fuel spill in the project area would not affect coastal habitats, as the project area is 64 mi (103 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. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Support Vessel Traffic

Support operations, including crew boats and supply boats as detailed in DOCD Section L, may have a minor incremental impact on barrier beaches and dunes, wetlands, oyster reefs and protected areas. 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 to barrier beaches and dunes, wetlands, oyster reefs and protected areas 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 could 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 these resources (BOEM, 2017a).

Impacts of a Large Oil Spill

Potential spill impacts on coastal habitats are discussed by BOEM (2017a, 2023b). 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.

Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days). NWRs and other protected areas along the coast are discussed in BOEM (2017a) and Anadarko'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 3**) are presented in **Table 8**.

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 of a spill (BOEM, 2017a,b).

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. 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 exposed to oil that persists in wetlands could take years to recover (BOEM, 2017a). 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). Entrained oil within the sediments of a submerged vegetation area may pose the risk of periodic re-releases of oil in the area, causing potential secondary impacts to the localized area (BOEM, 2023b). 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.

Table 8. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of 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	Peveto Woods Sanctuary
	Rockefeller State Wildlife Refuge and Game Preserve
	Sabine National Wildlife Refuge
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
	Bayou La Croix Preserve
	Grand Bayou Preserve
	Jourdan River Preserve
	Hancock County Marshes Preserve
	Bayou Portage Preserve
	Biloxi River Marshes Preserve
	Cat Island Preserve

Table 8. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Hancock and Harrison, Mississippi (cont'd)	Deer Island Preserve
	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 Wildlife Management Area
Baldwin, Alabama	Betty and Crawford Rainwater Perdido River Nature Preserve
	Bon Secour National Wildlife Refuge
	Gulf State Park
	Meaher State Park
	Mobile-Tensaw Delta CIAP Parcel State Habitat Area
	Mobile-Tensaw Delta Wildlife Management Area
	Perdido River Water Management Area
	W.L. Holland Wildlife Management Area
	Weeks Bay Harris and Worcester Tracts
	Weeks Bay National Estuarine Research Reserve
	Weeks Bay Reserve Addition - Beck Tract
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

Table 8. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Escambia, Florida (cont'd)	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

C.8 Socioeconomic and Other Resources

C.8.1 Recreational and Commercial Fishing

Potential impacts to recreational and commercial fishing were assessed by BOEM (2017a). 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 the spring and summer seasons. In August 2000, the federal government closed two areas in the northeastern Gulf of Mexico to longline fishing (65 FR 47214). The project area 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 33 to 98 ft (10 to 30 m) long, and their fishing trips last from approximately 1 to 3 weeks.

It is unlikely that any commercial fishing activity other than longlining occurs at or near 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 about 820 to 1,804 ft (250 to 550 m) (Stiles et al., 2007). Tilefishes (primarily golden tilefish *Lopholatilus chamaeleonticeps*) are caught by bottom longlining in water depths from about 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 platforms offshore Texas and Louisiana. Due to the 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 fishing is drilling rig presence (including marine sound and lights). Two types of potential accidents are also addressed below (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Drilling Rig Presence, Marine Sound, and Lights

There is a slight possibility of pelagic longlines becoming entangled in the drilling rig. 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.

Because it is unlikely that any recreational fishing activity is occurring in the project area, no adverse impacts are anticipated. Other project-related factors such as marine noise and lights are not relevant IPFs to commercial or recreational fishing.

Impacts of a Small Fuel Spill

The probability of a fuel spill is expected to be minimized by Anadarko's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Anadarko's OSRP is expected to potentially mitigate and reduce the potential for impacts. DOCD Section H provides details on spill response measures. Given the open ocean location of the project area, the duration of a small spill would be brief and opportunity for impacts to fishing activities would be minimal.

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 (2017a, 2023b). 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 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 of the spill, 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. At its peak on 12 July 2010, closures encompassed 84,101 mi^2 (217,821 km^2), or 34.8% of the U.S. Gulf of Mexico Economic Exclusion Zone.

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 would be unlikely to cause any impacts on public health and safety because it would affect only a small area of the open ocean. The project area is approximately 64 mi (103 km) from the nearest shoreline, and nearly all of the diesel fuel would evaporate or disperse naturally within 24 hours (see **Section A.9.1**). Impacts from a large oil spill are addressed below.

Impacts of a Large Oil Spill

In the event of a large oil spill resulting from a blowout, 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.

Krishnamurthy et al. (2019) identified that exposure to both crude oil and oil dispersant among USCG spill responders during the *Deepwater Horizon* incident was more strongly associated with the battery of acute neurological symptoms that were evaluated than exposure to oil alone. Those acute neurological symptoms observed in 1% to 3% of the responders surveyed included headaches, lightheadedness/dizziness, difficulty concentrating, numbness/tingling sensation, blurred/double vision, and memory loss/confusion. Krishnamurthy et al. (2019) did conduct sensitivity analyses to exclude responders in the highest environmental heat categories and responders with relevant preexisting conditions due to the symptoms being similar to heat stress.

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 activities 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. 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 from a large oil spill are addressed below.

Impacts of a Large Oil Spill

Potential socioeconomic impacts of an oil spill are discussed by BOEM (2017a). For this DOCD, 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.

C.8.4 Recreation and Tourism

There are no known recreational uses of the project area. Recreational resources and tourism in coastal areas would not be affected by any routine activities due to the distance from shore. Compliance with NTL BSEE-2015-G03 is intended to minimize the chance of trash or debris being lost overboard from the drilling rig and subsequently washing up on beaches. A small fuel spill in the project area would be unlikely to affect recreation and tourism because, as explained in **Section A.9.1**, it would not be expected to make landfall or reach coastal waters prior to dispersing naturally.

Impacts of a Large Oil Spill

Potential impacts of an oil spill on recreation and tourism are discussed by BOEM (2017a, 2023b). 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.

Based on the 30-day OSRA modeling (**Table 3**), Plaquemines Parish, Louisiana is the coastal area most likely to be affected (21% probability within 30 days). Within 30 days, shoreline segments of an additional five Louisiana parishes, two Mississippi counties, two Alabama counties, and four Florida counties have a probability of 1% to 3% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Matagorda County, Texas to Levy County, Florida (up to 24% conditional probability within 60 days). 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 (2017a, 2023b). There are no routine IPFs that potentially may affect land use. The project will use existing onshore support facilities in Louisiana where the land use is industrial. The project will not involve any 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 substantially 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. However, it is located in Military Warning Areas W-155C and W-155B. Anadarko will comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. The site clearance letter for the proposed wellsites (Oceaneering, 2024) reported two wells, eight umbilicals, five pipelines, and multiple pieces of other infrastructure (e.g., SUTAs, PLETs, mattresses, etc.) within 2,000 ft (610 m) of the proposed wellsites.

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 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

A large accidental spill would be unlikely to substantially affect shipping or other marine uses. In the event of a large spill requiring numerous response vessels, coordination would be required to manage the vessel traffic for safe operations. Anadarko will 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[2]

Prior Studies. BOEM prepared a multi-lease sale EIS in which it analyzed the environmental impact of activities that might occur in the multi-lease sale area. The level and types of activities planned in Anadarko's EP are within the range of activities described and evaluated by BOEM in the 2017 to 2022 Programmatic Environmental Impact Statement for the OCS Oil and Gas Leasing Program (BOEM, 2016a), and the Final Programmatic EIS for Gulf of Mexico OCS Oil and Gas Lease Sales 2017-2022 (BOEM, 2017a). Past, present, and reasonably foreseeable activities were identified in these documents, which are incorporated by reference. The proposed action should not result in any additional impacts beyond those evaluated in the multi-lease sale and Final EISs (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a, 2023b).

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. Anadarko 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, 2023b).

[2] On May 20, 2022, the National Environmental Policy Act (NEPA) original requirements came into effect and were reinstated by the Council on Environmental Quality (CEQ), which is responsible for Federal agency implementation of NEPA.

Impacts of Planned Actions. 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 EIS considered exploration, delineation, and development wells; platform installation; service vessel trips; and oil spills. The EISs examined the potential additive effects on each specific resource for the entire Gulf of Mexico.

The level and type of activity proposed in Anadarko's EP 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 Anadarko's proposed actions to the cumulative impacts analysis in these prior analyses are not expected to be significant.

D. Environmental Hazards

D.1 Geologic Hazards

The site clearance letter for the proposed wellsites concluded that the locations of the proposed activities are generally favorable for drilling activities (Oceaneering, 2024). See DOCD Section C 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 drilling rig under consideration for this project. High winds and limited visibility during a severe storm could disrupt support activities (vessel and helicopter traffic) and make it necessary to suspend some activities for safety reasons until the storm or weather event passes. In the event of a hurricane, procedures as outlined in the Hurricane Evacuation Plan would be adhered to.

From 2011 to 2024, 22 tropical storms and/or hurricanes have shut down oil and gas activities in the Gulf of Mexico (BSEE, 2024b). Damage was minimal from the storms in 2017 to 2023 and only Hurricane Ida in 2021 caused an accidental release from a ruptured pipeline and well head off the Louisiana coastline (BSEE, 2024b). Evacuation in the event of a hurricane or other severe weather would increase the number and frequency of support vessel and helicopter trips to and from the project area.

D.3 Currents and Waves

Meteorology and (physical) oceanography 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 drilling rig under consideration for this project. High waves during a severe storm could disrupt support activities (i.e., vessel and helicopter traffic), and risks to the project brought on by such conditions would be closely monitored and managed. In some cases, it may be necessary to suspend some activities on the drilling rig 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 wellsite and the selection of a potential drilling rig, were considered by Anadarko.

F. Mitigation Measures

The proposed action includes numerous mitigation measures required by laws, regulations, and BSEE and BOEM lease stipulations and NTLs. The project will comply with all applicable federal, state, and local requirements concerning air pollutant emissions, discharges to water, and solid waste disposal. All project activities will be conducted under guidance by Anadarko's OSRP and Safety and Environmental Management System. Additional information can be found in DOCD Section H.

G. Consultation

No persons or agencies other than those listed as Preparers (**Section H**) were consulted during the preparation of the EIA.

H. Preparers

The EIA was prepared by CSA Ocean Sciences Inc. Contributors included:

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I. References

ABS Consulting Inc. 2016. 2016 Update of Occurrence Rates for Offshore Oil Spills. Prepared for the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement. Contract # E15PX00045, Deliverable 7. https://www.bsee.gov/sites/bsee.gov/files/osrr-oil-spill-response-research//1086aa.pdf.

ABSG Consulting, Inc. 2018. US Outer Continental Shelf Oil Spill Statistics. Arlington VA: Prepared for US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-006.

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of Occurrence Rates for Offshore Oil Spills. U.S. Department of the Interior, Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement. OCS Report BOEM 2012-069, BSEE 2012-069.

Almagro, A. and C. Barría. 2024. The end of silent predators: first cases of active sound production in batoids from the Mediterranean Sea and its potential implications. Marine Biology 171: 208.

Azzara, A.J., W.M. von Zharen, and J.J. Newcomb. 2013. Mixed-methods analytic approach for determining potential impacts of vessel noise on sperm whale click behavior. Journal of the Acoustical Society of America 134(6): 4566-4574.

Barkaszi, M.J. and C.J. Kelly. 2019. Seismic Survey mitigation Measures and Protected Species Observer Reports: Synthesis Reports. New Orleans, LA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. OCS Study BOEM 2019-012. 141 pp + apps.

Barkaszi, M.J., M. Butler, R. Compton, A. Unietis, and B. Bennett. 2012. Seismic Survey Mitigation Measures and Marine Mammal Observer Reports. New Orleans, LA. OCS Study BOEM 2012-015.

Barkuloo, J.M. 1988. Report on the Conservation Status of the Gulf of Mexico sturgeon, *Acipenser oxyrinchus desotoi*. Panama City, FL: U.S. Department of the Interior, U.S. Fish and Wildlife Service.

Barroil, A., J. Deter, F. Holon, and F. Bertucci. 2024. Sound production in wild Mediterranean blonde ray *Raja brachyura*. Ecology, 105: e440.

Baum, J.K. and R.A. Myers. 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. Ecology Letters 7(2): 135-145.

Beazley, M.J., R.J. Martinez, S. Rajan, J. Powell, Y.M. Piceno, L.M. Tom, G.L. Andersen, T.C. Hazen, J.D. Van Nostrand, J. Zhou, B. Mortazavi, and P.A. Sobecky. 2012. Microbial community analysis of a coastal salt marsh affected by the *Deepwater Horizon* oil spill. PLoS One 7(7): e41305.

Beerkircher, L., C.A. Brown, and V. Restrepo. 2009. Pelagic Observer Program Data Summary, Gulf of Mexico Bluefin Tuna (*Thunnus thynnus*) Spawning Season 2007 and 2008; and Analysis of Observer Coverage Levels. NOAA Technical Memorandum NMFS-SEFSC-588. 33 pp.

Bélanger, L. and J. Bédard. 1989. Responses of staging greater snow geese to human disturbance. Journal of Wildlife Management 53(3): 713-719.

Belter, M., J. Blondeau, C. Donovan, K. Edwards, I. Enochs, N. Formel, E. Geiger, S. Gittings, J. Grove, S. Groves, E. Hickerson, M. Johnston, H. Kelsey, K. Lohr, N. Miller, M. Nuttall, G.P. Schmahl, E. Towle, and S. Viehman. 2020. Coral Reef Condition: A Status Report for the Flower Garden Banks. NOAA Coral Reef Conservation Program. 7 pp.

Bergman, D.A. and P.A. Moore. The role of chemical signals in the social behavior of crayfish. Chemical Senses 30: i305-i306.

Berry, M., D.T. Booth, and C.J. Limpus. 2013. Artificial lighting and disrupted sea-finding behaviour in hatchling loggerhead turtles (*Caretta caretta*) on the Woongarra coast, south-east Queensland, Australia. Australian Journal of Zoology 61(2): 137-145.

Biggs, D.C. and P.H. Ressler. 2000. Water column biology. In: Deepwater Program: Gulf of Mexico Deepwater Information Resources Data Search and Literature Synthesis. Volume I: Narrative Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049.

BirdLife International 2018. *Charadrius melodus*. The IUCN Red List of Threatened Species 2018.

Blackstock, S.A., J.O. Fayton, P.H. Hulton, T.E. Moll, K. Jenkins, S. Kotecki, E. Henderson, V. Bowman, S. Rider, and C. Martin. 2018. Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods And Analytical Approach For Phase III Training And Testing. NUWC-NPT Technical Report August 2018. N.U.W.C. Division. Newport, Rhode Island. 109 pp.

Blackwell, S.B. and C.R. Greene Jr. 2003. Acoustic measurements in Cook Inlet, Alaska, during August 2001. Greeneridge Sciences, Inc., for NMFS, Anchorage, AK. 43 pp.

Bolle, L.J., C.A.F. de Jong, S.M. Bierman, P.J.G. Van Beek, O.A. van Keeken, P.W. Wessels, C.J.G. van Damme, H.V. Winter, D. de Haan, and R.P.A. Dekeling. 2012.Ccommon sole larvae survive high levels of pile-driving sound in controlled exposure experiments. PLoS One 7(3): e33052.

Bonde, R.K. and T.J. O'Shea. 1989. Sowerby's beaked whale (*Mesoplodon bidens*) in the Gulf of Mexico. Journal of Mammology 70: 447-449.

Brame, A.B., T.R. Wiley, J.K. Carlson, S.V. Fordham, R.D. Grubbs, J. Osborne, R.M. Scharer, D.M. Bethea, and G.R. Poulakis. 2019. Biology, ecology, and status of the smalltooth sawfish *Pristis pectinata* in the USA. Endangered Species Research 39: 9-23.

Brooke, S. and W.W. Schroeder. 2007. State of deep coral ecosystems in the Gulf of Mexico region: Texas to the Florida Straits, pp 271-306. In: S.E. Lumdsen, T.F. Hourigan, A.W. Bruckner and G. Dorr (Eds.), The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3, Silver Spring, MD.

Brooks, J.M., C. Fisher, H. Roberts, E. Cordes, I. Baums, B. Bernard, R. Church, P. Etnoyer, C. German, E. Goehring, I. McDonald, H. Roberts, T. Shank, D. Warren, S. Welsh, and G. Wolff. 2012. Exploration And Research Of Northern Gulf Of Mexico Deepwater Natural and Artificial Hard-Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs, And Wrecks — "Lophelia II" Interim Report. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study BOEM 2012-106.

Bruintjes, R. and A.N. Radford. 2013. Context-dependent impacts of anthropogenic noise on individual and social behaviour in a cooperatively breeding fish. Animal Behaviour 85(6): 1343-1349.

Bureau of Ocean Energy Management (BOEM). 2012a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017. Western Planning Area Lease Sales 229, 233, 238, 246, and 248. Central Planning Area Lease Sales 227, 231, 235, 241, and 247. Final 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 2012-019.

Bureau of Ocean Energy Management (BOEM). 2012b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2012. Central Planning Area Lease Sale 216/222. Final Supplemental 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 2012-058.

Bureau of Ocean Energy Management (BOEM). 2013. Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014. Western Planning Are Lease Sale 233. Central Planning Area 231. Final Supplemental 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 2013-0118.

Bureau of Ocean Energy Management (BOEM). 2014. Gulf of Mexico OCS Oil and Gas Lease Sales: 2015-2017. Central Planning Area Lease Sales 235, 241, and 247. Final Supplemental 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 2014-655.

Bureau of Ocean Energy Management (BOEM). 2015. Gulf of Mexico OCS Oil and Gas Lease Sales: 2016 and 2017. Central Planning Area Lease Sales 241 and 247; Eastern Planning Area Lease Sale 226. Final Supplemental 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 2015-033.

Bureau of Ocean Energy Management (BOEM). 2016a. Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022. Final Programmatic Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EIA BOEM 2016-060.

Bureau of Ocean Energy Management (BOEM). 2016b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2016. Western Planning Area Lease Sale 248. Final Supplemental 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 2016-005.

Bureau of Ocean Energy Management (BOEM). 2016c. Essential Fish Habitat Assessment for the Gulf of Mexico. U.S. Department of the Interior. New Orleans, LA. OCS Report BOEM 2016-016.

Bureau of Ocean Energy Management (BOEM). 2017a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022. Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261. Final Multisale Environmental Impact Statement. 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 (BOEM). 2017b. Catastrophic Spill Event Analysis: High-Volume, Extended Duration Oil Spill Resulting from Loss of Well Control on the Gulf of Mexico Outer Continental Shelf. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report BOEM 2017-007.

Bureau of Ocean Energy Management (BOEM). 2023a. 2024-2029 National Outer Continental Shelf Oil and Gas Leasing Program. Final Programmatic Environmental Impact Statement. OCS EIS/EA BOEM 2023-054. 2 Volumes.

Bureau of Ocean Energy Management (BOEM). 2023b. Gulf of Mexico OCS Oil and Gas Lease Sales 259 and 261. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, New Orleans Office. OCS EIS/EA BOEM 2023-001.

Bureau of Safety and Environmental Enforcement (BSEE). 2024a. Offshore Incident Statistics. U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement. https://www.bsee.gov/stats-facts/offshore-incident-statistics.

Bureau of Safety and Environmental Enforcement (BSEE). 2024b. Hurricane Activity Updates. https://www.bsee.gov/resources-tools/planning-preparedness/hurricane/hurricane-history.

Burger, J. 2017. Avian Resources of the Northern Gulf of Mexico. In: Ward, C. (Ed.). Habitats and Biota of the Gulf of Mexico: Before the *Deepwater Horizon* Oil Spill. New York, NY: Springer.

C&C Technologies. 2014. Archaeological Assessment Report, Blocks 85 (OCS-G-08797), 129 (OCS-G-10977), and Vicinity, Mississippi Canyon Area. C&C Project No. 141022. 11 pp. + Apps.

Cada, G. 1990. A review of studies relating to the effects of propeller-type turbine passage on fish early life stages. North American Journal of Fisheries Management 10(4): 418-426.

Camhi, M.D., E.K. Pikitch, and E.A. Babcock, (Eds.) 2008. Sharks of the Open Ocean: Biology, Fisheries, and Conservation. Blackwell Publishing Ltd. Oxford, UK. 502 pp.

Camilli, R., C.M. Reddy, D.R. Yoerger, B.A. Van Mooy, M.V. Jakuba, J.C. Kinsey, C.P. McIntyre, S.P. Sylva, and J.V. Maloney. 2010. Tracking hydrocarbon plume transport and biodegradation at *Deepwater Horizon*. Science 330(6001): 201-204.

Carlson, J.K., J. Osborne, and T.W. Schmidt. 2007. Monitoring of the recovery of smalltooth sawfish, *Pristis pectinata,* using standardized relative indices of abundance. Biological Conservation 136: 195-202.

Carlson, J.K. and J. Osborne. 2012. Relative Abundance of Smalltooth Sawfish (*Pristis pectinata*) Based on Everglades National Park Creel Survey. NOAA Technical Memorandum NMFS-SEFSC-626. 15 pp.

Carr, A. 1996. Suwanee River sturgeon, pp 73-83. In: M.H. Carr, A Naturalist in Florida. Yale University Press. New Haven, CT.

Carvalho, R., C.-L. Wei, G.T. Rowe, and A. Schulze. 2013. Complex depth-related patterns in taxonomic and functional diversity of polychaetes in the Gulf of Mexico. Deep Sea Research Part I: Oceanographic Research Papers 80: 66-77.

Casper, B.M. and D.A. Mann. 2006. Evoked potential audiograms of the nurse shark (*Ginglymostoma cirratum*) and the yellow stingray (*Urobatis jamaicensis*). Environmental Biology of Fishes 76: 101-108.

Casper, B.M., P.S. Lobel, and H.Y. Yan. 2003. The hearing sensitivity of the little skate, *Raja erinacea*: a comparison of two methods. Environmental Biology of Fishes 68: 371-379.

Cave, E.J. and S.M. Kajiura. 2018. Effect of *Deepwater Horizon* crude oil water accomodated fraction on olfactory function in the Atlantic stingray, *Hypanus sabinus.* Scientific Reports 8: 15786.

Centers for Disease Control and Prevention. 2010. Health Hazard Evaluation of *Deepwater Horizon* Response Workers. HETA 2010-0115. http://www.cdc.gov/niosh/hhe/pdfs/interim_report_6.pdf.

Clapp, R.B., R.C. Banks, D. Morgan-Jacobs, and W.A. Hoffman. 1982a. Marine Birds of the Southeastern United States and Gulf of Mexico. Part I. Gaviiformes through Pelicaniformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. FWS/OBS-82/01.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1982b. Marine birds of the Southeastern United States and Gulf of Mexico. Part II. Anseriformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington DC. FWS/OBS 82/20.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1983. Marine Birds of the Southeastern United States and Gulf of Mexico. Part III. Charadriiformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. FWS/OBS-83/30.

Conn, P. B., and G. K. Silber. 2013. Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. Ecosphere 4(4): 1–16.

Continental Shelf Associates, Inc. 1997. Characterization and Trends of Recreational and Commercial Fishing from the Florida Panhandle. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. USGS/BRD/CR 1997 0001 and OCS Study MMS 97-0020.

Continental Shelf Associates, Inc. 2002. Deepwater Program: Bluewater fishing and OCS Activity, Interactions Between The Fishing And Petroleum Industries In Deepwaters of the Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002-078.

Cruz-Kaegi, M.E. 1998. Latitudinal Variations In Biomass And Metabolism Of Benthic Infaunal Communities. Ph.D. Dissertation, Texas A&M University, College Station, TX. 140 pp.

CSA International, Inc. 2007. Characterization of Northern Gulf Of Mexico Deepwater Hard-Bottom Communities with Emphasis on Lophelia Coral. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2007-044.

Daling, P.S., F. Leirvik, I.K. Almås, P.J. Brandvik, B.H. Hansen, A. Lewis, and M. Reed. 2014. Surface weathering and dispersability of MC252 crude oil. Marine Pollution Bulletin 15(87): 1-2.

Davis, R.W. and G.S. Fargion, (Eds.). 1996. Distribution and Abundance of Cetaceans in The North-Central and Western Gulf of Mexico: Technical report. New Orleans, LA: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. OCS Study MMS 96-0026.

Davis, R.W., W.E. Evans, and B. Würsig. 2000. Cetaceans, Sea Turtles, And Seabirds in the Northern Gulf of Mexico: Distribution, Abundance and Habitat Associations. Volume II: Technical Report. U.S. Geological Survey, Biological Resources Division, USGS/BRD/CR 1999 0006 and U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-003.

De Guise, S., M. Levin, E. Gebhard, L. Jasperse, L. Burdett Hart, C.R. Smith, S. Venn-Watson, R. Townsend, R. Wells, B. Balmer, E. Zolman, T. Rowles, and L. Schwacke. 2017. Changes in immune functions in bottlenose dolphins in the northern Gulf of Mexico associated with the *Deepwater Horizon* oil spill. Endangered Species Research 33: 291-303.

Ditty, J.G. 1986. Ichthyoplankton in neritic waters of the northern Gulf of Mexico off Louisiana: Composition, relative abundance, and seasonality. Fishery Bulletin 84(4): 935-946.

Ditty, J.G., G.G. Zieske, and R.F. Shaw. 1988. Seasonality and depth distribution of larval fishes in the northern Gulf of Mexico above 26°00’N. Fishery Bulletin 86(4): 811-823.

Du, M. and J.D. Kessler. 2012. Assessment of the spatial and temporal variability of bulk hydrocarbon respiration following the *Deepwater Horizon* oil spill. Environmental Science & Technology 46: 10499-10507.

Dubinsky, E.A., M.E. Conrad, R. Chakraborty, M. Bill, S.E. Borglin, J.T. Hollibaugh, O.U. Mason, Y.M. Piceno, F.C. Reid, W.T. Stringfellow, L.M. Tom, T.C. Hazen, and G.L. Andersen. 2013. Succession of hydrocarbon-degrading bacteria in the aftermath of the *Deepwater Horizon* oil spill in the Gulf of Mexico. Environmental Science & Technology 47(19): 10860-10867.

Efroymson, R.A., J.P. Nicolette, and G.W. Sutter II. 2003. A framework for Net Environmental Benefit Analysis for Remediation or Restoration Of Petroleum-Contaminated Sites. ORNL/TM-2003/17.

Efroymson, R.A., W.H. Rose, S. Nemeth, and G.W. Sutter II. 2000. Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft. Oak Ridge National Laboratory. Oak Ridge, TN. ORNL/TM-2000/289 ES-5048.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada, including Hawaii and Puerto Rico. Palo Alto, CA: Stanford University Press. 259 pp.

Electric Power Research Institute. 2000. Technical Evaluation of the Utility of Intake Approach Velocity as an Indicator of Potential Adverse Environmental Impact Under Clean Water Act Section 316(b). Technical Report 1000731.

Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel. 2012. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology, 26(1): 21-28.

Fetterplace, L.C., J.J.D. Esteban, J. Pini-Fitzsimmons, J. Gaskell, and B.E. Wueringer. 2022. Evidence of sound production in wild stingrays. Ecology 103: e3812.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, and N. Adimey. 2005. Manatee occurrence in the northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17(1): 69-94.

Finneran JJ, Henderson E.E., D.S. Houser, K. Jenkins, S. Kotecki, and J. Mulsow. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical report by Space and Naval Warfare Systems Center Pacific (SSC Pacific). 183 pp.

Fisheries Hydroacoustic Working Group (FHWG). 2008. Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities. Memorandum to Applicable Agency Staff. 12 June 2008. 4 pp.

Florida Fish and Wildlife Conservation Commission (FWC). nd-a. Loggerhead Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/.

Florida Fish and Wildlife Conservation Commission (FWC). nd-b. Green Turtle Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/green-turtle/.

Florida Fish and Wildlife Conservation Commission (FWC). nd-c. Leatherback Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/.

Florida Fish and Wildlife Conservation Commission (FWC). nd-d. Florida Salt Marsh Vole, Microtus pennsylvanicus dekecampbelli. https://myfwc.com/wildlifehabitats/profiles/mammals/land/florida-salt-marsh-vole/.

Florida Fish and Wildlife Conservation Commission (FWC). nd-e. Florida's Endangered and Threatened Species. https://myfwc.com/media/1945/threatend-endangered-species.pdf.

Florida Fish and Wildlife Conservation Commission (FWC). 2016. Draft Panama City Crayfish Management Plan. *Procambarus econfinae*.

Foley, K.A., C. Caldow, and E.L. Hickerson. 2007. First confirmed record of Nassau Grouper *Epinephelus striatus* (Pisces: Serranidae) in the Flower Garden Banks National Marine Sanctuary. Gulf of Mexico Science 25(2): 162-165.

Fonseca, M., G.A. Piniak, and N. Cosentino-Manning. 2017. Susceptibility of seagrass to oil spills: A case study with eelgrass, *Zostera marina* in San Francisco Bay, USA. Marine Pollution Bulletin 115(1-2): 29-38.

Fox, D.A., J.E. Hightower, and F.M. Parauka. 2000. Gulf Sturgeon spawning migration and habitat in the Choctawhatchee River System, Alabama–Florida. Transactions of the American Fisheries Society 129(3): 811-826.

Fritts, T.H. and R.P. Reynolds. 1981. Pilot Study of the Marine Mammals, Birds, and Turtles In OCS Areas of the Gulf of Mexico. U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program. FWS/OBS 81/36.

Galaiduk, R., D.L. McLean, C.W. Speed, D. Greer, R. McIntosh, E.A. Treml. 2024. Offshore oil and gas infrastructure plays a minor role in marine metapopulation dynamics. Science of the Total Environment 934: 172981.

Gallaway, B.J., (Ed.). 1988. Northern Gulf of Mexico Continental Slope Study, Final Report: Year 4. Volume II: SynthesisRreport. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 88-0053.

Gallaway, B.J. and G.S. Lewbel. 1982. The Ecology of Petroleum Platforms in the Northwestern Gulf of Mexico: a Community Profile. U.S. Fish and Wildlife Service, Biological Services Program and U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. FWS/OBS-82/27 and USGS Open File Report 82-03.

Gallaway, B.J., J.G. Cole, and R.G. Fechhelm. 2003. Selected Aspects of the Ecology of the Continental Slope Fauna of the Gulf of Mexico: A Synopsis of the Northern Gulf of Mexico Continental Slope Study, 1983-1988. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-072.

Gates, A.R., M.C. Benfield, D.J. Booth, A.M. Fowler, D. Skropeta, and D.O.B. Jones. 2017. Deep-sea observations at hydrocarbon drilling locations: Contributions from the SERPENT Project after 120 field visits. Deep-Sea Research Part II: Topical Studies in Oceanography 137: 463-479.

Geraci, J.R. and D.J. St. Aubin. 1990. Sea Mammals and Oil: Confronting the Risks. San Diego, CA: Academic Press. 282 pp.

Gitschlag, G., B. Herczeg, and T. Barcack. 1997. Observations of sea turtles and other marine life at the explosive removal of offshore oil and gas structures in the Gulf of Mexico. Gulf Research Reports 9(4): 247-262.

Gomez, C., J.W. Lawson, A.J. Wright, A.D. Buren, D. Tollit, and V. Lesage. 2016. A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. Canadian Journal of Zoology 94: 801-819.

Gulf of Mexico Fishery Management Council (GMFMC). 2005. Generic Amendment Number 3 for addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and adverse effects of fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp fishery of the Gulf of Mexico, United States waters red drum fishery of the Gulf of Mexico, reef fish fishery of the Gulf of Mexico coastal migratory pelagic resources (mackerels) in the Gulf of Mexico and South Atlantic, stone crab fishery of the Gulf of Mexico, spiny lobster in the Gulf of Mexico and South Atlantic, coral and coral reefs of the Gulf of Mexico. Tampa, FL: Gulf of Mexico Fishery Management Council. 104 pp. https://gulfcouncil.org/wp-content/uploads/FISHERY%20MANAGEMENT/GENERIC/FINAL3_EFH_Amendment.pdf.

Gulf of Mexico Fishery Management Council (GMFWC) and National Marine Fisheries Service (NMFS). 2018. Coral habitat areas considered for habitat area of particular concern designation in the Gulf of Mexico: Final Amendment 9 to the fishery management plan for the coral and coral reefs of the Gulf of Mexico, U.S. Waters, Including Final Environmental Impact Statement. National Oceanic and Atmospheric Administration: 320 pp.

Hamdan, L.J., J.L. Salerno, A. Reed, S.B. Joye, and M. Damour. 2018. The impact of the *Deepwater Horizon* blowout on historic shipwreck-associated sediment microbiomes in the northern Gulf of Mexico. Scientific Reports 8: 9057.

Haney, C.J., H.J. Geiger, and J.W. Short. 2014. Bird mortality from the *Deepwater Horizon* oil spill. Exposure probability in the Gulf of Mexico. Marine Ecology Progress Series 513: 225-237.Hawkins, A.D. and A.N. Popper. 2014. Assessing the impact of underwwater sounds on fishes and other forms of marine life. Acoustics Today. Spring 2014: 30-41.

Hawkins AD, Hazelwood RA, Popper AN, Macey PC. 2021. Substrate vibrations and their potential effects upon fishes and invertebrates. The Journal of the Acoustical Society of America, 149: 2782-90.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, B. Byrd, S. Chavez-Rosales, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, R.M. Pace, D.L. Palka, J. Powell, and F.W. Wenzel. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-258.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, J. Turek, B. Byrd, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, J. Ortega-Ortiz, R.M. Pace, D.L. Palka, J. Powell, G. Rappucci, and F.W. Wenzel. 2021. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-271.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, J.W. Wallace, A. Brossard, S. Chavez-Rosales, T.V.N. Cole, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, K. Murray, C. Orphanides, J. Ortega-Ortiz, R.M. Pace, D.L. Palka, J. Powerll, G. Rappicci, M. Soldevilla, and F.W. Wenzel. 2022. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2021. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-288. 387 pp.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle Chelonia mydas. Endangered Species Research 3: 105-113.

Hazen, T.C., E.A. Dubinsky, T.Z. DeSantis, G.L. Andersen, Y.M. Piceno, N. Singh, J.K. Jansson, A. Probst, S.E. Borglin, J.L. Fortney, W.T. Stringfellow, M. Bill, M.E. Conrad, L.M. Tom, K.L. Chavarria, T.R. Alusi, R. Lamendella, D.C. Joyner, C. Spier, J. Baelum, M. Auer, M.L. Zemla, R. Chakraborty, E.L. Sonnenthal, P. D'Haeseleer, H.Y. Holman, S. Osman, Z. Lu, J.D. Van Nostrand, Y. Deng, J. Zhou, and O.U. Mason. 2010. Deep-sea oil plume enriches indigenous oil-degrading bacteria. Science 330(6001): 204-208.

Hazen EL, Carlisle AB, Wilson SG, Ganong JE, Castleton MR, Schallert RJ, Stokesbury MJW, Bograd SJ, Block BA. 2016. Quantifying overlap between the Deepwater Horizon oil spill and predicted bluefin tuna spawning habitat in the Gulf of Mexico. Scientific Reports, 6: 33824.

HDR (Athens AL). 2022. Passive acoustic monitoring program for the Northern Gulf of Mexico: project report. U.S. Department of the Interior, Bureau of Ocean Energy Management, New Orleans, LA. Contract No: M17PC00001. Report No: OCS Study BOEM 2022-074. 337 pp.

Higashi, G.R. 1994. Ten years of fish aggregating device (FAD) design development in Hawaii. Bulletin of Marine Science 55(2-3): 651-666.

Hildebrand, J.A. 2005. Impacts of anthropogenic sound, pp 101-124. In: J.E. Reynolds III, W.F. Perrin, R.R. Reeves, S. Montgomery and T.J. Ragen (Eds.), Marine Mammal Research: Conservation Beyond Crisis. Johns Hopkins University Press, Baltimore, MD.

Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395: 5-20.

Hildebrand, J.A., S. Baumann-Pickering, K.E. Frasier, J.S. Trickey, K.P. Merkens, S.M. Wiggins, M.A. McDonald, L.P. Garrison, D. Harris, T.A. Marques, and L. Thomas. 2015. Passive acoustic monitoring of beaked whale densities in the Gulf of Mexico. Scientific Reports 5: 16343.

Holland, K.N. 1990. Horizontal and vertical movements of yellowfin and bigeye tuna associated with fish aggregating devices. Fishery Bulletin 88: 493-507.

Horn, K.N., C. Karnauskas, M. Doerr, J. C. Miller, M. H. Neuman, M. Hill, R. McCarthy, K. J. 2022. Endangered species act status review report: Queen conch (*Aliger gigas*). NOAA Technical Memorandum NMFS-SEFSC-756.

Intergovernmental Panel on Climate Change. 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. https://www.ipcc.ch/report/ar5/wg2/.

International Association of Oil & Gas Producers. 2010. Risk Assessment Data Directory: Blowout Frequencies. OGP Report No. 434 2. 13 pp.

International Tanker Owners Pollution Federation Limited. 2018. Weathering. https://www.itopf.org/knowledge-resources/documents-guides/fate-of-oil-spills/weathering/.

Jensen, A. S. and G. K. Silber. 2004. Large whale ship strike database. Silver Spring, MD: Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-25.

Ji, Z.-G., W.R. Johnson, C.F. Marshall, and E.M. Lear. 2004. Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report MMS 2004-026.

Jochens, A., D.C. Biggs, D. Benoit-Bird, D. Engelhaupt, J. Gordon, C. Hu, N. Jaquet, M. Johnson, R.R. Leben, B. Mate, P. Miller, J.G. Ortega-Ortiz, A. Thode, P. Tyack, and B. Würsig. 2008. Sperm Whale Seismic Study in The Gulf of Mexico: Synthesis Report. Minerals Management Service, U.S. Department of the Interior, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2008-006.

Johnsgard, P.A. 1990. Hawks, Eagles, and Falcons of North America; Biology and Natural History. Washington, DC: Smithsonian Institution Press. 456 pp.

Keithly, W.R. and K.J. Roberts. 2017. Commercial and Recreational Fisheries of the Gulf of Mexico., pp 1039-1188. In: C.H. Ward (Ed.), Habitats and Biota of the Gulf of Mexico: Before the *Deepwater Horizon* Oil Spill. Volume 2: Fish Resources, Fisheries, Sea Turtles, Avian Resources, Marine Mammals, Diseases and Mortalities. New York, NY: Springer.

Kennicutt, M.C. 2000. Chemical Oceanography, pp. 123-139. In: Continental Shelf Associates, Inc. Deepwater Program: Gulf of Mexico Deepwater Information Resources Data Search and Literature Synthesis. Volume I: Narrative report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049.

Keppner, E.J. and L.A. Keppner. 2004. A Summary of the Panama City Crayfish, *Procambarus econfina* Hobbs, 1942. Prepared for The Candidate Conservation Agreement with Assurances.

Kessler, J.D., D.L. Valentine, M.C. Redmond, M. Du, E.W. Chan, S.D. Mendes, E.W. Quiroz, C.J. Villanueva, S.S. Shusta, L.M. Werra, S.A. Yvon-Lewis, and T.C. Weber. 2011. A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico. Science 331: 312-315.

Ketten, D.R. and S.M. Bartol. 2005. Functional Measures of Sea Turtle Hearing. Woods Hole Oceanographic Institution: ONR Award No: N00014-02-0510.

Krishnamurthy J., L.S. Engel, L. Wang, E.G. Schwartz, K. Christenbury, B. Kondrup, J. Barrett, and J.A. Rusiecki. 2019. Neurological symptoms associated with oil spill response exposures: results from the *Deepwater Horizon* Oil Spill Coast Guard Cohort Study. Environment International. 131: 104963. doi:10.1016/j.envint.2019.104963.

Kiszka, J., M. Caputo, J. Vollenweider, M.R. Heithaus, L.A. Dias, and L.P. Garrison. 2023. Critically endangered Rice's whales (*Balaenoptera ricei*) selectively feed on high-quality prey in the Gulf of Mexico. Scientific Reports 13: 6710.

Kyhn, L.A., S. Sveegaard, and J. Tougaard. 2014. Underwater noise emissions from a drillship in the Arctic. Marine Pollution Bulletin 86: 424-433.

Ladich, F. and R.R. Fay. 2013. Auditory evoked potential audiometry in fish. Reviews in Fish Biology and Fisheries 23(3): 317-364.

Laist, D. W., A. R. Knowlton, J. G. Mead, A. S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science 17(1): 35-75.

Lin, Q. and I.A. Mendelssohn. 2012. Impacts and recovery of the *Deepwater Horizon* oil spill on vegetation structure and function of coastal salt marshes in the northern Gulf of Mexico. Environmental Science & Technology 46(7): 3737-3743.

Liu, J., H.P. Bacosa, and Z. Liu. 2017. Potential environmental factors affecting oil-degrading bacterial populations in deep and surface waters of the northern Gulf of Mexico. Frontiers in Microbiology 7: 2131.

Lohoefener, R., W. Hoggard, K.D. Mullin, C. Roden, and C. Rogers. 1990. Association of sea turtles with petroleum platforms in the north central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 90-0025. 90 pp.

Louisiana Wildlife & Fisheries. 2020. Rare Species and Natural Communities by Parish. https://www.wlf.louisiana.gov/page/rare-species-and-natural-communities-by-parish.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival, pp. 387-409. In: P.L. Lutz and J.A. Musick (Eds.), The Biology of Sea Turtles. Boca Raton, FL: CRC Press.

Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28(4): 417-422.

MacDonald, I.R. 2002. Stability and Change in Gulf of Mexico Chemosynthetic Communities. Volume II: Technical Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002-036.

Main, C.E., H.A. Ruhl, D.O.B. Jones, A. Yool, B. Thornton, and D.J. Mayor. 2015. Hydrocarbon contamination affects deep-sea benthic oxygen uptake and microbial community composition. Deep Sea Research. Part I: Oceanographic Research Papers 100: 79-87.

Marine Mammal Commission (MMC). 2011. Assessing the Long-Term Effects of the BP *Deepwater Horizon* Oil Spill on Marine Mammals in the Gulf of Mexico: A statement of research needs. https://www.mmc.gov/wp-content/uploads/longterm_effects_bp_oilspil.pdf.

Marshall, A., R. Barreto, J. Carlson, D. Fernando, S. Fordham, M.P. Francis, D. Derrick, K. Herman, R.W. Jabado, K.M. Liu, C.L. Rigby, and E. Romanov. 2020. *Mobula birostris.* The IUCN Red List of Threatened Species. 2018: e.T198921A68632946. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T198921A68632946.en.

Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig. 2000. A comparative review of entrainment survival studies at power plants in estuarine environments, pp. S295−S302. In: J. Wisniewski (Ed.), Environmental Science & Policy; Power Plants & Aquatic Resources: Issues and Assessment, Vol. 3, Supplement 1. New York, NY: Elsevier Science Ltd.

McCauley, R. 1998. Radiated Underwater Noise Measured from the Drilling Rig Ocean General, Rig Tenders Pacific Ariki and Pacific Frontier, Fishing Vessel Reef Venture and Natural Sources in the Timor Sea, northern Australia. Prepared for Shell Australia, Melbourne. 52 pp. http://cmst.curtin.edu.au/local/docs/pubs/1998-19.pdf.

McDonald, T.L., F.E. Hornsby, T.R. Speakman, E.S. Zolman, K.D. Mullin, C. Sinclair, P.E. Rosel, L. Thomas, and L.H. Schwacke. 2017. Survival, density, and abundance of common bottlenose dolphins in Barataria Bay (USA) following the *Deepwater Horizon* oil spill. Endangered Species Research 33: 193-209.

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131: 92-103.

McLaughlin, K.E. and H.P. Kunc. 2015. Changes in the acoustic environment alter the foraging and sheltering behaviour of the cichlid *Amititlania nigrofasciata*. Behavioural Processes 116: 75-79.

Mendelssohn, I.A., G.L. Andersen, D.M. Baltx, R.H. Caffey, K.R. Carman, J.W. Fleeger, S.B. Joyce, Q. Lin, E. Maltby, E.B. Overton, and L.P. Rozas. 2012. Oil impacts on coastal wetlands: Implications for the Mississippi River delta ecosystem after the *Deepwater Horizon* oil spill. BioScience 62(6): 562-574.

Mississippi Natural Heritage Program. 2018. Natural Heritage Program Online Database. Museum of Natural Science, Mississippi Deptartment of Wildlife, Fisheries, and Parks. https://www.mdwfp.com/museum/seek-study/heritage-program/nhp-online-data/.

Møhl, B., M. Wahlberg, and P.T. Madsen. 2003. The monopulsed nature of sperm whale clicks. Journal of the Acoustical Society of America 114(2): 1143-1154.

Morrow, J.V.J., J.P. Kirk, K.J. Killgore, H. Rugillio, and C. Knight. 1998. Status and recovery of Gulf sturgeon in the Pearl River system, Louisiana-Mississippi. North American Journal of Fisheries Management 18: 798-808.

Muhling BA, Roffer MA, Lamkin JT, Ingram Jr GW, Upton MA, Gawlikowski G, Muller-Karger F, Habtes S, Richards WJ. 2012. Overlap between Atlantic bluefin tuna spawning grounds and observed Deepwater Horizon surface oil in the northern Gulf of Mexico. Marine Pollution Bulletin. 64: 679-87.

Mullin, K.D. 2007. Abundance of Cetaceans in the Oceanic Gulf of Mexico based on 2003-2004 Ship Surveys. Pascagoula, MS: U.S. Department of Commerce, National Marine Fisheries Service, Southeast Fisheries Science Center.

Mullin, K.D., W. Hoggard, C. Roden, R. Lohoefener, C. Rogers, and B. Taggart. 1991. Cetaceans on the Upper Continental Slope in the North-Central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 91-0027.

National Marine Fisheries Service (NMFS). 2007. Endangered Species Act, Section 7 Consultation – Biological Opinion. Gulf of Mexico Oil and Gas Activities: Five Year Leasing Plan for Western and Central Planning Areas 2007-2012. St. Petersburg, FL: U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. https://repository.library.noaa.gov/view/noaa/3720.

National Marine Fisheries Service (NMFS). 2009a. Sperm Whale (*Physeter macrocephalus*) 5-Year Review: Summary and Evaluation. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division.

National Marine Fisheries Service (NMFS). 2009b. Smalltooth Sawfish Recovery Plan (*Pristis pectinata*). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 102 pp. https://repository.library.noaa.gov/view/noaa/15983.

National Marine Fisheries Service (NMFS). 2009c. Final Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan Essential Fish Habitat. Silver Spring, MD: Highly Migratory Species Management Division, Office of Sustainable Fisheries. http://pbadupws.nrc.gov/docs/ML1219/ML12195A241.pdf.

National Marine Fisheries Service (NMFS). 2010. Final Recovery Plan For The Sperm Whale (*Physeter macrocephalus*). Silver Spring, MD. https://www.fisheries.noaa.gov/resource/document/recovery-plan-sperm-whale-physeter-macrocephalus#:~:text=The%20goal%20of%20this%20Recovery,the%20provisions%20of%20the%20ESA.

National Marine Fisheries Service (NMFS). 2011. Species of Concern: Atlantic Bluefin Tuna, *Thunnus thynnus*. https://www.fisheries.noaa.gov/species/western-atlantic-bluefin-tuna.

National Marine Fisheries Service (NMFS). 2014a. Loggerhead Sea Turtle Critical Habitat in the Northwest Atlantic Ocean. https://www.fisheries.noaa.gov/resource/map/loggerhead-turtle-northwest-atlantic-ocean-dps-critical-habitat-map.

National Marine Fisheries Service (NMFS). 2014b. Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). https://www.fisheries.noaa.gov/species/gulf-sturgeon.

National Marine Fisheries Service (NMFS). 2015. Recovery Plan for Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*A. cervicornis*). Southeast Regional Office. Saint Petersburg, FL. https://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/2160/final_acropora_recovery_plan.pdf.

National Marine Fisheries Service (NMFS). 2018a. 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. NOAA Technical Memorandum NMFS-OPR-59.https://repository.library.noaa.gov/view/noaa/17892.

National Marine Fisheries Service (NMFS). 2018b. Smalltooth Sawfish (*Pristis pectinata*) 5-Year Review: Summary and Evaluation of United States Distinct Population Segment of Smalltooth Sawfish. St. Petersburg, FL: National Marine Fisheries Service, Southeast Regional Office. 63 pp. https://repository.library.noaa.gov/view/noaa/19253/Print.

National Marine Fisheries Service (NMFS). 2020a. Endangered Species Act, Section 7 Consultation – Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. St. Petersburg, FL. https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico.

National Marine Fisheries Service (NMFS). 2020b. Sea Turtles, Dolphins, and Whales-10 years after the *Deepwater Horizon* Oil Spill. https://www.fisheries.noaa.gov/national/marine-life-distress/sea-turtles-dolphins-and-whales-10-years-after-deepwater-horizon-oil.

National Marine Fisheries Service (NMFS). 2021. Amended ITS on BOEM Gulf of Mexico Oil and Gas Program. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. Tracking No. FPR-2017-92341, Amended 26 April 2021. 245 pp.

National Marine Fisheries Service (NMFS). 2024a. 2024 Update to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0); Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. NOAA Technical Memorandum NMFS-OPR-71 October 2024. 193 pp. https://www.fisheries.noaa.gov/s3/2024-11/Tech_Memo-Guidance_-3.0-_OCT-2024-508_OPR1.pdf.

National Marine Fisheries Service (NMFS). 2024b. National Marine Fisheries Service: Summary of Endangered Species Act Acoustic Thresholds (Marine Mammals, Fishes, and Sea Turtles). January 2023. 10 pp.

National Marine Fisheries Service (NMFS). 2025. Oceanic Whitetip Shark. https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark.

National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS) and Secretaría de Medio Ambiente y Recursos Naturales. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii), Second Revision. https://www.fisheries.noaa.gov/resource/document/bi-national-recovery-plan-kemps-ridley-sea-turtle-2nd-revision.

National Oceanic and Atmospheric Administration (NOAA). 2011a. Joint Analysis Group. *Deepwater Horizon* Oil Spill: Review of Preliminary Data to Examine Subsurface Oil in the Vicinity of MC252#1, May 19 to June 19, 2010. Silver Spring, MD: U.S. Department of Commerce, National Ocean Service. NOAA Technical Report NOS OR&R 25. https://repository.library.noaa.gov/view/noaa/130.

National Oceanic and Atmospheric Administration (NOAA). 2011b. Joint Analysis Group, *Deepwater Horizon* Oil Spill: Review of R/V Brooks McCall Data to Examine Subsurface Oil. Silver Spring, MD: U.S. Department of Commerce, National Ocean Service. NOAA Technical Report NOS OR&R 24. https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=226571.

National Oceanic and Atmospheric Administration (NOAA). 2011c. Joint Analysis Group, *Deepwater Horizon* oil spill: Review of preliminary data to examine oxygen levels in the vicinity of MC252#1 May 8 to August 9, 2010. Silver Spring, MD:U.S. Department of Commerce, National Ocean Service. NOAA Technical Report NOS OR&R 26. https://repository.library.noaa.gov/view/noaa/390.

National Oceanic and Atmospheric Administration (NOAA). 2014. Flower Garden Banks National Marine Sanctuary. http://flowergarden.noaa.gov/about/cnidarianlist.html.

National Oceanic and Atmospheric Administration (NOAA). 2016. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.

National Oceanic and Atmospheric Administration (NOAA). 2018. Giant Manta Ray. https://www.fisheries.noaa.gov/species/giant-manta-ray.

National Oceanic and Atmospheric Administration (NOAA). 2024a. Oil Types. Office of Response and Restoration. http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/oil-types.html.

National Oceanic and Atmospheric Administration (NOAA). 2021. Oil and Sea Turtles. Biology, Planning, and Response. U.S. Department of Commerce, National Ocean Service, Office of Response and Restoration. 150 pp. https://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles_2021.pdf.

National Oceanic and Atmospheric Administration (NOAA). 2022a. WebGNOME. https://gnome.orr.noaa.gov/#.

National Oceanic and Atmospheric Administration (NOAA). 2022b. Trophic Interactions and Habitat Requirements of Gulf of Mexico Rice's Whales. https://www.fisheries.noaa.gov/southeast/endangered-species-conservation/trophic-interactions-and-habitat-requirements-gulf-mexico.

National Oceanic and Atmospheric Administration (NOAA). 2023a. Small Diesel Spills (500 - 5,000 gallons). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration. https://response.restoration.noaa.gov/sites/default/files/Small-Diesel-Spills.pdf.

National Oceanic and Atmospheric Administration (NOAA). 2023b. Nassau Grouper. https://www.fisheries.noaa.gov/species/nassau-grouper.

National Oceanic and Atmospheric Administration (NOAA). 2024b Queen Conch. https://www.fisheries.noaa.gov/species/queen-conch.

National Oceanic and Atmospheric Administration (NOAA). 2024c. Western Atlantic bluefin tuna. NOAA Fisheries. https://www.fisheries.noaa.gov/species/western-atlantic-bluefin-tuna.

National Oceanic and Atmospheric Administration (NOAA). 2024d. 2024 Atlantic Bluefin Tuna Landings Updates. https://www.fisheries.noaa.gov/atlantic-highly-migratory-species/2024-atlantic-bluefin-tuna-landings-updates.

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2020. Species Directory – ESA Threatened and Endangered. www.fisheries.noaa.gov/species-directory/threatened-endangered.

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2024a. Giant Manta Ray, *Manta birostris*. https://www.fisheries.noaa.gov/species/giant-manta-ray.

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2024b. Smalltooth Sawfish, *Pristis pectinata*. https://www.fisheries.noaa.gov/species/smalltooth-sawfish.

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2024c. Trophic Interactions and Habitat Requirements of Gulf of Mexico Rice's Whales. https://www.fisheries.noaa.gov/southeast/endangered-species-conservation/trophic-interactions-and-habitat-requirements-gulf-mexico#animal-telemetry.

National Park Service. 2010. Breton Wilderness 300 km Radius.

National Research Council. 2003a. Oil in the Sea III: Inputs, Fates, and Effects. Washington, DC: National Academy Press. 182 pp. + app.

National Research Council. 2003b. Ocean Noise and Marine Mammals. Washington, DC: National Academy Press. 204 pp.

National Wildlife Federation. 2016. Wildlife Library: Whooping Crane. https://www.nwf.org/Educational-Resources/Wildlife-Guide/Birds/Whooping-Crane.

Natural Resources Defense Council. 2014. A petition to list the Gulf of Mexico Bryde's whale (*Balaenoptera edeni*) as endangered under the Endangered Species Act. https://www.nrdc.org/sites/default/files/wil_14091701a.pdf.

Nedwell, J.R. and B. Edwards. 2004. A Review of Measurements of Underwater Man-Made Noise Carried Out by Subacoustech Ltd, 1993 - 2003. Prepared by Subacoustech Report Reference: 565R00109, September 2004; prepared for ChevronTexaco Ltd, Total Final Elf Exploration UK PLC, DSTL, DTI, Shell UK.

Nedwell, J.R. and D. Howell. 2004. A Review of Offshore Windfarm Related Underwater Noise Sources. Report No. 544 R 0308. Subacoustech Ltd., Southampton, UK. 63 pp.

Nedwell, J.R., K. Needham, and B. Edwards. 2001. Report on Measurements of Underwater Noise from the Jack Bates Drill Rig. Report No. 462 R 0202. Subacoustech Ltd., Southhampton, UK. 49 pp.

Nieder, C., E. Parmentier, A.G. Jeffs, and C. Radford. 2025. Evidence of active sound production by a shark. Royal Society Open Science 12: 242212.

Noirungsee, N., S. Hackbush, J. Viamonte, P. Bubenheim, A. Liese, and R. Muller. 2020. Influence of oil, dispersant, and pressure on microbial communities from the Gulf of Mexico. Nature Research: Scientific Reports. 10: 7079. https://doi.org/10.1038/s41598-020-63190-6.

Nowlin, W.D.J., A.E. Jochens, S.F. DiMarco, R.O. Reid, and M.K. Howard. 2001. Deepwater Physical Oceanography Reanalysis and Synthesis of Historical Data: Synthesis Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2001-064.

Oceaneering. 2024. Wellsite Clearance Report, Proposed Well MC41-A: Block 85, Mississippi Canyon, Gulf of Mexico. Oceaneering Document Number 229620-OII-RPT-WSC-001. 21 pp.

Operational Science Advisory Team. 2011. Summary Report for Fate and Effects of Remnant Oil Remaining in the Beach Environment. Prepared for Lincoln D. Stroh, Capt., U.S. Coast Guard, Federal On-Scene Coordinator, *Deepwater Horizon* MC252.

Pabody, C.M., R.H. Carmichael, L. Rice, and M. Ross. 2009. A new sighting network adds to 20 years of historical data on fringe West Indian Manatee (*Trichechus manatus)* populations in Alabama waters. Gulf of Mexico Science 1: 52-61.

Picciulin, M., L. Sebastianutto, A. Codarin, A. Farina, and E.A. Ferrero. 2010. In situ behavioural responses to boat noise exposure of *Gobius cruentatu*s (Gmelin, 1789; fam. Gobiidae) and *Chromis chromis* (Linnaeus, 1758; fam. Pomacentridae) living in a Marine Protected Area. Journal of Experimental Marine Biology and Ecology 386(1): 125-132.

Pitman, R.L. and R.L. Brownell Jr. 2020. *Mesoplodon bidens*. The IUCN Red List of Threatened Species 2020: eT13241A50363686. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13241A50363686.en.

Poot, H., B.J. Ens, H. de Vries, M.A. Donners, M.R. Wernand, and J.M. Marquenie. 2008. Green light for nocturnally migrating birds. Ecology and Society 13(2): 47.

Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D. Zeddies, and W.N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report. ASA S3/SC1.4 TR-2014 prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. ASA Press, Springer.

Powers, S.P., F.J. Hernandez, R.H. Condon, J.M. Drymon, and C.M. Free. 2013. Novel pathways for injury from offshore oil spills: Direct, sublethal and indirect effects of the *Deepwater Horizon* oil spill on pelagic Sargassum communities. PLoS One 8(9): e74802.

Prince, R.C. 2014. Crude oil Releases to the Environment: Natural Fate and Remediation Options. Reference Module in Earth Systems and Environmental Sciences. Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.09112-0.

Pritchard, P.C.H. 1997. Evolution, phylogeny, and current status, pp. 1-28. In: P.L. Lutz and J.A. Musick (Eds.), The Biology of Sea Turtles. Boca Raton, FL: CRC Press.

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? Behavioral Ecology 25(5): 1,022-1,030.

Ramseur, J.L. 2010. *Deepwater Horizon* Oil Spill: The Fate of the Oil. Congressional Research Service Report prepared for Members and Committees of Congress. http://cwc.lumcon.edu/wp-content/uploads/2012/09/BP-Oil-Spill-Fate-of-the-Oil.pdf.

Rathbun, G.B. 1988. Fixed-wing airplane versus helicopter surveys of manatees. Marine Mammal Science 4(1): 71-75.

Reddy, C.M., J.S. Arey, J.S. Seewald, S.P. Sylva, K.L. Lemkau, R.K. Nelson, C.A. Carmichael, C.P. McIntyre, J. Fenwick, G.T. Ventura, A.S. Van Mooy, and R. Camilli. 2012. Composition and fate of gas and oil released to the water column during the *Deepwater Horizon* oil spill. Proceedings of the National Academy of Sciences USA 109(50): 20229-20234.

Relini, M., L.R. Orsi, and G. Relini. 1994. An offshore buoy as a FAD in the Mediterranean. Bulletin of Marine Science 55(2-3): 1099-1105.

Reşitoğlu, İ.A., K. Altinişik, and A. Keskin. 2015. The pollutant emissions from diesel-engine vehicles and exhaust after treatment systems. Clean Technologies and Environmental Policy 17(1): 15-27.

Richards, W.J., T. Leming, M.F. McGowan, J.T. Lamkin, and S. Kelley-Farga. 1989. Distribution of fish larvae in relation to hydrographic features of the Loop Current boundary in the Gulf of Mexico. ICES Marine Science Symposia 191: 169-176.

Richards, W.J., M.F. McGowan, T. Leming, J.T. Lamkin, and S. Kelley-Farga. 1993. Larval fish assemblages at the Loop Current boundary in the Gulf of Mexico. Bulletin of Marine Science 53(2): 475-537.

Richardson, W.J., C.R. Greene Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. San Diego, CA, Academic Press. 592 pp.

Rigby, C.L., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019. Carcharhinus longimanus. The IUCN Red List of Threatened Species 2019: e.T39374A2911619. https://www.iucnredlist.org/species/39374/2911619.

Rodgers, J.A. and S.T. Schwikert. 2002. Buffer-zzone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. Conservation Biology 16(1): 216-224.

Rosel, P.E., L.A. Wilcox, T.K. Yamada, and K.D. Mullin. 2021. A new species of baleen whale (Balnaenoptera) from the Gulf of Mexico, with a review of its geographic distribution. Marine Mammal Science 37(2): 577-610.

Rosel, P.E., P. Corkeron, L. Engleby, D. Epperson, K.D. Mullin, M.S. Soldevilla, and B.L. Taylor. 2016. Status Review of Bryde's Whales (*Balaenoptera edeni*) in the Gulf of Mexico under the Endangered Species Act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center. NOAA Technical Memorandum NMFS-SEFSC-692. 133 pp.

Ross, S.W., A.W.J. Demopoulos, C.A. Kellogg, C.L. Morrison, M.S. Nizinski, C.L. Ames, T.L. Casazza, D. Gualtieri, K. Kovacs, J.P. McClain, A.M. Quattrini, A.Y. Roa-Varón, and A.D. Thaler. 2012. Deepwater Program: Studies of Gulf of Mexico Lower Continental Slope Communities Related to Chemosynthetic and Hard Substrate Habitats. U.S. Department of the Interior, U.S. Geological Survey. U.S. Geological Survey Open-File Report 2012-1032.

Rowe, G.T. and M.C. Kennicutt. 2009. Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study. Final Report. New Orleans, LA.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. OCS Study MMS 2009-039.

Rudd, M.B., R.N.M. Ahrens, W.E. Pine III, and S.K. Bolden. 2014. Empirical spatially explicit natural mortality and movement rate estimates for the threatened Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). Canadian Journal of Fisheries and Aquatic Sciences 71: 1407-1417.

Russell, R.W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the northern Gulf of Mexico: Final Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2005-009.

Sadovy, Y. 1997. The case of the disappearing grouper; *Epinephelus striatus*, the Nassau grouper in the Caribbean and western Atlantic. Proceedings of the Gulf and Caribbean Fisheries Institute 45: 5-22.

Salmon, M. and J. Wyneken. 1990. Do swimming loggerhead sea turtles (*Caretta caretta* L.) use light cues for offshore orientation? Marine and Freshwater Behaviour and Physiology 17(4): 233-246.

Samuel, Y., S.J. Morreale, C.W. Clark, C.H. Greene, and M.E. Richmond. 2005. Underwater, low-frequency noise in a coastal sea turtle habitat. Journal of the Acoustical Society of America 117(3): 1465-1472.

Sarà G., Dean J.M., D'Amato D., Buscaino G., Oliveri A., Genovese S., Ferro S., Buffa G., Lo Martire M., Mazzola S. 2007. Effect of boat noise on the behaviour of bluefin tuna *Thunnus thynnus* in the Mediterranean Sea. Marine Ecology Progress Series 331: 243-53.

Schwemmer, P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications 21(5): 1851-1860.

Seitz, J.C. and G.R. Poulakis. 2006. Anthropogenic effects on the smalltooth sawfish (*Pristis pectinata*) in the United States. Marine Pollution Bulletin 52(11): 1533-1540.

Shiroza A., Malca E., Lamkin J.T., Gerard T., Landry M.R., Stukel M.R., Laiz-Carrión R., Swalethorp R. 2021. Active prey selection in developing larvae of Atlantic bluefin tuna (*Thunnus thynnus*) in spawning grounds of the Gulf of Mexico. Journal of Plankton Research 00: 1-19.

Simões, T.N., A. Candido de Silva, C. Carneiro de Melo Moura. 2017. Influence of artificial lights on the orientation of hatchlings of *Eretmochelys imbricata* in Pernambuco, Brazil. Zoologia 34: e13727.

Simons, T.R.; Lee, D.S.; Haney, J.C. 2013. Diablotin *Pterodroma hasitata*: a biography of the endangered Black-capped Petrel. Marine Ornithology 41: 3-43.

Smithsonian Tropical Research Institute. 2015. Speices: *Ariomma bondi*, Silver Rag Driftfish, Silver Rage, Silver-rag driftfish. https://biogeodb.stri.si.edu/caribbean/en/thefishes/species/4273.

Smultea, M.A., J.R. Mobley Jr., D. Fertl, and G.L. Fulling. 2008. An unusual reaction and other observations of sperm whales near fixed wing aircraft. Gulf and Caribbean Research 20: 75-80.

Soldevilla, M.S., A.J. Debich, L.P. Garrison, J.A. Hildebrand, and S.M. Wiggins. 2022. Rice's whales in the northwestern Gulf of Mexico: call variation and occurrence beyond the known core habitat. Endangered Species Research 48: 155-174.

Southall B.L., Finneran J.J., Reichmuth C., Nachtigall P.E., Ketten D.R., Bowles A.E., Ellison W.T., Nowacek D.P., Tyack P.L. 2019. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals 45(2): 125-232.

Southall BL, D.P. Nowacek, A.E. Bowles, V. Senigaglia, L. Bejder, and L. Tyack Peter. 2021. Marine mammal noise exposure criteria: assessing the severity of marine mammal behavioral responses to human noise. Aquatic Mammals 47(5): 421-464.

Southall, B.L., D.P. Nowacek, P.J. Miller, and P.L. Tyack. 2016. Experimental field studies to measure behavioral responses of cetaceans to sonar. Endangered Species Research 31: 293-315.

Stewart, J.D., M. Nuttall, E.L. Hickerson, and M.A. Johnson. 2018. Important juvenile manta ray habitat at Flower Garden Banks National Marine Sanctuary in the northwestern Gulf of Mexico. Marine Biology 165: 111.

Stiles, M.L., E. Harrould-Kolieb, R. Faure, H. Tlitalo-Ward, and M.F. Hirschfield. 2007. Deep sea trawl fisheries of the southeast U.S. and Gulf of Mexico: rock shrimp, royal red shrimp, calico scallops. New York, NY: Oceana. 13 pp.

Stoner, A.W., and R.S. Appeldoorn 2022. Synthesis of Research on the Reproductive biology of Queen conch (*Aliger gigas*): toward the goals of sustainable fisheries and species conservation. Reviews in Fisheries Science & Aquaculture 30(3): 346-390.

Sulak, K.J. and J.P. Clugston. 1998. Early life history stages of Gulf sturgeon in the Suwanee River, Florida. Transactions of the American Fisheries Society 127: 758-771.

The Wildlife Society, 2023. Are Rufa Red Knots On The Rise? https://wildlife.org/are-rufa-red-knots-on-the-rise/.

Tierney, K.B., Baldwin, D.H., Hara, T.J., Ross, P.S., Scholz, N.L., and C.J. Kennedy. 2010. Olfactory toxicity in fishes. Aquatic Toxicology 96:2-26.

Todd, V.L.G., W.D. Pearse, N.C. Tegenza, P.A. Lepper, and I.B. Todd. 2009. Diel echolocation activity of harbour porpoises (*Phocoena phocoena*) around North Sea offshore gas installations. ICES Journal of Marine Science 66: 734-745.

Turtle Island Restoration Network. 2024. Kemp's Ridley Sea Turtle Count on the Texas Coast. https://seaturtles.org/turtle-count-texas-coast/.

Tuxbury, S.M. and M. Salmon. 2005. Competitive interactions between artificial lighting and natural cues during seafinding by hatchling marine turtles. Biological Conservation 121: 311-316.

U.S. Department of Homeland Security. 2014. U.S. Coast Guard Incident Management Handbook. COMDTPUB P3120.17B. Washington, DC: U.S. Government Printing Office.

U.S. Environmental Protection Agency (USEPA). 2016. Questions and answers about the BP oil spill in the Gulf Coast. https://archive.epa.gov/emergency/bpspill/web/html/qanda.html.

U.S. Environmental Protection Agency (USEPA). 2025. The Green Book Nonattainment Areas for Criteria Pollutants. https://www.epa.gov/green-book.

U.S. Fish and Wildlife Service (USFWS), Gulf States Marine Fisheries Commission and National Marine Fisheries Service (NMFS). 1995. Gulf Sturgeon Recovery/Management Plan. U.S. Department of Interior, U.S. Fish and Wildlife Service, Southeast Region. Atlanta, GA. https://www.gsmfc.org/publications/WB-Sport%20Fish/Gulf%20Sturgeon%20Plan.PDF.

U.S. Fish and Wildlife Service (USFWS). 2001a. Florida Manatee Recovery Plan (*Trichechus manatus latirostris*), Third Revision. Atlanta, GA: U.S. Department of the Interior, Southeast Region. https://sjrda.stuchalk.domains.unf.edu/files/content/sjrda_535.pdf.

U.S. Fish and Wildlife Service (USFWS). 2001b. Endangered and threatened wildlife and plants; Endangered status for the Florida salt marsh vole. Federal Register 56(9):1457-1459.

U.S. Fish and Wildlife Service (USFWS). 2003. Recovery plan for the Great Lakes Piping Plover (*Charadrius melodus*). Fort Snelling, MN: U.S. Department of the Interior.

U.S. Fish and Wildlife Service (USFWS). 2007. International Recovery Plan: Whooping Crane (*Grus americana*), Third Revision. Albequerque, NM: U.S. Department of the Interior.

U.S. Fish and Wildlife Service (USFWS). 2011. FWS *Deepwater Horizon* Oil Spill Response. Bird Impact Data and Consolidated Wildlife Reports. *Deepwater Horizon* Bird Impact Data from the DOI-ERDC NRDA Database 12 May 2011. https://dokument.pub/deepwater-horizon-bird-impact-data-from-the-doi-erdc-nrda-flipbook-pdf.html.

U.S. Fish and Wildlife Service (USFWS). 2014. West Indian Manatee (*Trichechus manatus*). Florida Stock (Florida subspecies, *Trichechus manatus latirostris*). Stock Definition and Geographic Range. https://www.fws.gov/sites/default/files/documents/west-indian-manatee-florida-stock-assessment-report.pdf.

U.S. Fish and Wildlife Service (USFWS). 2016a. Hawksbill Sea Turtle (*Eretmochelys imbricata*). https://ecos.fws.gov/ecp/species/3656.

U.S. Fish and Wildlife Service (USFWS). 2016b. Find Endangered Species. http://www.fws.gov/endangered/.

U.S. Fish and Wildlife Service (USFWS). 2020. FWS-Listed U.S. Species by Taxonomic Group. Accessed at: https://ecos.fws.gov/ecp/report/species-listings-by-tax-group-totals.

U.S. Fish and Wildlife Service (USFWS). 2023a. Whooping Crane Survey Results: Winter 2022-2023. https://www.fws.gov/sites/default/files/documents/WHCR%20Update%20Winter%202022-2023.pdf.

U.S. Fish and Wildlife Service (USFWS). 2023b. Species Status Assessment Report for the Black-capped Petrel (*Pterodroma hasitata*). Version 1.3, May 2023. https://ecos.fws.gov/ServCat/DownloadFile/242904.

U.S. Fish and Wildlife Service USFWS). nd-a. *Charadrius melodus*: Piping Plover. https://www.fws.gov/species/piping-plover-charadrius-melodus.

U.S. Fish and Wildlife Service (USFWS). nd-b. Rufa Red Knot. https://www.fws.gov/species/rufa-red-knot-calidris-canutus-rufa.

Valentine, D.L., G.B. Fisher, S.C. Bagby, R.K. Nelson, C.M. Reddy, S.P. Sylva, and M.A. Woo. 2014. Fallout plume of submerged oil from *Deepwater Horizon*. Proceedings of the National Academy of Sciences USA 111(45): 906-915.

Van de Laar, F.J.T. 2007. Green Lights to Birds: Investigations into the Effect of Bird Friendly Lighting. NAM bv/Assen (NDL), NAM LOCATIE L15-FA-1. 23 pp. https://tethys.pnnl.gov/sites/default/files/publications/van-de-Laar-2007.pdf.

Vanderlaan, A. S., and C. T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. Marine Mammal Science 23(1): 144-156.

Wakeford, A. 2001. State of Florida Conservation Plan for Gulf Sturgeon (*Acipencer oxyrinchus desotoi*). Florida Marine Research Institute Technical Report TR-8.

Wang, V.H., C.R. Zapfe, and F.J. Hernandez. 2021. Assemblage structure of larval fishes in epipelagic and mesopelagic waters of the northern Gulf of Mexico. Frontiers in Marine Science 8: 766369.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E.e. Rosel. 2016. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2015. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS NE 238.

Wartzok, D. and D.R. Ketten. 1999. Marine mammal sensory systems, pp 117-175. In: J.E. Reynolds III and S. Rommelz (Eds.), Biology of Marine Mammals. Washington, DC: Smithsonian Institution Press.

Wei, C.-L. 2006. The Bathymetric Zonation and Community Structure of Deep-Sea Macrobenthos in The Northern Gulf of Mexico. M.S. Thesis, Texas A&M University. https://oaktrust.library.tamu.edu/handle/1969.1/4927.

Wei, C.-L., G.T. Rowe, G.F. Hubbard, A.H. Scheltema, G.D.F. Wilson, I. Petrescu, J.M. Foster, M.K. Wickstein, M. Chen, R. Davenport, Y. Soliman, and Y. Wang. 2010. Bathymetric zonation of deep-sea macrofauna in relation to export of surface phytoplankton production. Marine Ecology Progress Series 39: 1-14.

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the north-west Atlantic. Marine Pollution Bulletin 42(12): 1285-1290.

Wilson, C.A., A. Pierce, and M.W. Miller. 2003. Rigs and Reefs: A Comparison of the Fish Communities at Two Artificial Reefs, a Production Platform, and a Natural Reef in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-009.

Wilson, C.A., M.W. Miller, Y.C. Allen, K.M. Boswell, and D.L. Nieland. 2006. Effects of Depth, Location, and Habitat Type on Relative Abundance and Species Composition of Fishes Associated with Petroleum Platforms and Sonnier Bank in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2006-037.

Wilson, J. 2003. Manatees in Louisiana. Louisiana Conservationist July/August 2003: 7 pp.

Würsig, B., S.K. Lynn, T.A. Jefferson, and K.D. Mullin. 1998. Behaviour of cetaceans in the northern Gulf of Mexico relative to survey ships and aircraft. Aquatic Mammals 24(1): 41-50.

Würsig, B., T.A. Jefferson, and D.J. Schmidly. 2000. The Marine Mammals of the Gulf of Mexico. College Station, TX, Texas A&M University Press. 232 pp.

Young, C.N. and J.K. Carlson. 2020. The biology and conservation status of the oceanic whitetip shark (*Carcharhinus longimanus*) and future directions for recovery. Reviews in Fish Biology and Fisheries 30: 293-312.

SECTION Q
ADMINISTRATIVE INFORMATION

(a) Proprietary Information

Proprietary copies of this plan contain information not available to the public and include structure maps, seismic information, cross sections, depths of wells, etc.

(b) Bibliography

1. Shallow Hazards Report prepared by C&C Technologies Survey Services
   Mississippi Canyon Blocks 84, 85 and 128 (July 2013, Project No. 130295)
2. Archaeological Assessment prepared by C&C Technologies Survey Services
   Mississippi Canyon Blocks 85 and 129 (October 2014, Project No. 141022)
3. Final Sale Packages for Gulf of Mexico, Sale Numbers 110 & 247