

UNITED STATES GOVERNMENT
MEMORANDUM

April 23, 2026

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

Subject: Public Information copy of plan

Control #	-	Control S-8216
Type	-	Supplemental Development Operations Coordination Document
Lease(s)	-	OCS-G 19027 Block - 598 East Breaks Area OCS-G 19028 Block - 599 East Breaks Area
Operator	-	Anadarko Petroleum Corporation
Description	-	Subsea Wells Z, ZZ, Y, YY, X and XX
Rig Type	-	DP Semisubmersible or Drillship

Attached is a copy of the subject plan.

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

Nicole Reaux
Plan Coordinator

SUPPLEMENTAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

**EAST BREAKS BLOCK 599
OCS-G 19028**

OFFSHORE, LOUISIANA

PUBLIC

Anadarko Petroleum Corporation
1201 Lake Robbins Drive
The Woodlands, Texas 77380
Contact: Jill Wiederhold
Jill_Wiederhold@oxy.com
(832) 636-1554

1 – Confidential PDF
1 – Public Copy PDF

January 2026

**ANADARKO PETROLEUM CORPORATION
SUPPLEMENTAL DEVELOPMENT OPERATIONS
COORDINATION DOCUMENT
EAST BREAKS 599
OCS-G 19028**

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SECTION A
PLAN CONTENTS

(a) Plan Information Form

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

- Drill, complete, and conduct an extended flowback on six well locations: East Breaks (EB) 599 Z, ZZ, Y, YY, X and XX
- Place one well on production: EB 599 #005 will be drilled and renamed to EB 599 SS005
- Conduct subsea infrastructure installation activities

Anadarko anticipates utilizing Location “Y” to drill EB 599 #005, but any of the proposed well locations could be utilized. The well will be renamed to EB 599 SS005 upon initial completion and coming on production.

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 (including potential future workover ops), 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	Hydrocarbons/Fuel Oil Storage Tank	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 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
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	

(e) 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.

Production from the EB 599 005 (SS005) will be transported to Anadarko's Boomvang Spar located in EB 643.

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 Boomvang Spar 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.

(f) Description of Previously Approved Lease Activities

The following well locations were approved on 9/12/2000 under Initial EP Plan Control No. N-6881:

Well Location	Status of Well Location	Potential Future Operations
EB 599 A	Location used to drill EB 599 SS001	Well on production
EB 599 B	Open location for future drilling operations.	Future drill location
EB 599 C	Location used to drill EB 599 SS004	Well on production

The following location was approved on 2/18/2005 under Supplemental EP Plan Control No. S-6595:

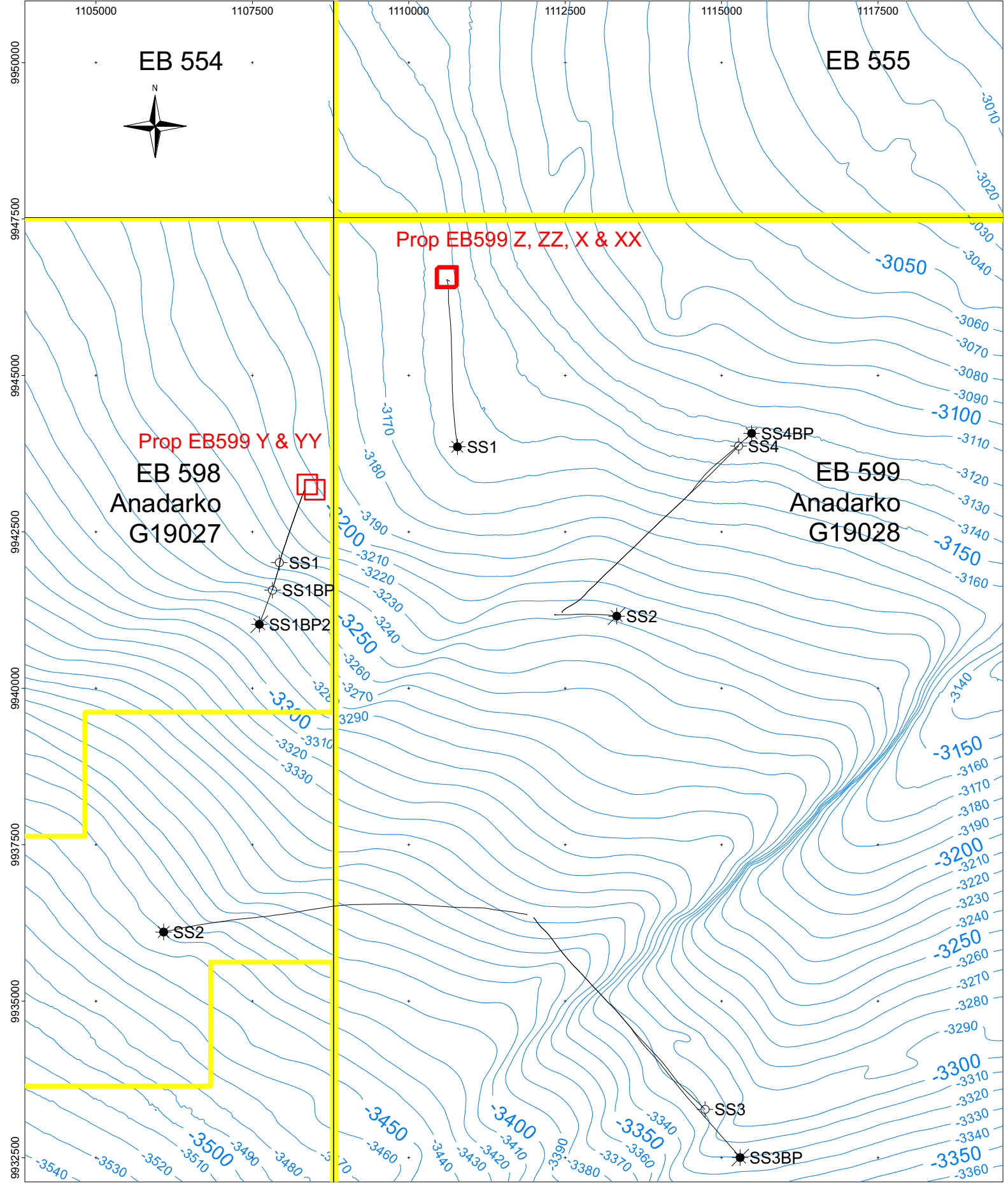
Well Location	Status of Well Location	Potential Future Operations
EB 599 D	Location used to drill EB 599 SS002	Well now P&A'd

The following well locations were approved on 1/19/2007 under Supplemental EP Plan Control No. S-7014:

Well Location	Status of Well Location	Potential Future Operations
EB 599 E	Location used to drill EB 599 SS003	Well now P&A'd
EB 599 F	Open location for future drilling operations.	Future drill location

OCS PLAN INFORMATION FORM

General Information									
Type of OCS Plan:	Exploration Plan (EP)		Development Operations Coordination Document (DOCD)					X	
Company Name: Anadarko Petroleum Corporation			BOEM Operator Number: 00981						
Address:			Contact Person: Jill Wiederhold						
1201 Lake Robbins Drive			Phone Number: 832-636-1554						
The Woodlands, TX 77380			E-Mail Address: Jill_Wiederhold@oxy.com						
If a service fee is required under 30 CFR 550.125(a), provide the				Amount paid	\$16,695.00	Receipt No.	77127751595		
Project and Worst Case Discharge (WCD) Information									
Lease(s): OCS G-19028		Area: EB	Block: 599	Project Name (If Applicable): Boomvang Updip					
Objective(s)	<input checked="" type="checkbox"/> Oil	<input checked="" type="checkbox"/> Gas	<input type="checkbox"/> Sulphur	<input type="checkbox"/> Salt	Onshore Support Base(s): Fourchon, LA				
Platform/Well Name: EB 599 #5 (Y)		Total Volume of WCD: 6,893,674 bbls				API Gravity: 26.5			
Distance to Closest Land (Miles): 109 miles			Volume from uncontrolled blowout: 97,094 BOPD						
Have you previously provided information to verify the calculations and assumptions for your WCD?							Yes	<input checked="" type="checkbox"/>	No
If so, provide the Control Number of the EP or DOCD with which this information was provided							X		
Do you propose to use new or unusual technology to conduct your activities?							Yes	<input checked="" type="checkbox"/>	No
Do you propose to use a vessel with anchors to install or modify a structure?							Yes	<input checked="" type="checkbox"/>	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?							Yes	<input checked="" type="checkbox"/>	No
Description of Proposed Activities and Tentative Schedule (Mark all that apply)									
Proposed Activity		Start Date	End Date	No. of Days					
Drill & complete Loc. Y; Place EB 599 005 on production		6/1/2026	8/15/2026	75 days					
Drill & complete Loc. YY		2/1/2027	4/17/2027	75 days					
Drill & complete Loc. X		2/1/2028	4/17/2028	75 days					
Drill & complete Loc. XX		2/1/2029	4/17/2029	75 days					
Drill & complete Loc. Z		2/1/2030	4/17/2030	75 days					
Drill & complete Loc. ZZ		2/1/2031	4/17/2031	75 days					
Description of Drilling Rig					Description of Structure				
<input type="checkbox"/>	Jackup	<input checked="" type="checkbox"/>	Drillship		<input type="checkbox"/>	Caisson	Tension leg platform		
<input type="checkbox"/>	Gorilla Jackup	<input type="checkbox"/>	Platform rig		<input type="checkbox"/>	Fixed platform	Compliant tower		
<input type="checkbox"/>	Semisubmersible	<input type="checkbox"/>	Submersible		<input type="checkbox"/>	Spar	Guyed tower		
<input checked="" type="checkbox"/>	DP Semisubmersible	<input checked="" type="checkbox"/>	Other (Attach Description)		<input type="checkbox"/>	Floating production system	Other (Attach Description)		
Drilling Rig Name (If Known): DP Construction Vessel									
Description of Lease Term Pipelines									
From (Facility/Area/Block)		To (Facility/Area/Block)		Diameter (Inches)		Length (Feet)			
EB 599 SS005 (EB 598)		PLEM B1 (EB 599)		6.625		100'			



1:24000
 0 2000 4000 FEET
 NAD27 / BLM 15N (AUS) (EPSG 32065)
 Transverse Mercator
 Clark 1866 spheroid
 Natural Origin: [93 99 00W, 0 00 00N]


Location coordinates on separate page

Anadarko
 Petroleum Corporation

EB 599
 OCS-G-19028
 Public Bathymetry
 Proposed Wells EB599 Z, ZZ, Y, YY, X & XX

Scale: 1"=2000'	Date: 09/23/2024	C.I. = 10'
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Well Name	Location	Footages		X (ft)	Y (ft)	Latitude	Longitude	Water Depth
EB 599 Z	SFL EB 599	949.56 FNL	1807.28 FWL	1110607.28	9946570.44	27.400814	-94.633308	3153'
EB 599 ZZ	SFL EB 599	929.56 FNL	1827.28 FWL	1110627.28	9946590.44	27.400869	-94.633325	3153'
EB 599 Y	SFL EB 598	4346.00 FNL	303.88 FEL	1108496.00	9943174.00	27.391395	-94.639677	3204'
EB 599 YY	SFL EB 598	4261 FNL	422.88 FEL	1108377.00	9943259.00	27.391624	-94.640047	3204'
EB 599 X	SFL EB 599	959.56 FNL	1817.41 FWL	1110617.28	9946560.44	27.400787	-94.633277	3153'
EB 599 XX	SFL EB 599	969.56 FNL	1787.41 FWL	1110587.28	9946550.44	27.400758	-94.633369	3153'

	
EB 599 OCS-G-19028 Public Location Coordinates Proposed Wells EB599 Z, ZZ, Y, YY, X & XX	
Date: 9/23/2024	



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Payment Type: Debit or credit card

Payment Amount: \$16,695.00

Transaction Date: 08/14/2025 03:19:27 PM EDT

Payment Date: 08/14/2025

Region: Gulf of America

Contact: Jill Wiederhold (832) 636-1554

Company Name/No: Anadarko Petroleum Corporation, 00981

Lease Number(s): 19208

Area-Block: East Breaks EB, 599



Account Information

Cardholder Name: Elizabeth Price

Card Type: Master Card

Card Number: *****6277

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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): EB 599 X				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19028			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	599			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 959.56'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L N/S Departure: F ___ L N/S Departure: F ___ L			
	E/W Departure: F ___ L 1817.41'FWL			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: 1110617.28			X:			X: X: X:			
	Y: 9946560.44			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27.400787			Latitude			Latitude Latitude Latitude			
	Longitude -94.633277			Longitude			Longitude Longitude Longitude			
Water Depth (Feet): 3153'				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet: N/A								MD (Feet):		TVD (Feet):
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 =					

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): EB 599 XX				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19028			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	599			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 969.56'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L N/S Departure: F ___ L N/S Departure: F ___ L			
	E/W Departure: F ___ L 1787.41'FWL			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: 1110587.28			X:			X: X: X:			
	Y: 9946550.44			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27.400758			Latitude			Latitude Latitude Latitude			
	Longitude -94.633369			Longitude			Longitude Longitude Longitude			
Water Depth (Feet): 3153'				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet: N/A								MD (Feet):		TVD (Feet):
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 =						

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): EB 599 Y				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19027			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	598			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 4346'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L N/S Departure: F ___ L N/S Departure: F ___ L			
	E/W Departure: F ___ L 303.88'FEL			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: 1108496.00			X:			X: X: X:			
	Y: 9943174.00			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27.391395			Latitude			Latitude Latitude Latitude			
	Longitude -94.639677			Longitude			Longitude Longitude Longitude			
Water Depth (Feet): 3204'				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet: N/A								MD (Feet):		TVD (Feet):
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 =					

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): EB 599 YY					Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19027			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	598			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 4261'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L N/S Departure: F ___ L N/S Departure: F ___ L			
	E/W Departure: F ___ L 422.88'FEL			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: 1108377.00			X:			X: X: X:			
	Y: 9943259.00			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27.391624			Latitude			Latitude Latitude Latitude			
	Longitude -94.640047			Longitude			Longitude Longitude Longitude			
Water Depth (Feet): 3204'				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 =						

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): EB 599 Z				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19028			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	599			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 949.56'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L N/S Departure: F ___ L N/S Departure: F ___ L			
	E/W Departure: F ___ L 1807.28'FWL			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: 1110607.28			X:			X: X: X:			
	Y: 9946570.44			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27.400814			Latitude			Latitude Latitude Latitude			
	Longitude -94.633308			Longitude			Longitude Longitude Longitude			
Water Depth (Feet): 3153'				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet: N/A								MD (Feet):		TVD (Feet):
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 =						

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): EB 599 ZZ				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):			For structures, volume of all storage and pipelines (Bbls):			API Gravity of fluid			
	Surface Location			Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS G 19028			OCS G 19028			OCS OCS			
Area Name	East Breaks			East Breaks						
Block No.	599			599						
Blockline Departures (in feet)	N/S Departure: F ___ L 929.56'FNL			N/S Departure: F ___ L			N/S Departure: F ___ L			
	E/W Departure: F ___ L 1827.28'FWL			E/W Departure: F ___ L			E/W Departure: F ___ L			
Lambert X-Y coordinates	X: 1110627.28			X:			X:			
	Y: 9946590.44			Y:			Y:			
Latitude/ Longitude	Latitude 27.400869			Latitude			Latitude			
	Longitude -94.633325			Longitude			Longitude			
Water Depth (Feet): 3153'				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet: N/A								MD (Feet):		TVD (Feet):
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 =						

**SECTION B
GENERAL INFORMATION**

(a) Applications and Permits

Prior to beginning development operations in East Breaks 599, 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
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	20,000 bbls per well*
Synthetic-based (internal olefin, ester)	10,000 bbls per well
Oil-based	N/A

**The actual volume of water-based ordered out will be an estimated 15,000 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 17,000 bbls/well (17,000 bbls/well x 6 well locations=102,000 bbls total)*

(c) Production

The following table provides information about each type of anticipated production from the EB 599 #005 (SS005):

Discussions regarding geologic information are considered proprietary and have been omitted from this section of the public copy DOCD.

(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. The 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 - Drilling Worst Case Discharge Scenario

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

Purpose

This overview 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. The East Breaks 599 005 is addressed in this blowout scenario since it is the location determined

to have the highest potential drilling worst-case discharge (WCD) rate for the East Breaks 599 block. A similar approach would be taken in the event of a blowout for existing EB 599 wells and the wells covered under this plan. Based on NTL No. 2015-N01 guidance, the maximum hydrocarbon discharge for East Breaks 599 is calculated to be **97,094 bopd**.

Information Requirements

The Pliocene 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 blowout at the seabed occurs. Discharge simulations were run for the single well section expected to encounter producible, hydrocarbon-bearing sands.

Estimated Flow Rate of the Potential Blowout

Category	DOCD
Type of Activity	Drilling
Facility Location (area/block/location)	EB 599 005 (<i>Loc. Y</i>)
Facility Designation	MODU
Distance to Nearest Shoreline (miles)	109 Miles
Uncontrolled Blowout (volume per day)	97,094 bopd
Type of Fluid(s)	Crude Oil

a) Potential for the well to bridge over:

Formation collapse and bridging is expected in a blowout scenario, sanding would occur. Mechanical collapse of the reservoirs in the open-hole section of the wellbore was not considered in determining WCD. 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 subsea intervention to stop the blowout:

The likelihood of surface intervention to stop a blowout is high. In addition to the surface intervention equipment the contracted MODU will have the equipment/ability to perform the following:

ROV Secondary BOP Control System: The BOP is confirmed to have a ROV Intervention Panel and circuits that have the following attributes:

- ROV Intervention is capable of Opening and Closing each Shear Ram, Ram Locks, One Pipe Ram and Disconnect the LMRP, all under MASP conditions.

- ROV Intervention is to be tested during the initial stump test and during the initial BOP latch up.
- BOP panels also can 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:

- Inadvertent disconnect of the LMRP
- 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 the preliminary Mutual Aid agreements that are being worked between E&P Operators in the Gulf of America, Anadarko will select from the best rig option available in the Gulf of America fleet if and when 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. The rig is currently under contract to Anadarko.

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

d) Rig constraints:

The minimum capability for a drilling rig, is to be able to drilling in 6,000' of water, to a depth of greater than 30,000' TVD (up to 40,000' TVD), and a 15k BOP Stack to drill a relief well. The *Noble Blackhawk* drillship meets these requirements.

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

An estimate of 7-21 days is required to suspend operations on a deepwater GOA 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 zone is 40-50 days, for a total estimated time of 47-71 days from time of blowout to finishing the relief well.

f) Assumptions and calculations used in the Plan:

- The maximum total volume during a blowout could potentially be **6,893,674 bbls** assuming 71-days for the maximum duration of a blowout, multiplied by the worst case daily uncontrolled blowout volume of **97,094 bopd**.
- Multiplying the WCD rate by the max number of days to drill a relief well, 71-days (max days), assumed a constant flowing bottom hole pressure across that entire time period for the blowout scenario as denoted above, which is not realistic. Bottom hole pressure will drop over time as the well produces and the reservoir depletes.

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 vast depth of experience Anadarko possesses in the deep water drilling 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 Registered Professional Engineer review and approval of the final casing design and cementing program.

A detailed pre-drill assessment of formation pressure provided by Anadarko's Geological and Geophysical team, along with third-party consultants, allows for a mud program that provides an overbalanced mud weight for the safe drilling of the well. For an exploration well, this may also include taking formation pressures to confirm the actual formation pressure during the well construction process to minimize the risk of an unplanned well control event. The pore pressure environment is understood due to the nearby offset wells.

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 tested barriers including one mechanical barrier, across each flow path during well operations.

For the final casing string (or liner if it is the final string), there shall be two mechanical barriers in addition to cement inside the wellbore.

It is also standard practice to conduct pressure testing, in accordance with the law, to confirm integrity on all relevant barriers.

In addition, all intermediate and production casings returned to the wellhead will be locked down before subsequent wellbore construction is proceeded.

- **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 third-party. Prior to commencement of operations, independent third-party verification will be obtained that the sub-sea BOP is designed for the specific equipment on the rig and this specific well design. 250.731(c) and (d).
- **BOP and Well Control Equipment Testing:** To ensure effectiveness of the BOP and well control equipment, a testing program will be conducted prior to running the BOP and then during the well operations. 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, renewable every two years for the type of floating drilling operation being conducted. Anadarko also monitors compliance for its personnel with the federal regulations and Subpart O for 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, Inc. for advice, management, engineering, well kick pre- and post-modeling, and resource support for an unplanned loss-of-well-control event. If any well control event occurs, Wild Well Control, Inc. 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 EB 599 005 well, in that casing weights, grades, and setting points would be very similar. Site clearance letters for surface locations will be completed and deemed acceptable for drilling prior to any drilling operations. 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 for best suitability for the location of the relief well if needed. The conceptual well design is not anticipated to take over two days to finalize upon initialization.
- Anadarko's philosophy 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", and 14") and connectors required. Smaller OD casing (9-7/8") are considered widely available on the ground in the GOA and would be resourced out of existing inventory or from suppliers as required.
- Existing service agreements will be in place for support services, including drilling fluids, casing running, cementing, ROVs, 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/Halliburton and Baker Hughes have in-house personnel to supplement Vector Magnetics LLC under our existing directional drilling agreements.

k) Blowout Scenario - Production Worst Case Discharge

The production worst-case discharge scenario for this project is defined as an uncontrollable discharge to the seafloor during production operations. The scenario assumes that the wellhead fails mechanically, and a blowout occurs at the seafloor, allowing the entire wellbore fluid to flow up the existing production string.

The maximum oil discharge during production is calculated to be 10,000 BOPD from the East Breaks Block Well #005 (EB 599 005). The EB 599 005 is addressed in this blowout scenario since it is the location with the highest potential production worst-case discharge (WCD) within the block.

Should a blowout occur, the formation types present in the GOA tend to bridge over in most cases. Additional well intervention and time requirements to drill a relief well pursuant to guidance provided in NTL No. 2015-N01 are discussed under the “Blowout Scenario - Drilling Worst Case Discharge Scenario” section above. Anadarko would utilize the same response methodology for both a drilling and production blowout scenario.

The maximum total volume during a blowout from the completed well could potentially be 71,000 bbls assuming 71 days for the maximum duration of a blowout, multiplied by the worst case daily uncontrolled blowout volume of 10,000 bopd.

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 section of the public copy DOCD.

(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 Fugro USA Marine, Inc. covering areas of EB 555, 598, & 599 was submitted under EP Plan Control No. N-10241 (EB 555 IEP).

(f) Shallow Hazards Assessment

A Shallow Hazards Site Clearance (SC) Letter for proposed well locations is enclosed as **Attachment C-4**. Locations "Y, YY" will utilize the EB 599 "Y" SC Letter (surface in EB 598), and "Z, ZZ, X, XX" will utilize EB 599 "Z" SC Letter.

(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.



Proposed Wellsite EB 599 #Y

Wellsite Clearance Letter |

Block 599, East Breaks Area, Gulf of Mexico

02.00228113-003 03 | April 7, 2025

Final

Anadarko Petroleum Corporation



Document Control

Document Information

Project Title	Wellsite Clearance Letter
Document Title	Proposed Wellsite EB 599 #Y
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Issuing Office Address	13501 Katy Freeway, Suite 1050, Houston, TX 77079 USA

Client Information

Client	Anadarko Petroleum Corporation
Client Address	1201 Lake Robbins Dr., The Woodlands, TX 77380
Client Contact	Natasha Jeansonne

Document History

Issue	Date	Status	Comments on Content	Prepared By	Checked By	Approved By
01	March 31, 2023	For Review	Awaiting client comments	JA/GB/RB	SW	SV
02	April 4, 2023	Final				
03	April 7, 2025	Final	Well name changed	JA/GB/RB	SW	SV

Project Team

Initials	Name	Role
JA	Juliet Aralu	Interpretation Geoscientist
GB	Gokce Bean	Staff Engineering Geoscientist
RB	Rebecca Boon	Consultant Geoscientist
RG	Rick Garza	GIS Analyst
SV	Stephen Varnell	Project Oversight and Administration
SW	Scott Wegner	Project Technical Oversight

**FUGRO**

Fugro USA Marine, Inc.
13501 Katy Freeway, Suite 1050
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USA

Anadarko Petroleum Corporation

1201 Lake Robbins Drive
The Woodlands, TX 77380
United States of America

April 7, 2025

Dear Ms. Jeansonne

Anadarko Petroleum Corporation (Anadarko) contracted Fugro USA Marine, Inc., (Fugro) to prepare a wellsite clearance letter addressing shallow drilling geohazards for proposed wellsite EB 599 #Y, East Breaks area, Gulf of Mexico. The proposed well is planned to deviate within the tophole section. This letter is intended to address specific seafloor conditions within a 2,000-ft radius and shallow geologic conditions within a 3,000-ft radius of the proposed wellsite. The depth limit of investigation (DLI) is defined as approximately 7,000 ft below sea surface (BSS). This letter also is intended to be submitted to the United States Bureau of Ocean Energy Management (BOEM) and will meet or exceed the BOEM requirements as stipulated in the Notices to Lessees (NTLs) 2022-G01 (Shallow Hazards Program), 2008-G04 (Exploration Plans), and 2009-G40 (Deepwater Benthic Communities). NTL 2015-N02 was released February 06, 2015, and eliminates the expiration dates of certain previous NTLs, continuing their validity. Full references for these regulations are included after the main text.

Graphics

A 3D seismic power spectrum (Figure 1) is included as an assessment of the resolution of the seismic data in the vicinity of the proposed wellbore. Four 1:12,000-scale maps, including seafloor rendering (Figure 2), water depth and seafloor features (Figure 3), seafloor amplitude (Figure 4), and subsurface geologic features (Figure 5) are provided. A 2,000-ft radius circle around the proposed wellsite is shown on the seafloor maps, as required by Notice to Lessees (NTL) 2009-G40 (BOEM, 2009) and extended by NTL 2015-N02 (BOEM, 2015). Annotated data examples of the nearest 3D seismic survey inline (Figure 6) and crossline (Figure 7) to the well surface location also are included. The tophole prognosis chart (Figure 8) provides a summary of the expected shallow geologic conditions at proposed wellbore EB 599 #Y.

Seismic Survey Parameters

The geophysical dataset used in this assessment is a 3D seismic data depth volume (Full-Stack_5-40_deg_SOF_Spec_Bal_Trim_in_Depth) provided by Anadarko to Fugro in SEG-Y format for loading onto a seismic interpretation workstation. Inlines are oriented northwest–southeast, crosslines are oriented

northeast–southwest, and both have a line spacing of 41.01 ft. The seafloor in the 3D volume is represented by a peak reflector with a positive reflection coefficient, which indicates the data follow the North American seismic polarity convention. The seismic wavelet is estimated to be approximately zero-phase based on an analysis of the seafloor reflector and of low-impedance, high-amplitude anomalies indicative of possible shallow gas accumulations.

For the 3D seismic depth volume, the wave number was extracted and plotted versus power because of its direct relationship to units of distance, making it suitable for use in understanding vertical resolution limitations when working with depth-converted data. This plot can be used to determine the limit of separability (LS), which is an indicator of the vertical resolution of the data. This parameter provides a close approximation of the minimum sediment bed thickness for which the top and bottom of the bed can be fully resolved in the seismic data and is based on the 1/4 acoustic wavelength approximation. Wavelength is equivalent to the inverse of the wavenumber, and using a dominant wavenumber of approximately 9.4×10^{-3} (Figure 1), the LS is computed as 27 ft within the shallow section. Individual strata or other geologic features thinner than this limit of separability may be detected but may not be resolved in true thickness or lateral extent. Small-scale topographic features and anthropogenic obstructions such as pipelines, shipwrecks, and seafloor debris generally cannot be resolved in 3D seismic data.

Previous Work

In conjunction with this wellsite clearance letter, Fugro has prepared for Anadarko a comprehensive shallow hazard assessment including Blocks EB 555, 598, and 599 (Fugro, 2023). In 2013, Fugro provided Anadarko with wellsite clearance letters for proposed wellsites EB 599 G, H, and I in Block 599 (Fugro, 2013a; 2013b; 2013c). Fugro also performed a shallow hazards assessment over Block 598 and vicinity for Kerr-McGee in 2002 (Fugro, 2002). Lithological, regional geologic, and stratigraphic information from the 2023, 2002, and 2013 work products was reviewed and used to prepare this wellsite clearance letter.

Proposed Well Location

Table 1 details the surface location for proposed wellsite EB 599 #Y in the northeastern quadrant of EB Block 598:

Table 1: Proposed wellsite location project information

Proposed Wellsite EB 599 #Y Blocks 598, East Breaks Area CRS: NAD27, UTM Zone 15, feet (EPSG: 32065)	
Surface X = 1,108,357.00 ft	Y = 9,943,239.00 ft
Latitude: 27° 23' 29.6459"N	Longitude: 94° 38' 24.3884"N
Nearest 3D Inline: 12297	Nearest 3D Crossline: 5638
443 ft FEL	4281 ft FNL

Offset Well Data

Anadarko provided ten offset wells for this assessment. Of the ten wellbores, six were original holes and four were side tracks. Information from the deeper side tracks was considered below the depth limit of investigation of the shallow hazards study. The nearest well to the proposed well site is EB 598 #1, drilled by Kerr McGee in 2003 and currently operated by Anadarko. It is approximately 73 ft south-southwest of the proposed well. The relevant details of the other offset wells are discussed in the shallow hazard assessment report covering the area (Fugro, 2023). The shallow section and upper well section drilling histories of the offset wells have been incorporated into this assessment.

Water Depth and Seafloor Gradient

The water depth at the proposed wellsite is predicted to be about 3,204 ft, with zero datum at sea surface (Figures 2 and 3). The local seafloor gradient at the surface hole location is approximately 1.4° to the southwest and range from less than 1° to approximately 5° within the 2,000 ft of the proposed wellsite. Slopes of 3° to 5° are associated with the seafloor expression of a fault to the south of the proposed wellsite. The regional slope direction is to the west and southwest.

Seafloor and Near-Surface Features

The seafloor appears smooth at the proposed wellsite and is interpreted to be stable under natural conditions. No pockmarks or areas of anomalous seafloor amplitude were identified in the 3D seismic data within 2,000 ft of the proposed well (Figures 3 and 4). A seafloor fault is present as close as 1,100 ft to the south, and dips away from the proposed wellsite, to the southeast.

No fluid expulsion features within 2,000 ft of the proposed well were identified in the 3D seismic data (Figure 3).

Potential High-Density Benthic Communities

There is no geophysical evidence of hydrocarbon fluid seepage sites or areas that could potentially support high-density benthic communities within 2,000 ft of the proposed wellsite (Figures 3 and 4). Therefore, there is a negligible potential for high-density communities of benthic and/or chemosynthetic organisms within 2,000 ft of the proposed wellsite, in accordance with NTL 2009-G40 (BOEM, 2009) and extended by NTL 2015-N02 (BOEM, 2015).

Anthropogenic Obstructions

According to Fugro's internal GIS database of infrastructure and obstructions, as queried during January 2023, six existing pipelines and four umbilical segments are reported to pass within 2,000 ft of the proposed wellsite. Two electrical flying leads (EFLs) and two hydraulic flying leads (HFLs) are located within the vicinity of the wellsite.

Of the bulk oil pipelines, the closest approach of Anadarko 6" BLKO segments 18099, 18140 and 14699 to the proposed wellsite are 70 ft, 57 ft, and 130 ft to the southeast respectively; the closest approach of the

Anadarko 5" BLKO segment 14700 is 65 ft east of the proposed wellsite. The closest approach of service line Anadarko 6" SERV segments 15574 and 15575 are 104 ft and 68 ft to the southeast of the proposed wellsite, respectively.

Of the umbilicals, Anadarko 4" UBEH 14701 and 14702 pass approximately 10 ft and 117 ft northwest and south of the proposed wellsite respectively. Anadarko 3" 16055 and Anadarko 3" UBEH 15576 pass approximately 214 ft and 276 ft southeast of the proposed surface hole location. All the umbilicals are reported as active.

An umbilical EFL and an umbilical HFL are located 33 ft and 65 ft southwest of the proposed wellsite, respectively. A cable EFL and a cable HFL are located 47 ft to the south, and 60 ft to the southeast, of the proposed wellsite, respectively.

Additional infrastructure in the area include the EB 598 #1 well situated 73 feet south-southwest of the proposed EB 599 #Y wellsite, and the Pipeline End Manifold (PLEM) D2 and Pipeline End Termination (PLET) C structures located 73 ft and 93 ft southeast and south of the proposed wellsite respectively (Figure 3).

It is possible there are other anthropogenic features present and not reported to database sources. In addition, the entirety of the study area is within a designated industrial dumping area. The precise nature of potential dumped material is unknown. It is therefore possible there are unreported seafloor obstructions within the study area. No other reported anthropogenic obstructions are located within 2,000 ft of the proposed wellsite (Figures 2, 3 and 4). Please see the shallow hazards assessment (Fugro, 2023) for additional details.

In general, we recommend a remotely operated vehicle (ROV) be used to inspect the seafloor at the proposed wellsite immediately before well spud to confirm there are no unexpected seafloor obstructions, because most articles of seafloor debris and anthropogenic obstructions cannot be identified within the resolution limits of conventional 3D seismic data.

Stratigraphy

The seafloor and five subsurface horizons (H10, H20, H30, H40, and H50) were mapped in the 3D seismic data and are displayed on the seismic inline (Figure 6) and crossline (Figure 7) nearest the proposed wellsite. These divide the tophole section into six units (Units 1 through 6) of distinctive seismic and inferred lithologic character at the proposed wellbore. All mapped horizons are present at the proposed EB 599 #Y well. Predicted depths and thicknesses along the proposed well path for each of the mapped horizons and units are provided in Table 2 below and displayed on the tophole prognosis chart (Figure 8). Note a KB of 81 ft is assumed for all depths and thicknesses, and below mudline (BML) values are calculated with respect to the surface hole location.

Table 2: Summary of horizons, units, and lithologies along the proposed wellbore.

Unit/Horizon	Seismic Character and Inferred Lithology or Significance	Wellpath unit Thickness [ft] or Horizon Depth [ft BML]
Unit 1	This unit comprises continuous predominantly low-amplitude and occasionally moderate-amplitude reflectors representing stratified fine-grained deposits and hemipelagic drape underlain by interbedded silts and clays.	223
Horizon 10	Prominent, continuous positive amplitude reflector at the base of sediments in Unit 1, marking the top of Unit 2.	223
Unit 2	This unit comprises mostly low- to moderate-amplitude continuous reflectors, interpreted as interbedded layered clay, silt, and possible sand.	462
Horizon 20	Moderate-amplitude continuous positive reflector, representing sediment drape overlying mass transport deposits (MTDs).	685
Unit 3	This unit contains low- to moderate-amplitude, mostly discontinuous to chaotic reflectors interpreted to represent fine- and coarse-grained MTDs.	231
Horizon 30	Moderate-amplitude, continuous trough (negative-amplitude) reflector at the base of Unit 3, representing an erosional unconformity separating Units 3 and 4.	916
Unit 4	This unit is characterized by continuous, mostly moderate-amplitude reflectors overlying continuous to subchaotic low- to high-amplitude reflectors, inferred to represent mostly fine-grained stratified sediments overlying sand-prone channelized sediments and fine- to coarse-grained MTDs. High-amplitude low-impedance anomalies are present within the lower half of the unit and are interpreted to represent possible gas sands.	806
Horizon 40	A high-amplitude continuous trough reflector representing sand-prone sediments and separating Unit 4 from Unit 5.	1,722
Unit 5	This unit contains mostly moderate- to high-amplitude continuous to discontinuous reflectors interpreted to represent possible gas sands, overlying primarily low-amplitude continuous, discontinuous, and chaotic reflectors, interpreted to represent fine- to possibly coarse-grained MTDs and channelized deposits with interbedded stratified deposits.	1,493
Horizon 50	Continuous irregular low-amplitude trough reflector marking the base of the chaotic sediments of Unit 5.	3,215
Unit 6	This unit consists of low- to moderate-amplitude mostly continuous to occasionally chaotic reflectors inferred to represent stratified fine- to potentially coarse-grained sediments, as well as interbedded discontinuous reflectors indicative of interpreted MTDs and channelized deposits with possible sands. The unit is locally faulted.	685

Fault Penetrations

The planned deviated wellbore is predicted to penetrate one fault in the tophole section at approximately 3,244 ft BML (6,529 ft MD; Figure 8). The buried fault dips southeast, with strike to the southwest or northeast (Figure 6).

Penetration of the fault is not expected to pose a hazard or constraint to well installation. However, this fault represents a potential zone of weakness that could have increased permeability. This could lead to the loss of drilling fluid to formation and/or wellbore instability.

Gas Hydrate and Gas Hazards

Water-bottom temperature and pressure conditions at the proposed well location are suitable for gas hydrates to exist either on the seafloor or in the shallow subsurface. A bottom-simulating reflector (BSR) was not observed at the proposed well location but was observed in the southeastern part of EB Block 599 (Fugro, 2023), roughly 8,100 ft to the southeast. There are no geophysical indications of possible seafloor or subsurface gas hydrates, including massive gas hydrates, at or near the proposed wellsite. A negligible potential for high-concentration gas hydrate accumulations is assessed at the proposed wellbore. Localized instances of generally low-density gas hydrates may still be present in the area and may exist as essentially seismically unresolvable but generally non-hazardous occurrences of lenses and partings within porous strata and as fillings within faults and fractures.

No amplitude anomalies indicative of possible shallow gas accumulations are observed in the 3D seismic depth data within Units 1, 2, and 3 in the vicinity of the proposed wellbore (Figure 5). These intervals are assessed to have negligible potential for shallow gas (Figure 8).

The proposed wellbore will penetrate two amplitude anomalies at approximately 4,676 ft MD and 5,007 ft MD (1,391 ft BML and 1,722 ft BML; Figures 6 through 8), within Unit 4 and at the top of Unit 5. These anomalies are present within interpreted possible extensive gas sands. These anomalies were previously penetrated by the nearby offset well EB 598 #1 at approximately 4,678 ft MD and 5,006 ft MD (1,392 ft BML and 1,720 ft BML), respectively, without reported hazard instances, within the riserless drilling interval below the 36" conductor but above the 20" casing point. In addition, the reflectors immediately underlying the amplitude anomaly at the top of Unit 5 display high-amplitude to marginally anomalous-amplitude character. Although no gas influx is reported at the offset well, other than a small gas bubble that was noticed when tripping in hole at the 36" casing wellhead, that result cannot be tied with any confidence to either a lack of actual gas presence or to the drilling engineering mitigations that may have been used. Therefore, under Fugro's assumption of open-hole drilling with no pressure control in place, an elevated potential for shallow gas is warranted. The lower portion of Unit 4 and the upper portion of Unit 5, between 4,676 ft and 5,190 ft MD (1,391 ft and 1,905 ft BML) are assessed to have moderate potential for shallow gas (Figure 8). The upper portion of Unit 4 and the predominantly lower-amplitude lower portion of Unit 5 are considered to represent lower shallow gas hazard and are assessed to have low shallow gas potential (Figure 8).

The seismic character in Unit 6 is potentially attenuated. At very high gain, some features within the vicinity of the wellbore could be interpreted to be possible shallow gas accumulations due to their shape and amplitude expression. Out of an abundance of caution, Unit 6 is assessed to have low shallow gas potential.

In general, Fugro suggests avoiding shallow amplitude anomalies suggestive of possible shallow gas, and especially in the case of open hole drilling, where pressure and influx control options are limited.

Shallow Water Flow (SWF)

Based on regional analysis, EB Block 599 lies within a region of low to moderate generalized potential for shallow water flow (Pelletier, et al., 1999). Ostermeier, et al., (2000) indicate SWF sands in this area are associated with intraslope fans, canyons, and channels, which are features of the latest Pleistocene low-stand deposystems of the Mississippi River. One such SWF intraslope sand unit known as the "Orange Unit," which extends over a significant portion of the Garden Banks area and the eastern third of the East Breaks area, is interpreted to be roughly marginal to the study area (Winker & Booth, 2000; Ostermeier, et al., 2000). The presence of this known SWF sand indicates elevated shallow overpressure potential for the affected sandy stratigraphic intervals.

The primary overpressuring mechanism in the shallow section is expected to be the rapid loading of shallow sands by overlying and/or interlayered mostly fine-grained mass transport deposits (MTDs). Conversely, the presence in the local area of fluid expulsion sites and their interpreted possible fluid migration pathways and deeply seated faults that extend to the seafloor may represent conduits for the relief of pore pressures over hydrostatic to the seafloor, thereby decreasing the actual local potential for SWF.

Units 1 and 2 are interpreted to be predominantly stratified, normally-deposited marine clay and silt and are assessed to have negligible SWF potential (Figure 8).

Unit 3 is interpreted to consist of predominantly clay-rich MTDs due to the low- to moderate-amplitude strength and discontinuous nature of the reflectors. In general, MTDs can be self-pressured units with sealing pressures possible at their top and base. Unit 3 is therefore assessed to have low SWF potential.

Units 4 and 5 are intervals interpreted to contain significant stacked and channelized sand-prone strata, occasionally offset by faults in the extended area around the proposed well. These sands may represent the western margin of the "Orange Unit" slope sand body tied to previous regional SWF and overpressure drilling events (Winker & Booth, 2000). The upper part of Unit 4, from 4,201 ft MD to 4,440 ft MD (916 ft BML to 1,155 ft BML) is interpreted as primarily fine-grained stratified deposits and is assessed to have low SWF potential (Figures 6 through 8). No flow was reported at the EB 598 #1 well within this interval, while the EB 599 #1 well, approximately 4,000 ft northeast of the proposed EB 599 #Y wellsite, observed slight to moderate flow while drilling at the base of Unit 4, between 4,904 ft MD to 5,655 ft MD (1,668 ft BML to 2,419 ft BML) within the surface casing interval. No flow was observed when drilling ahead. The lower part of Unit 4 at the proposed wellbore, from 4,440 ft MD to 5,007 ft MD (1,155 ft BML to 1,722 ft BML) is interpreted as sand-prone channelized deposits with fine-grained MTDs and is assessed to have moderate SWF potential.

The upper part of Unit 5 represents a continuation of the sand-prone sediments of lower Unit 4. Lower Unit 5 is interpreted to represent an overall fine- to coarse-grained section; however, sand content is inferred to be reduced and the stratigraphy less laterally continuous. Although no flow was reported at the EB 598 #1 well within this interval, relatively minor flows were reported during drilling at offset well EB 599 #1 within this interval, with minor background and connection gas noted from 6,100 ft MD to

6,608 ft MD (2,873 ft BML to 3,381 ft BML), where the well was observed to be flowing. The well was filled with sea water to control the flow. When running 16-inch casing at 6,510 ft MD (3,283 ft BML), pipe stuck and the well started flowing again. The whole of Unit 5 at the proposed wellbore is assessed to have moderate SWF potential (5,007 ft MD to 6,500 ft MD; 1,722 ft BML to 3,215 ft BML; Figure 8).

Unit 6 is inferred to comprise mostly shales with some fine-grained MTDs and possible sand; this is supported by a lithology report in the daily drilling reports of the EB 599 #2 well. This interval is assessed to have low SWF potential.

Based on the analysis of regional SWF hazard and the incorporated offset well information reviewed, it is important to consider the possibility of encountering overpressured sands within the riserless drilling interval of this proposed well. Appropriate SWF mitigation practices should be implemented when drilling through any intervals that have been assessed as having non-negligible potential for SWF in the tophole section. In general, pore-pressure modeling may assist in predicting flow; in the absence of pore-pressure modeling, the best mitigation is caution during drilling.

Wellbore Stability

During the drilling of the nearby offset well EB 598 #1, tight hole was encountered from 6,558 ft MD (3,346 ft BML) to 6,608 ft MD (3,396 ft BML). The mitigation methods utilized included increasing the weight on bit, washing, circulating, and using high-viscosity sweeps to clean out tight spots. This section corresponds to the upper part of Unit 5, which has been interpreted to comprise possible gas-prone sands, MTDs and channelized deposits. Similarly, offset well EB 599 #1 is reported to have encountered numerous tight spots within Units 4 and 5 below the 20-inch casing shoe depth. The tight spots were encountered between 4,710 ft MD (1,474 BML) and 5,877 ft MD (1,820 BML) in Unit 4 and again while tripping in to 6,586 ft MD. These sections may be either mechanically weaker, or less consolidated in the case of MTDs, than stratified, dominantly fine-grained marine deposits, with the inferred result being episodes of formation sloughing to cause tight-hole episodes. Tight spots were the major shallow drilling difficulties encountered by offset wells within EB Block 598 and the immediate vicinity (Fugro, 2023).

Suitability for Temporary Occupation for Drilling

Proposed well location EB 599 #Y is considered suitable for temporary-occupation drilling activities, provided the aforementioned conditions and constraints are considered and planned for in the final well design. There are other pipelines/umbilicals, a well, a PLET, and other infrastructure reported in the local area. Fugro recommends these infrastructure items be carefully considered during final planning for the proposed well and during well drilling and installation activities. We reiterate the recommendation to inspect the seafloor at the proposed wellsite prior to spud to ensure the absence of any other unreported obstructions.

With respect to subsurface geologic hazards, Fugro recommends caution when drilling through shallow amplitude anomalies indicative of possible shallow gas presence in Units 4 and 5. In addition, the proposed wellsite is inferred to be on the margin of an area of known SWF sand presence: the "Orange Unit" of the

Garden Banks and eastern East Breaks areas. Additionally, tight spots are recognized as the most common type of drilling difficulty encountered at offset wells.

We recommend the several nearby offset wells in the area be studied with respect to the drilling methodologies employed that resulted in overall successful shallow section drilling, in order to best inform the well design and drilling plan. The assessment of drilling hazards presented in this letter conveys the likelihood of particular hazards occurring based on a review of the available data and does not forecast the severity of any events that may occur.

Closing

We appreciate the opportunity to work with you on this project and look forward to continuing as your geohazards consultants. If you have any questions concerning this assessment, please do not hesitate to contact Stephen Varnell by phone at (713) 369-5822 or email at svarnell@fugro.com.

Sincerely,




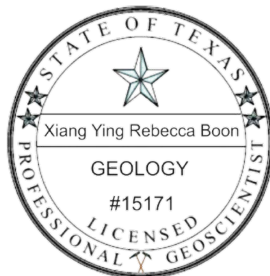
Juliet Aralu
Staff Geoscientist



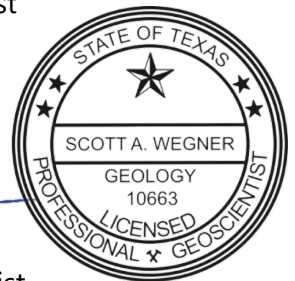
Gokce Bean
Staff Engineering Geoscientist



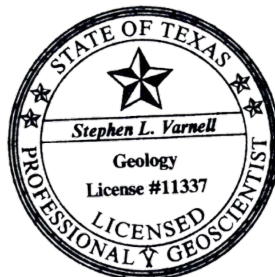
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Principal Geoscientist



Figures

Figure 1: 3D Seismic Power Spectrum

Figure 2: Seafloor Rendering

Figure 3: Water Depth and Seafloor Features

Figure 4: Seafloor Amplitude Rendering

Figure 5: Subsurface Geologic Features

Figure 6: Portion of Inline 12297 through Proposed Wellsite EB 599 #Y

Figure 7: Portion of Crossline 5638 through Proposed Wellsite EB 599 #Y

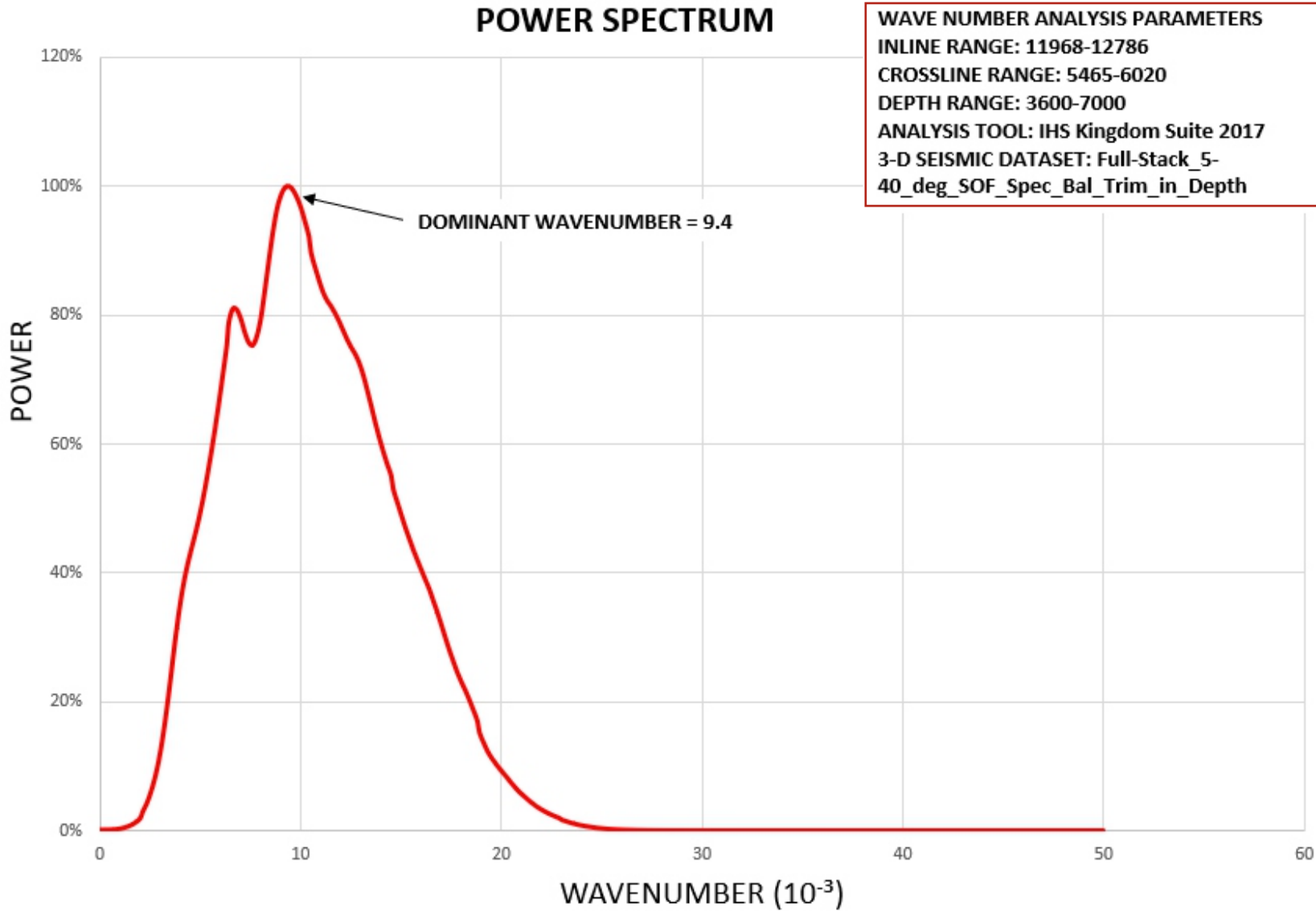
Figure 8: Tophole Prognosis Chart, Proposed Wellsite EB 599 #Y

References

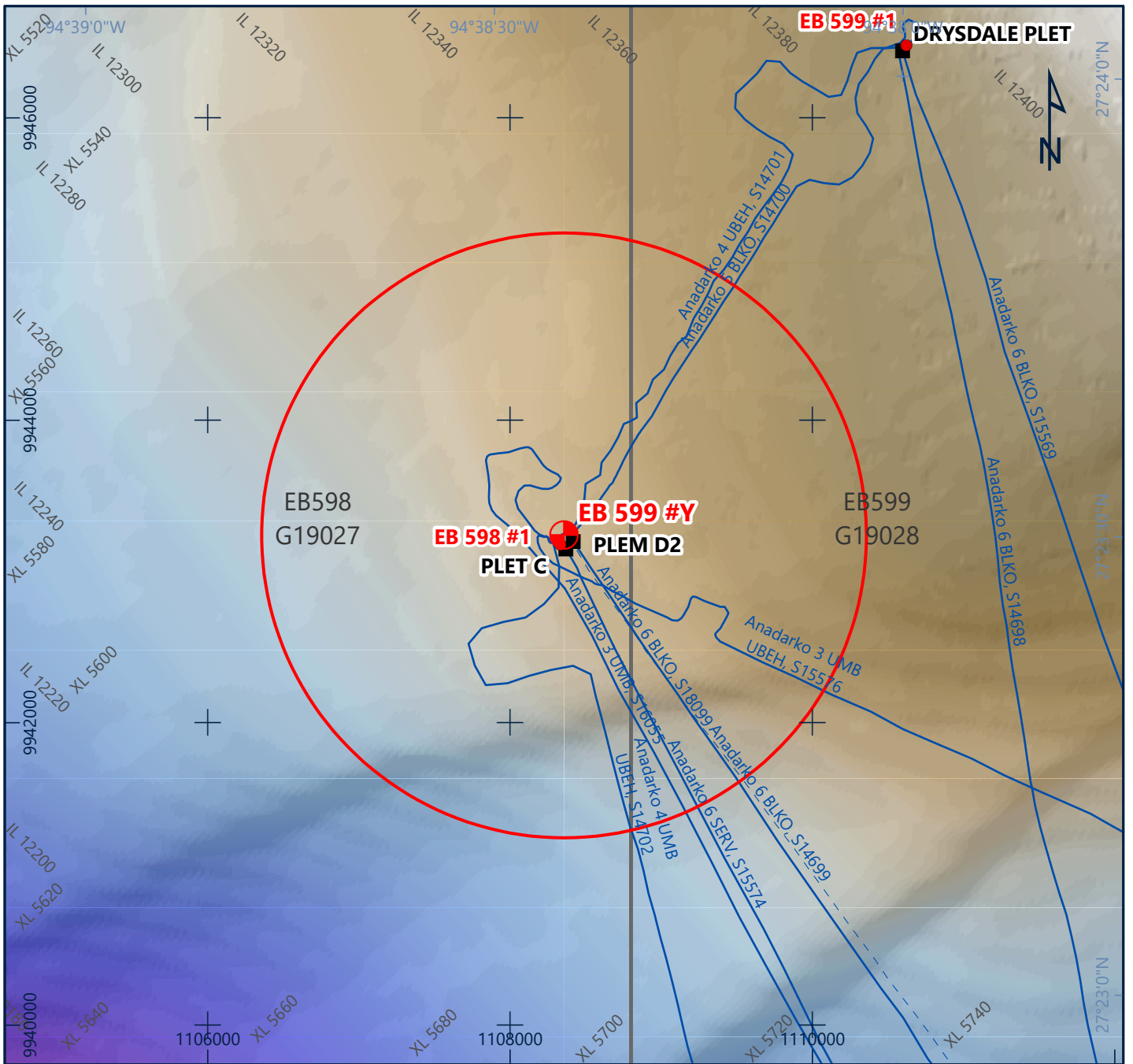
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Figures



3D SEISMIC POWER SPECTRUM








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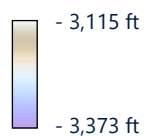
LEGEND

BACKGROUND

-  Proposed well location with 2,000-ft buffer
- IL 12300 3D Survey line number
-  Existing Pipeline or Pipeline Segment
-  Abandoned Pipeline or Pipeline Segment

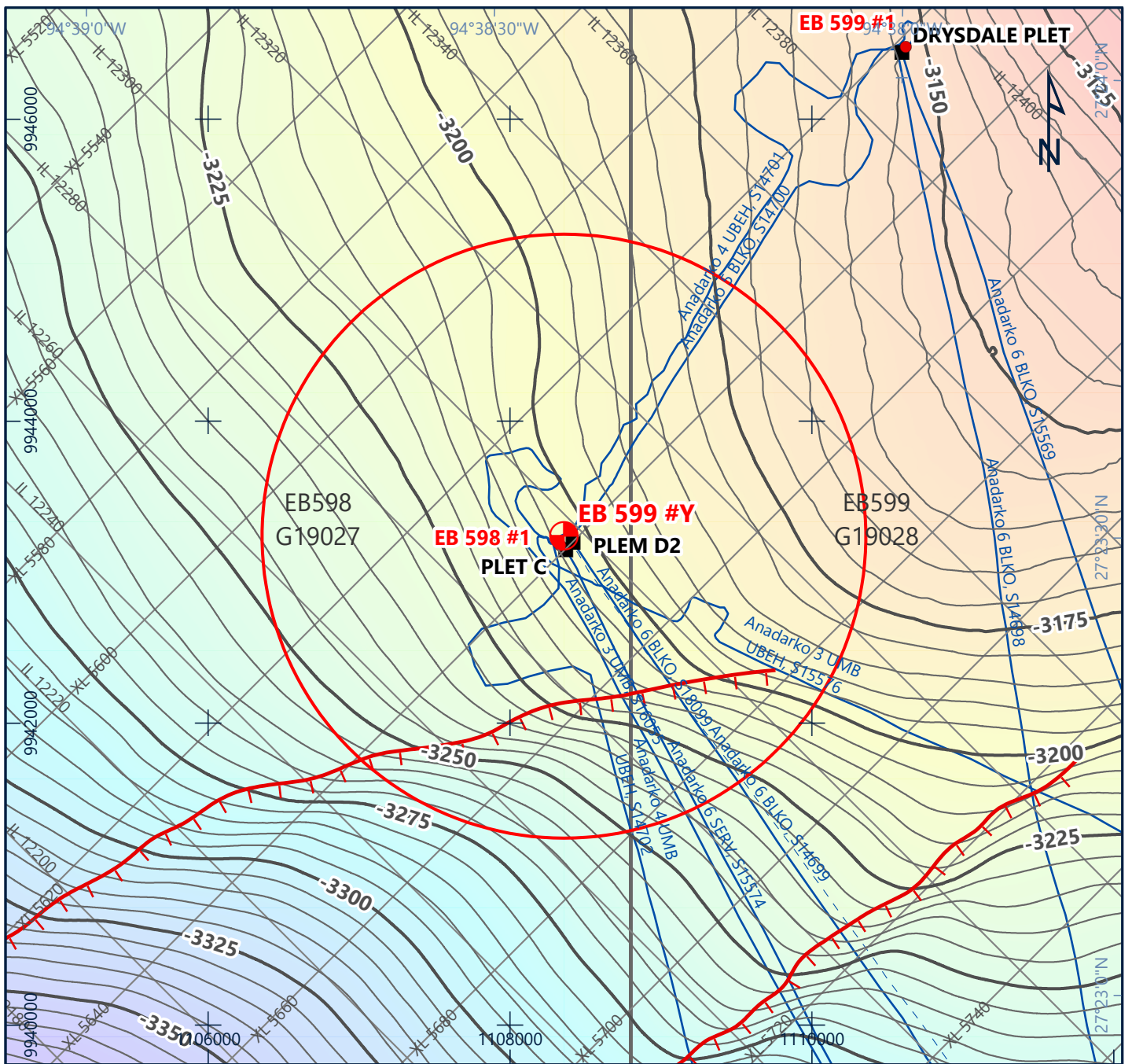
-  Well Surface Location
-  Platform, PLET or PLEM

WATER DEPTH



**SEAFLOOR RENDERING
PROPOSED WELLSITE EB 599 #Y**








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0 500 1000 US Feet

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

BACKGROUND

-  Proposed well location with 2,000-ft buffer
- IL 12300 3D Survey line and number
-  Existing Pipeline or Pipeline Segment
-  Abandoned Pipeline or Pipeline Segment

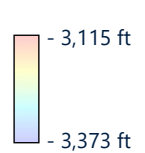
-  Well Surface Location
-  Platform, PLET or PLEM

- SEAFLOOR FEATURES**
-  Seafloor Fault or Seafloor Fault Expression

BATHYMETRY CONTOURS

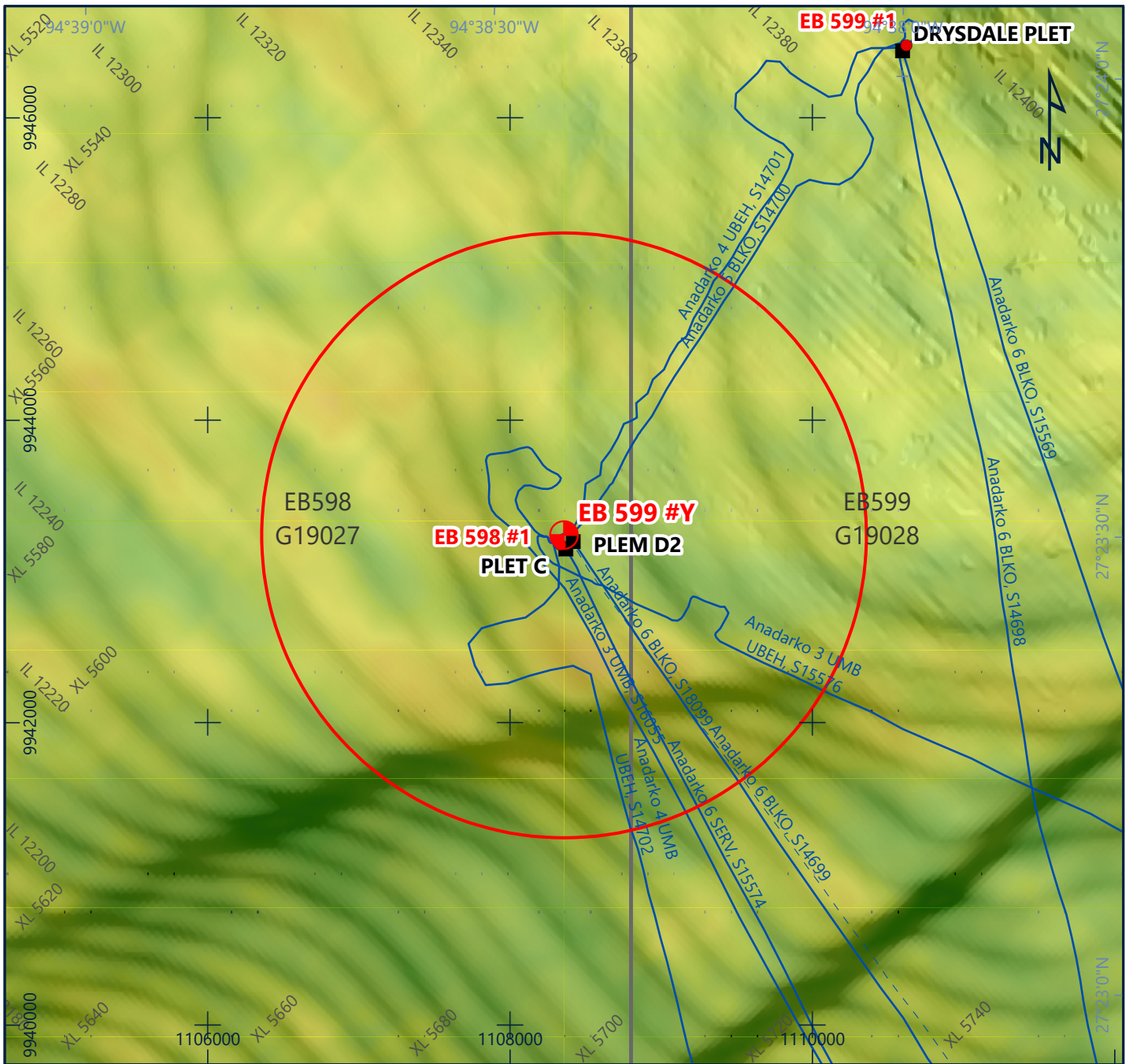
-  Major - 25 ft interval
-  Minor - 5 ft interval

WATER DEPTH



**WATER DEPTH AND SEAFLOOR FEATURES
PROPOSED WELLSITE EB 599 #Y**










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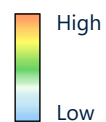
LEGEND

BACKGROUND

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- IL 12300 3D Survey line and number
-  Existing Pipeline or Pipeline Segment
-  Abandoned Pipeline or Pipeline Segment

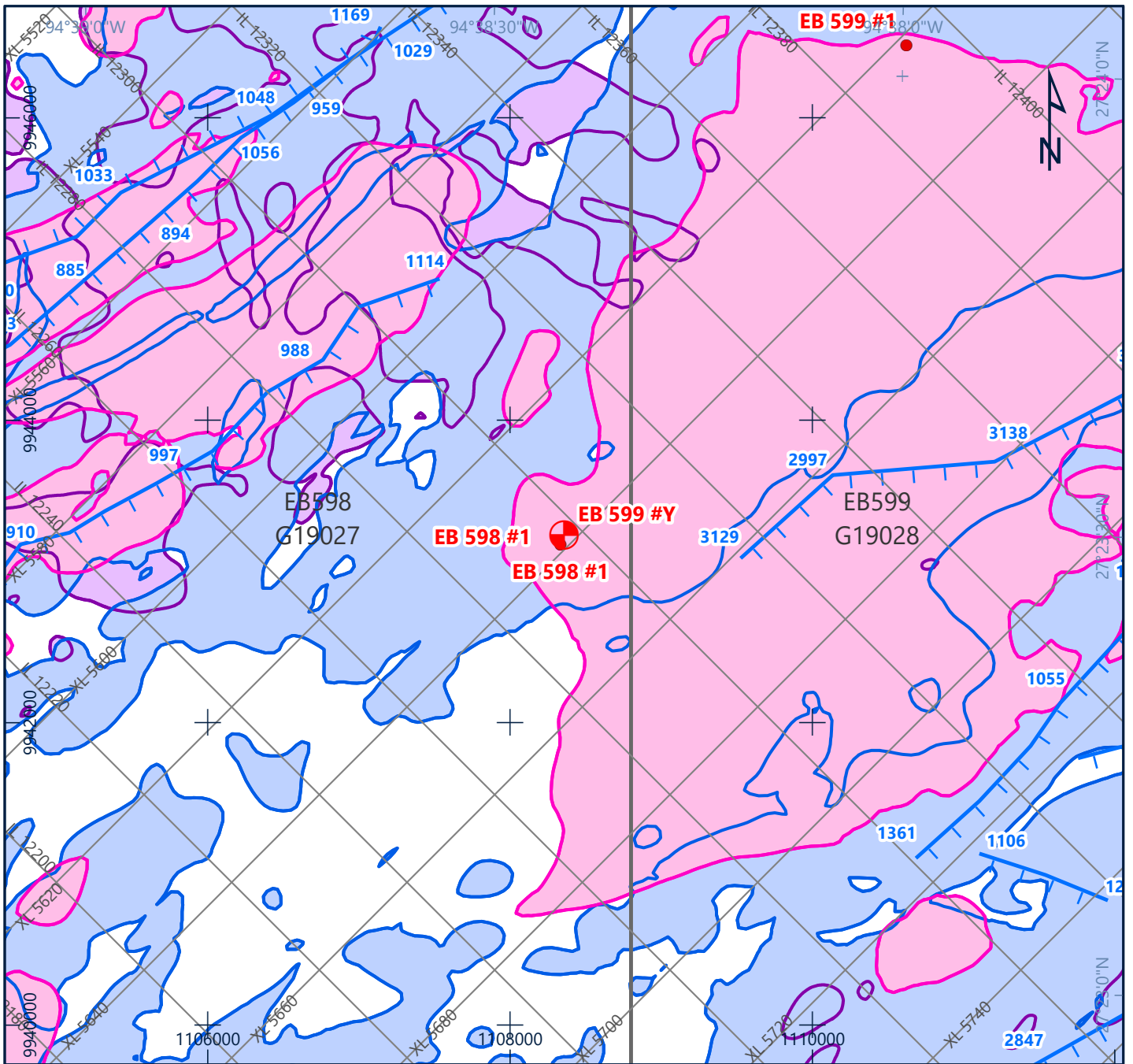
-  Well Surface Location
-  Platform, PLET or PLEM

RELATIVE SEAFLOOR AMPLITUDE



**SEAFLOOR AMPLITUDE RENDERING
PROPOSED WELLSITE EB 599 #Y**





EPSG CODE 32065 COORDINATE SYSTEM NAD 1927 Zone 15N

0 500 1000 US Feet

Scale 1:12,000 at original 8.5"x11" page size

LEGEND

BACKGROUND



Proposed well location

IL 12300 3D Survey line and number



Well Surface Location

SUBSURFACE FEATURES



Buried Fault and Depth BML (ft)

AMPLITUDE ANOMALIES



UNIT 4



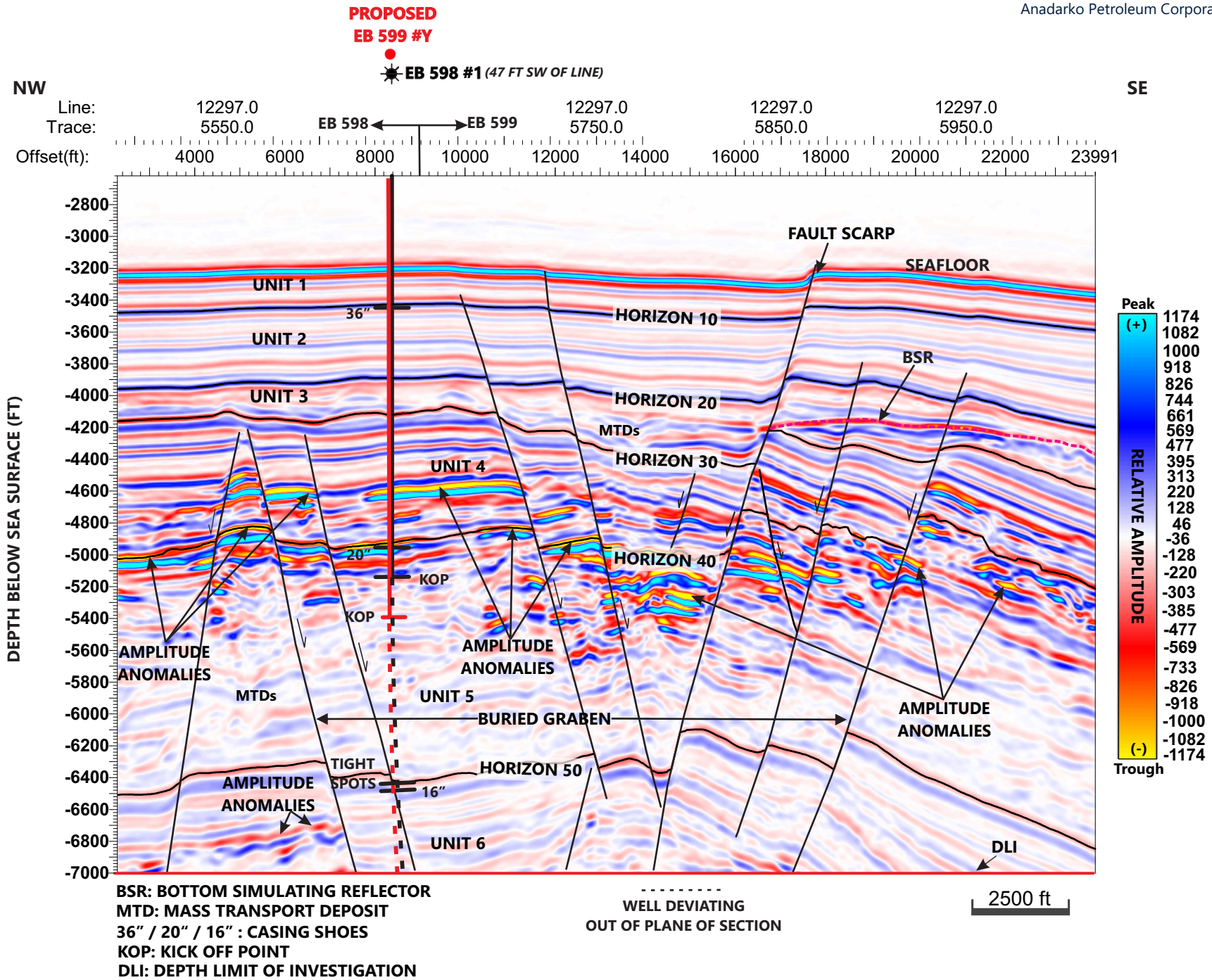
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UNIT 6

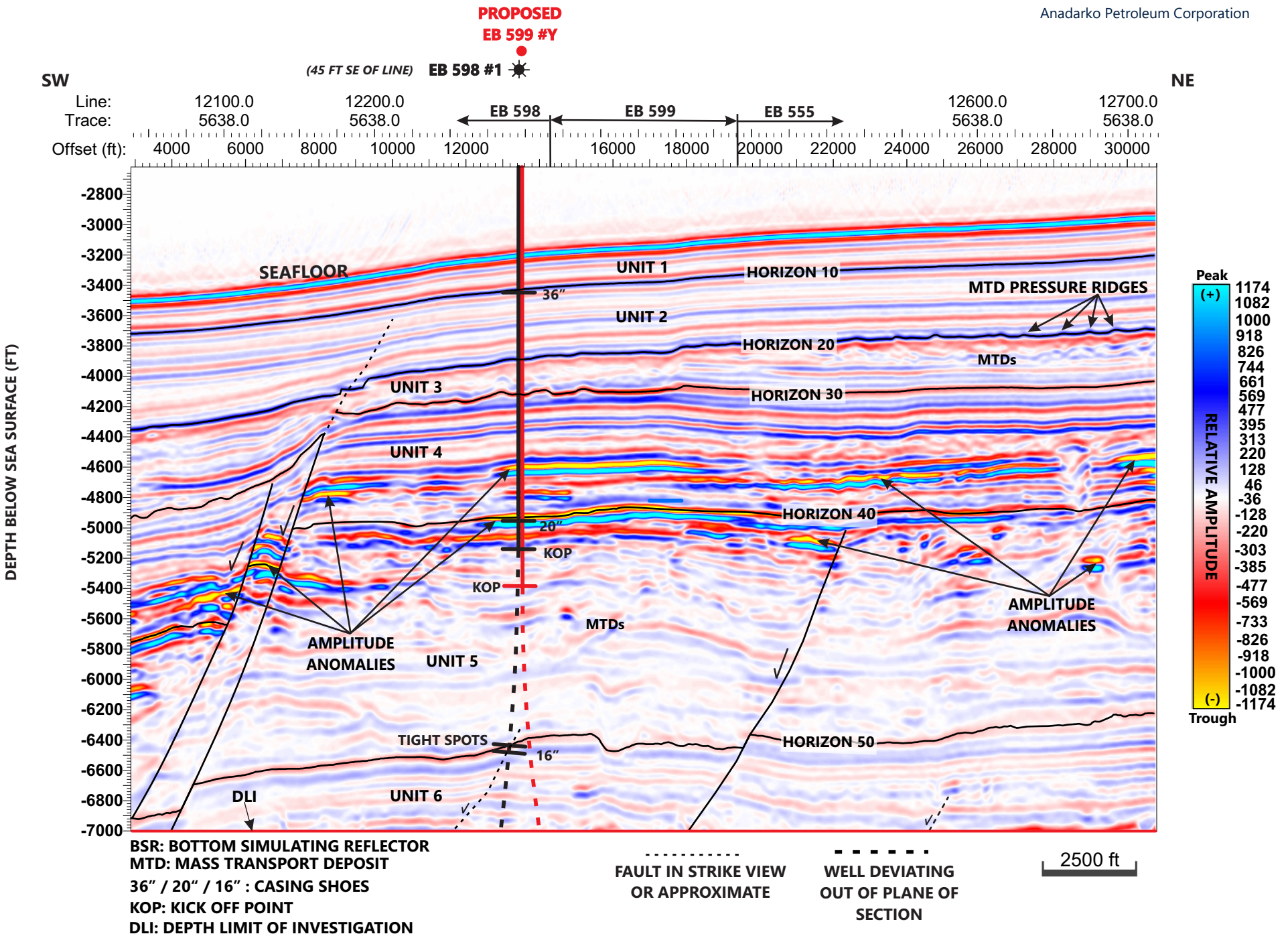
**SUBSURFACE GEOLOGIC FEATURES
PROPOSED WELLSITE EB 599 #Y**





PORTION OF INLINE 12297 THROUGH PROPOSED WELLSITE EB 599 #Y

**PROPOSED
EB 599 #Y**

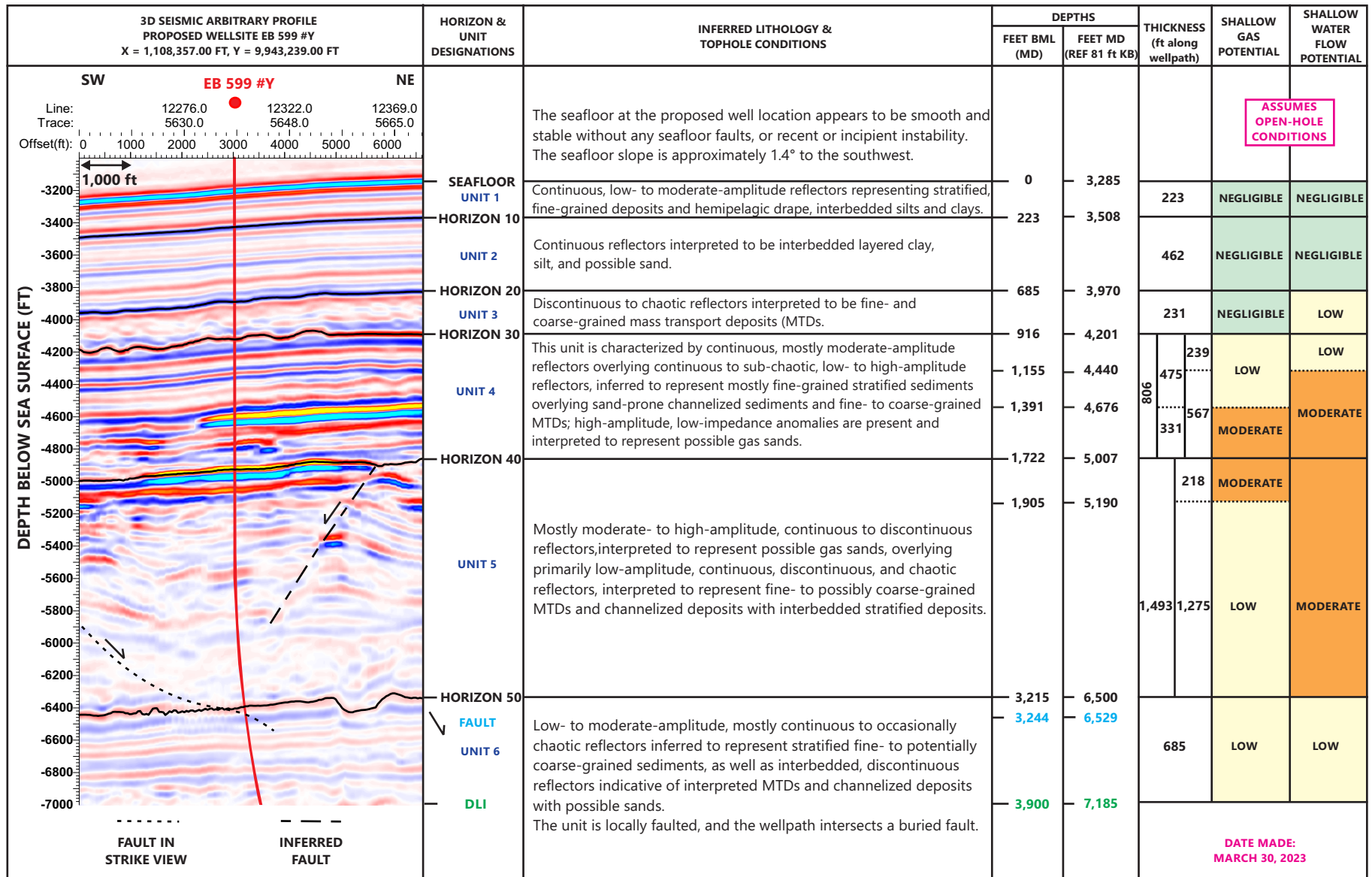


PORTION OF CROSSLINE 5638 THROUGH PROPOSED WELLSITE EB 599 #Y

02.00228113-003 03 | Proposed Wellsite EB 599 #Y

Figure 7





BML: Below Mud Line
 DLI: Depth Limit of Investigation
 MTD: Mass Transport Deposit

TOPHOLE PROGNOSIS CHART PROPOSED WELLSITE EB 599 #Y

Negligible: Not present or no possibility of occurrence
Low: Unlikely presence or occurrence; not significant
Moderate: Possible presence or occurrence; mitigation measure recommended
High: Probable presence or occurrence; mitigation measures highly recommended





Proposed Wellsite EB 599 #Z

Wellsite Clearance Letter | Block 599, East Breaks Area, Gulf of Mexico

02.00228113-002 03 | April 7, 2025

Final

Anadarko Petroleum Corporation



Document Control

Document Information

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Document Title	Proposed Wellsite EB 599 #Z
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Issuing Office Address	13501 Katy Freeway, Suite 1050, Houston, TX 77079 USA

Client Information

Client	Anadarko Petroleum Corporation
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Document History

Issue	Date	Status	Comments on Content	Prepared By	Checked By	Approved By
01	March 28, 2023	For Review	Awaiting client comments	JA/RB	SW/SV	SW/SV
02	April 3, 2023	Final	Reflects client comments	JA/RB	SW/SV	SW/SV
03	April 7, 2025	Final	Well name changed	JA/RB	SW/SV	SW/SV

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RB	Rebecca Boon	Project Lead Geoscientist
RG	Rick Garza	GIS Analyst
SV	Stephen Varnell	Project Oversight and Administration
SW	Scott Wegner	Project Technical Oversight

**FUGRO**

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Anadarko Petroleum Corporation

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April 7, 2025

Dear Ms. Jeansonne,

Anadarko Petroleum Corporation (Anadarko) contracted Fugro USA Marine, Inc., (Fugro) to prepare a wellsite clearance letter addressing shallow drilling geohazards for proposed wellsite EB 599 #Z, East Breaks, Gulf of Mexico. The proposed well is planned to deviate within the tophole section. This letter is intended to address specific seafloor conditions within a 2,000-ft radius and shallow geologic conditions within a 3,000-ft radius of the proposed wellsite. The depth limit of investigation (DLI) is defined as approximately 7,000 ft below sea surface (BSS). This letter also is intended to be submitted to the United States Bureau of Ocean Energy Management (BOEM) and will meet or exceed the BOEM requirements as stipulated in the Notices to Lessees (NTLs) 2022-G01 (Shallow Hazards Program), 2008-G04 (Exploration Plans), and 2009-G40 (Deepwater Benthic Communities). NTL 2015-N02 was released February 06, 2015, and eliminates the expiration dates of certain previous NTLs, continuing their validity. Full references for these regulations are included after the main text.

Graphics

A 3D seismic power spectrum (Figure 1) is included as an assessment of the resolution of the seismic data in the vicinity of the proposed wellbore. Four 1:12,000-scale maps, including seafloor rendering (Figure 2), water depth and seafloor features (Figure 3), seafloor amplitude (Figure 4), and subsurface geologic features (Figure 5) are provided. A 2,000-ft radius circle around the proposed wellsite is shown on the seafloor maps, as required by Notice to Lessees (NTL) 2009-G40 (BOEM, 2009), extended by NTL 2015-N02 (BOEM, 2015). Annotated data examples of the nearest 3D seismic survey inline (Figure 6) and crossline (Figure 7) to the well surface location also are included. The tophole prognosis chart (Figure 8) provides a summary of the expected shallow geologic conditions at proposed wellbore EB 599 #Z.

Seismic Survey Parameters

The geophysical dataset used in this assessment is a 3D seismic data depth volume (Full-Stack_5-40_deg_SOF_Spec_Bal_Trim_in_Depth) provided by Anadarko to Fugro in SEG-Y format for loading onto a seismic interpretation workstation. Inlines are oriented northwest–southeast, crosslines are oriented

northeast–southwest, and both have a line spacing of 41.01 ft. The seafloor in the 3D volume is represented by a peak reflector with a positive reflection coefficient, which indicates the data follow the North American seismic polarity convention. The seismic wavelet is estimated to be approximately zero-phase based on an analysis of the seafloor reflector and of low-impedance, high-amplitude anomalies indicative of possible shallow gas accumulations.

For the 3D seismic depth volume, the wave number was extracted and plotted versus power because of its direct relationship to units of distance, making it suitable for use in understanding vertical resolution limitations when working with depth-converted data. This plot can be used to determine the limit of separability (LS), which is an indicator of the vertical resolution of the data. This parameter provides a close approximation of the minimum sediment bed thickness for which the top and bottom of the bed can be fully resolved in the seismic data and is based on the 1/4 acoustic wavelength approximation. Wavelength is equivalent to the inverse of the wavenumber, and using a dominant wavenumber of approximately 9.4×10^{-3} (Figure 1), the LS is computed as 27 ft within the shallow section. Individual strata or other geologic features thinner than this limit of separability may be detected but may not be resolved in true thickness or lateral extent. Small-scale topographic features and anthropogenic obstructions such as pipelines, shipwrecks, and seafloor debris generally cannot be resolved in 3D seismic data.

Previous Work

In conjunction with this wellsite clearance letter, Fugro has prepared for Anadarko a comprehensive shallow hazard assessment including Blocks EB 555, 598, and 599 (Fugro, 2023). In 2013, Fugro provided Anadarko with wellsite clearance letters for proposed wellsites EB 599 G, H, and I in Block 599 (Fugro, 2013a; 2013b; 2013c). Fugro also performed a shallow hazards assessment over Block 598 and vicinity for Kerr-McGee in 2002 (Fugro, 2002). Lithological, regional geologic, and stratigraphic information from the 2023, 2002, and 2013 work products was reviewed and used to prepare this wellsite clearance letter.

Proposed Well Location

Table 1 details the surface location for proposed wellsite EB 599 #Z in the northwestern corner of Block EB 599:

Table 1: Proposed wellsite location project information

Proposed Wellsite EB 599 #Z Block 599, East Breaks Area CRS: NAD27, UTM Zone 15, feet (EPSG: 32065)	
Surface X = 1,110,607.28 ft	Y = 9,946,570.44 ft
Latitude: 27° 24' 2.9291"N	Longitude: 94° 37' 59.9097"W
Nearest 3D Inline: 12394	Nearest 3D Crossline: 5620
1,807.28 ft FWL	949.56 ft FNL

Offset Well Data

Anadarko provided ten offset wells for this assessment. Of the ten wellbores, six were original holes and four were side tracks. Information from the deeper side tracks was considered below the depth limit of investigation of the shallow hazards study. The nearest well to the proposed wellsite is EB 599 #1, drilled by Burlington Resources in 2000 and currently operated by Anadarko. It is approximately 78 ft southeast of the proposed wellsite. The relevant details of the other offset wells are discussed in the Shallow Hazard Assessment report covering the EB 599 area (Fugro, 2023). The shallow section and upper well section drilling histories of the offset wells have been incorporated into this assessment.

Water Depth and Seafloor Gradient

The water depth at the proposed wellsite is predicted to be about 3,153 ft, with zero datum at sea surface (Figures 2 and 3). The local seafloor gradient at the proposed surface hole location is approximately 1° to the west; slopes within a 2,000 ft radius of the proposed surface hole location range between approximately 0.5° and 3°. The regional slope direction is westerly to southwesterly.

Seafloor and Near-Surface Features

The seafloor appears smooth at the proposed wellsite and is interpreted to be presently stable under natural conditions. No seafloor faults, pockmarks, or areas of anomalous seafloor amplitude were identified in the 3D seismic data within 2,000 ft of the proposed well (Figures 3 and 4).

No fluid expulsion features were identified in the 3D seismic data within 2,000 ft of the proposed wellsite. Two interpreted fluid expulsion features lie to the northeast of the proposed wellsite, with the closest approximately 2,010 ft to the northeast (Figure 3).

Potential High-Density Benthic Communities

There is no geophysical evidence of hydrocarbon fluid seepage sites or areas that could potentially support high-density benthic communities within 2,000 ft of the proposed wellsite (Figures 3 and 4). Therefore, there is a negligible potential for high-density communities of benthic and/or chemosynthetic organisms within 2,000 ft of the proposed wellsite, in accordance with NTL 2009-G40 (BOEM, 2009), extended by NTL 2015-N02 (BOEM, 2015).

Anthropogenic Obstructions

According to Fugro's GIS database of infrastructure and obstructions, as queried during January 2023, four existing pipelines and one umbilical segment are reported within 2,000 ft of the proposed wellsite. The umbilical Anadarko 4" UBEH, segment 14701, passes through the proposed wellsite location; caution is advised. Of the four pipelines, two run southwest of the proposed wellsite and the other two run to the southeast. Anadarko 6" BLKO Segments 14698 and 15569 pass approximately 96 ft and 128 ft to the south and southwest of the proposed wellsite, respectively. Anadarko 6" BLKO 15570 and Anadarko 5" BLKO 14700 pass approximately 100 ft and 114 ft to the southwest, respectively. Other infrastructure includes the

EB 599 #1 well, located 78 ft southeast of the proposed wellsite, and the Drysdale Pipeline End Termination (PLET), located 130 ft south of the proposed wellsite (Figure 3). It is possible there are features not listed in Fugro’s database. In addition, the entirety of the study area is within a designated industrial dumping area. The precise nature of potential dumped material is unknown. Please see the shallow hazards assessment (Fugro, 2023) for additional details. It is therefore possible there are unreported seafloor obstructions within the study area. No other reported anthropogenic obstructions are located within 2,000 ft of the proposed wellsite (Figures 2, 3, and 4).

In general, we recommend a remotely operated vehicle (ROV) be used to inspect the seafloor at the proposed wellsite immediately before well spud to confirm there are no unexpected seafloor obstructions because most articles of seafloor debris and anthropogenic obstructions cannot be identified within the resolution limits of conventional 3D seismic data.

Stratigraphy

The seafloor and five subsurface horizons (H10, H20, H30, H40, and H50) were mapped in the 3D seismic data and are displayed on the seismic inline (Figure 6) and crossline (Figure 7) nearest the proposed wellsite. These divide the tophole section into six units (Units 1 through 6) of distinctive seismic and inferred lithologic character at the proposed wellbore. All mapped horizons are present at the proposed EB 599 #Z well. Predicted depths and thicknesses along the proposed well path for each of the mapped horizons and units are provided in Table 2 below and displayed on the tophole prognosis chart (Figure 8). Note a KB of 81 ft is assumed for all depths and thicknesses, and below mudline (BML) values are calculated with respect to the surface hole location.

Table 2: Summary of horizons, units, and lithologies along the proposed wellbore.

Unit/Horizon	Seismic Character and Inferred Lithology or Significance	Wellpath Unit Thickness [ft] or Horizon Depth [ft BML]
Unit 1	This unit comprises continuous predominantly low-amplitude and occasionally moderate-amplitude reflectors representing stratified fine-grained deposits and hemipelagic drape underlain by interbedded silts and clays.	231
Horizon 10	Prominent, continuous positive amplitude reflector at the base of sediments in Unit 1, marking the top of Unit 2.	231
Unit 2	This unit comprises mostly low- to moderate-amplitude continuous reflectors, interpreted as interbedded layered clay, silt, and possible sand.	467
Horizon 20	Moderate-amplitude continuous positive reflector, representing sediment drape overlying mass transport deposits (MTDs).	698
Unit 3	This unit contains primarily low- to moderate-amplitude mostly discontinuous to chaotic reflectors interpreted to represent fine- and coarse-grained MTDs. These overly a thin interval of low- to moderate-amplitude locally continuous and parallel reflectors interpreted as mostly fine-grained deposits with possible sands.	237
Horizon 30	Moderate-amplitude, continuous trough (negative-amplitude) reflector at the base of Unit 3, representing an erosional unconformity separating Units 3 and 4.	935

Unit/Horizon	Seismic Character and Inferred Lithology or Significance	Wellpath Unit Thickness [ft] or Horizon Depth [ft BML]
Unit 4	This unit is characterized by continuous, mostly moderate-amplitude reflectors overlying continuous to subchaotic low- to high-amplitude reflectors, inferred to represent mostly fine-grained stratified sediments overlying sand-prone channelized sediments and fine- to coarse-grained MTDs. High-amplitude low-impedance anomalies are present within the lower half of the unit and are interpreted to represent possible gas sands.	808
Horizon 40	A high-amplitude continuous trough reflector representing sand-prone sediments and separating Unit 4 from Unit 5.	1,743
Unit 5	This unit contains mostly moderate- to high-amplitude continuous to discontinuous reflectors interpreted to represent possible gas sands, overlying primarily low-amplitude continuous, discontinuous, and chaotic reflectors, interpreted to represent fine- to possibly coarse-grained MTDs and channelized deposits with interbedded stratified deposits.	1,608
Horizon 50	Continuous irregular low-amplitude trough reflector marking the base of the chaotic sediments of Unit 5.	3,351
Unit 6	This unit consists of low- to moderate-amplitude mostly continuous to occasionally chaotic reflectors inferred to represent stratified fine- to potentially coarse-grained sediments, as well as interbedded discontinuous reflectors indicative of interpreted MTDs and channelized deposits with possible sands. The unit is locally faulted.	706

Fault Penetrations

The planned deviated wellbore is predicted to penetrate one fault in the tophole section at approximately 3,921 ft BML (7,155 ft MD; Figure 8). The fault is buried and dips southeast, with strike to the southwest or northeast, and represents the margin of a shallowly buried graben (Figure 6).

Penetration of the fault is not expected to pose a hazard or constraint to well installation. However, this fault represents a potential zone of weakness that could have increased permeability. This could lead to the loss of drilling fluid to formation and/or wellbore instability.

Gas Hydrate and Gas Hazards

Water-bottom temperature and pressure conditions at the proposed well location are suitable for gas hydrates to exist either on the seafloor or in the shallow subsurface. A bottom-simulating reflector (BSR) was not observed at the proposed well location but was observed in the southeastern part of EB Block 599 (Fugro, 2023), roughly 8,665 ft to the southeast. There are no geophysical indications of possible seafloor or subsurface gas hydrates, including massive gas hydrates, at or near the proposed wellsite. A negligible potential for high concentration gas hydrate accumulations is assessed at the proposed wellbore. Localized instances of generally low-density gas hydrates may still be present in the area and may exist as essentially seismically unresolvable but generally non-hazardous occurrences of lenses and partings within porous strata, and as fillings within faults and fractures.

No amplitude anomalies indicative of possible shallow gas accumulations are observed in the 3D seismic depth data within Units 1, 2, 3, and 6 in the vicinity of the proposed wellbore (Figure 5). These intervals are assessed to have negligible potential for shallow gas (Figure 8).

The proposed wellbore will penetrate two amplitude anomalies at approximately 4,671 ft MD and 4,977 ft MD (1,437 ft BML and 1,743 ft BML; Figures 6 through 8), within Unit 4 and at the top of Unit 5. These anomalies are present within interpreted possible extensive gas sands. These anomalies were previously penetrated by the nearby offset well EB 599 #1 at approximately 4,648 ft MD (1,412 ft BML) and 4,846 ft MD (1,610 ft BML), respectively, without reported hazard instances, although both anomalies had been topset by the surface casing and pressure control had been established. In addition, the reflectors immediately underlying the amplitude anomaly at the top of Unit 5 display high-amplitude to marginally anomalous-amplitude character. Although no gas influx is reported at the offset well, that result cannot be tied with any confidence to either a lack of actual gas presence or to the drilling engineering mitigations that may have been used. Therefore, under Fugro's assumption of open-hole drilling with no pressure control in place, an elevated potential for shallow gas is warranted. The lower portion of Unit 4 and the upper portion of Unit 5, between 4,671 ft and 5,341 ft MD (1,437 ft and 2,107 ft BML) are assessed to have moderate potential for shallow gas (Figure 8).

The upper portion of Unit 4 and the predominantly lower-amplitude lower portion of Unit 5 are considered to represent lower shallow gas hazard and are assessed to have low shallow gas potential (Figure 8).

Fugro recommends elevated caution when drilling through intervals assessed to have moderate potential for shallow gas.

Shallow Water Flow (SWF)

Based on regional analysis, EB Block 599 lies within a region of low to moderate generalized potential for shallow water flow (Pelletier, et al., 1999). Ostermeier, et al., (2000) indicate SWF sands in this area are associated with intraslope fans, canyons, and channels, which are features of the latest Pleistocene low-stand deposystems of the Mississippi River. One such SWF intraslope sand unit known as the "Orange Unit," which extends over a significant portion of the Garden Banks area and the eastern third of the East Breaks area, is interpreted to be roughly marginal to the EB Block 599 area (Winker & Booth, 2000; Ostermeier, et al., 2000). The presence of this known SWF sand indicates elevated shallow overpressure potential for the affected sandy stratigraphic intervals.

The primary overpressuring mechanism in the shallow section is expected to be the rapid loading of shallow sands by overlying and/or interlayered mostly fine-grained mass transport deposits (MTDs). Conversely, the presence in the local area of fluid expulsion sites and their interpreted possible fluid migration pathways and deeply-seated faults that extend to the seafloor may represent conduits for the relief of pore pressures over hydrostatic to the seafloor, thereby decreasing the actual local potential for SWF.

Units 1 and 2 are interpreted to be predominantly stratified, normally deposited marine clay and silt and are assessed to have negligible SWF potential (Figure 8).

Unit 3 is interpreted to consist of predominantly clay-rich MTDs due to the low- to moderate-amplitude strength and discontinuous nature of the reflectors. In general, MTDs can be self-pressured units with sealing pressures possible at their top and base. Unit 3 is therefore assessed to have low SWF potential.

Units 4 and 5 are intervals interpreted to contain significant stacked and channelized sand-prone strata, occasionally offset by faults in the extended area around the proposed well. These sands may represent the western margin of the "Orange Unit" slope sand body tied to previous regional SWF and overpressure drilling events (Winker & Booth, 2000). The upper part of Unit 4, from 4,169 ft MD to 4,416 ft MD (935 ft BML to 1,182 ft BML) is interpreted as primarily fine-grained stratified deposits and is assessed to have low SWF potential (Figures 6 through 8). The EB 599 #1 well, approximately 78 ft southeast of the proposed EB 599 #Z wellsite, observed slight to moderate flow while drilling at the base of Unit 4, between 4,904 ft MD to 5,655 ft MD (1,668 ft BML to 2,419 ft BML) within the surface casing interval. No flow was observed when drilling ahead (Figure 8). The lower part of Unit 4, from 4,416 ft MD to 4,977 ft MD (1,182 ft BML to 1,743 ft BML) is interpreted as sand-prone channelized deposits with fine-grained MTDs and is assessed to have moderate SWF potential.

The upper part of Unit 5 represents a continuation of the sand-prone sediments of lower Unit 4. Lower Unit 5 is interpreted to represent an overall fine- to coarse-grained section; however, sand content is inferred to be reduced and the stratigraphy less laterally continuous. Relatively minor flows were reported during drilling at offset well EB 599 #1 within this interval, with minor background and connection gas noted from 6,100 ft MD to 6,608 ft MD (2,873 ft BML to 3,381 ft BML), where the well was observed to be flowing. The well was filled with sea water to control the flow. When running 16-inch casing at 6,510 ft MD (3,283 ft BML), pipe stuck and the well started flowing again. The whole of Unit 5 is assessed to have moderate SWF potential (4,977 ft MD to 6,585 ft MD; 1,743 ft BML to 3,351 ft BML; Figure 8).

Unit 6 is inferred to comprise mostly shales with some fine-grained MTDs and possible sand; this is supported by a lithology report in the daily drilling reports of the EB 599 #2 well. This interval is assessed to have low SWF potential.

Based on the analysis of regional SWF hazard and the incorporated offset well information reviewed, it is important to consider the possibility of encountering overpressured sands within the riserless drilling interval of this proposed well. Appropriate SWF mitigation practices should be implemented when drilling through any intervals that have been assessed as having non-negligible potential for SWF in the tophole section. In general, pore-pressure modeling may assist in predicting flow; in the absence of pore-pressure modeling, the best mitigation is caution during drilling.

Wellbore Stability

Nearby offset well EB 599 #1 is reported to have encountered numerous tight spots within Units 4 and 5 below the 20-inch casing shoe depth. The tight spots were encountered between 4,710 ft MD (1,474 BML) and 5,877 ft MD (1,820 BML) in Unit 4 and again while tripping in to 6,586 ft MD. Reported mitigations include increase in weight of bit, washing, circulating, and using high-viscosity sweeps to clean out tight spots. These events appear to be associated with inferred sand-prone sediments as well as discontinuous to chaotic reflectors suggestive of chaotic deposits such as MTDs. Either may be mechanically weaker, or less consolidated in the case of MTDs, than stratified predominantly fine-grained marine deposits, with the inferred result being episodes of formation sluffing to cause tight-hole episodes. Tight spots were the major shallow drilling difficulties encountered by offset wells within EB Block 599 and the immediate vicinity (Fugro, 2023).

Suitability for Temporary Occupation for Drilling and Recommendations

Proposed well location EB 599 #Z is considered suitable for temporary-occupation drilling activities, provided the aforementioned conditions and constraints are considered and planned for in the final well design. With respect to seafloor conditions, the reported location of an umbilical coincides with the proposed wellsite. There are other pipelines/umbilicals, a well, a PLET, and other infrastructure reported in the local area. Fugro recommends these infrastructure items be carefully considered during final planning for the proposed well and during well drilling and installation activities. We reiterate the recommendation to inspect the seafloor at the proposed wellsite prior to spud to ensure the absence of any other unreported obstructions.

With respect to subsurface geologic hazards, Fugro recommends caution when drilling through shallow amplitude anomalies indicative of possible shallow gas presence in Units 4 and 5. In addition, the proposed wellsite is inferred to be on the margin of an area of known SWF sand presence: the Garden Banks/East Breaks areas "Orange Unit." Additionally, tight spots are recognized as the most common type of drilling difficulty encountered at offset wells.

It is recommended the several nearby offset wells within the EB Block 599 area be studied with respect to the drilling methodologies employed that resulted in overall successful shallow section drilling, in order to best inform the well design and drilling plan. The assessment of drilling hazards presented in this letter conveys the likelihood of particular hazards occurring based on a review of the available data and does not forecast the severity of any events that may occur.

Closing

We appreciate the opportunity to work with you on this project and look forward to continuing as your geohazards consultants. If you have any questions concerning this assessment, please do not hesitate to contact Stephen Varnell by phone at (713) 369-5822 or email at svarnell@fugro.com.

Yours faithfully,



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Staff Geoscientist



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Senior Consultant Geoscientist
and Drilling Geohazards Technical Lead



Rebecca Boon, PG
Consultant Geoscientist



Stephen Varnell, PG (TX, CA), CEG (CA)
Principal Geoscientist

Figures

Figure 1: 3D Seismic Power Spectrum

Figure 2: Seafloor Rendering

Figure 3: Water Depth and Seafloor Features

Figure 4: Seafloor Amplitude Rendering

Figure 5: Subsurface Geologic Features

Figure 6: Portion of Inline 12394 through Proposed Wellsite EB 599 #Z

Figure 7: Portion of Crossline 5620 through Proposed Wellsite EB 599 #Z

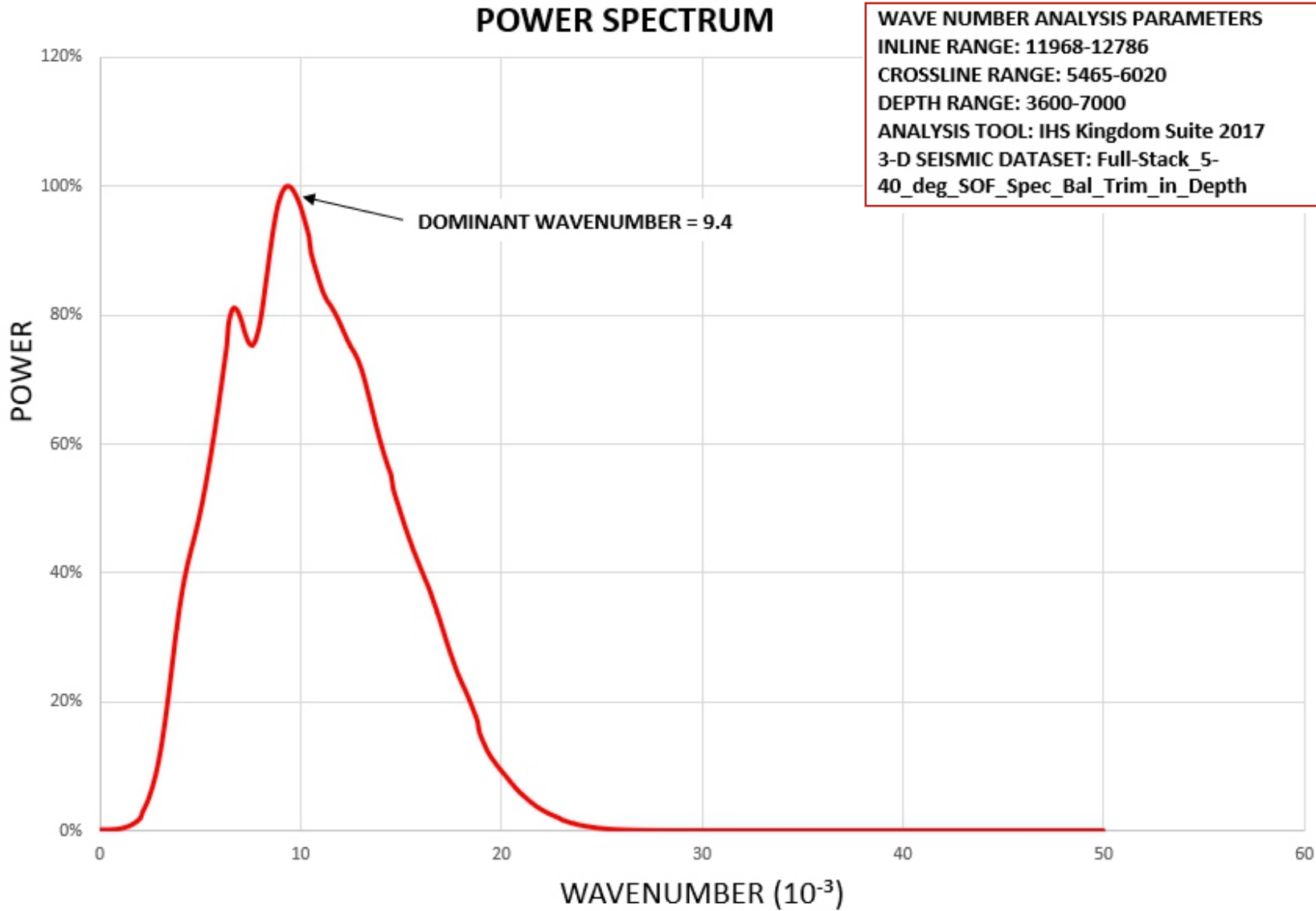
Figure 8: Tophole Prognosis Chart, Proposed Wellsite EB 599 #Z

References

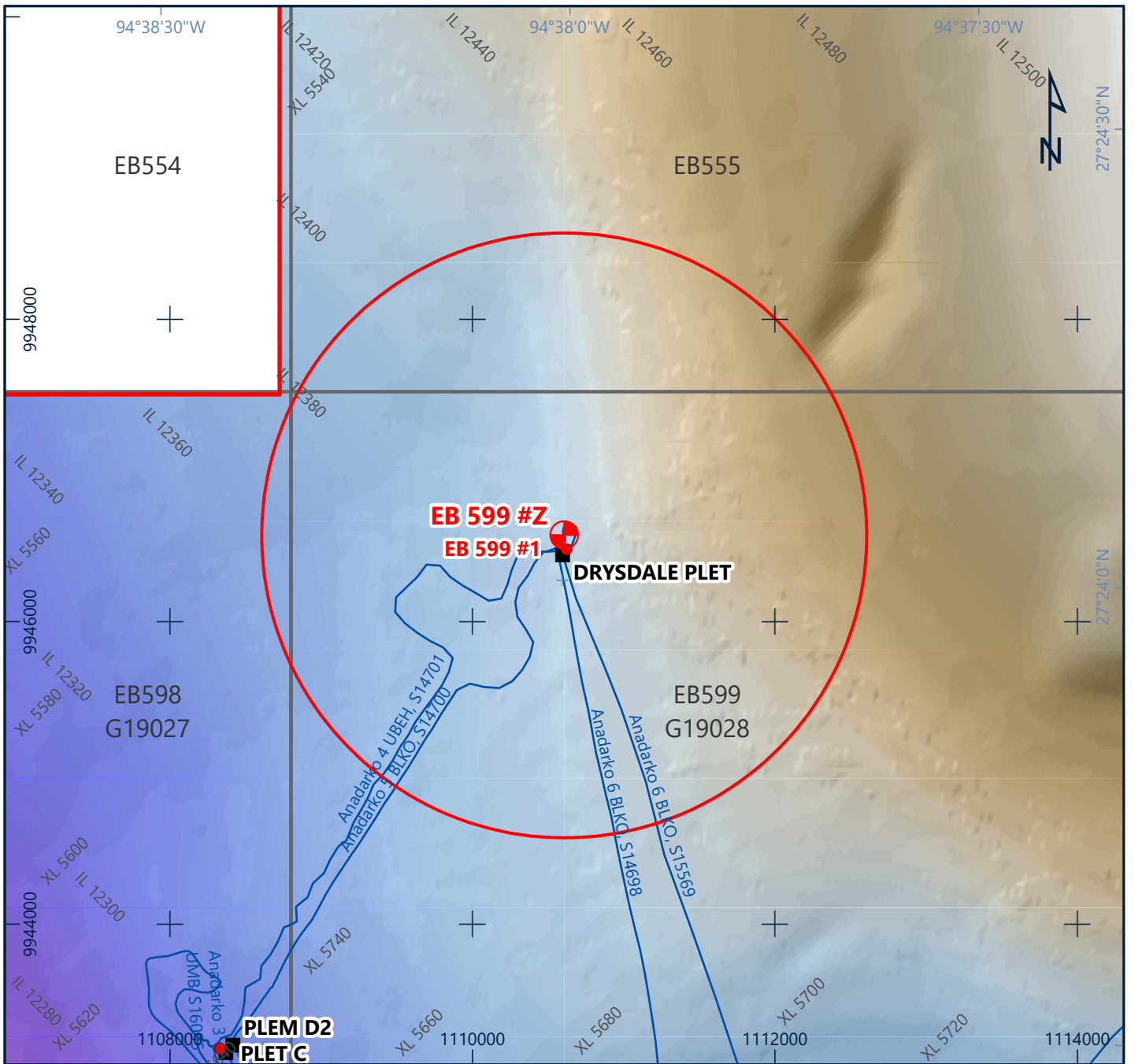
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Figures



3D SEISMIC POWER SPECTRUM







EPSG CODE 32065 COORDINATE SYSTEM NAD 1927 Zone 15N

0 500 1000 US Feet

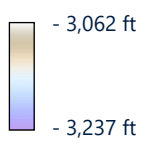
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LEGEND

BACKGROUND

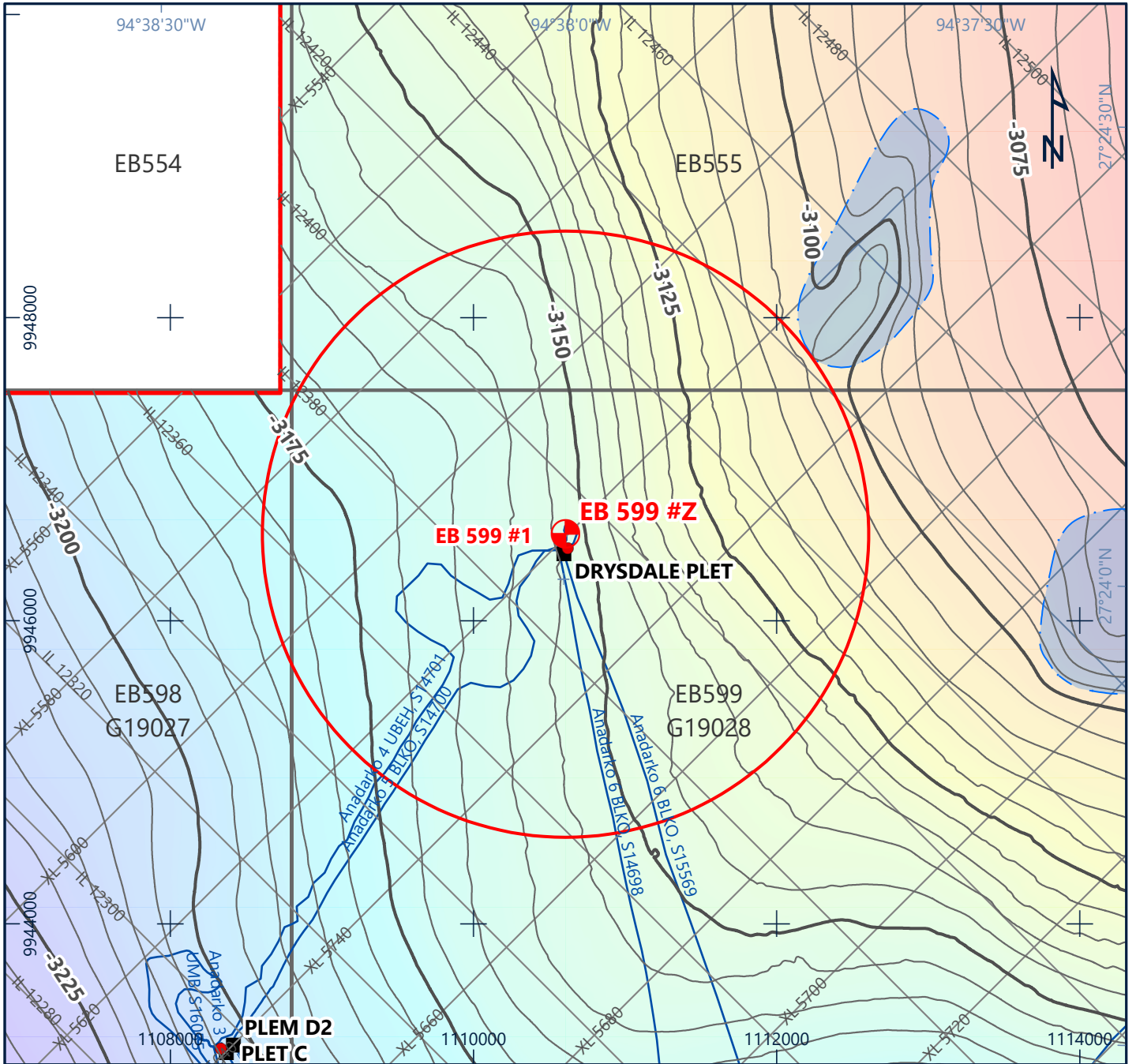
-  Proposed well location with 2,000-ft buffer
- IL 12300 3D Survey line number
-  Existing Pipeline or Pipeline Segment
-  Well Surface Location
-  Platform, PLET or PLEM

WATER DEPTH



**SEAFLOOR RENDERING
PROPOSED WELLSITE EB 599 #Z**










EPSG CODE 32065 COORDINATE SYSTEM NAD 1927 Zone 15N

0 500 1000 US Feet

Scale 1:12,000 at original 8.5"x11" page size

LEGEND

BACKGROUND

-  Proposed well location with 2,000-ft buffer
-  IL 12300 3D Survey line and number
-  Existing Pipeline or Pipeline Segment
-  Well Surface Location
-  Platform, PLET or PLEM

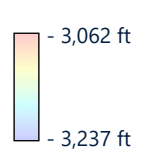
SEAFLOOR FEATURES

-  Interpreted Fluid Expulsion Site

BATHYMETRY CONTOURS

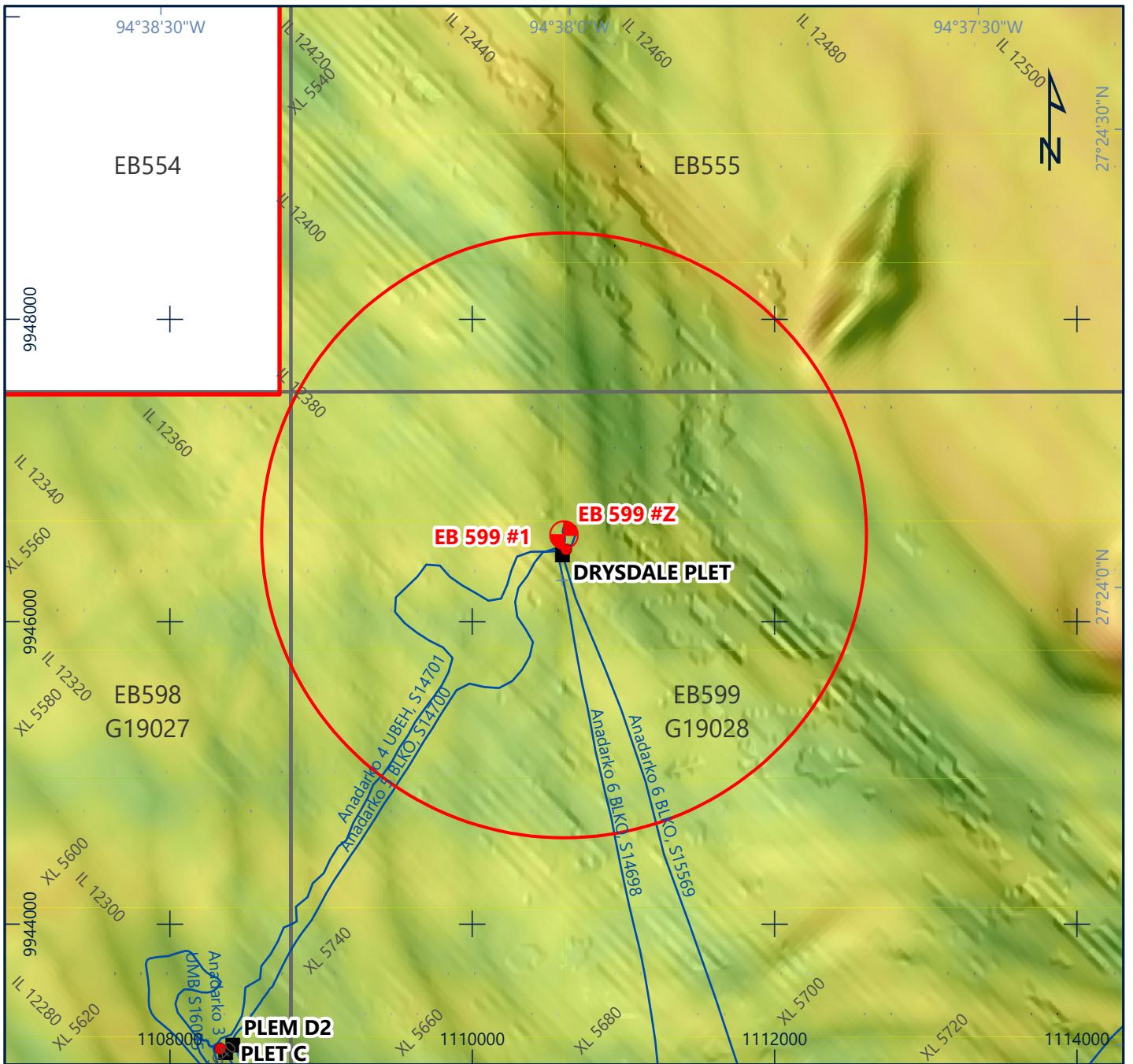
-  Major - 25 ft interval
-  Minor - 5 ft interval

WATER DEPTH



**WATER DEPTH AND SEAFLOOR FEATURES
PROPOSED WELLSITE EB 599 #Z**









EPSG CODE 32065 COORDINATE SYSTEM NAD 1927 Zone 15N

0 500 1000 US Feet

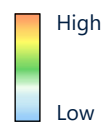
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LEGEND

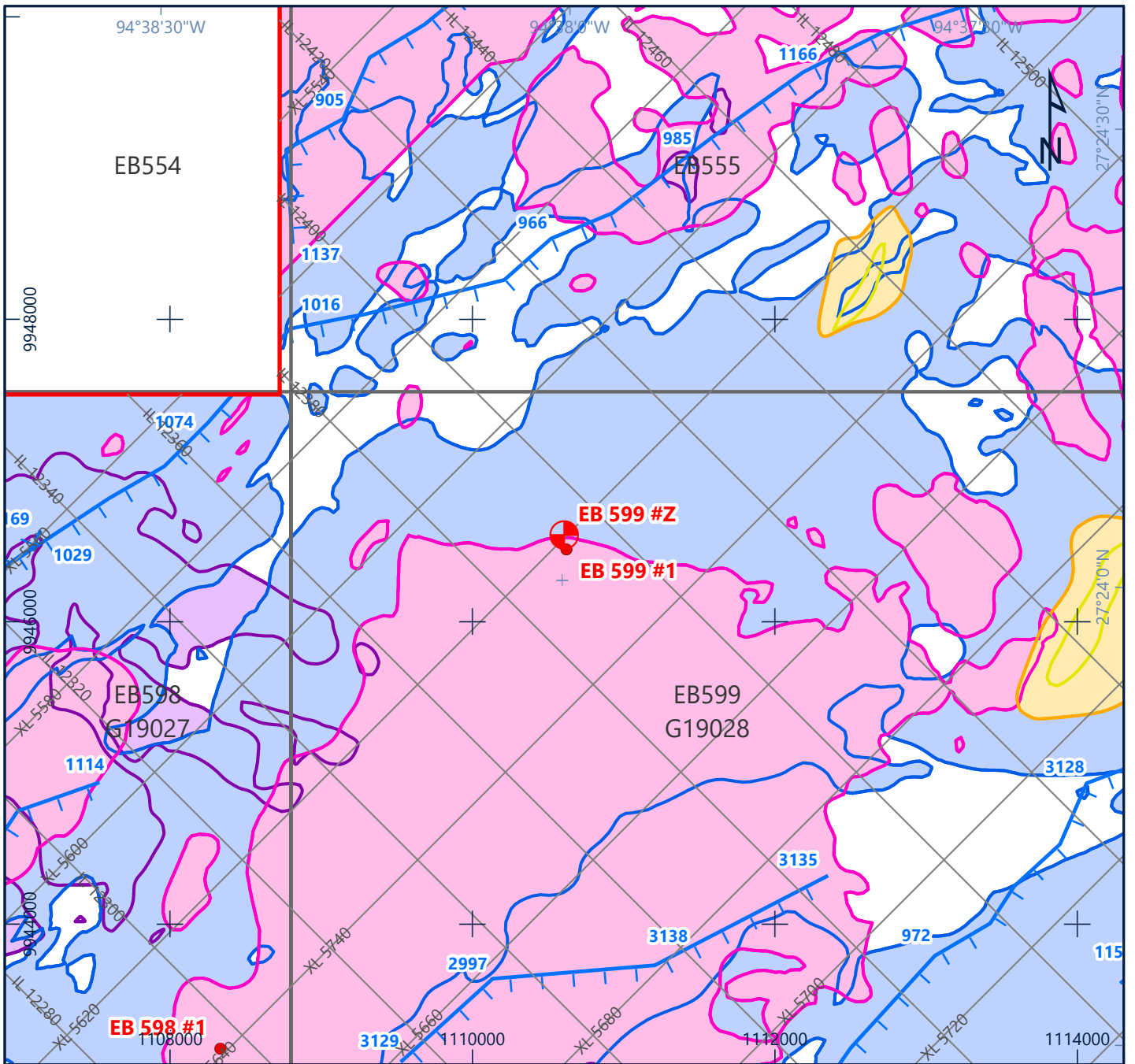
BACKGROUND

-  Proposed well location with 2,000-ft buffer
- IL 12300 3D Survey line number
-  Existing Pipeline or Pipeline Segment
-  Well Surface Location
-  Platform, PLET or PLEM

RELATIVE SEAFLOOR AMPLITUDE



**SEAFLOOR AMPLITUDE RENDERING
PROPOSED WELLSITE EB 599 #Z**



EPSG CODE 32065 COORDINATE SYSTEM NAD 1927 Zone 15N

0 500 1000 US Feet

Scale 1:12,000 at original 8.5"x11" page size

LEGEND

BACKGROUND



Proposed well location

IL 12300 3D Survey line and number



Well Surface Location

SUBSURFACE FEATURES



Buried Fault and Depth BML (ft)

AMPLITUDE ANOMALIES



UNIT 1



UNIT 3



UNIT 4

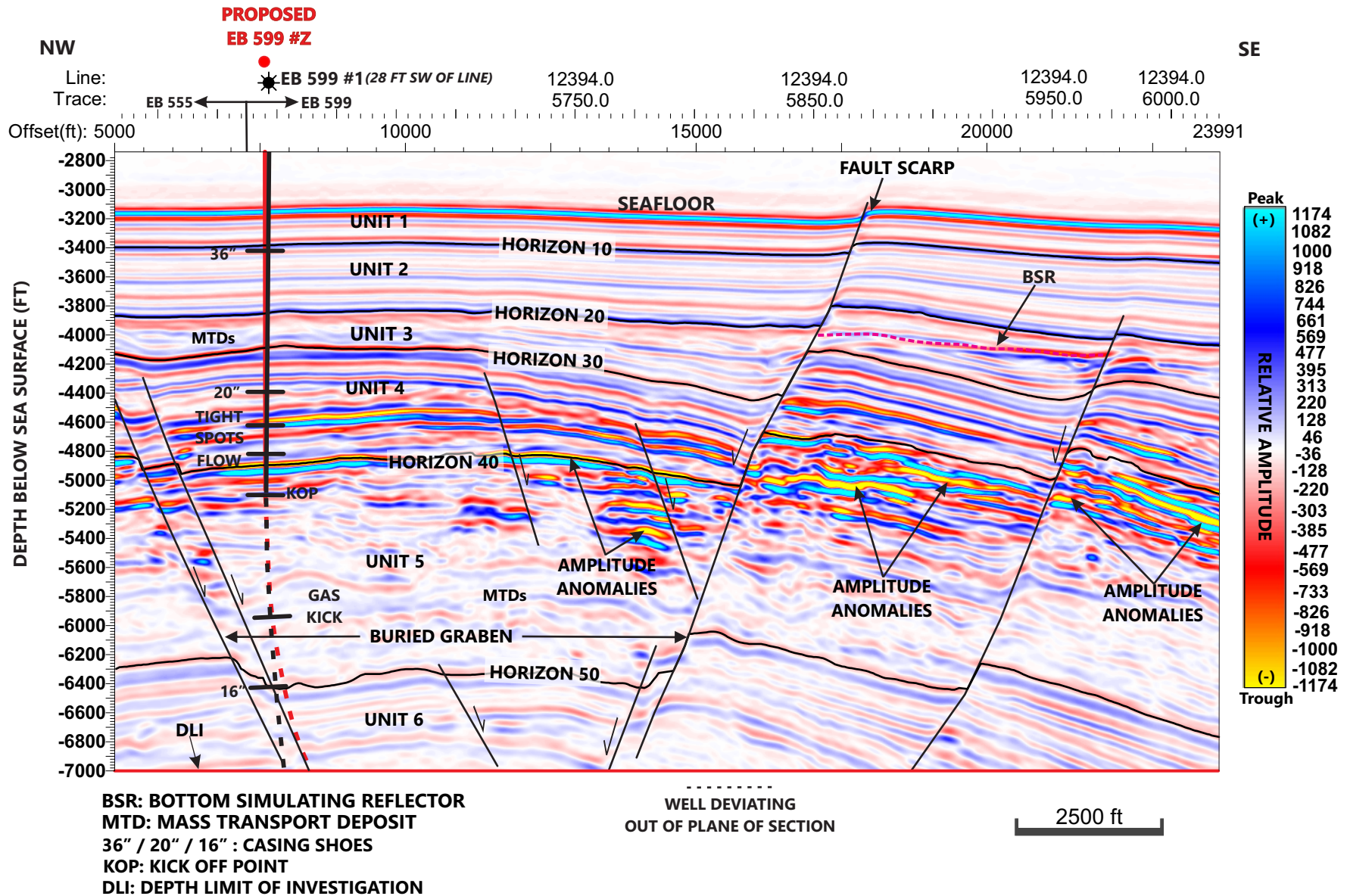


UNIT 5

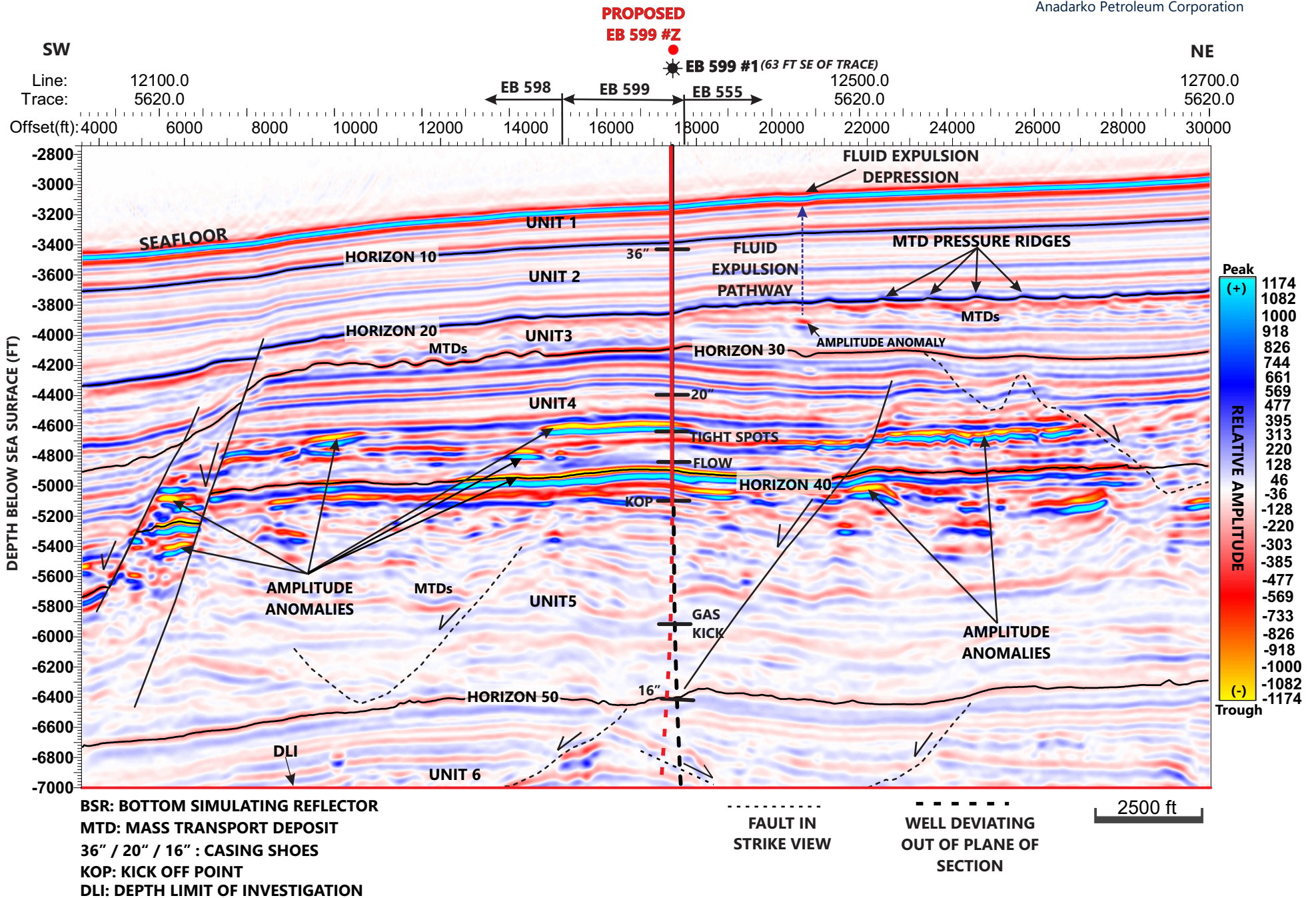


UNIT 6

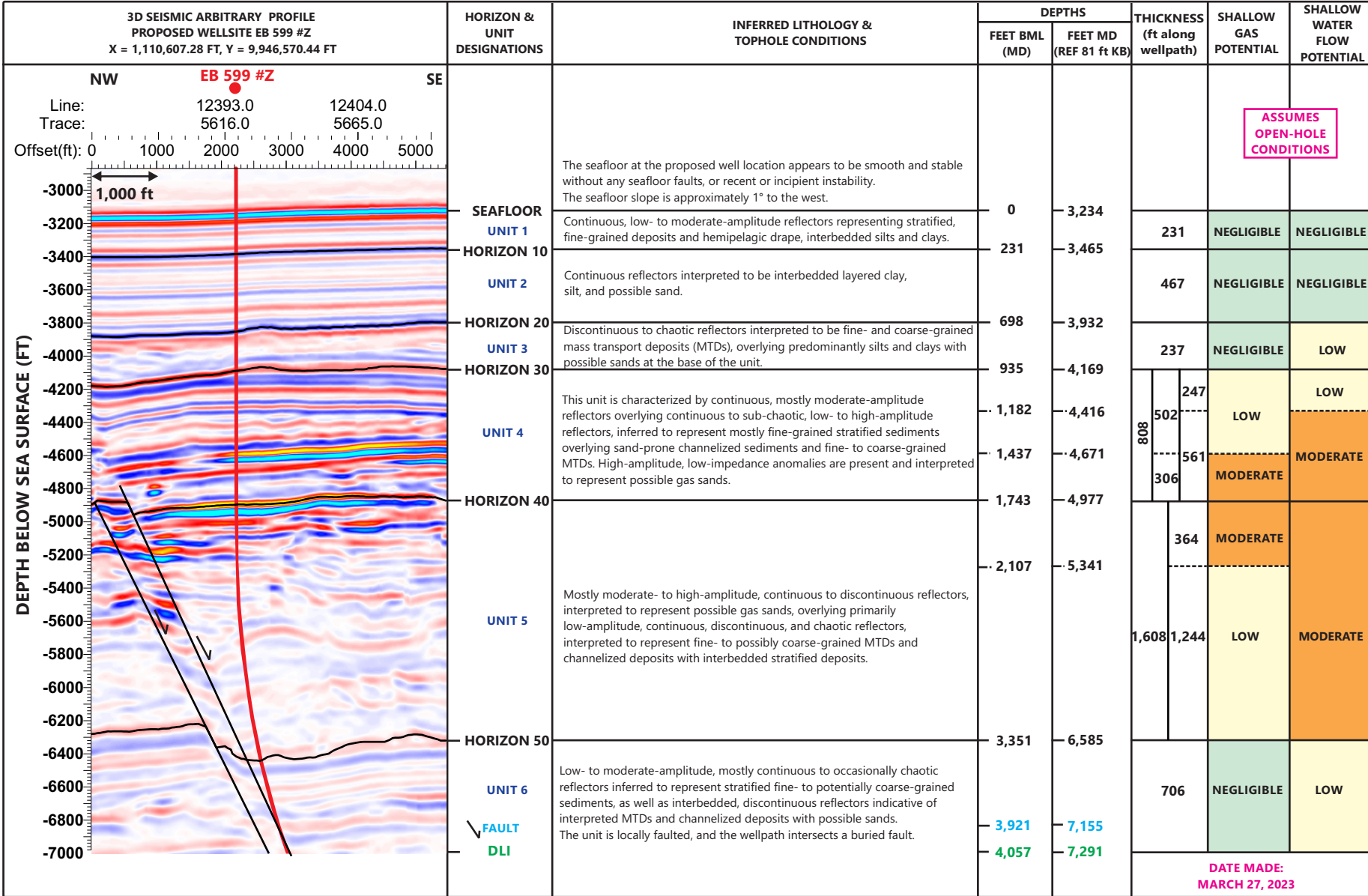
**SUBSURFACE GEOLOGIC FEATURES
PROPOSED WELLSITE EB 599 #Z**



PORTION OF INLINE 12394 THROUGH PROPOSED WELLSITE EB 599 #Z



PORTION OF CROSSLINE 5620 THROUGH PROPOSED WELLSITE EB 599 #Z



BML: Below Mud Line
DLI: Depth Limit of Investigation
MTD: Mass Transport Deposit

Negligible: Not present or no possibility of occurrence
Low: Unlikely presence or occurrence; not significant
Moderate: Possible presence or occurrence; mitigation measure recommended
High: Probable presence or occurrence; mitigation measures highly recommended

**TOPHOLE PROGNOSIS CHART
PROPOSED WELLSITE EB 599 #Z**



SECTION D
HYDROGEN SULFIDE INFORMATION

Anadarko does not anticipate encountering H₂S while conducting the proposed activities.

The proposed EB 599 “Z/ZZ”, EB 599 “Y/YY”, and EB 599 “X/XX” locations will penetrate and test a stratigraphic section from the seafloor through the objective sands. The equivalent sand section has been penetrated by multiple wells in EB 598 and 599. None of these penetrations encountered any Hydrogen Sulfide within the supra-salt section. No Hydrogen Sulfide is expected to be encountered in this wellbore.

Since no (H₂S) was encountered in any of these wells we request the area be classified as “H₂S absent”.

H₂S Contingency Plan

Anadarko does not anticipate encountering H₂S while conducting the proposed activities, therefore a contingency plan is not required at this time.

Modeling Report

Anadarko does not anticipate encountering H₂S while conducting the proposed activities, therefore a modeling report is not required at this time.

SECTION E
Mineral Resource Conservation Information

(a) Technology and Reservoir Engineering Practices and Procedures

Anadarko does not plan to use enhanced recovery methods for 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 ~3,153' - 3,204' 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 America 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 America
			Project Area	Coastal	
Marine Mammals					
Rice's whale	<i>Balaenoptera ricei</i>	E	X	--	None
Sperm whale	<i>Physeter macrocephalus</i>	E	X	--	None
West Indian manatee	<i>Trichechus manatus</i> ¹	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	<i>Caretta caretta</i>	T,E ²	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); <i>Sargassum</i> habitat including most of the central & western Gulf of America
Green turtle	<i>Chelonia mydas</i>	T	X	X	None
Leatherback turtle	<i>Dermochelys coriacea</i>	E	X	X	None
Hawksbill turtle	<i>Eretmochelys imbricata</i>	E	X	X	None
Kemp's ridley turtle	<i>Lepidochelys kempii</i>	E	X	X	None
Birds					
Piping Plover	<i>Charadrius melodus</i>	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	<i>Grus americana</i>	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Black-capped Petrel	<i>Pterodroma hasitata</i>	E	X	--	None
Rufa Red Knot	<i>Calidris canutus rufa</i>	T	--	X	None

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of America
			Project Area	Coastal	
Fishes					
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	T	X	--	None
Giant manta ray	<i>Mobula birostris</i>	T	X	X	None
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	<i>Epinephelus striatus</i>	T	--	X	None
Smalltooth sawfish	<i>Pristis pectinata</i>	E	--	X	Southwest Florida
Invertebrates					
Elkhorn coral	<i>Acropora palmata</i>	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	<i>Acropora cervicornis</i>	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	<i>Dendrogyra cylindrus</i>	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	<i>Mycetophyllia ferox</i>	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	<i>Orbicella annularis</i>	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	<i>Orbicella faveolata</i>	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	<i>Orbicella franksi</i>	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	<i>Procambarus econfinae</i>	T	--	X	South-central Bay County, Florida
Queen conch	<i>Aliger gigas</i>	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	<i>Peromyscus polionotus</i>	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	<i>Microtus pennsylvanicus dukecampbelli</i>	E	--	X	None

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

¹There are two subspecies of West Indian manatee: the Florida manatee (*T. m. latirostris*), which ranges from the northern Gulf of America to Virginia, and the Antillean manatee (*T. m. manatus*), which ranges from northern America to eastern Brazil. Only the Florida manatee subspecies is likely to be found in the northern Gulf of America. On 30 March 2017, the USFWS announced the West Indian manatee, including the Florida manatee subspecies, was reclassified as Threatened.

²The 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

East Breaks 598 and 599 are not located in an area designated as having high archaeological potential and, as such, an Archaeological Report is not required per NTL No. 2011-JOINT-G01. However, an Archaeological Report prepared by Oceaneering, covering areas of EB 555, 598, & 599, was submitted under EP Plan Control No. N-10241 (EB 555 IEP). The survey was conducted in accordance with the latest guidelines established by the BOEMRE in 2011.

(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, completion, and potential workover operations within the EB 599 block are reflected below. Projected amounts may vary during operations. Total amounts reflected under sections (a) and (b) assume drilling, completing, and conducting flowbacks on 6 wells will take a total of 450 days (75 day/well). Same assumptions apply to potential future workover ops. Total amounts reflected under sections (c) and (d) assume subsea installation and commissioning activities for 1 well will take a total of 10 days.

(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	10,000 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	9,600 bbls/well	Treated and discharge overboard <i>*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.</i>
Water-based drilling fluids	Water based drilling muds (NaCl saturated, seawater, freshwater, barite)	17,000 bbls/well**	Discharge overboard or at seafloor
Cuttings wetted with water-based fluids	Cuttings coated with water-based drilling muds/fluids	8,400 bbls/well	Discharge overboard
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene Diesel	1,498.5 bbls total 373.5 bbls total 7501.5 bbls total 300 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. <i>*Note, on average an estimated 5-10% of product total volume used during well treatment ops is sent back to shore for disposal. Volume shown reflects volume to be disposed of</i>
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 / recompletion 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	750 bbls total	Transport to shore in disposal bags by vessel to shorebase for pickup by municipal operations.
*Sanitary Wastes	Treated human body waste	2,250,000 gals total	Chlorinate and discharge overboard
*Domestic Waste	Gray water	2,250,000 gals total	Chlorinate and discharge overboard
Deck drainage	Platform washings and rainwater	1,575,000 bbls total	Treat for oil and grease and discharge overboard
Subsea production control fluid	Subsea production control fluid for actuating valves	50 bbls/well during commissioning and start-up. 12 bbls/well/year average during normal operations	Discharge at seafloor
Produced water	Formation water	18,000 bbls total	Treat through flotation unit and discharge overboard
Desalinization Unit	Seawater	157,000 bbls total	Discharge overboard
Wash water	Drill/water (fresh)	22,500 bbls total	Discharge overboard
Blowout preventer fluid	Blend (3% Stack Magic & Filtered Fresh Water)	59,464 gals total	Discharge at seafloor
Ballast water	Seawater	47,650 m3/year	Discharge overboard
Bilge water	Seawater	142,650 bbls total	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	Nitrified cement slurry	1,500 bbls/well	Discharge overboard
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	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	1,613 bbls total	Transport in DOT approved containers to shore for recycling

**The rig is designed for maximum personnel capacity of 200 people. The discharge rates are based off of maximum personnel capacity but will generally not have this many personnel onboard during drilling and/or completion operations.*

***The actual volume of water-based ordered out will be an estimated 15,000 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 17,000 bbls/well (17,000 bbls/well x 6 well locations=102,000 bbls total)*

(b) Projected Ocean Discharges - -- Drilling and Completion Operations

Type of Waste	Total Amount to be Discharged	Discharge Rate	Discharge Method
*Sanitary Wastes	2,250,000 gals total	25 gals per person daily	Chlorinate and discharge overboard
*Domestic waste	2,250,000 gals total	25 gals per person daily	Chlorinate and discharge overboard
Deck drainage	1,575,000 bbls total	3,500 bbls/well/day	Treat for oil and grease and discharge overboard
Desalinization Unit	157,500 bbls total	350 bbls/well/day	Discharge overboard
Wash water	22,500 bbls total	50 bbls/day/well	Discharge overboard
Blowout preventer fluid	59,464 bbls total	925 gals/week/well	Discharge at seafloor
Ballast water	47,650 m3/year	Not continuous	Discharge overboard
Bilge water	142,650 bbls	317 bbls/day	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	9,000 bbls total	1,500 bbls/well	Discharge at seafloor
Fire water	61,713,900 bbls total	137,142 bbls/day	Discharge overboard
Cooling water	61,713,900 bbls total	137,142 bbls/day	Discharge overboard
Cuttings wetted with Water-based fluids	50,400 bbls total	8,400 bbls/well	Discharge overboard
Water-based drilling fluids	102,000 bbls total	17,000 bbls/well**	Discharge at seafloor or overboard
Cuttings wetted with Synthetic-based fluids	57,600 bbls total	9,600 bbls/well	Treated and discharge overboard <i>*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.</i>
Subsea production control fluid	50 bbls/well during commissioning and start-up. 12 bbl/well/year average during normal operations	5 bbl/well/day during commissioning and start-up (1 well @ 10 days total). 1 bbl/well/month average during normal operations	Discharge at seafloor
Produced Water	18,000 bbls total	3,000 bbls/well	Treat through flotation unit and discharge overboard
Non-pollutant completion / recompletion fluids	30,000 bbls total	100 bbl/hour	Discharge overboard

**The rig is designed for maximum personnel capacity of 200 people. The discharge rates are based off of maximum personnel capacity but will generally not have this many personnel onboard during drilling and/or completion operations.*

***The actual volume of water-based ordered out will be an estimated 15,0000 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 17,000 bbls/well (17,000 bbls/well x 6 well locations=102,000 bbls total)*

(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 <i>*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.</i>
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
Chemical product waste (well treatment fluids)	Ethylene glycol	33.3 bbls total	Transport to shore in DOT approved containers to an approved waste disposal facility, such as Fourchon, Louisiana and on to Ecoserv Base. <i>*Note, on average an estimated 5-10% of product total volume used during well treatment ops is sent back to shore for disposal. Volume shown reflects volume to be disposed of</i>
	Methanol	8.3 bbls total	
	Xylene	166.7 bbls total	
	Diesel	50 bbls total/year	
Completion/Recompletion Fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	N/A	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/ recompletion fluids	Low density uninhibited completion brines	N/A	Discharge overboard
Workover fluids/ Stim fluids	Brine, spent acid, prop sand, debris, gelled fluids, dead oil	N/A	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	17 bbls total	Transport to shore in disposal bags by vessel to shorebase for pickup by municipal operations.
*Sanitary Wastes	Treated human body waste	50,000 gals total	Chlorinate and discharge overboard
*Domestic Waste	Gray water	50,000 gals total	Chlorinate and discharge overboard

Type of Waste	Composition	Projected Amount	Treatment/Storage/Disposal
Deck drainage	Platform washings and rainwater	35,000 bbls total	Treat for oil and grease and discharge overboard
Subsea production control fluid	Subsea production control fluid for actuating valves	50 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	3,500 bbls total	Discharge overboard
Wash water	Drill/water (fresh)	500 bbls total	Discharge overboard
Blowout preventer fluid	Blend (3% Stack Magic & Filtered Fresh Water)	N/A	Discharge at seafloor
Ballast water	Seawater	47,650 m3/year	Discharge overboard
Bilge water	Seawater	3,170 bbls total	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	Nitrified cement slurry	N/A	Discharge overboard
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	36 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	50,000 gals	25 gals per person daily	Chlorinate and discharge overboard
*Domestic waste	50,000 gals	25 gals per person daily	Chlorinate and discharge overboard
Deck drainage	35,000 bbls	3,500 bbls/well/day	Treat for oil and grease and discharge overboard
Desalinization Unit	3,500 bbls	350 bbls/well/day	Discharge overboard
Wash water	500 bbls	50 bbls/day/well	Discharge overboard
Blowout preventer fluid	N/A	N/A	Discharge at seafloor
Ballast water	47,650 m3/year	Not continuous	Discharge overboard
Bilge water	3,170 bbls total	317 bbls/day	Discharge overboard through 15 ppm equipment
Excess cement at the seafloor	N/A	N/A	Discharge at seafloor
Fire water	1,371,420 bbls	137,142 bbls/day	Discharge overboard
Cooling water	1,371,420 bbls	137,142 bbls/day	Discharge overboard
Cuttings wetted with Water-based fluids	N/A	N/A	Discharge overboard
Water-based drilling fluids	N/A	N/A	Discharge at seafloor or overboard
Cuttings wetted with Synthetic-based fluids	N/A	N/A	Treated and discharge overboard <i>*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.</i>
Subsea production control fluid	50 bbls/well during commissioning and start-up. 12 bbl/well/year average during normal operations	5 bbl/well/day during commissioning and start-up (1 well @ 10 days each= 10 days total). 1 bbl/well/month average during normal operations	Discharge at seafloor
Produced Water	N/A	N/A	Treat through flotation unit and discharge overboard
Non-pollutant completion/ recompletion fluids	N/A	N/A	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 ₂ S 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

(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. Well life production emissions not included since the well(s) will tieback and produce from the Boomvang Spar located in EB Block 643. The facility air emissions were previously approved utilizing max throughput volumes, therefore placing additional wells onto production does not increase the facility AQR's. NOTE: AQR totals also include vessels for unplanned/ hypothetical operations throughout upcoming years to provide air emission coverage for unforeseen operations for all wells within East Breaks Block 599. Air Emission Spreadsheets have been prepared and are enclosed as **Attachment H-1**.

(c) Summary Information

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL					
Anadarko Petroleum Corporation	599	OCS-G 19028		EB 599 Z, ZZ, Y, YY, X & XX; Location "Y" is planned to be used for drilling the EB 599 #SS005						
Year	Facility Emitted Substance									
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	
2026-2031	40.95	24.74	24.00	0.62	982.08	29.59	0.00	166.61	0.29	
2032-2036	40.95	24.74	24.00	0.62	982.08	29.59	0.00	166.61	0.29	
Allowable	3,629.70			3629.70	3629.70	3629.70		77582.41		

Jill Wiederhold
Regulatory Consultant
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DOCD/DPP - AIR QUALITY

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

COMPANY	Anadarko Petroleum Corporation
AREA	East Breaks
BLOCK	599
LEASE	OCS-G 19028
FACILITY	
WELL	EB 599 Z, ZZ, Y, YY, X & XX; Location "Y" is planned to be used for drilling the EB 599 #SS005
COMPANY CONTACT	Jill Wiederhold
TELEPHONE NO.	832-636-1554
REMARKS	Drill/Complete EB 599 Z, ZZ, Y, YY, X & XX (years 2026-2031); Place EB 599 #SS005 on production (tieback to EB643-A); also includes vessels for unplanned/ hypothetical operations through years 2032-2036 to cover unforeseen well operations within EB Block 599. Well life production emissions not included since the well(s) will tieback and produce from the Boomvang Spar located in EB Block 643. The facility air emissions were previously approved utilizing max throughput volumes, therefore placing additional wells onto production does not increase the facility AQR's.

The Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.) requires us to inform you that BOEM collects this information as part of an applicant's DOCD submitted for our approval. We use the information to facilitate our review and data entry for OCS plans. We will protect proprietary data according to the Freedom of Information Act and 30 CFR 250.197. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid Office of Management and Budget (OMB) control number. Responses are mandatory (43 U.S.C. 1334). The reporting burden for this form is included in the burden for preparing EPs and DOCDs. We estimate that burden to average 700 hours per response, including the time for reviewing instructions, gathering and maintaining the data, and completing and reviewing the forms associated with subpart B. Direct comments on the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166.

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	6.9998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttnchie1/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/ttnchie1/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/ttnchie1/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/ttnchie1/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf
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://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
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 NEILTSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
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 NEILTSP refer to Diesel Recip. > 600 hp reference	3/19	
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 NEILTSP (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 NEILTSP 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/cru1/final/c03s04.pdf https://www3.epa.gov/ttnchie1/ap42/cru1/final/c03s04.pdf
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/ttnchie1/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.aplwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b6238701125d
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 NEILTSP 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 NEILTSP 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 - 4TH YEAR

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																	
Anadarko Petroleum Corporation	East Breaks	599	OCS-G 19028		EB 599 Z ZZ Y YY X & XX Location "Y" is planned to be used for drilling the EB 599 #SS005	Wiederhorn	832-636-1554	Drill/Complete EB 599 Z ZZ Y YY X & XX (years 2026-2031). Place EB 599 #SS005 on production (lieback to EB643-A). also includes vessels for unplanned/hypothetical operations #																	
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATINGS	MAX. FUEL		ACT. FUEL		RUN TIME		MAXIMUM POUNDS PER HOUR										ESTIMATED TONS					
				HP	SCF/HR	GAU/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
DRILLING	VESSLS - Drilling - Propulsion Engine - Diesel		64370	3311.579	7947.90	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
	VESSLS - Drilling - Propulsion Engine - Diesel		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	0.00	0.00
	VESSLS - 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
	VESSLS - 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	VESSLS - 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	VESSLS - 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	VESSLS - 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	--
	VESSLS - 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
	VESSLS - 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	--	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	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	0																		
	COMBUSTION FLARE - no smoke		0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--
	COMBUSTION FLARE - light smoke		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	--
	COMBUSTION FLARE - medium smoke		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	--
	COMBUSTION FLARE - heavy smoke		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	--
	COLD VENT			0	0	0	0	--	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--
	FLUGITIVES			0	0	0	0	--	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--
	GLYCOL DEHYDRATOR			0	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	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	0.00	0.00	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			833333	24	4	1.75	1.75	1.75	0.48	59.50	29.94	--	271.25	--	0.08	0.08	0.08	0.02	2.86	1.44	--	13.02	--	
	COMBUSTION FLARE - medium smoke			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	--	
	COMBUSTION FLARE - heavy smoke			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	--	
ALASKA-SPECIFIC SOURCES	VESSLS		kW			HR/D	D/YR																		
	VESSLS - 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	--
2026-2031	Facility Total Emissions							47.16	29.15	28.33	1.14	1,147.53	#DIV/0!	0.00	441.90	0.32	40.96	24.74	24.00	0.62	982.08	29.59	0.00	166.61	0.29
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																								
	109.0																								
DRILLING	VESSLS - Crew Diesel (3 trips/week)		10551	542.80675	13027.36	24	32	7.44	4.49	4.36	0.11	178.34	5.13	0.00	27.97	0.05	2.86	1.72	1.67	0.04	68.48	1.97	0.00	10.74	0.02
	VESSLS - Supply Diesel (2 trips/week)		14805	761.65803	18279.79	24	21	10.44	6.30	6.11	0.15	250.24	7.20	0.00	39.25	0.07	2.63	1.59	1.54	0.04	63.06	1.81	0.00	9.89	0.02
	VESSLS - Supply Diesel (Flowback Vessel)		12,217	628.51578	15084.38	24	2	8.62	5.20	5.04	0.13	206.50	5.94	0.00	32.39	0.06	2.21	1.12	1.12	0.02	4.96	0.14	0.00	0.78	0.00
	VESSLS - Supply (2) Diesel (Support Vessel)		27493	1414.4049	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	VESSLS - Support Diesel, Laying		45000	2315.07	55561.68			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	VESSLS - 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
	VESSLS - 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
	VESSLS - 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	VESSLS - Multi Service Vessel (MSV)		22000	1131.812	27163.49	24	10	15.52	9.36	9.08	0.23	371.86	10.69	0.00	58.33	0.11	1.86	1.12	1.09	0.03	44.62	1.28	0.00	7.00	0.01
SUPPLY/SUPPORT	VESSLS - Supply Diesel (LCV Vessel)		12363	638.0269	15264.65			8.72	5.26	5.10															

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL					
Anadarko Petroleum Corporation	599	OCS-G 19028		EB 599 Z, ZZ, Y, YY, X & XX; Location "Y" is planned to be used for drilling the EB						
Year	Facility Emitted Substance									
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	
2026-2031	40.95	24.74	24.00	0.62	982.08	29.59	0.00	166.61	0.29	
2032-2036	40.95	24.74	24.00	0.62	982.08	29.59	0.00	166.61	0.29	
Allowable	3,629.70			3629.70	3629.70	3629.70		77582.41		

**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 latest OSRP biennial update was submitted on June 30, 2025, and in compliance with 30 CFR 254.30(a) as of October 14, 2025.

(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 America. 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 America 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	Production
Facility Location (area/block)	GC 683	EB 599	GC 680	EB 599
Facility Designation	GC 683 G	EB 599 #005 (Loc. Y)	Platform A	EB 599 #005
Distance to Nearest Shoreline	120 miles	109 miles	120 Miles	109 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	232 bbls
Uncontrolled Blowout	403,608 bopd	97,094 bopd	47,380 bopd	10,000 bopd
Total Volume	403,608 bopd	97,094 bopd	66,689 bopd	10,232 bopd
Type of Oil(s)	Oil	Oil	Oil	Oil
API Gravity	28.9°	26.5°	30°	26.5°

Anadarko has determined that the worst-case scenario from the activities proposed in this 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 June 2025 biennial update acknowledged as in compliance in October 2025, 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

The drilling scenario worst-case discharge (WCD) calculations and assumptions within this section utilized guidelines and requirements pursuant with NTL No. 2015-N01. Within this plan, the highest WCD volume for East Breaks Block 599 was determined to be 97,094 BOPD.

The WCD volume assumptions and exhibits are enclosed as **Attachment I-1**.

(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 97,094 bopd

with an API gravity of 26.5°. A discussion of the blowout scenario from this proposed activity is included within this DOCD under **Section B**.

Land Segment and Resource Identification Modeling

The 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 America. Additional information may be referenced in the “Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of America OCS Activities” (OCS Report MMS 2004-026), using the average conditional probability for 3, 10 and 30 day impacts.

East Breaks 599 is located within Launch Area 21. According to the BOEM OSRAM, the trajectory indicates a 9% probability of potential impact to the shoreline in Matagorda County, Texas. The results are shown in **Table I-2**.

Matagorda County is identified as the most probable potential impacted parish or county within the Gulf of America for this operation. Matagorda County is located in Texas and includes Big Boggy National Wildlife Refuge (NWR), Aransas NWR, San Bernard NWR, and Mad Island Wildlife Management Area (WMA).

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 H-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 97,094 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 16% (15,535 bbls) of the initial volume would be evaporated/dispersed within 24 hours.

If approved and appropriate, 4 sorties (8,000 gallons) from the Basler aircraft and 8 sorties (9,600 gallons) from two DC-3 aircrafts could disperse approximately 7,540 barrels of oil.

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% (4,858 bbls) of the total initial worst case discharge could be burned.

Although unlikely in a spill lasting thirty (30) days, potential shoreline impact in Cameron and/or 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 81,559 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 America 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 America 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:		EB 599
i.	Type of Oil (crude, condensate, diesel)	Crude
ii.	API Gravity	26.5°
iii.	Location Used for NTL No. 2015-N01 WCD for EB 599	EB 599 #005, Location “Y”
iv.	Largest Anticipated WCD Rate during blowout	97,094 bopd
v.	WCD Total for Drilling Operations for EB 599 (> 10 miles from shore):	97,094 bopd

Table I-2

Trajectory by Land Segment						
<p>The 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 Western Gulf of America. This information can be found on the BOEM website using 3/10/30 day potential impact, as applicable. The results are listed below.</p>						
Area/Block	OCS-G	Launch Area	Land Segment and/or Resource	Conditional Probability (%)		
				3 days	10 days	30 days
East Breaks 599 Drilling (109 miles from shore)	G19028	Launch Area 21	Cameron County, TX	--	--	2
			Willacy County, TX	--	--	1
		Western Planning Area	Kenedy County, TX	--	--	4
			Kleberg County, TX	--	--	3
			Nueces County, TX	--	--	3
			Aransas County, TX	--	--	4
			Calhoun County, TX	--	1	5
			Matagorda County, TX	--	1	9
			Brazoria County, TX	--	--	3
			Galveston County, TX	--	--	5
			Jefferson County, TX	--	--	2
			Cameron Parish, LA	--	--	5
			Vermilion Parish, LA	--	--	1
			Iberia Parish, LA	--	--	--
Terrebonne Parish, LA	--	--	--			

Table I-3

WCD Scenario Production Activities – Based on a single well uncontrolled blowout (109 miles from shore)
 East Breaks 599, Location Y (#005)
 97,094 bopd (initial volume)
 81,559 bopd (after evaporation/dispersion)
 API Gravity 26.5°

Offshore Equipment from Spill Detection to Equipment Deployment Response Time: East Breaks 599

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	Vermillion	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: East Breaks 599

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	Vermillion	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	Vermillion	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 Egmpopol	1810	100	NA	3	Galveston	2	2	5	2	1	12
SWS Marco	3588	20	NA	3	Vermillion	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Vermillion	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	Vermillion	2	2	2	2	1	9
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermillion	2	2	2	2	1	9
MSRC											
30 ft. Kvichak <i>Marco I Skimmer</i>	3588	24	NA	2	Ingleside	1	1	10	2	1	15
30 ft. Kvichak <i>Marco I Skimmer</i>	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 <i>Marco I Skimmer</i>	3588	24	NA	2	Belle Chasse	1	1	2	2	1	7
30 ft. Kvichak <i>Marco I Skimmer</i>	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+

I-3 *(continued)*

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 not utilize any new or unusual technology during the operations proposed under this DOCD.

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 DOCD will result in the harassment, capture, collection or killing of any 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 May 20, 2025:
 - Appendix A.1: Seismic Survey Mitigation and Protected Species Observer Protocols
 - Appendix A.2: Marine Trash and Debris Awareness and Elimination Survey Protocols
 - Appendix A.3: Vessel Strike Avoidance and Injured/Dead Aquatic Protected Species Reporting Protocols
 - Appendix A.6: Vessel Transit within the Rice’s Whale Area as identified in the 2020 Biological Opinion’s Reasonable and Prudent Alternative (2020 RWA)
 - Appendix A.5: Moon Pool Monitoring Protocol
 - Appendix A.7: 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 area (RWA) for the operations covered under this plan as identified in the 2020 Biological Opinion’s Reasonable and Prudent Alternative (2020 RWA) found in the Biological Opinion (BiOp) issued by the National Marine Fisheries Service (NMFS) on May 20, 2025. If the vessel routes change, BSEE/BOEM will be contacted 15 days in advance.

SECTION K
LEASE STIPULATIONS INFORMATION

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Protected Species

This stipulation is meant to reduce the potential taking of federally protected threatened or endangered species and marine mammals. Anadarko will operate in accordance with BOEM NTL 2016-G01 to minimize the risk of vessel strikes to protected species and will report observations of injured or dead protected species. Anadarko will operate in accordance with BSEE NTL 2015-G03 to prevent intentional and/or accidental introduction of debris into the marine environment.

There is no reason to believe that any of the endangered, protected, or threatened species and marine mammals as listed in the ESA will be incidentally “taken” as a result of the operations under this plan. In the event of an incidental take, Anadarko’s mitigation measures will adhere and be implemented in accordance to the requirements set forth in NTL 2008-G04, extended by NTL 2015-N02.

Military Area

East Breaks 599 is located within Military Warning Area W-147D. Anadarko will enter into an agreement with the 147th Fighter Wing to coordinate the control of electromagnetic emissions. during these proposed operations as needed.

SECTION L
RELATED FACILITIES AND OPERATIONS INFORMATION

(a) Related OCS Facilities and Operations

The proposed subsea well, EB 599 SS005, with a surface location in EB 598 will be tied back to the existing Boomvang Spar in EB Block 643. The well will each be equipped with a 10k subsea wellhead and subsea tree. The EB 599 SS005 subsea tree will be tied into the existing PLEM B1 located in EB 599 via a new well jumper. Production will flow back to the Boomvang Spar via the existing pipeline S-14698. The pipelines will shut-in according to the BSEE regulations in Subpart H and the approved DWOP. The boarding shut down valves will close in 45 seconds. The well will be controlled via a control umbilical. No modifications to the Boomvang Spar are proposed as a part of this plan.

(b) Transportation System

Oil production from the Boomvang Spar will be transported via an existing 16" right-of way (S-13284) export pipeline operated by Williams Oil Gathering LLC which travels to the Galveston A-244 Platform A and then to shore at Freeport Texas. Gas production from the Boomvang Spar will be transported via an existing 18" right-of-way export pipeline (S-13281) operated by Williams Field Services-Gulf Coast Company LLC which travels to Galveston A-244 Platform A and then to Brazos 538 Platform A and then to shore at Markham Texas. 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 expected 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/Recompletion/ Flowback 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	70,000 gallons	1	3 trips/week
Support Vessel	450,698 gallons	1	3 days total/well
Flowback Vessel	302,500 gallons	1	2 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
DP Construction Vessel	450,698 gallons	1	10 days/well; 1 well equals 10 days total

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 area (RWA) for the operations covered under this plan as identified in the 2020 Biological Opinion's Reasonable and Prudent Alternative (2020 RWA) found in the Biological Opinion (BiOp) issued by the National Marine Fisheries Service (NMFS) on May 20, 2025. If the vessel routes change, BSEE/BOEM will be contacted 15 days in advance.

(b) Diesel Oil Supply Vessels

Fuel for the MODU and 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 East Breaks 599 will be transported by 1-2 flowback vessel(s). Anadarko anticipates flaring a max volume of (*proprietary – volume removed*) per well total during the 96-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	<i>Proprietary</i>	1-2/well
Flowback Barge	50,000 – 130,000 bbls	<i>Proprietary</i>	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	60,000 bbls	10,000 bbls/year/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> • Recycle or Reuse • Landfarm • Injection Well
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	57,600 bbls	9,600 bbls/well <i>*An estimated 5-10% of cuttings may be transported to shore</i>	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> • Recycle or Reuse • Landfarm • Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol	1,498.5 bbls	100 bbls/month	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
	Methanol	373.5 bbls	25 bbls/month			
	Xylene	7,501.5 bbls	16.67 bbls/day			
	Diesel	300 bbls total/year	50 bbls/well/year			
Used - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	18,000 bbls	3,000 bbls/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station 	<ul style="list-style-type: none"> • Landfarm • Injection well

Unused - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	18,000 bbls	3,000 bbls/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Anadarko Petroleum Corporation (PMF) – Fourchon LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Reuse Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	750 bbls	50 bbls /month/ well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Anadarko Petroleum Corporation (PMF) – Fourchon LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Reuse Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Used oil from engines	1,613 bbls*	430 bbls/120 days/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Republic Services – LaRose, LA Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> Landfill Landfill
Produced Sand	Oil-contaminated formation Sand	300 bbls/year	50 bbls/well/year	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Republic Services – LaRose, LA Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> Landfill Landfill

NOTE: Total amount assumes drilling, completing, & conduct flowbacks on 6 wells with 450 Total No. of Days (75 day/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	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Baroid or MI Swaco - Fourchon R360 - Fourchon Transfer Station EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> 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	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Baroid or MI Swaco - Fourchon R360 - Fourchon Transfer Station EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> Recycle or Reuse Landfarm Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene Diesel	33.3 bbls total 8.3 bbls total 166.7 bbls total 50 bbls total/year	100 bbls/month 25 bbls/month 16.67 bbls/day 50 bbls/well/year	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration
Used - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> R360 - Fourchon Transfer Station EcoServ – Fourchon transfer station 	<ul style="list-style-type: none"> Landfarm Injection well
Unused - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Anadarko Petroleum Corporation (PMF) – Fourchon LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Reuse Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration

Trash and debris	Refuse generated during operations	17 bbls	50 bbls /month/ well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Used oil from engines	36 bbls	430 bbls/120 days/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill
Produced Sand	Oil-contaminated formation Sand	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill

NOTE: Total amount assumes subsea installation and commissioning activities on 1 well will take a total of 10 days.

(f) Vicinity Map

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

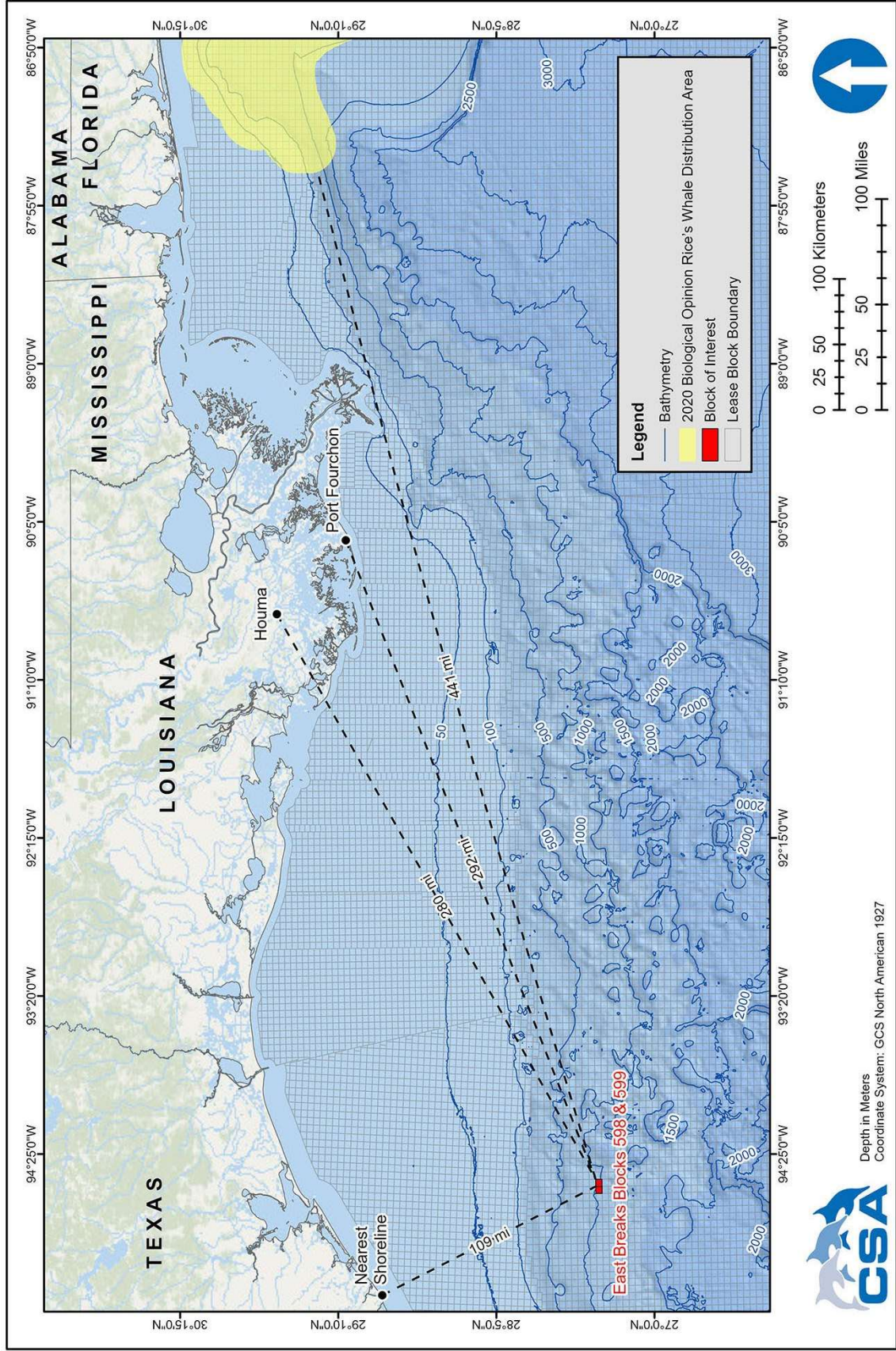


Figure 1. Location of East Breaks Blocks 598 and 599 relative to the Louisiana shoreline, the Rice's whale habitat area, and offshore bathymetric contours.

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 GOA 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 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	60,000 bbls	10,000 bbls/year/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> • Recycle or Reuse • Landfarm • Injection Well
Cuttings wetted with synthetic-based muds	Cuttings coated with synthetic drilling muds, including drilled out cement	57,600 bbls	9,600 bbls/well <i>*An estimated 5-10% of cuttings may be transported to shore</i>	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Baroid or MI Swaco - Fourchon • R360 - Fourchon Transfer Station • EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> • Recycle or Reuse • Landfarm • Injection Well

Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene Diesel	1,498.5 bbls 373.5 bbls 7,501.5 bbls 300 bbls total/year	100 bbls/month 25 bbls/month 16.67 bbls/day 50 bbls/well/year	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used - Completion/ Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	18,000 bbls	3,000 bbls/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • R360 - Fourchon Transfer Station • EcoServ – Fourchon transfer station 	<ul style="list-style-type: none"> • Landfarm • Injection well
Unused - Completion/ Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	18,000 bbls	3,000 bbls/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Trash and debris	Refuse generated during operations	750 bbls	50 bbls /month/ well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Used oil from engines	1,613 bbls*	430 bbls/120 days/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill
Produced Sand	Oil-contaminated formation Sand	300 bbls/year	50 bbls/well/year	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill

NOTE: Total amount assumes drilling, completing, & conduct flowbacks on 6 wells with 450 Total No. of Days (75 day/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	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Baroid or MI Swaco - Fourchon R360 - Fourchon Transfer Station EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> 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	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Baroid or MI Swaco - Fourchon R360 - Fourchon Transfer Station EcoServ – Fourchon Transfer Station 	<ul style="list-style-type: none"> Recycle or Reuse Landfarm Injection Well
Chemical product waste (well treatment fluids)	Ethylene glycol Methanol Xylene Diesel	33.3 bbls total 8.3 bbls total 166.7 bbls total 50 bbls total/year	100 bbls/month 25 bbls/month 16.67 bbls/day 50 bbls/well/year	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration
Used - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> R360 - Fourchon Transfer Station EcoServ – Fourchon transfer station 	<ul style="list-style-type: none"> Landfarm Injection well
Unused - Completion /Workover/ Stimulation Fluids	Brine, acid, prop sand, debris, gelled fluids, dead oil	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> Anadarko Petroleum Corporation (PMF) – Fourchon LEI – Hammond, LA Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> Reuse Landfill, reuse, solvent recovery, fuel blending, or incineration Landfill, reuse, solvent recovery, fuel blending, or incineration

Trash and debris	Refuse generated during operations	17 bbls	50 bbls /month/ well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Anadarko Petroleum Corporation (PMF) – Fourchon • LEI – Hammond, LA • Chemical Waste Management - Lake Charles, LA 	<ul style="list-style-type: none"> • Reuse • Landfill, reuse, solvent recovery, fuel blending, or incineration • Landfill, reuse, solvent recovery, fuel blending, or incineration
Used oil	Used oil from engines	36 bbls	430 bbls/120 days/well	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill
Produced Sand	Oil-contaminated formation Sand	N/A	N/A	Transport to shore in DOT approved containers	<ul style="list-style-type: none"> • Republic Services – LaRose, LA • Total Waste Solutions – Golden Meadow, LA 	<ul style="list-style-type: none"> • Landfill • Landfill

NOTE: Total amount assumes subsea installation and commissioning activities on 1 well will take a total of 10 days.

SECTION O
COASTAL ZONE MANAGEMENT ACT INFORMATION

Consistency review from Texas Coastal Zone Management (CZM) was obtained under DOCD Plan Control No. N-08053, and Louisiana CZM consistency was obtained under DOCD Plan Control No. S-07014. Therefore, additional consistency reviews are not required for this plan.

SECTION P
ENVIRONMENTAL IMPACT ANALYSIS

Environmental Impact Analysis

for a
SUPPLEMENTAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
for
East Breaks Blocks 598 and 599 (OCS-G 19027 and OCS-G 19028)

Offshore Texas
Gulf of Mexico

July 2025

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Environmental Impact Analysis for a Supplemental Development Operations Coordination Document
for
East Breaks Blocks 598 and 599 (OCS-G 19027 and OCS-G 19028)
Offshore Texas
Gulf of Mexico

DOCUMENT NO. CSA-Anadarko-FL-25-4207-01-REP-01-002

Internal review process

Version	Date	Description	Prepared by:	Reviewed by:	Approved by:
INT-01	06/02/2025	Initial draft for science and TE review	J. O'del	J. Tiggelaar	J. O'del

Client deliverable

Version	Date	Description	Project Manager Approval
001	07/01/2025	Client Deliverable	J. O'del
002	07/22/2025	Final	J. O'del

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Acronyms and Abbreviations

μPa	micropascal	NAAQS	National Ambient Air Quality Standards
ac	acre		
Anadarko	Anadarko Petroleum Corporation	NMFS	National Marine Fisheries Service
bbf	barrel	NMS	National Marine Sanctuary
BOEM	Bureau of Ocean Energy Management	NOAA	National Oceanic and Atmospheric Administration
BSEE	Bureau of Safety and Environmental Enforcement	NO _x	nitrogen oxides
CFR	Code of Federal Regulations	NPDES	National Pollutant Discharge Elimination System
CGA	Clean Gulf Associates	NTL	Notice to Lessees and Operators
CO	carbon monoxide		
dB	decibel	NWR	National Wildlife Refuge
DOCD	Development Operations Coordination Document	OCS	Outer Continental Shelf
DP	dynamically positioned	OSRA	Oil Spill Risk Analysis
DPS	distinct population segment	OSRP	Regional Oil Spill Response Plan
EB	East Breaks	PAH	polycyclic aromatic hydrocarbons
EFH	Essential Fish Habitat	PBR	Potential Biological Removal
EIA	Environmental Impact Analysis	PM	particulate matter
EIS	Environmental Impact Statement	PTS	permanent threshold shift
ESA	Endangered Species Act	re	referenced to
FAD	fish aggregating device	ROV	remotely operated vehicle
FR	<i>Federal Register</i>	SEL _{24h}	sound exposure level over 24 hours
GPS	global positioning system	SEMS	Safety and Environmental Management system
H ₂ S	hydrogen sulfide		
ha	hectare	SO _x	sulfur oxides
HAPC	Habitat Area of Particular Concern	SL	source level
IPF	impact-producing factor	SPL	root-mean-square sound pressure level
km	kilometer	TTS	temporary threshold shift
LCV	light construction vessel	USCG	U.S. Coast Guard
m	meter	USEPA	U.S. Environmental Protection Agency
MARPOL	International Convention for the Prevention of Pollution from Ships	USFWS	U.S. Fish and Wildlife Service
MMC	Marine Mammal Commission	VOC	volatile organic compound
MMPA	Marine Mammal Protection Act	WCD	worst-case discharge
MMS	Minerals Management Service		
MSRC	Marine Spill Response Corporation		
MSV	multi-service vessel		
MWCC	Marine Well Containment Company		

Introduction

Anadarko Petroleum Corporation (Anadarko) is submitting a Supplemental Development Operations Coordination Document (DOCD) for East Breaks (EB) Blocks 598 and 599. Under this DOCD, Anadarko proposes to drill and complete six exploration wells (one primary well and five backup wells) and fit the wells with subsea wellheads. The DOCD also covers flowback testing, subsea installation of jumpers, and placing the EB 599 #005 well onto production. The Environmental Impact Analysis (EIA) provides information on potential environmental impacts of Anadarko's proposed activities.

The project area is approximately 109 mi (176 km) from the nearest shoreline (Texas), 292 mi (470 km) from the onshore support base at Port Fourchon, Louisiana, and 280 mi (450 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the location of the proposed wellsites is approximately 3,170 ft (966 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. An additional 10 days are expected for the installation and hookup of jumpers and commissioning tests for the EB 599 #005 well.

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 (NLTs) issued by BOEM and its predecessors, Minerals Management Service (MMS) and Bureau of Ocean Energy Management, Regulation and Enforcement, including NLTs 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, 2025a). 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.

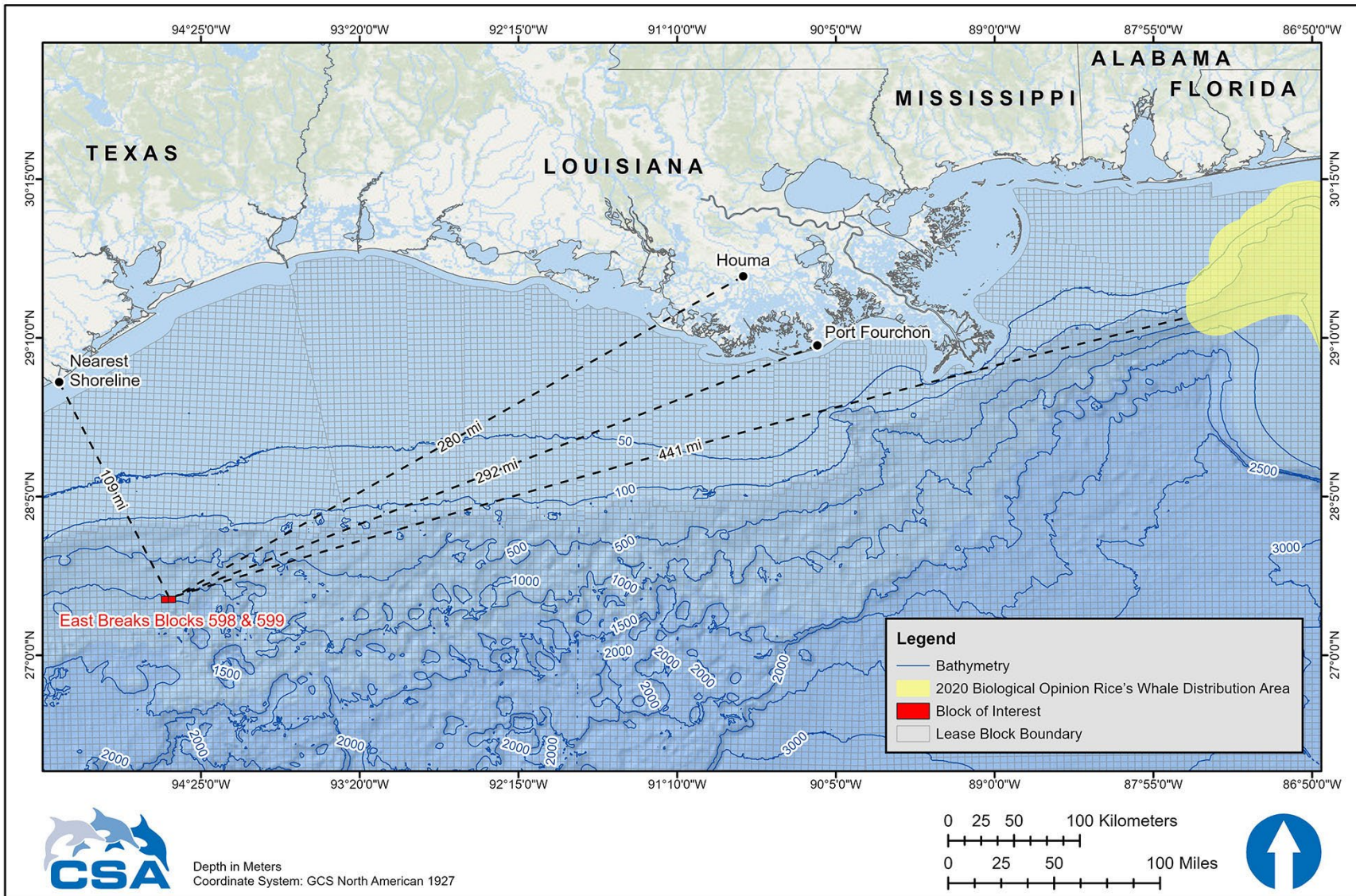


Figure 1. Location of East Breaks Blocks 598 and 599 relative to the Louisiana shoreline, the Rice's whale habitat area, and offshore bathymetric contours.

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 Attachment 3 (NMFS, 2025a)	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. This NTL may be reissued to address recent changes made in the 2025 NMFS Biological Opinion (NMFS, 2025a).
BOEM-2016-G02 or Attachment 1 (NMFS, 2025a)	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 Attachment 2 (NMFS 2025a)	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 <i>Federal Register</i> [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, and an additional 10 days for commissioning tests of the EB #005 well. 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 (Fugro, 2025a,b).
- (5) *Exploration or production activities where Hydrogen Sulfide (H₂S) concentrations greater than 500 ppm might be encountered.*
 - East Breaks Blocks 598 and 599 are classified as H₂S 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. East Breaks Block 598 and 599 are not in an area designated as having a high potential for the presence of archaeological resources. An archaeological report was previously submitted under EP Plan Control No. N-10241.
- (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 PM₁₀), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and carbon monoxide (CO) (Reşitoğlu et al., 2015), as well as ammonia (NH₃) 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 750 barrel(s) (bbl) 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, 2025a).

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 and commissioning portion of the project will be supported by a support vessel, on site for 3 days total per well and a flowback vessel on site for 2 days total per well. The lease term pipeline installation portion of the project will be supported by a work/supply vessel making four round trips per week, and one DP construction vessel present in the project area for 10 days per well.

NMFS (2025a) noted 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, 2025a). 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 may be reissued to address recent changes made in the 2025 NMFS Biological Opinion (NMFS, 2025a). 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.

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 μ Pa 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 μ Pa 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 (H₂S) 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).

H₂S Release. EB 598 and 599 are classified as H₂S 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 109 mi (176 km) from the nearest shoreline (Texas). 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 97,094 bopd per day. The maximum total volume during a blowout could potentially be 7,961,708 bbl, assuming 82 days for the maximum duration of a blowout, multiplied by the worst-case daily uncontrolled blowout volume of 97,094 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 137 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 21 and the results are presented in **Table 3**. The model predicts a 1% chance of shoreline contact in Calhoun and Matagorda counties, Texas within 10 days of spill and a 1 to 9% conditional probability of shoreline contact within 30 days of a spill from Cameron County, Texas, to Vermilion Parish, Louisiana (**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
C01	Cameron, Texas	--	--	2
C02	Willacy, Texas	--	--	1
C03	Kenedy, Texas	--	--	4
C04	Kleberg, Texas	--	--	3
C05	Nueces, Texas	--	--	3
C06	Aransas, Texas	--	--	4
C07	Calhoun, Texas	--	1	5
C08	Matagorda, Texas	--	1	9
C09	Brazoria, Texas	--	--	3
C10	Galveston, Texas	--	--	5
C12	Jefferson, Texas	--	--	2
C13	Cameron, Louisiana	--	--	5
C14	Vermilion, Louisiana	--	--	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 21) 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 5, located in the Western 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 5 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 (2017b).

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 (%)															
Cameron, Texas	--	--	--	--	--	--	2	3	--	1	5	6	--	--	3	4
Willacy, Texas	--	--	--	--	--	--	2	3	--	--	3	3	--	--	2	3
Kenedy, Texas	--	--	--	--	--	--	3	8	--	1	7	9	--	1	9	12
Kleberg, Texas	--	1	1	1	--	--	2	3	--	1	4	4	--	--	5	6
Nueces, Texas	--	1	2	2	--	--	1	2	--	1	4	4	--	1	5	6
Aransas, Texas	--	1	3	3	--	--	2	3	--	1	4	5	--	1	7	8
Calhoun, Texas	--	5	10	10	--	--	5	7	--	2	6	7	--	2	10	13
Matagorda, Texas	--	17	28	28	--	1	9	13	--	3	9	11	--	3	12	15
Brazoria, Texas	--	8	13	13	--	1	6	9	--	1	3	4	--	1	3	5
Galveston, Texas	--	5	16	17	--	1	7	11	--	1	2	2	--	1	2	3
Jefferson, Texas	--	--	10	11	--	--	2	4	--	--	--	1	--	--	--	1
Cameron, Louisiana	--	1	5	5	--	--	4	6	--	--	--	--	--	--	--	--
Vermillion, Louisiana	--	--	1	2	--	--	1	2	--	--	--	--	--	--	--	--
Iberia, Louisiana	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
Terrebonne, Louisiana	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--
Plaquemines, Louisiana	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
State Coastline	Conditional Probability of Contact ¹ (%)															
Texas	--	39	84	88	--	5	40	66	--	12	47	55	--	9	58	76
Louisiana	--	1	7	8	--	--	7	11	--	--	--	--	--	--	3	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 5, potential shoreline contacts within 60 days range from Cameron County, Texas, to Plaquemines Parish, Louisiana. Based on statewide contact probabilities within 60 days, Texas has the highest likelihood of contact during all four seasons, with a 39% to 88% probability of a spill reaching Texas shorelines during spring, and up to a 76% probability the rest of the year. Louisiana has a smaller likelihood of contact throughout the year, with up to a 8% probability during spring, 11% in summer, <0.5% in fall, and up to 5% in winter. Based on the 60-day trajectories, counties or parishes with a 10% or greater contact probability during any season include Kenedy, Calhoun, Matagorda, Brazoria, Galveston, and Jefferson counties in Texas (**Table 4**). No Louisiana parishes have a probability of 10% or greater at any point during the year.

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 109 mi (176 km) from the nearest shoreline (Texas), 292 mi (470 km) from the onshore support base at Port Fourchon, Louisiana, and 280 mi (450 km) from the helicopter base at Houma, Louisiana (**Figure 1**). The water depth at the location of the proposed activities is approximately 3,170 (966 m) (**Figure 2**). The seafloor in the vicinity of the proposed activities exhibited varying reflectivity dominated by fine-grained sediments with some mixed mass transport deposits (Fugro, 2025a,b).

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 EB 599 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**.

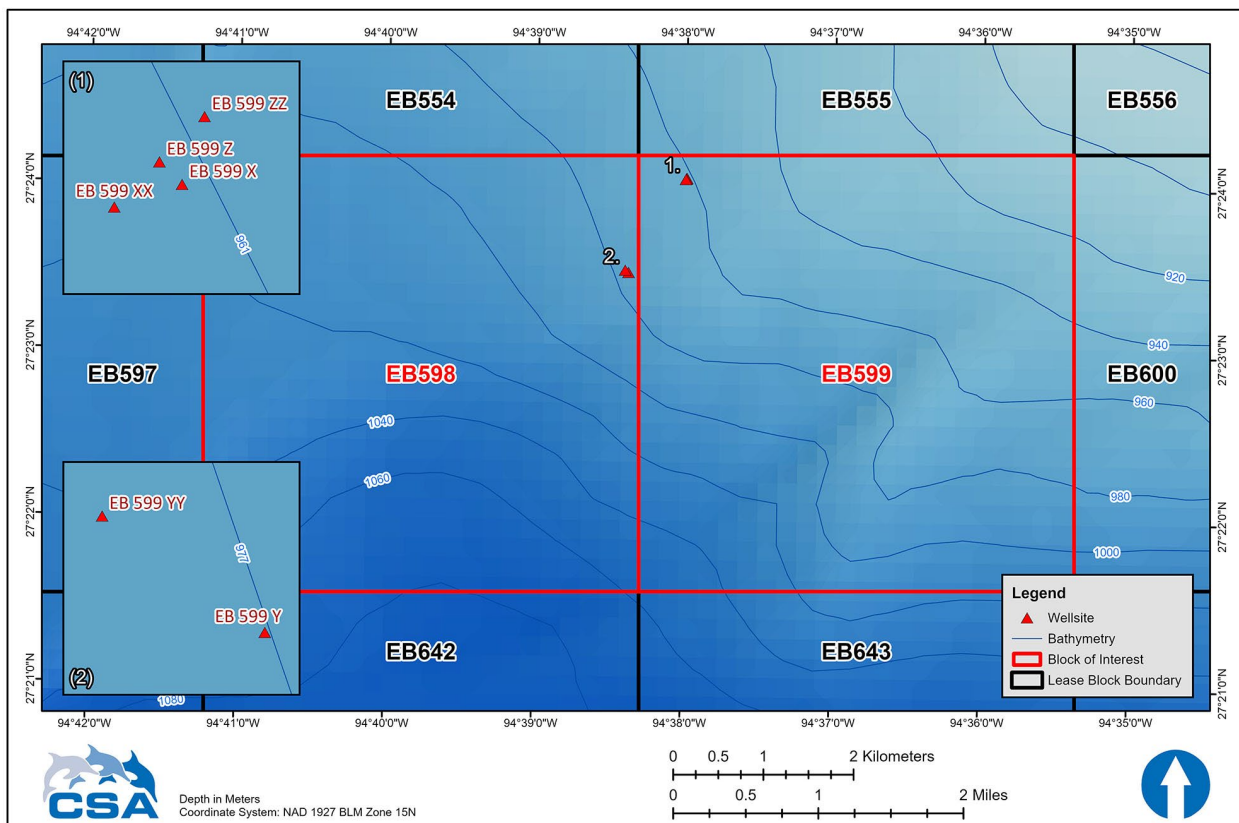


Figure 2. Bathymetric map of the project area showing the proposed wellsites in EB 598 and 599.

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 PM₁₀, 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 357 mi (574 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 640 mi (1,029 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 (109 mi [176 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 (Fugro, 2025a,b).

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 109 mi (176 km) from the nearest shoreline (Texas), 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% conditional probability within 60 days).

C.2 Seafloor Habitats and Biota

The water depth at the proposed activities is approximately 3,170 ft (966 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 (Fugro, 2025a,b). 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})	Macrofauna (>300 μm ; 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); macrofaunal 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 macrofauna 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), macrofaunal densities in the water depth of the project area are expected to be approximately 3,321 individuals m^{-2} .

Polychaetes are typically the most abundant macrofaunal 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 mississippiana*; 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 (Galloway, 1988; Galloway 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 (Fugro, 2025a,b). The nearest confirmed high-density deepwater benthic community is located in EB 602, approximately 6 mi (10 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 31 mi (50 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 393 mi (632 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 437 mi (703 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	<i>Balaenoptera ricei</i>	E	X	--	None
Sperm whale	<i>Physeter macrocephalus</i>	E	X	--	None
West Indian manatee	<i>Trichechus manatus</i> ¹	T	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	<i>Caretta caretta</i>	T,E ²	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); <i>Sargassum</i> habitat including most of the central & western Gulf of Mexico
Green turtle	<i>Chelonia mydas</i>	T	X	X	None
Leatherback turtle	<i>Dermochelys coriacea</i>	E	X	X	None
Hawksbill turtle	<i>Eretmochelys imbricata</i>	E	X	X	None
Kemp's ridley turtle	<i>Lepidochelys kempii</i>	E	X	X	None
Birds					
Piping Plover	<i>Charadrius melodus</i>	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	<i>Grus americana</i>	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Black-capped Petrel	<i>Pterodroma hasitata</i>	E	X	--	None
Rufa Red Knot	<i>Calidris canutus rufa</i>	T	--	X	None
Fishes					
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	T	X	--	None
Giant manta ray	<i>Mobula birostris</i>	T	X	X	None
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Nassau grouper	<i>Epinephelus striatus</i>	T	--	X	None
Smalltooth sawfish	<i>Pristis pectinata</i>	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	<i>Acropora palmata</i>	T	--	X	Florida Keys and the Dry Tortugas
Staghorn coral	<i>Acropora cervicornis</i>	T	--	X	Florida Keys and the Dry Tortugas
Pillar coral	<i>Dendrogyra cylindrus</i>	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Rough cactus coral	<i>Mycetophyllia ferox</i>	T	--	X	Southeast Florida and Florida Keys, Puerto Rico, St. Thomas, St. John, St. Croix, and Navassa Island
Lobed star coral	<i>Orbicella annularis</i>	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	<i>Orbicella faveolata</i>	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	<i>Orbicella franksi</i>	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	<i>Procambarus econfinae</i>	T	--	X	South-central Bay County, Florida
Queen conch	<i>Aliger gigas</i>	T	--	X	None
Terrestrial Mammals					
Beach mice (Alabama, Choctawhatchee, Perdido Key, St. Andrew)	<i>Peromyscus polionotus</i>	E	--	X	Alabama and Florida (Panhandle) beaches
Florida salt marsh vole	<i>Microtus pennsylvanicus dukecampbelli</i>	E	--	X	None

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

¹There 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.

²The 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 (*Pterodroma 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 (2025a) stated marine debris as an IPF, compliance with BSEE NTL 2015-G03 will minimize the potential for marine debris-related impacts on sperm whales. NMFS (2025a) 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 45 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 μ Pa 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 $\mu Pa^2 s$. Similarly, temporary threshold shifts (TTS) are estimated to occur when the animal has received an SEL_{24h} of 181 dB re 1 $\mu Pa^2 s$. 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, 2021, 2025a). 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, 2025a) 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, 2025a) 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. NMFS (2025a) estimated that there would be four nonlethal takes and 12 lethal vessel strikes over the course of 45 years of proposed action. 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, 2025a) 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, 2025a) 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, 2025a) 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, 2025a) stated marine debris as an IPF, compliance with BSEE NTL 2015-G03, NMFS (2021) Appendix B, and NMFS (2025a) Attachment 2 will minimize the potential for marine debris-related impacts on Rice's whales. NMFS (2025a) estimated no lethal takes of Rice's whale (previously referred to as Bryde's whales) from marine debris over 45 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, 2025a) 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 μ Pa 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 μ Pa 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 $\mu\text{Pa}^2 \text{ s}$ and 177 re 1 $\mu\text{Pa}^2 \text{ s}$, 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).

The current PBR level for the Gulf of Mexico stock of Rice's whale is 0.1 (Hayes et al., 2021). NMFS (2025a) estimated three nonlethal takes and nine lethal vessel strikes over the course of 45 years of proposed action. 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, 2025a) 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, 2025a), 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 109 mi (176 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 (*S. 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; Hildebrand 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 naive 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, 2025a). 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. 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 403 mi (648 km) from the project area. The project area is located approximately 0 mi (0 km) from the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 3**). Given the project area being within the *Sargassum* critical habitat, there is a possibility of impact on loggerhead sea turtles.

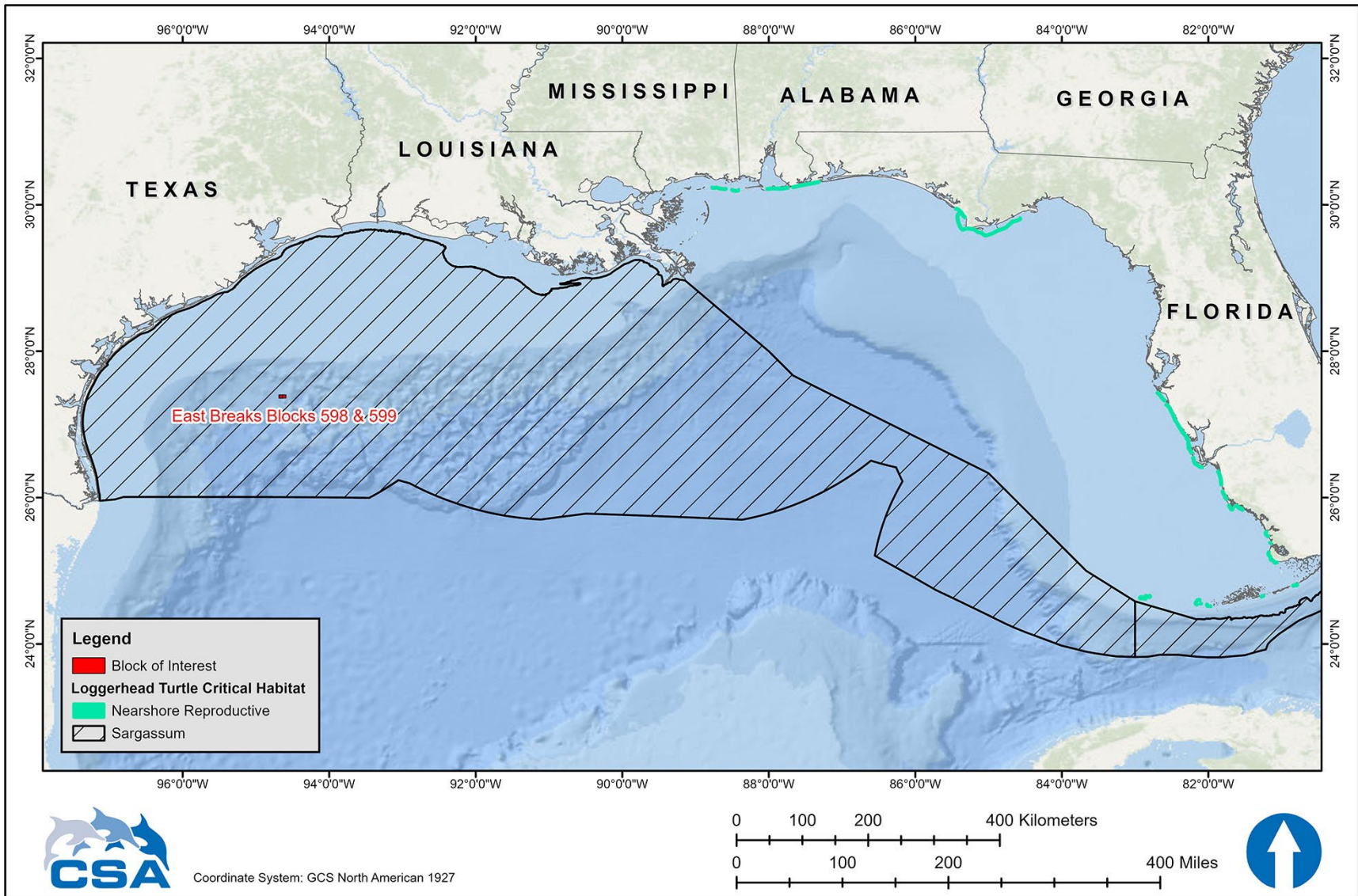


Figure 3. Location of loggerhead turtle designated *Sargassum* critical habitat and nearshore reproductive habitat in relation to the project area.

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 (2025a) stated marine debris as an IPF, compliance with NTL BSEE 2015-G013 (See **Table 1**) and NMFS (2025a) Attachment 2 will minimize the potential for marine debris-related impacts on sea turtles. NMFS (2025a) 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 $\mu\text{Pa}^2 \text{ s}$ for the onset of TTS and an SEL_{24h} of 220 dB re 1 $\mu\text{Pa}^2 \text{ s}$ 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 (Lohoefer 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 (2025a) 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 (2025a) 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 2025a). 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, 2025a).

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..

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by NMFS (2025a) 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.

Loggerhead Critical Habitat – Sargassum. The project area is located 0 mi (0 km) from the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 3**). Given the project location being within this habitat, fuel would likely come in contact with *Sargassum* in the event of a spill. 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, and thus impacts to the loggerhead population would be limited. 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). 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 quickly inhale before diving and continually resurface over time, which may result in repeated exposure to volatile vapors and oiling (NMFS, 2025a). This could have a substantial impact on the population if juveniles are present.

Loggerhead Critical Habitat – Nesting Beaches. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2025a). 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% conditional probability within 60 days). The nearest nearshore reproductive critical habitat for the loggerhead turtle is located approximately 403 mi (648 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 within 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).

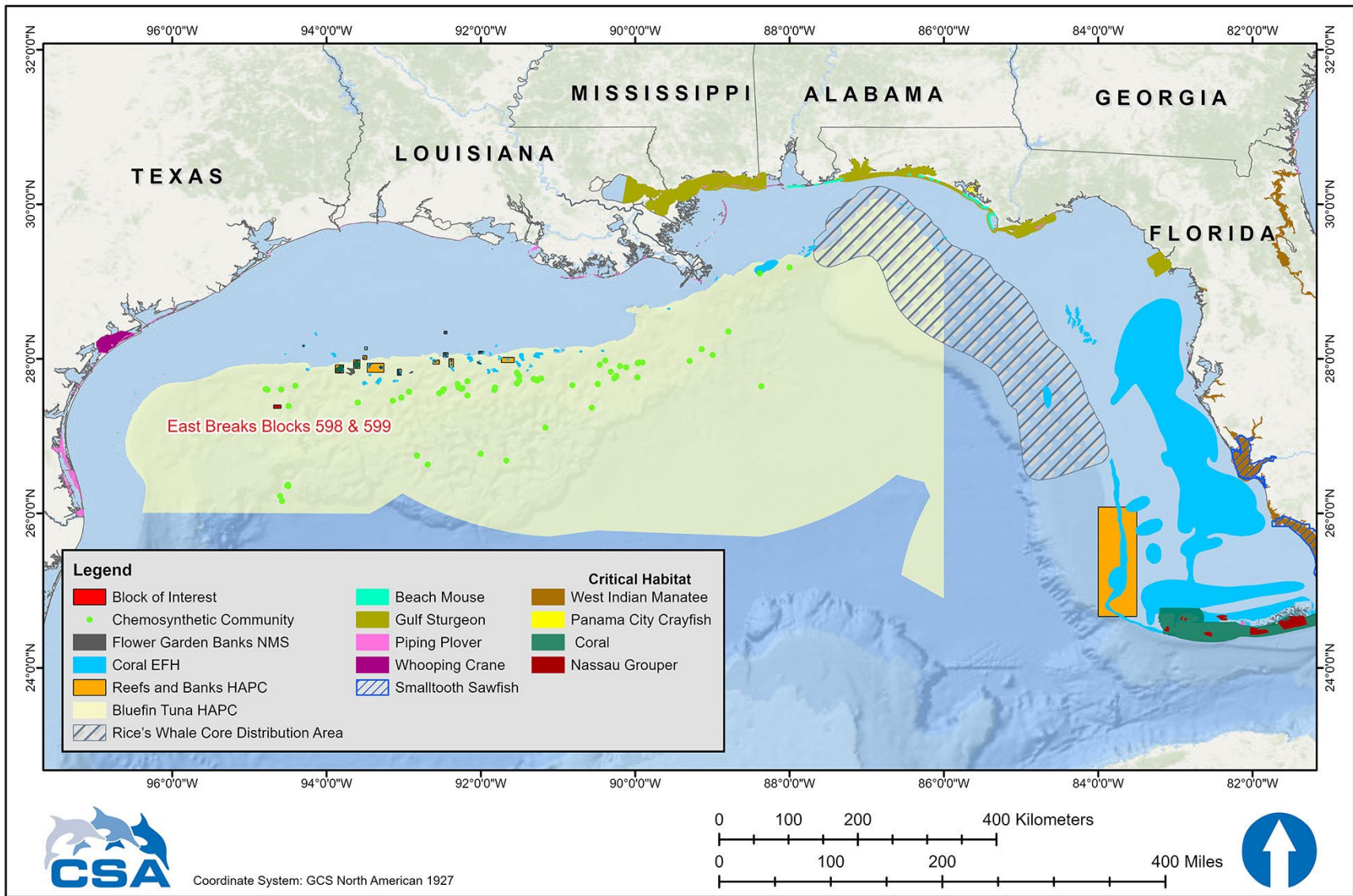


Figure 4. Location of selected environmental features in relation to the project area. EFH = Essential Fish Habitat; HAPC = Habitat of Particular Concern, NMS = National Marine Sanctuary.

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 110 mi (178 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 4**). Based on the 30-day OSRA modeling (**Table 3**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 126 mi (203 km) from the Aransas NWR, which is the nearest designated critical habitat. The 60-day OSRA model (**Table 4**) predicts that there is a 3% to 13% 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 (2025b) 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, 2025a) 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 that 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 (2025a) 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 (52 miles [83 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).

Large oil spills and vessel strikes are the IPFs 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 (2025a) estimated 104 Gulf sturgeon would be killed by vessel strikes over 45 years of proposed action. All vessel strikes from oil and gas vessels are assumed to be lethal to Gulf sturgeon due to vessel and propeller size (NMFS, 2025a). Due to the distance of the project area from the nearest Gulf Sturgeon critical habitat (324 miles [521 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 (2025a) and BOEM (2012a, 2017a). For this DOCD, there are no unique site-specific issues with respect to this species.

The project area is approximately 324 mi (521 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 <0.5% conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project areas has <0.5% 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 or electrosensory 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, 2025a). 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 would also not be expected to reach grouper habitat, and all new pipelines that overlap with grouper habitat would be subject to step-down review (NMFS, 2025a).

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 or large oil 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 was not considered an IPF for smalltooth sawfish in the 2025 NMFS Biological Opinion (NMFS, 2025a).

Impacts of a Large Oil Spill

The project area is approximately 759 mi (1,222 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 or electrosensory 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 443 mi (712 km) from the project area. The 30-day OSRA results (**Table 3**) predicts a <0.5% 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 <0.5% 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 708 mi (1139 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 <0.5% 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 571 miles (918 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 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 <0.5% 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 environment, 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), and NMFS (2025a) states that listed corals are not likely to be adversely affected by oil spills. 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 52 mi [83 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

NMFS (2025a) states that listed corals are not likely to be adversely affected by oil spills. 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 109 mi (176 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 (Efroymsen 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 Efroymsen 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 μ Pa over a 48-hour period for onset of recoverable injury and 158 dB re 1 μ Pa 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 μ Pa 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; Brintjes 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 μ Pa² 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 37 mi (59 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	<i>Thunnus thynnus</i>	Spawning, eggs, larvae, adults
Bigeye Thresher Shark	<i>Alopias superciliosus</i>	All
Bigeye Tuna	<i>Thunnus obesus</i>	Juveniles
Blue marlin	<i>Makaira nigricans</i>	All
Dusky shark	<i>Carcharhinus obscurus</i>	Juveniles, adults
Longbill spearfish	<i>Tetrapturus pfluegeri</i>	All
Sailfish	<i>Istiophorus albicans</i>	Spawning, eggs, larvae, adults
Silky shark	<i>Carcharhinus falciformis</i>	All
Skipjack tuna	<i>Katsuwonus pelamis</i>	All
Swordfish	<i>Xiphias gladius</i>	Juvenile, adult
Whale shark	<i>Rhincodon typus</i>	All
White marlin	<i>Tetrapturus albidus</i>	Juveniles, adults
Yellowfin tuna	<i>Thunnus albacares</i>	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**), including the project area. The areal extent of the HAPC is approximately 300,000 km² (115,831 mi²).

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. Flower Garden Bank is the HAPC nearest to the project area (approximately 52 mi [83 km]). The Flower Garden Banks are part of a National Marine Sanctuary (NMS) that protect 17 banks across 160 square miles of ocean in the western-central region of the Gulf (NOAA, n.d.). The Flower Garden Banks NMS protect several types of corals, gorgonians, fish, and rare invertebrate communities, in addition to unique geological features like mud volcanos and active salt diapir (NOAA, n.d.). The banks currently part of the NMS range from 16 to 220 m (52 to 722 feet) deep. Anchoring is prohibited throughout the NMS to protect the coral and other sensitive communities, including 31 coral species identified in the East and West Garden Banks alone (Clark et al., 2014). Limited coral bleaching has been observed due to the depth of the banks protecting the corals from extreme temperatures (NOAA, 2020; Clark et al., 2014). Lesions from an unknown disease were observed on 3% of coral colonies in 2022 (Johnston et al., 2023). The 128 fishes found within the East and West Garden Banks represent several trophic groups, from zooplanktivores to piscivores (Clark et al., 2014). IPFs that potentially may affect EFH or HAPC 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 μ Pa over a 48-hour period for onset of recoverable injury and SPL of 158 dB re 1 μ Pa 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 μ Pa 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 the Flower Garden Banks NMS.

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 37 mi (59 km) from the project area. A small fuel spill would float and dissipate on the sea surface and would not contact the corals of the Flower Garden Banks NMS as these are 52 mi (83 km) from the project area.

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 corals located 37 mi (59 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

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. 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. 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 (3,170 ft [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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 109 mi (176 km) from the nearest shoreline (Texas). 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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). 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 21 based on the 30-day OSRA model.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Cameron, Texas	Boca Chica State Park
	Brazos Island State Park
	Laguna Atascosa National Wildlife Refuge
	Las Palomas Wildlife Management Area
	Lower Rio Grande Valley National Wildlife Refuge
Willacy, Texas	Laguna Atascosa National Wildlife Refuge
Willacy, Kenedy, and Kleberg, Texas	Padre Island National Seashore
Nueces, Texas	I.B. Magee Beach State Park
	Mustang Island State Park
	Port Aransas Nature Preserve
	Roberts Point Park
Aransas, Texas	Aransas National Wildlife Refuge
	Goose Island State Park
	Lydia Ann Island Audubon Sanctuary
	Rattlesnake Island, Ayres Island, and Roddy Island Audubon Sanctuary
	Redfish Bay State Scientific Area
	Mission-Aransas National Estuarine Research Reserve
Calhoun, Texas	Aransas National Wildlife Refuge
	Chester Island Bird Sanctuary
	Guadalupe Delta Wildlife Management Area
	Welder Flats Wildlife Management Area
Matagorda, Texas	Big Boggy National Wildlife Refuge
	Chamber Park
	Matagorda Bay Nature Park
	Matagorda Island Wildlife Management Area
	San Bernard National Wildlife Refuge
	West Moring Dock Park
Brazoria, Texas	Brazoria National Wildlife Refuge
	Christmas Bay Coastal Preserve
	Justin Hurst Wildlife Management Area
	San Bernard National Wildlife Refuge

Table 8. (Continued).

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Galveston, Texas	Anahuac National Wildlife Refuge
	Apfell Park
	Bolivar Flats Shorebird Sanctuary
	Fort Travis Seashore Park
	Galveston Island State Park
	Horseshoe Marsh Bird Sanctuary
	Mundy Marsh Bird Sanctuary
	Seawolf Park
Chambers, Texas	Anahuac National Wildlife Refuge
	Atkinson Island Wildlife Management Area
	Candy Abshier Wildlife Management Area
	McFaddin National Wildlife Refuge
	Moody National Wildlife Refuge
Jefferson, Texas	McFaddin National Wildlife Refuge
	Sea Rim State Park
	Texas Point National Wildlife Refuge
Cameron, Louisiana	Peveto Woods Sanctuary
	Rockefeller State Wildlife Refuge and Game Preserve
	Sabine National Wildlife Refuge

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 mi² (217,821 km²), 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 109 mi (176 km) from the nearest shoreline (Texas), 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**), Matagorda County, Texas is the coastal area most likely to be affected (9% probability within 30 days). Within 30 days, shoreline segments of an additional nine Texas counties and two Louisiana parishes have a probability of 1% to 5% of being contacted. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Plaquemines Parish, Louisiana (up to 28% 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 Area W-147D. 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 letters for the proposed wellsites (Fugro, 2025a,b) reported ten pipelines, five umbilicals, two wells, and multiple pieces of other infrastructure (e.g., electrical and hydraulic flying leads, manifolds, pipeline end termination structures) within 2,000 ft (610 m) of the proposed wellsites. Additionally, the project area is within a designated industrial dumping area, but the materials dumped are unknown (Fugro, 2025a,b).

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 Impacts²

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).

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 (Fugro, 2025a,b). See DOCD Section C for supporting geological and geophysical information.

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.

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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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. Initial EP Plan Control No. N-10241 (EB 555 IEP)
2. Initial DOCD Plan Control No. N-08053
3. Supplemental DOCD Plan Control No. S-07014
4. Shallow Hazards Report prepared by Fugro GeoConsulting, Inc. (FGCI), previously submitted with EP Plan Control No. N-10241
5. Archaeological Reports prepared by Oceaneering covering areas of EB 555, 598, and 599 submitted under EP Plan Control No. N-10241
6. Final Sale Packages for Gulf of Mexico, Sale Number 168