UNITED STATES GOVERNMENT   August 18, 2017
MEMORANDUM

To: Public Information (MS 5030)

From: Plan Coordinator, FO, Plans Section (MS 5231)

Subject: Public Information copy of plan

Control # - N-09989

Type - Initial Development Operations Coordinations Document

Lease(s) - OCS-G34458 Block - 768 Mississippi Canyon Area
OCS-G34460 Block - 811 Mississippi Canyon Area
OCS-G34461 Block - 812 Mississippi Canyon Area

Operator - Shell Offshore Inc.

Description - Wells K1(001), K3(002), K4(002), F & F-Alt, rev. aqr Platform A-URSA

Rig Type - Not Found

Attached is a copy of the subject plan.

It has been deemed submitted as of this date and is under review for approval.

Michelle Griffitt
Plan Coordinator

Site Type/Name	**Botm Lse/Area/Blk**	**Surface Location**	**Surf Lse/Area/Blk**
TLP/A-URSA		5890 FSL, 3518 FEL	G05868/MC/809
WELL/F	G34461/MC/812	4428 FNL, 4847 FEL	G34461/MC/812
WELL/F-ALT	G34461/MC/812	4378 FNL, 4797 FEL	G34461/MC/812
WELL/K1(001)	G34458/MC/768	3133 FNL, 5061 FEL	G34461/MC/812
WELL/K3(002)	G34461/MC/812	3516 FNL, 4702 FEL	G34461/MC/812
WELL/K4(002)	G34460/MC/811	4183 FNL, 5323 FEL	G34461/MC/812

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Public Information

June 7, 2017

Mrs. Michelle Picou, Section Chief
Bureau of Ocean Energy Management
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

Attn: Plans Group GM 235D

SUBJECT: Initial Development Operations Coordination Document (DOCD)
Mississippi Canyon (MC) Area
OCS-G 34458. Mississippi Canyon Block 768
OCS-G 34460, Mississippi Canyon Block 811
OCS-G 34461, Mississippi Canyon Block 812
Offshore Louisiana

Dear Mrs. Picou:

In compliance with 30 CFR 550.211 and NTLs 2008-G04, 2009-G27 and 2015-N01, giving DOCD Plan guidelines, Shell Offshore Inc. (Shell) requests your approval of this Initial DOCD for the Kaikias Subsea Development. The Kaikias Subsea Development will be tied back for production to our existing Ursa TLP (MC 809).

This plan consists of a series of attachments describing our intended operations. The attachments we desire to be exempted from disclosure under the Freedom of Information Act are marked "Proprietary" and excluded from the Public Information Copies of this submittal. The cost recovery fee is attached to the Proprietary copy of the plan.

Shell previously provided copies of following report prepared by Gems, Inc. (Project No. 0912-2139) of the shallow drilling hazards and archeological assessment entitled "*Geologic, Stratigraphic and Archeological Assessment of Blocks 768, 811 and 812, Mississippi Canyon Area, Gulf of Mexico*" dated May 9, 2013 with plan N-9727.

Should you require additional information, please contact me as detailed above or Tracy Albert at 504.425.4652, tracy.albert@shell.com.

Sincerely,

Sylvia A. Bellone

SHELL OFFSHORE INC.

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT (DOCD)

For

OCS-G 34458. Mississippi Canyon Block 768
OCS-G 34460, Mississippi Canyon Block 811
OCS-G 34461, Mississippi Canyon Block 812

PUBLIC INFORMATION
JUNE 2017

PREPARED BY:

Sylvia A. Bellone
Sr. Regulatory Specialist

504.425.7215

sylvia.bellone@shell.com

REVISIONS TABLE:

Date Requested	Plan Section	What Changed	Date Resubmitted
6/27/17	1A, 1I & 1H (History and Plan Info Froms)	Added Reference to Revised EP R 6575	7/5/17
6/27/17	4 (H2S Info)	Removed H2S Classification Request	7/5/17
6/27/17	8 (Air Emissions)	Provided Full Page for Ursa AQR	7/5/17
6/27/17	9 (Oil Spills)	Removed Drilling from table and corrected Revised OSRP Date	7/5/17
7/10/17	17 (Coastal Zone Management)	Added Texas CZM	7/11/17
	8 (AQR)	Removed Ursa TLP Air emission spreadsheet	8/9/17
	1E (Plan Info Form)	Removed Ursa TLP	8/9/17

INITIAL DOCD
OFFSHORE LOUISIANA

TABLE OF CONTENTS

SECTION 1: PLAN CONTENTS

A. DESCRIPTION, OBJECTIVES & SCHEDULE

History of Development to date

Shell Offshore Inc. (Shell) is submitting this initial Development Operations Coordination Document (DOCD/plan) for the following Mississippi Canyon (MC) Leases:

OCS-G 34458, Mississippi Canyon Block 768
OCS-G 34460, Mississippi Canyon Block 811
OCS-G 34461, Mississippi Canyon Block 812

Shell submitted exploration plans for the drilling/completion of the wells in plan N-9727 in 2013 (wells A, B, C, D and E) for MC 768 (BHL) and MC 812 (SL). Shell drilled well location A (MC 768 Well 001 ST00 BP01) in 2014. Shell filed plan N-9840 for wells B, C, D and E to move the BHL to MC 811 for well B. Shell filed plan S-7801 to rename the new D & E locations to F and G.

Shell also filed plan S-7826 for the drilling and completion of wells H, I and J.

The wells drilled to date are as follows:

Location A: MC 768 001 API 608174127800 was spud 5/6/2014 – Well ST'd
Location A: MC 768 001 BP01 API 608174127801 was spud 7/18/2014 – Well TA'd
(N-9727)

Location C: MC 812 001 Drilled and PA'd API 6081741346
(N9840)

Location B: MC 811 001 API 608174129800 spudded 2/2/2015
Location B: MC 811 001 ST01 API 608174129801 spudded 6/23/2015
(N9840)
Location C: MC 811 001 ST02 API 608174129802 sidetracked and completed
(N9727)

Location F: Revised Exploration Plan R6575 approved 6/30/17 to amend surface and bottom hole locations for previously approved locations B (N-9727) and F (S-7801)

Location G: MC 811 002 API 608174134800 drilled and completed
(S7810)
Location H: Undrilled
Location I: Undrilled
Location J: Undrilled

Proposed Development

Under this proposed DOCD Shell plans to install jumpers for four subsea wells, a subsea manifold, umbilcals and a flowline to Shell's existing Ursa TLP located in MC 809. A back up well (F Alt) is also included in the event there are any issues during drilling the last well.

No expansion to the existing Ursa TLP is anticipated as a result of the addition of the Kaikias wells.

As shown on attahed subsea layout, production from the wells will flow from the wellhead via jumpers to a subsea manifold. From the manifold production will flow into the flowline to Ursa TLP. The wells will be controlled from the Ursa TLP through a steel-tube electro-hydraulic umbilical. The umbilical will be utilized to deliver chemical and waste-based hydraulic control fluid to the subsea wells and flowline, as well as provide for multiplexed electrical control and monitoring of the subsea system. Also included is this DOCD is the commencement of production and future well work for the producing wells. The subsea tie back from the wells will be installed using a dynamically positioned multi serverce vessel (MSV) and a pipeline installation vessel. No anchors will be used with these vessels.

The MC 812 surface lease is 56 statute miles from the nearest shoreline, 102 statute miles from the onshore support base at Port Fourchon, Louisiana and 81 statute miles from the helicopter base at Boothville, Louisiana. Water depths at the well sites range from 4,487' to 4,497' (Attachment 1A).

The proposed rig for future well work is either a dynamically positioned (DP) semi-submersible (Atwood Condor or similar) or a Drill Ship (Noble Don Taylor or similar); both are self-contained drilling vessels with accommodations for a crew which include quarters, galley and sanitation facilities. The rigs will comply with the requirements in the Interim Final Rules. The rig activities for future well work will be supported by the support vessels and aircraft as well as onshore support facilities as listed in Sections 14 and 15 of the DOCD. Shell has employed or contracted with trained personnel to carry out its exploration activities. Shell is committed to local hire, local contracting and local purchasing to the maximum extent possible. Shell personnel and contractors are experienced at operating in the Gulf of Mexico and are well versed in all Federal and State laws regulating operations. Shell's employees and contractors share Shell's deep commitment to operating in a safe and environmentally responsible manner.

Shell, through its parent and affiliate corporations, has extensive experience safely exploring for oil and gas in the Gulf of Mexico. Shell will draw upon this experience in organizing and carrying out its drilling program. Shell believes that the best way to manage blowouts is to prevent them from happening. Significant effort goes into the design and execution of wells and into building and maintaining staff competence. In the unlikely event of a spill, Shell's Regional Oil Spill Response Plan (OSRP) is designed to contain and respond to a spill that meets or exceeds the worst case discharge (WCD) as detailed in Section 9 of this DOCD. The WCD does not take into account potential flow mitigating factors such as well bridging, obstructions in wellbore, reservoir barriers, or early intervention. We continue to invest in research and development to improve safety and reliability of our well systems. All operations will be conducted in accordance with applicable federal and state laws, regulations and lease and permit requirements. Shell will have trained personnel and monitoring programs in place to ensure such compliance.

B. <u>LOCATION</u>

See attached location plats (Attachments 1A and 1B), Subsea Layout (Attachment 1C) and BOEM forms (Attachments 1D through 1H).

C. <u>RIG SAFETY AND POLLUTION FEATURES</u>

The rig (Atwood Condor or similar DP semi-submersible or Noble Don Taylor or similar Drill Ship) will comply with all of the regulations of the American Bureau of Shipping (ABS), International Maritime Organization (IMO) and the United States Coast Guard (USCG). All drilling operations will be conducted under the provisions of 30 CFR, Part 250, Subpart D and other applicable regulations and notices, including those regarding the avoidance of potential drilling hazards and safety and pollution prevention control. Such measures as inflow detection and well control, monitoring for loss of circulation and seepage loss and casing design will be our primary safety measures. Primary pollution prevention measures are contaminated and non-contaminated drain system, mud drain system and oily water processing.

The following drain items are typical for rigs in Shell's fleet.

DRAIN SYSTEM POLLUTION FEATURES

Drains are provided on the rig in all spaces and on all decks where water or oil can accumulate. The drains are divided into two categories, non-contaminated and contaminated. All deck drains are fitted with a removable strainer plate to prevent debris from entering the system.

Deck drainage from rainfall, rig washing, deck washing and runoff from curbs and gutters, including drip pans and work areas, are discharged depending on if it comes in contact with the contaminated or non-contaminated areas of the Rig.

1) Non-contaminated Drains

Non-contaminated drains are designated as drains that under normal circumstances do not contain hydrocarbons and can be discharged directly overboard. These are mostly located around the main deck and outboard in places where it is unlikely that hydrocarbons will be found.

Drains within 50 feet of a designated chemical storage area which uses the weather deck as a primary containment means shall be designated "normally plugged." An adequate number of drains around the rig shall be designated as "normally open" to allow run-off of rain water. Normally open drains shall have a plug located in a conspicuous area near the drain which can be easily installed in the event of a spill.

The rig's drain plug program consists at a minimum of a weekly check of all deck drains leading to the sea to verify that their status is as designated. If normally open they shall verify that the drain is open and that the plug is available in the area. If normally closed they shall verify that the plug is securely installed in the drain.

In the event a leak or spill is observed, the event shall be contained (drain plug installation and/or spill kit deployment as appropriate) and reported immediately.

Rig personnel shall ensure that the perimeter kick-plates on weather decks are maintained and drain plugs are in place as needed to ensure a proper seal.

2) Contaminated Drains

Contaminated drains are designated as drains that contain hydrocarbons and cannot be discharged overboard. When oil-based mud is used for drilling it will be collected in portable tanks and sent to shore for processing.

3) Mud Drain System

None

4) Oily Water Processing

Oily water is collected in an oily water tank. It must be separated and not pumped overboard until oil content is <15 ppm. The separated oil is pumped to a dirty oil tank and has to be sent ashore for disposal. On board the MODU an oil record log has to be kept according to instructions included in the log. Any and all pollution pans are subjected to a sheen test before being pumped out. If the water passes the sheen test then it is pumped overboard. If it does not pass the sheen test then the water/oil mixture is pumped to a dirty oil tank and sent to shore for disposal. All waste oil that is sent in to be disposed of is recorded in the MODU's oil log book.

All discharges will be in accordance with applicable NPDES permits. See Section 18, EIA.

5) Lower Hull Bilge System

- The main bilge system is designed to drain the pontoons. There are Goulds electrically driven, self-priming centrifugal pumps - one for each main pump room. The aux pumps can be pump out with the bilge pump but has to be lined up manually from the main pump room.
- Bilge water is pumped overboard after a sheen test has been completed.
- The pontoon bilge pumps are operable from the Bridge and have audible and visual bilge alarms set for high and low levels.
- Portable submersible pumps are carried onboard the rig to service all column void spaces and are also used for emergency bilge pumps in the event of the main pump room flooding.
- Alternate means of pumping the bilges in each pontoon pump room include the use of:
  - The ballast system emergency bilge valve which is operated from the control panel.
  - Portable submersible pumps
  - Emergency bilge suction line connected directly to the ballast manifold. (Main Pump rooms only)

The Bilge pumps are manual/automatic type pumps. They are equipped with sensors that give a high and a high-high alarm. They are set to a point at which the water gets to a certain point they will automatically turn on to pump water out to keep flooding under control. The pumps are also capable of being put in manual mode in which they can be turned on by hand.

6) Emergency Bilge System

Main ballast pumps may also be used for emergency bilge pumping directly from the pump rooms via remotely actuated direct bilge suction valves on the ballast system. These valves will operate in a fully flooded compartment. The ballast pumps can be supplied from the emergency switchboard.

7) Oily Water Drain/Separation System

Oily water/engine room bilge water is collected in an oily water tank. It must be separated and not pumped overboard until oil content is <15 ppm. The separated oil is pumped to a dirty oil tank and sent ashore for disposal. On board all drilling Units, an oil record log has to be kept according to instructions included in the log. The rig floor has two skimmer tanks and each is subjected to a sheen test before pumping overboard to ensure environmental safety. All three anchor winch windlasses have skimmer tanks and are subjected to sheen tests before discharge as well.

8) Drain, Effluent and Waste Systems

- The rig's drainage system is designed in line with our environmental and single point discharge policies. Drains are either hazardous, i.e. from a hazardous area as depicted on the Area Classification drawings, or non-hazardous drains from nonhazardous areas.
- To prevent migration of hazardous materials and flammable gas from hazardous to non-hazardous areas, the drainage systems are segregated.
- The rig drainage systems tie into oily water separators that take out elements in the drainage that could harm the environment.

9) Rig Floor Drainage

The rig floor is typically outfitted with a Facet International MAS 34-3 separator. The separator has coalescent plates that remove the solids from the drainage and the remaining drainage goes to a skimmer tank. From the skimmer tank it is drained to one of the column dirty oil tank systems where it is then sent through 2 separators and cleaned further to reduce oil content to less than 15 ppm.

10) Columns #3 & 4

The drains on the decks and machinery spaces are separated at mid ship and directed to either the #3 or #4 columns. The separators in these columns go through three cycles of circulation and remove oil to <15 ppm, then discharge the clean product to sea.

11) Main Engine Rooms

The engine rooms have their own drainage and handling system. The engine rooms are outfitted with a dirty oil tank and the drainage in the tank is processed through the separator, the waste from the separator goes back to the dirty oil tank and the clean water (<15 ppm) goes overboard.

12) Helideck Drains

The helideck has a dedicated drainage system around its perimeter to drain heli-fuel from a helicopter incident. The fuel can be diverted to the designated heli fuel recovery tank which is located under the Helideck structure.

Operating configurations are as follows:

- The overboard piping valves and hydrocarbons take on valves are closed and locked. To unlock overboard or take on valves a permit has to be filled out.
- The oily water collection tank overflow valve is closed.

- The drill floor drains are lined-up to the drill floor skimmer tank. The kkimmer tanks have a high alarm which sounds by means of an air horn. Before tanks are pumped out a sheen test is performed. Water is pumped out the skimmer tanks down the shunt line. Oil containment side is pumped out into 550 gal tote tanks.
- The BOP test area drains are normally lined-up to drain overboard.
- The oily water separator continuously circulates the oily water collection tank. Waste oil is discharged into the waste oil tank and oily water is re-circulated back into the oily water collection tank. Clean water is pumped overboard, which is controlled/monitored by the oil content detector, set at 15 ppm.
- The solids control system is capable of being isolated for cuttings collection.
- The bilge system is normally pumped directly overboard after a sheen test has been performed.
- The engine dirty oil sump can be drained down in port column oily water separator which discharges water overboard from the water side and oil being pumped out into a 550 gal tote tank oil containment side. There is a high audible alarm on the ballast control panel.

D. Storage Tanks – Atwood Condor DP Semi-Submersible or similar:

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (Specific)
Diesel Tank in stbd 1 80% fill in all hull tanks	Drilling Rig	3597	1		Marine Diesel (0.91 SG)
Diesel Tank in stbd 2	Drilling Rig	2713	1		Marine Diesel (0.91 SG)
Diesel Tank in stbd 3	Drilling Rig	3456	1		Marine Diesel (0.91 SG)
Diesel Tank in stbd 4	Drilling Rig	653	1		Marine Diesel (0.91 SG)
Diesel Tank in port 1	Drilling Rig	2090	1		Marine Diesel (0.91 SG)
Diesel Tank in port 2	Drilling Rig	1366	1		Marine Diesel (0.91 SG)
Diesel Tank in port 3	Drilling Rig	4787	1		Marine Diesel (0.91 SG)
Diesel Tank in port 4	Drilling Rig	3456	1		Marine Diesel (0.91 SG)
Diesel Settling Tanks	Drilling Rig	129	1		Marine Diesel (0.91 SG)
Diesel Settling Tanks	Drilling Rig	129	1		Marine Diesel (0.91 SG)
Diesel Settling Tanks	Drilling Rig	139	1		Marine Diesel (0.91 SG)
Diesel Settling Tanks	Drilling Rig	129	1		Marine Diesel (0.91 SG)
Diesel Day Tank	Drilling Rig	100	1		Marine Diesel (0.91 SG)
Diesel Day Tank	Drilling Rig	115	1		Marine Diesel (0.91 SG)
Diesel Day Tank	Drilling Rig	114	1		Marine Diesel (0.91 SG)
Diesel Day Tank	Drilling Rig	115	1		Marine Diesel (0.91 SG)
Lube Oil Tank	Drilling Rig	86.25	4	345	Lube Oil (0.91 SG)

Storage Tanks – Noble Don Taylor Drillship or similar:

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (Specific)
Fuel oil	Drilling Rig	2,889	4	11,556	Marine Diesel (0.91 SG)
Fuel oil	Drilling Rig	3,225	4	12,900	Marine Diesel (0.91 SG)
Fuel oil	Drilling Rig	2,887	4	11,548	Marine Diesel (0.91 SG)
Fuel oil	Drilling Rig	2,680	4	10,720	Marine Diesel (0.91 SG)
Fuel oil	Drilling Rig	178	8	1,424	Marine Diesel (0.91 SG)

E. Pollution Prevention Measures

Pursuant to NTL 2008-G04 the proposed operations covered by this DOCD do not require Shell to specifically address the discharges of oil and grease from the rig during rainfall or routine operations. Nevertheless, Shell has provided this information as part of its response to 1(c) above.

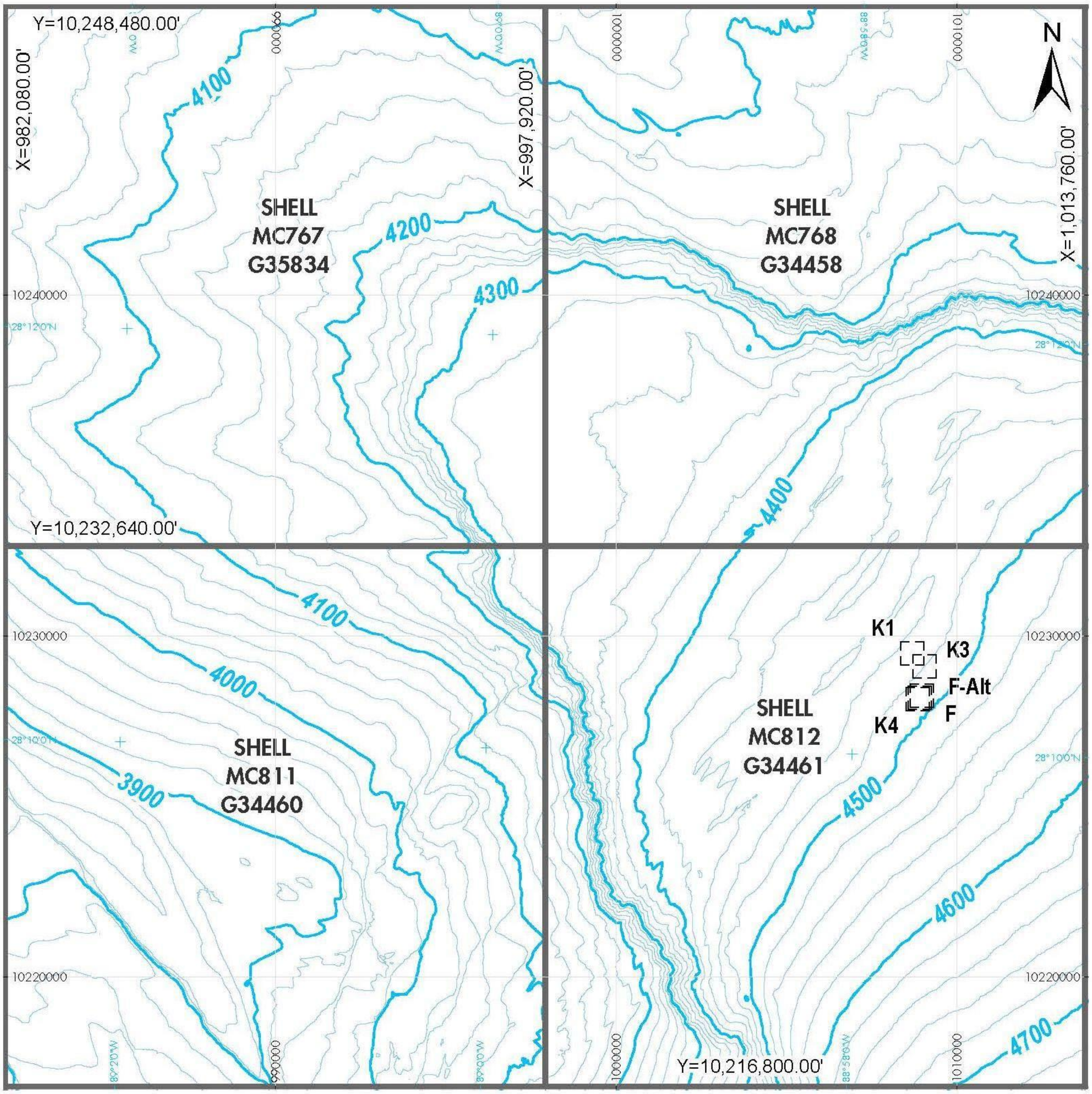
F. Additional Measures

- HSE (health, safety, and environment) are the primary topics in pre-tour and pre-job safety meetings. The discussion around no harm to people or environment is a key mindset. All personnel are reminded daily to inspect work areas for safety issues as well as potential pollution issues.
- All tools that come to and from the rig have their pollution pans inspected, cleaned and confirmation of plugs installed prior to leaving dock and prior to loading on the boat.
- Preventive maintenance of rig equipment includes visual inspection of hydraulic lines and reservoirs on routine scheduled basis.
- All pollution pans on rig are inspected daily.
- Containment dikes are installed around all oil containment, drum storage areas, fuel vents and fuel storage tanks.
- All used oil and fuel is collected and sent in for recycling.
- Every drain on the rig is assigned a number on a checklist. The checklist is used daily to verify drain plugs are installed.
- All trash containers are checked and emptied daily. The trash containers are kept covered. Trash is disposed of in a compactor and shipped in via boat.
- The rig is involved in a recycling program for cardboard, plastic, paper, glass and aluminum.
- Fuel hoses and SBM are changed on annual basis.
- TODO spill prevention fittings are installed on all liquid take on hoses.
- Waste paint thinner is recycled on board with a solvent still to reduce hazard of shipping and storage.
- All equipment on board utilizes Envirorite hydraulic fluid as opposed to hydraulic oil.
- Shell has obtained ISO14001 certification.
- Shell uses low sulfur fuel.

G. Description of Previously Approved Lease Activities

See Section 1A for this information.

Attachment 1A Bathymetry and Surface Locations



MAP INFORMATION

Legend

- Proposed Surface Location
- Shell Lease Block
- Bathymetry (Index)
- Bathymetry (Intermediate)
- Graticule Grid Tick
- Measured Grid Line

Proposed Surface Locations

F X=1,008,913.00' Y=10,228,212.00'
4,847.00' FEL & 4,428.00' FNL of Blk MC 812

F-Alt X=1,008,963.00' Y=10,228,262.00'
4,797.00' FEL & 4,378.00' FNL of Blk MC 812

K1 X=1,008,699.00' Y=10,229,507.00'
5,061.00' FEL & 3,133.00' FNL of Blk MC 812

K3 X=1,009,058.00' Y=10,229,124.00'
4,702.00' FEL & 3,516.00' FNL of Blk MC 812

K4 X=1,008,863.00' Y=10,228,162.00'
4,897.00' FEL & 4,478.00' FNL of Blk MC 812

MAP SCALE

0 1,000 2,000 4,000 6,000 8,000
Feet

1:48,000
Print size: 8.5"x11" (ANSI A)

SHELL OFFSHORE INC.

D.O.C.D.
Gulf of Mexico
Mississippi Canyon Area Blocks 768, 811 and 812
Proposed Surface Locations

GEODETIC PARAMETERS

Horizontal Coordinate Reference System
CRS name (ESRI): NAD 1927 BLM Zone 16N (US Feet)
CRS name (Shell): NAD27 / BLM 16N (ftUS)
CRS code (EPSG): 32066
Geodetic datum: North American 1927
Projection name: Transverse Mercator
Horizontal units: Foot US

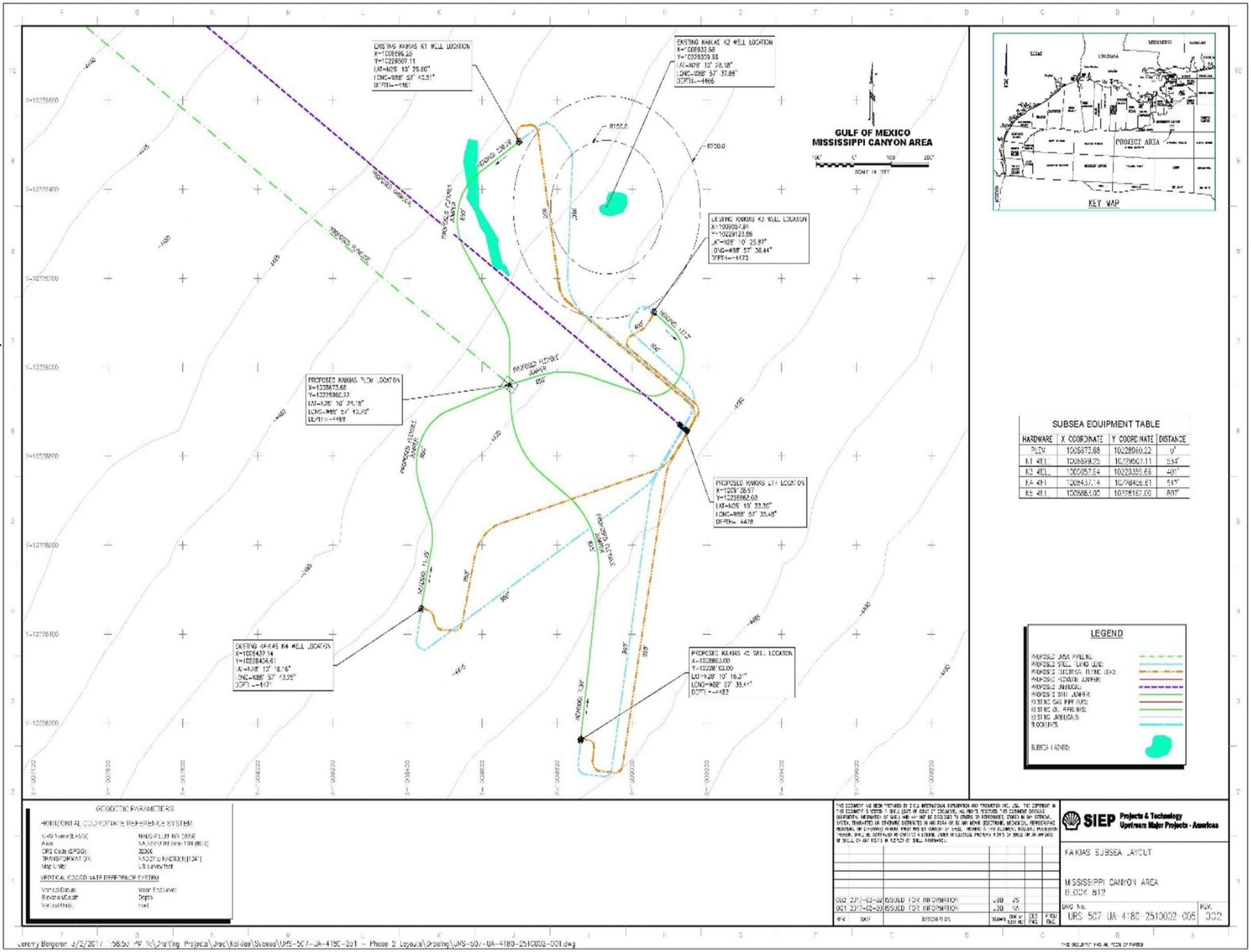
Author: S.A. Bellone / D.G. Oalmann	Date: 02 May 2017
Reviewed By: S. Long	EP Catalog No.: EP201705200359001

G:\30_Project\CAD_NewOrleans\Maps\Permit Plats\Kaikias\Kaikias Proposed Surface Locations DOCD May 2017.mxd

Attachment 1B Bottom-Hole Locations

Omitted from Public Inforamtion Copies

Attachment 1C Subsea Layout



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

Attachment 1D

OMB Control Number: 1010-0151
OMB Approval Expires: 12/31/14

OCS PLAN INFORMATION FORM

General Information					
Type of OCS Plan:		Exploration Plan (EP)	Development Operations Coordination Document (DOCD)		X

Company Name: Shell Offshore Inc.	BOEM Operator Number: 0689
Address: 701 Poydras St., Room 3464	Contact Person: Sylvia Bellone
New Orleans, LA 70131	Phone Number: 504.425.7215
	Email Address: Sylvia.bellone@shell.com

If a service fee is required under 30 CFR 550.125(a) provide:	Amount Paid: $11,019	Receipt No. : 262S3E7T

Project and Worst Case Discharge (WCD) Information

Lease(s) OCS-G 34458, 34460 & 34461	Area: MC	Block(s): 768, 811 & 812	Project Name: Kaikias

Objectives(s):	X	Oil		Gas		Sulphur		Salt	Onshore Support Base(s) Fourchon & Boothville

Platform/Well Name: B	Total Volume of WCD: 468,000 BOPD	API Gravity: 31°

Distance to Closest Land (Miles): 56 (MC 812 WCD)	Volume from uncontrolled blowout: 53 MMBBL

Have you previously provided information to verify the calculations and assumptions of your WCD?	X	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	N-9840			
Do you propose to use new or unusual technology to conduct your activities?		Yes	X	No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	X	No
Do you propose any facility that will serve as a host facility for Deepwater subsea development?		Yes	X	No

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

Proposed Activity	**Start Date**	**End Date**	**No. of Days**
Exploratory drilling			
Development drilling – future well work after wells are drilled	2018	2030	200
Well completion			
Well test flaring (for more than 48 hours)			
Installation or modification of structure			
Installation of production facilities			
Installation of subsea wellheads and/or dry hole tree			
Installation of lease term pipelines	2018	2018	50
Commence production	2018	2034	365
Other (Specify and attach description)			

Description of Drilling Rig				**Description of Structure**			
	Jackup	x	Drillship		Caisson		Tension Leg Platform
	Gorilla Jackup		Platform rig		Fixed Platform		Compliant Tower
	Semisubmersible		Submersible		Spar Other		Guyed tower
x	DP Submersible		Other (attached description)		Floating production system	X	Other (attached description) Subsea Facility

Drilling Rig Name (If known): Noble Don Taylor or similar, Atwood Condor or Similar

Description of Lease Term Pipelines

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
Well (MC 812)	New Subsea Manifold (MC812)	10"	650'
Well (MC 812)	New Subsea Manifold (MC 812)	10"	650'
Well (MC 812)	New Subsea Manifold (MC 812)	10"	650'
Well (MC 812)	New Subsea Manifold (MC 812)	10"	875'
New Subsea Manifold (MC 812)	Host facility – Ursa TLP (MC 809)	8.625"	52,955'

Attachment 1D Schedule

Schedule to drill, complete and install tree:

Activity	Start date	End Date	Duration
Production flowline & pipeline end manifold (PLEM) installation	2/1/18	2/18/18	17
Electro hydraulic umbilical installation	2/19/18	3/13/18	22
Flexible well jumpers & steel flying leads installation	3/27/18	4/8/18	12
Subsea commissioning	4/9/18	6/8/18	12
First Production	6/9/18		
Future well work	2018	2040	200

Attachment 1F

Proposed Well/Structure Location					
Well or Structure Name/Number (if renaming well or structure, reference previous name): K1 (A)	Previously reviewed under an approved EP or DOCD? N-09727	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API Number: 608174127801	NA

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD Info	For wells, volume of uncontrolled Blowouts (bbls/day): 468,000 BOPD	For structures, volume of all storage and pipelines (bbls): NA		API Gravity of fluid	31°
	Surface Location	**Bottom Hole Location (for Wells)**		**Completion (for multiple enter separate lines)**	
Lease Number	OCS-G 34461	OCS-G 34458		OCS OCS	
Area Name	MC	MC			
Block No.	812	768			
Blockline Departure (in feet)	N/S Departure: 3,133' FNL			N/S Departure: N/S Departure:	
	E/W Departure 5,061' FEL			E/W Departure: E/W Departure:	
Lambert X-Y Coord.	X: 1,008,699			X:	
	Y: 10,229,507			Y:	
Lat/Long	Latitude 28° 10' 29.603" N			Latitude 2	
	Longitude -88° 57' 40.513" W			Longitude	
Water Depth (Feet): 4,461'		MD (Feet):	TVD (Feet):	MD (Feet)	TVD (Feet)

Anchor Radius (if applicable) in feet:

Anchor locations for drilling rig or construction barge (if anchor radius is 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=	

Attachment 1G

Proposed Well/Structure Location					
Well or Structure Name/Number (if renaming well or structure, reference previous name): K3 (B/C)	Previously reviewed under an approved EP or DOCD? N-9840	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API Number: 608174129802	NA

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD Info	For wells, volume of uncontrolled Blowouts (bbls/day): 468,000 BOPD	For structures, volume of all storage and pipelines (bbls): NA		API Gravity of fluid	31°	
	Surface Location	**Bottom Hole Location (for Wells)**		**Completion (for multiple enter separate lines)**		
Lease Number	OCS-G 34461	OCS-G 34461		OCS		
Area Name	MC	MC				
Block No.	812	812				
Blockline Departure (in feet)	N/S Departure: 3,516' FNL			N/S Departure:		
	E/W Departure 4,702' FEL			E/W Departure:		
Lambert X-Y Coord.	X: 1,009,058			X:		
	Y: 10,229,124			Y:		
Lat/Long	Latitude 28° 10' 25.866 N			Latitude		
	Longitude -88° 57' 36.437" W			Longitude		
Water Depth (Feet): 4,473'		MD (Feet):	MD (Feet):	MD (Feet):	TVD (Feet)	
Anchor Radius (if applicable) in feet:						

Anchor locations for drilling rig or construction barge (if anchor radius is 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=	

Attachment 1H

Proposed Well/Structure Location					
Well or Structure Name/Number (if renaming well or structure, reference previous name): K4 (G)	Previously reviewed under an approved EP or DOCD? S-7801	X	Yes		No

Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API Number: 608174134800	NA

Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?	X	Yes		No

WCD Info	For wells, volume of uncontrolled Blowouts (bbls/day): 468,000 BOPD	For structures, volume of all storage and pipelines (bbls): NA	API Gravity of fluid	31°

	Surface Location	**Bottom Hole Location (for Wells)**	**Completion (for multiple enter separate lines)**	
Lease Number	OCS-G 34461	OCS-G 34460	OCS	
Area Name	MC	MC		
Block No.	812	811		
Blockline Departure (in feet)	N/S Departure: 4,183' FNL		N/S Departure:	
	E/W Departure 5,323' FEL		E/W Departure:	
Lambert X-Y Coord.	X: 1,008,437		X:	
	Y: 10,228,457		Y:	
Lat/Long	Latitude 28° 10' 19.1610"		Latitude	
	Longitude -88° 57' 43.2514"		Longitude	
Water Depth (Feet): 4,471'		MD (Feet): / TVD (Feet):	MD (Feet)	TVD (Feet)
Anchor Radius (if applicable) in feet:				

Anchor locations for drilling rig or construction barge (if anchor radius is 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=	

Attachment 1I

Proposed Well/Structure Location							
Well or Structure Name/Number (if renaming well or structure, reference previous name): F			Previously reviewed under an approved EP or DOCD? S-7801, R6575	X	Yes		No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API Number:	NA	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?				X	Yes		No

WCD Info	For wells, volume of uncontrolled Blowouts (bbls/day): 468,000 BOPD		For structures, volume of all storage and pipelines (bbls): NA	API Gravity of fluid	31°
	Surface Location	**Bottom Hole Location (for Wells)**		**Completion (for multiple enter separate lines)**	
Lease Number	OCS-G 34461	OCS-G 34461		OCS	
Area Name	MC	MC			
Block No.	812	812			
Blockline Departure (in feet)	N/S Departure: 4,428' FNL			N/S Departure:	
	E/W Departure 4,847' FEL			E/W Departure:	
Lambert X-Y Coord.	X: 1,008,913			X:	
	Y: 10,228,212			Y:	
Lat/Long	Latitude: 28° 10' 16.816"			Latitude	
	Longitude: -88° 57' 37.891"			Longitude	
Water Depth (Feet): 4,479'		MD (Feet):	TVD (Feet):	MD (Feet)	TVD (Feet)
Anchor Radius (if applicable) in feet:					

Anchor locations for drilling rig or construction barge (if anchor radius is 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=	

Attachment 1J

Proposed Well/Structure Location								
Well or Structure Name/Number (if renaming well or structure, reference previous name): F Alt (B)				Previously reviewed under an approved EP or DOCD? S-7801, R6575	X	Yes		No
Is this an existing well or structure?		Yes	X	No	If this is an existing well or structure, list the Complex ID or API Number:	NA		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?					X	Yes		No

WCD Info	For wells, volume of uncontrolled Blowouts (bbls/day): 468,000 BOPD	For structures, volume of all storage and pipelines (bbls): NA	API Gravity of fluid	31°

	Surface Location	**Bottom Hole Location (for Wells)**	**Completion (for multiple enter separate lines)**
Lease Number	OCS-G 34461	OCS-G 34461	
Area Name	MC	MC	
Block No.	812	812	
Blockline Departure (in feet)	N/S Departure 4378' FNL		
	E/W Departure 4797' FEL		
Lambert X-Y Coord.	X: 1,008,963		
	Y: 10,228,262		
Lat/Long	Latitude: 28° 10' 17.3185"		
	Longitude: 88° 57' 37.3419"		

Water Depth (Feet): 4,479'	MD (Feet):	TVD (Feet	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:				

Anchor locations for drilling rig or construction barge (if anchor radius is 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 2: GENERAL INFORMATION

A. Application and Permits

There are no individual or site-specific permits other than general NPDES permit and rig move notification that need to be obtained. Prior to beginning future well work operations, an Application for Permit to Modify (APM) will be submitted and approved by the Bureau of Safety and Environmental Enforcement (BSEE).

B. Drilling Fluids

Type of Drilling Fluid	Est. Volume of Drlg. Fluid per Well
Water based fluid or mud	85,000 bbls/well
Synthetic based fluid or mud	6,500 Bbls/well

See Section 7, Tables 7A and 7B for drilling fluids to be used and disposal of same.

C. Production

Omitted from Public Inforamtion Copies

D. Oil Characteristics

Article I.
Provide the estimated chemical and physical characteristics of the oils that will be handled, stored, or transported on/by the facility.

Oil properties from Kaikias listed below:

Characteristic	Analytical Methodologies Should Be Compatible With:
1. Gravity (API) 31°/30°	ASTM D4052
2. Flash Point (ºC) N/A	ASTM D93/IP 34
3. Pour Point (ºC) **4/-3.8 to (-1)**	ASTM D97
4. Viscosity (Centipoise at 25 ºC): 18 cp @ 16°C/ 23 cp @ 16°C	ASTM D445
5. Wax Content (wt %): **4.4/3.7**	Precipitate with 2-butanon/dichloromethane (UOP 46-64)
(1 to 1 volume) at -10 ºC	
6. Asphaltene Content (wt %) **0.87/0.4 – 0.6**	IP-Method 143/84 (Shell Modified)
7. Resin Content (wt %) **9.27/7 – 7.8**	Jokuty et al., 1996 (IP-Method 143/84 - Shell Modified)

Note: If the distillation information in Item No. 8 in the above table is not available, the GOMR may accept the following information in lieu of Items Nos. 5, 6, 7, and 8: weight percent total of saturates, aromatics, waxes, asphaltenes, and resins; and total BTEX (ppm) using analytical methods compatible with the Hydrocarbon Groups methodology found in Jokuty et al., 1996.

SARA (Topped Basis) All in wt %					
Well #	Sand	Saturates	Aromatics	Resin	Asphaltenes
MC 0768 OCS-G 34458 001	Lambda	41	47	11	0.8
MC 0811 OCS-G 34460 001	Beta	41	48	11	0.6
MC811-2 ST00BP00 OCS-G 34460	Kappa	Pending	Pending	Pending	Pending

Oil from one well	Oil from more than one well sampled on a facility	Oil from a pipeline system
·Area/Block- ·BOEM platform ·API Well No. ·Completion perforation interval ·BOEM's reservoir name ·Sample date ·Sample No.(if more than one is taken)	·Area/Block- - **See Table Below** ·BOEM platform ID ·Field/Unit ·Sample date ·Sample No. (if more than one is taken) ·Listing of API Well Nos. ·Storage tank ID No. (if sampled at a storage tank)	·Pipeline segment number ·For each pipeline that feeds into the system, the ID codes for the closest upstream LACT units and/or facility measurement points ·Storage tank ID No. (if sampled at a storage tank)

Oil from More than one well Sampled on a facility:				
BOEM platform ID	Ursa TLP ID70004			
Field/Unit	Kaikias			
Area/Block	MC768	MC811	MC-812	MC811
Well	K1BP1	K3ST1	K3ST2	K4
API Well Number	608174127801	608174129801	608174129802	608174134800
Completion Perforation Interval	24,828' – 24,985' MD	NA	27,590' – 27,683' MD	28,401' – 28,447' MD
BOEM Reservoir Name	Lambda	Beta	Beta	Kappa
Sample Date	7/29/2014	7/11/2015	No Samples	10/24/2016
Sample Number (if more than one)	NG-T-2371/NG-T-2381/NG-T-2385/NG-T-2387	NG-T-2687/NG-T-2699	No Samples	NG-T-3506/NG-T-3517

E. New Or Unusual Technology

Shell is not proposing to use new or unusual technology as defined in 30 CFR 250.200 to carry out the proposed activities in this plan.

F. Bonding

The bond requirement for the activities proposed in this plan are satisfied by an area-wide bond furnished and maintained per 30 CFR Part 256, Subpart I-Bonding; NTL No. 2000-G16, "Guideline for General Lease Surety Bonds" and additional security under 30 CFR 256.53(d) and National NTL No. 2016-BOEM-N01.

G. Oil Spill Financial Responsibility (OSFR)

Shell Offshore Inc., BOEM Operator Number 0689, has demonstrated oil spill financial responsibility for the activities proposed in this EP per 30 CFR Parts 250 and 253 and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities."

H. Deepwater well control statement

Shell Offshore Inc., BOEM Operator Number 0689, has the financial capability to drill a relief well and conduct other emergency well control operations if required.

I. Suspension of Production

The leases discussed in this plan are not held by a Suspension of Production.

J. Blowout scenario

Summary

The WCD for drilling activities for the wells in this plan was reviewed and accepted by BOEM in exploration plan N-9840, approved December 31, 2014. The wells proposed in this DOCD do not exceed this amount.

Please see plan N-9840 for supporting documents.

Uncontrolled blowout (volume first day)	468,000 bbls.
Uncontrolled blowout rate (first 30-days average daily rate)	432,000 bopd
Duration of flow (days) based on relief well	185 days
Total volume of spill (bbls) for 185 days	53 MMBO

Table 2.1. Kaikias Worst Case Discharge Summary

Summary

The following is provided for your convenience and remains as previously accepted (updated NTL number only).

This Section 2J was prepared by Shell pursuant to the guidance provided in the BOEM's NTL 2015-N01 with respect to blowout and worst case discharge (WCD) scenario descriptions. Shell intends to comply with all applicable laws, regulations, rules and Notices to Lessees.

Shell focuses on an integrated, three-pronged approach to a blowout, including prevention, intervention, containment, and recovery.

1. Shell believes that the best way to manage blowouts is to prevent them from happening. Significant effort goes into design and execution of wells and into building and maintaining staff competence. Shell continues to invest independently in R&D to improve safety and reliability of our well systems.

2. Shell is a founding member of the MWCC, which provides robust well containment (shut-in and controlled flow) capabilities. Additionally, Shell is investing in R&D to improve containment systems.

3. As outlined in Shell's OSRP, and detailed in EP Section 9a (ii), Shell has contracts with OSROs to provide the resources necessary to respond to this WCD scenario. The capabilities for on-water recovery, aerial and subsea dispersant application, in-situ burning, and nighttime monitoring and tracking have been significantly increased.

The WCD blowout scenario for this plan is calculated for the MC 811 (BHL)/ MC812 (SL) Well B location penetration of the target interval and is based on the guidelines outlined in NTL 2015-N01 along with subsequent Frequently Asked Questions (FAQ). In the unlikely event of a spill, Shell's Regional OSRP (approved in April 2013) is designed to contain and respond to a spill that exceeds this WCD. This WCD does not take into account potential flow mitigating factors such as well bridging, obstructions in wellbore, reservoir barriers, and early intervention including containment capabilities.

Uncontrolled blowout (volume first day)	468,000 bbls.
Uncontrolled blowout rate (first 30-days average daily rate)	432,000 bopd
Duration of flow (days) based on relief well	185 days
Total volume of spill (bbls) for 185 days	53 MMBO

Table 2.1. Kaikias Worst Case Discharge Summary

The exploration prospect is located approximately 56 statute miles south-southeast of the nearest Louisiana shoreline in the Gulf of Mexico, in water depths of 3833-4738' across blocks MC 768, MC811 and MC812, where the prospect is located. The prospect comprises an embayment culmination against the base salt. The objective interval for the proposed well with flow potential is the MC811-B well, which is expected to have the highest flow rates. The alternate well locations were also evaluated; however, their flow rates are lower than the WCD calculated for the MC 811 B well.

1) Purpose

Pursuant to 30 CFR 250.213(g), 250.219, 250.250, and NTL 2015-N01, this document provides a blowout scenario description, further information regarding any potential oil spill, the assumptions and calculations used to determine the WCD and the measures taken to 1) enhance the ability to prevent a blowout and 2) respond and manage a blowout scenario if it were to occur. These calculations are based on best technical estimates of subsurface parameters that are derived from the regional formation of offset well data and seismic data. These parameters are better than or consistent with the estimates used by Shell to justify the investment. Therefore, these assumed parameters were used to calculate the WCD. They do not reflect probabilistic estimates.

2) Background

This attachment has been developed to document the additional information requirements for EPs as requested by NTL No. 2015-N01 in response to the explosion and sinking of the MODU Deepwater Horizon and the resulting subsea well blowout and recovery operations of the exploration well at the MC-252 Macondo location.

3) Information Requirements

a) Blowout scenario

All well locations addressed in this EP were assessed for WCD. The MC 811 well from the B location represents the highest flow potential. The "B" well penetrates the objective interval as outlined in the Geological and Geophysical Information Section of the EP using a subsea wellhead system, conductor, surface and intermediate casing program, and using a DP MODU with a marine riser and subsea blowout preventer (BOP). A hydrocarbon influx and a well control event are modeled to occur from reservoirs in the objective interval. The modeled blowout results in unrestricted flow from the well at the seafloor, which represents the WCD (no restrictions in wellbore, failure/loss of the subsea BOP, and a blowout to the seabed).

b)

Estimated flow rate of the potential blowout

Category	**EP**
Type of Activity	Drilling
Facility Location (area/block)	MC-811
Facility Designation	MODU
Distance to Nearest Shoreline (Statute miles)	56
Uncontrolled blowout (volume first day)	468,000 bbl.
Uncontrolled blowout rate (first 30-days average daily rate)	432,000 bopd

Table 2.2 Estimated Flow Rates of a Potential Blowout

c) Total volume and maximum duration of the potential blowout

Duration of flow (days)	185 days total duration to drill relief well (14 days rig demobilization, 3 days rig mobilization, 102 days spud to ranging point, 30 days ranging, 36 days contingency).
Total volume of spill (bbls)	53 MMBO based on 185 days flowing. Note: From GAP/Prosper/MBAL model

Table 2.3 Estimated Duration and Volume of a Potential Blowout

There is usually a decline in the discharge rate as time proceeds, which is illustrated by the differences between the first 24-hour volume and 30-day average rate. The total volume calculated until a well is killed in a potential blowout further demonstrates this decline. At very short times, e.g. during the first 24 hours, the pressure profile in the reservoir changes from the moment when a well first starts flowing to a pseudo-steady state pressure profile with time, and as a result the rate declines. At somewhat longer time scales, effects such as reservoir voidage and the impact of boundaries can cause the rate to drop continuously with production. Simulation and material balance models can include these effects and form the basis of the NTL 2015-N01 calculations for 24-hour and 30-day rates as well as maximum duration volumes.

SECTION 3: GEOLOGICAL AND GEOPHYSICAL INFORMATION

A. Geological description

Omitted from Public Information Copies

B. Structure Contour Map(s)

Omitted from Public Information Copies

C. Interpreted 2D and/or 3D Seismic line(s)

Omitted from Public Information Copies

D. Geological Structure Cross-section(s)

Omitted from Public Information Copies

E. Stratigraphic Column with Time vs Depth Table

Omitted from Public Information Copies

F. Shallow Hazards Report

See Section 6A of this plan.

G. Shallow Hazards Assessment

See Section 6A of this plan for detailed site assessment.

H. Geochemical Information

This information is not required for plans submitted in the GOM Region.

I. Future G&G Activities

This information is not required for plans submitted in the GOM Region.

SECTION 4: HYDROGEN SULFIDE (H_2S)

A. Concentration

0 ppm

B. Classification

The area has been classified as an area where the absence of H2S has been confirmed.

C. H_2S Contingency Plan

The area has been classified as an area where the absence of H2S has been confirmed.

D. Modeling Report

The area has been classified as an area where the absence of H2S has been confirmed.

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SECTION 5: MINERAL RESOURCE CONSERVATION INFORMATION

A. Technology and reservoir engineering practices and procedures

The Kaikias development is a primary depletion recovery program designed to produce hydrocarbon from the discovered reservoirs in the Kaikias field. The project is scheduled to start in 2018 and will initially consist of four producers.

B. Technology and recovery practices and procedures

The wells will produce the discovered Kaikias reservoirs by depletion with (limited) aquifer drive. No water injection is currently planned.

C. Reservoir Development

The current depletion plan calls for 4 producers in the Kaikias area, each targeting one discovered reservoir. First oil is planned for 2018.

SECTION 6: BIOLOGICAL, PHYSICAL AND SOCIOECONOMIC INFORMATION

A. Wellsite Assessment

Introduction

This provides a summary of the specific seafloor archaeological and potential high-density deepwater benthic communities, inclusive of chemosynthetic communities, at the proposed subsea production system installation from the wells proposed in this DOCD to the existing Ursa TLP located in MC 809.

Shallow Hazard and Archaeological Reports and Data:

"Geologic, Stratigraphic, and Archaeological Assessment of Blocks 768 (OCS G 34458), 811 (OCS G 34460), and 812 (OCS G 34461) Mississippi Canyon Area, Gulf of Mexico", Geoscience Earth and Marine Services, Inc., May 7, 2013, Project No. 0912-2139. Data: AUV side-scan sonar and sub-bottom profiler, and frequency enhanced 3-D seismic. Submitted with Plan # N-09727 and revised Plan # N-9840 to move BHL for B, C, D, and E.

"Archaeological, Engineering, and Hazard Report, 8-inch Kaikias Production Pipeline Kaikias Umbilical Block 766,767,768, 809, 810, and 812 Mississippi Canyon, Gulf of Mexico", Fugro Geoservices, Inc., August 31,2016, Project No. 2416-5096 Shell Offshore, Inc." This report will be submitted with the pipeline permit.

This assessment is based on the analysis of: a) 2D high-resolution geophysical datasets (sub-bottom profile, side-scan sonar and multi-beam bathymetry); b) reprocessed exploration 3D seismic data volume. The coordinates of the existing and proposed well locations are given in Table. 1.

List of Figures

Table 1: Existing / Proposed Well Locations:

Locations	Spheroid & Datum: Clarke 1866, NAD 27 Projection: UTM Zone 16 North	Water depth (ft.)
MC 768 No. 1 (AST)	X:1008699.25 ft.; Y:10229507.11 ft.	-4,461
MC 812 No. 2 (C)	X: 1009057.94 ft.; Y: 10229123.86 ft.	-4473
MC 811 No. 2 (G)	X: 1008437.14 ft.; Y:10228456.61 ft.	-4471
F (Proposed)	X: 1008913.00 ft.; Y:10228212.00 ft.	-4483
F ALT (Rvd B) (Proposed)	X: 1008963.00 ft.; Y:10228262.00 ft.	-4483

Subsea Installation

Seafloor Conditions
The subsea development site will consist of three previously drilled wells and one proposed new well, listed above, and subsea infrastructure. All of the existing and proposed wells were previously approved in Exploration Plans No. N-9840 and Plan No. N-9727, S-7801 and S-7826 The proposed new well will be drilled with a dynamically positioned drilling vessel. The water depths in the area of the subsea installation range from -4461 ft. to -4483 ft. MSL. The subsea field occurs within an arcuate failure valley. The edge of the nearest fault associated with the failure scar is approximately 1690 feet to the west-northwest of the development site. There is a presence of draped sediments about 20ft thick which indicate the arcuate failure is not active and occurred in the late Pleistocene. Five areas displaying evidence of drilling splays were observed on the pipeline / umbilical survey (Fugro, 2016) within 2000ft of the development site. There is one area of reduced reflectivity within 2000 ft. of the proposed development site that was observed on the pipeline / umbilical survey (Fugro, 2016), these areas represent altered seafloor due to recent activity. See Figure 4.

Archaeological Assessment
Based on the archaeological interpretation conducted by GEMS, 2013 and Fugro,2016 there are two sonar contacts within 2000ft. of the subsea layout. Neither of the sonar contacts were interpreted as being archaeological significant and have no archaeological avoidance. They are interpreted to most likely be industrial waste barrels or debris. Reference Sonar contact table in GEMS Archaeological and Hazards report, 2013, (Project No. 0912-2139) for details for Contact No. 194 and Fugro Geoservices Archaeological and Engineering report, 2016 (Project No. 2416-5096) for Contact No. 71, this report will be submitted with the pipeline permit. See Figure 4.

High-Density Deepwater Benthic Community
High-density deepwater benthic communities are not expected within 2,000 ft. of the proposed subsea installation. There are no features or areas that could support high-density benthic communities within 2,000 ft. of the proposed site. The closest areas with potential for high-density deepwater benthic communities occur approximately 1.6 miles to the west-southwest and southwest and are associated high-backscatter seabed above gas-charged sediment zones (GEMS, 2013). See Figure 2.

No water bottom anomalies as defined by BOEM (BOEM, 2016b) occur within 2,000 ft. of the proposed development site.

Man-Made Features
Infrastructure consisting of previously drilled wells are within 2000 ft. of the subsea installation and will be considered during installation activities There are no other man-made features within 2000 ft. of the proposed subsea installation in Mississippi Canyon Block 812.

Proposed Pipeline and Umbilical Routes

Seafloor Conditions
The proposed 8-inch Kaikias Production Pipeline will originate at the Pipeline End Manifold (PLEM) within MC 812 and extends to the URSA Tension Leg Platform (TLP). The route is calculated to be 52,995.20 feet (10.03 miles).

The proposed Kaikias Umbilical will originate at the URSA TLP within MC 809 and extend to an Umbilical Termination Hub (UTH). The route is calculated to be 53,597.65 feet (10.15 miles).

Water depths along the pipeline and umbilical routes range from approximately -3808 feet in the eastern portion of the routes, MC 809, to -4504 feet in the northeastern portion of the routes, MC 812, MSL. Seafloor slopes range from nearly horizontal to roughly 40 degrees which increases sharply in the proximity of the seafloor faults and topographic features. Both the pipeline and the umbilical routes will cross seafloor faults with offsets ranging from 1-85 feet and are considered active. However, they are not likely to impact installation or long term operations as spanning issues will be mitigated. See Figure 5.

High-Density Deepwater Benthic Communities
High-Density deepwater benthic communities are not expected along the pipeline or umbilical routes. No expulsion features were observed. No seafloor features related to possible high-density deepwater benthic communities were

identified with in 250 ft. along the pipeline and umbilical routes. No seafloor anomalies related to fluid expulsion were identified within 250 ft. of the pipeline and umbilical routes. Seafloor faults could act as migration path for fluids to seafloor however no amplitudes were observed. See Figure 3.
No water bottom anomalies as defined by BOEM (BOEM, 2016b) occur within 500 ft. of the proposed pipeline and umbilical routes.

Archaeological Conditions
Based on the archaeological interpretation conducted by GEMS,2013 and Fugro,2016 forty-one sonar contacts were identified along the pipeline/umbilical route within 500ft. None of the forty-one sonar contacts were interpreted as being archaeological significant and have no archaeological avoidance. They are interpreted to most likely be industrial waste barrel or debris. Operations will be conducted using state of the art DGPS for positioning to depict all existing hazards located within 500 ft. of the operation. The sonar contacts were identified on more than one survey and could possible represent the same contact. The study area is located within a previously sanctioned ocean dumping site. Reference Sonar contact table in GEMS, 2013 Archaeological and Hazards report (Project No. 0912-2139) for details on Contacts No. 51,61,62,72, 76, 81, 82, 86, 88, 97,117, 126, and 127. Reference Sonar contact table in Fugro Geoservices, 2016 Archaeological and Engineering report (Project No. 2416-5096) for details on Contacts No. 6,7,9, 10,11,12, 13, 14, 19, 30, 35, 36, 37, 42, 47, 48, 51, 52, 54, 59, 63, 64, 65, 66, 67, and 70, this report will be submitted with the pipeline permit. Two additional sonar contacts were identified on previously acquired surveys in the area. See Figure 5.

Man Made
The proposed pipeline and umbilical routes will cross two pipelines and one umbilical protective measure will be taken during construction. Infrastructure consisting of pipelines, umbilical, wells and one structure exist within the proximity to the proposed umbilical and pipeline route will be considered during installation activities. Further details of the proposed pipeline and umbilical routes will be handled in the pipeline / umbilical permit. Operations will be conducted using state of the art DGPS for positioning to depict all existing pipeline located within 500 ft. of the operation.

<u>Conclusions:</u>

- No shallow hazards constraints are identified based on analysis of 3D seismic data and/or high resolution AUV data.
- No potentially submerged cultural resources of archaeological significance are identified based on the analysis of side scan sonar data.
- There are no expected high-density deepwater benthic communities within 2000ft of the proposed well locations or the subsea infrastructure.
- There are no expected high-density deepwater benthic communities within a 250ft of the proposed pipeline and umbilical routes.

Based on high-resolution geophysical survey consisting of AUV Multibeam Echo-sounder, Side Scan Sonar, and Sub-Bottom Profiler; Re-processed 3-D Seismic; Enhanced Surface Renderings (ESRs) and ESRs with amplitudes applied, Proposed Locations MC 812 Subsea Installation consisting of: PLEM, UTH, Flexible Jumpers, Flowline and Umbilical are clear of shallow hazards, archeological and deepwater high-density benthic community avoidances and appear suitable for the planned activity.

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)

Shell 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. Remotely Operated Vehicle (ROV) Monitoring Plan

This information is no longer required by BOEM GoM.

H. 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 proposes activities under this plan.

Currently there are no designated critical habitats for the listed species in the Gulf of Mexico Outer Continental Shelf; however, it is possible that one or more of these species could be seen in the area of our operations. The following table reflects the Federally-listed endangered and threatened species in the lease area and along the northern Gulf coast:

Common Name	Scientific Name	T/E Status
Hawksbill Turtle	*Eretmochelys imbricata*	E
Green Turtle	*Chelonia mydas*	T/E
Kemp's Ridley Turtle	*Lepidochelys kempii*	E
Leatherback Turtle	*Dermochelys coriacea*	E
Loggerhead Turtle	*Caretta caretta*	T

Table 6.6 – Threatened and Endangered Sea Turtles

The green sea turtle is threatened, except for the Florida breeding population, which is listed as endangered.

There are 29 species of marine mammals that may be found in the Gulf of Mexico (see Table 6.7 below). Of the species listed as Endangered, only the Sperm whale is commonly found in the project area. No critical habitat for these species has been designated in the Gulf of Mexico.

Common Name	Scientific Name	T/E Status
Atlantic Spotted Dolphin	*Stenella frontalis*	
Blainville's Beaked Whale	*Mesoplodon densirostris*	
Blue Whale	*Balaenoptera musculus*	E
Bottlenose Dolphin	*Tursiops truncatus*	
Bryde's Whale	*Balaenoptera edeni*	
Clymene Dolphin	*Stenella clymene*	
Cuvier's Beaked Whale	*Ziphius cavirostris*	
Dwarf Sperm Whale	*Kogia simus*	
False Killer Whale	*Pseudorca crassidens*	
Fin Whale	*Balaenoptera physalus*	E
Fraser's Dolphin	*Lagenodelphis hosei*	
Gervais' Beaked Whale	*Mesoplodon europaeus*	
Humpback Whale	*Megaptera novaeangliae*	E
Killer Whale	*Orcinus orca*	
Melon-headed Whale	*Peponocephala electra*	
Minke Whale	*Balaenoptera acutorostrata*	
North Atlantic Right Whale	*Eubalaena glacialis*	E
Pantropical Spotted Dolphin	*Stenella attenuata*	
Pygmy Killer Whale	*Feresa attenuata*	
Pygmy Sperm Whale	*Kogia breviceps*	
Risso's Dolphin	*Grampus griseus*	
Rough-toothed Dolphin	*Steno bredanensis*	
Sei Whale	*Balaenoptera borealis*	E
Short-finned Pilot Whale	*Globicephala macrorhynchus*	
Sowerby's Beaked Whale	*Mesoplodon bidens*	
Sperm Whale	*Physeter macrocephalus*	E
Spinner Dolphin (Long-snouted)	*Stenella longirostris*	
Striped Dolphin	*Stenella coeruleoalba*	
Florida manatee	*Trichechus manatus*	E

Table 6.7 – Threatened and Endangered Marine Mammals

The blue, fin, humpback, North Atlantic right and sei whales are rare or extralimital in the Gulf of Mexico and are unlikely to be present in the lease area. The Environmental Impact Analysis found in Section 18 discusses potential impacts and mitigation measures related to threatened and endangered species.

I. Archaeological Report

See Section 6A for this data.

J. Air and Water Quality Information

Mississippi Canyon Block 812 is located 56 miles from the nearest shoreline. Drilling/completion operations will produce air pollutant emissions, but as provided in the Air Emissions Spreadsheet (see Section 8 of this Plan), these operations are below the exemption levels.

The well work operations will result in the discharge of authorized effluents under the EPA Region VI General permit. Impacts of these discharges are expected to be minimal on water quality in the area.

For specific information relating to air and water quality information please refer to Section 18.

K. Socioeconomic Information

1) Shell will utilize its existing shorebase located in Fourchon, Louisiana which is fully staffed and operational and does not expect to employ persons from within the State of Florida.

2) Shell does not expect to purchase major supplies, services, energy, water or other resources from within the State of Florida for these operations.

3) Shell does not expect to hire contractors or vendors from within the State of Florida.

For specific information relating to socioeconomic information please refer to Section 18 in this Plan.

L. Waste Barrels Report

Shell is including the "Waste Barrel Avoidance and Release Response in the Mississippi Canyon Area " dated May 22, 2017 in this section of the plan.

Shell Exploration & Production

Waste Barrel Avoidance and Release Response in the Mississippi Canyon Area

Document Title	Waste Barrel Avoidance and Release Response in the Mississippi Canyon Area
Document Number	MRB-100-HX-0505-0000002-000
Document Revision	REV 3
Version Code	Not Applicable
Document Status	Issued for Review
EIS Discipline / Document Type	Hazard Analysis Report
Originator / Author	Bertrand Montchanin
Classification	Restricted
ECCN	EAR 99
Issue Date	05/22/17

Revision History is shown on next page

REVISION HISTORY

Rev #	Date of Issue	Issue Description	Originator	Reviewer	Approver
2	10/20/10	Formalized existing document into Document Mgmt program	RB Kuehn	RB Kuehn	Nilesh Popat
3	05/22/17	Generalized to all MC projects and updated contact info	Bertrand Montchanin	Bertrand Montchanin	Teresa Hetrick

Summary

Contents

Purpose

This document provides expectations and guidance for avoiding, and responding to a release of the contents of, a seafloor waste barrel. The procedures below describes Shell's expectations for routine barrel avoidance, data management, and response to inadvertent release of barrel contents.

Applicability

This document applies to all ROV, anchor and other operations which could cause a seafloor barrel rupture.

Changes to this procedure must be approved by BOEM.[1]

Revision History

Date	Person	Revision
12/16/08	RBKuehn	Incorporated comments from MMS[1] and issued as final.
8/16/10	RBKuehn	Incorporated comment from BOEMRE[2] to include New Orleans District manager in the notification of Step 2 of the section ***Barrel Impact Reporting.*** Also revised all relevant references to MMS as BOEMRE
10/20/10	RBKuehn	➢ In Background, added in summary of suspected materials disposed at the site, based on research of the site in public records. ➢ In section on Equipment Decontamination- **Decon Procedure:** o clarified what types of detergents are preferred/allowed, using the NPDES Vessel General Permit as a guide. o Expanded on appropriate PPE and other personnel precautions o Noted a need for secondary containment as appropriate Significant changes to the text are shown in yellow shade. ➢ Added page numbers and cleaned up format. ➢ Issued as REV 2
05/19/17	BMontchanin	➢ Deleted Mars B reference to generalize procedure to all projects in the MC area ➢ Changed BOEMRE to BOEM ➢ Changed name of duty phone ➢ Changed Shell contact focal point to Joshua O'Brien

[1] Per MMS approval of West Boreas Supplemental -Exploration Plan, MS 5231 December 16, 2008
Control No. S-07273, Lease(s) OCS-G07957, Block 762, Mississippi Canyon Area OCS-G07962, Block 806, Mississippi Canyon Area
[2] Per BOEM approval of the Supplement to the Conceptual DWOP for Mars B project, 8/12/10, MS 5220

Background

Various projects will be carried out in an area of the Mississippi Canyon known to contain barrels of chemical waste.

- The barrels were discharged in this area in the 1970's under government approved permits.

- The content, and its toxicity, of each individual barrel is not known. However, there are records of a wide range of industrial waste materials that were disposed in the barrels including chlorinated hydrocarbons and liquid metal salts. Below is a summary of the barrel contents based on available records.

    1. Metallic sodium and calcium; calcium oxide, sodium oxide, and inert salts.[3]

    2. 80-90% dichlorobutene, 20% organic high-boilers, and 1% quaternary ammonium salts. "Other wastes produced from the manufacture of fungicides and herbicides".[4]

- Within the area there are/could be many hundreds of waste barrels. Many of the barrels may have released their contents over time. However, an unknown number of barrels still look intact, and they may or may not still contain their original content. Also, as some of the barrels contained metal based solid waste, some of the barrels that no longer look intact may still contain some waste.

- Extensive sonar surveys of the area exist and are available for planning purposes.

Potential Hazards

Although there are no records of any issues regarding the barrels during the many years of Oil and Gas operations in the Mississippi Canyon area, the following potential hazards exist:

- Personnel exposure or equipment damage due to adherence of waste chemicals to recovered subsea equipment
- Equipment damage from sodium exposure to water (very vigorous reaction).

Normal Operations

For normal operations, all contractors and Shell employees must meet the following expectations:

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[3] EPA Permit Application No. 730D009E from Ethyl Corp, March 1, 1977, Public Notice April 20, 1977,
[4] Chapter 5 "Ocean Discharge" in the book Assessing Potential Ocean Pollutants, A Report of the Study Panel on Assessing Potential Ocean Pollutants. National Academy of Sciences, Washington DC, 438 pp. This document details DuPont's application to dispose of the following at the ocean disposal site

1. Shell's over-arching policy is to avoid barrel contact.

2. Press releases making any reference to the chemical waste or barrels, or any incidents involving any chemical waste or barrels, will require the express written permission from Shell.

3. All recorded video material is confidential and the property of Shell (standard contract provision).

   If during normal ROV operations there is a discovery of any potential archaeological resource (i.e., cannot be definitively identified as waste barrel/barrel remnant, modern debris, or refuse), any seafloor-disturbing activities in its proximity, must be stopped, the discovery must be reported to Dr. Chris Horrell at 504-736-2796, and further instructions must be obtained before proceeding.

4. <u>Equipment Placement/Stand-off Distance</u>
   4.1. A safe stand-off distance from the waste barrels is considered 10m (33ft). Care must be taken that flexible components (e.g. ROV tether, anchor lines, seismic cables) are controlled as well (e.g. don't drag through a barrel field).
   4.2. If a seafloor action will generate cuttings or debris, increase the stand-off distance as needed to avoid debris contact with nearby barrels.
   4.3. Do not investigate any barrels or remainders of barrels. Remain the minimum stand-off of 10m (33ft) at all times.
   4.4. Survey the anchor/pile/export locations with an ROV to ensure barrel avoidance.
   4.5. Record the (approximate) location of any chemical waste barrel seen, if feasible, without getting closer than the 10m (33ft) stand-off distance.

5. Contact the Shell GOM Environmental Duty Phone for any questions or concerns. 1-504-390-1330

6. Decontamination of Equipment: In the event of contact with a barrel contents decontaminate equipment per **Decontamination of Equipment** below.

7. Make reports of barrel contact/rupture per **Barrel Release Reporting** below.

Decontamination of Equipment

1. **General**
   In the unlikely case that contact is suspected or has been made with any wastes from a barrel, appropriate action needs to be taken to guarantee the topside safety of personnel handling the equipment (e.g. ROV, anchor lines, etc).
   It is left solely to the judgment of the Person-in-Charge of the equipment/vessel to determine if it is necessary to abandon all or part of the equipment on the sea floor.

2. Decon Procedure

Based on various factors[5], Shell recommends the following:

2.1. Use the ocean to "wash" the equipment (e.g. fly an ROV for at least an hour at depth high enough above sea floor to prevent umbilical dragging or other disturbance of the sea floor). For other equipment, provide any movement through the water column that's possible, again avoiding seafloor dragging.

2.2. Retrieve the equipment to the surface, but do not bring onboard if feasible.

2.3. Hose the equipment off before retrieving onto the vessel. Use as high a water flow as is available/safe. **CAUTION-** detergent/soap may be used BUT in as low a quantity as practicable to minimize foam. Only non-toxic and phosphate free cleaners and detergents may be used. Furthermore, cleaners and detergents should not be caustic or only minimally caustic and should be biodegradable[6].

2.4. Avoid physical contact with the equipment, and keep the equipment off the vessel at this point..

2.5. Dunk the equipment back in the sea and "wash" the equipment for approximately 15 minutes.

2.6. Retrieve the equipment to the surface. Before recovering, visually inspect the equipment, umbilical, cable surfaces with binoculars for signs of corrosion, discoloration, air reaction such as fuming/smoking, or any other signs of chemical contact. Rewash and dunk the equipment as needed.

2.7. Retrieve the equipment onto the back deck. Monitor the equipment and surrounding storage area for indications of chemical contamination (corrosion, discoloration, air reaction such as fuming/smoking, etc). Establish secondary containment as necessary to collect any potentially contaminated drips.

2.8. Only essential personnel should be allowed near the equipment, once retrieved on the back deck.

2.9. While performing cleaning operations on the equipment, involving contact with potentially contaminated surfaces, personal protective equipment must be worn

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[5] Shell assumes, for purposes of this decontamination guidance, that:

- The most toxic material identified in the disposal area's permits and other available documents is involved . However Shell cannot guarantee there are not other toxic materials present than those identified in the permits and other documents.
- It is assumed that the materials do not chemically interact with the materials of the ROV, its tools and equipment.

[6] The NPDES General Permit for Discharges Incidental to the Normal Operation of a Vessel provides insight into managing any washing. Also, EPA provides the following definitions:
"Non-toxic" soaps, cleaners, and detergents means these materials which do not exhibit potentially harmful characteristics as defined by the Consumer Product Safety Commission regulations found at 16 CFR Chapter II, Subchapter C, Part 1500.
"Phosphate Free" soaps, cleaners, and detergents means these materials which contain, by weight, 0.5% or less of phosphates or derivatives of phosphates.

including, but not limited to: safety eye goggles, safety clothing such as coverall and aprons, Nitrile type chemical resistant industrial-safety gloves, and PVC boots.

2.10. Wash hands thoroughly and take a shower after performing cleaning operations on the equipment.

2.11. Avoid drinking liquids or eating food in the work area.

2.12. If contamination is still suspected, consult with the Shell representatives/management for further actions including additional washing, abandonment on the seafloor, segregated storage on the boat, wrapping the equipment partially or fully in plastic sheeting, etc.

2.13. Document all actions and results in a log.

Barrel Impact Reporting

1. Initial reporting:

   1.1. Equipment operator is to inform the Shell onsite representative and the Shell operations supervisor on duty.

   1.2. The Shell onsite representative or the Shell operations supervisor will call the SEPCO Environmental Duty Engineer at 1-504-390-1330. As a back-up, call 504-425-9097 (Joshua O'Brien).

   - The call should be made at the earliest convenience.
   - Be prepared to report the lat/long of the ruptured barrel (not the surface location) and water depth.

2. The SEPCO Environmental Duty Engineer will call

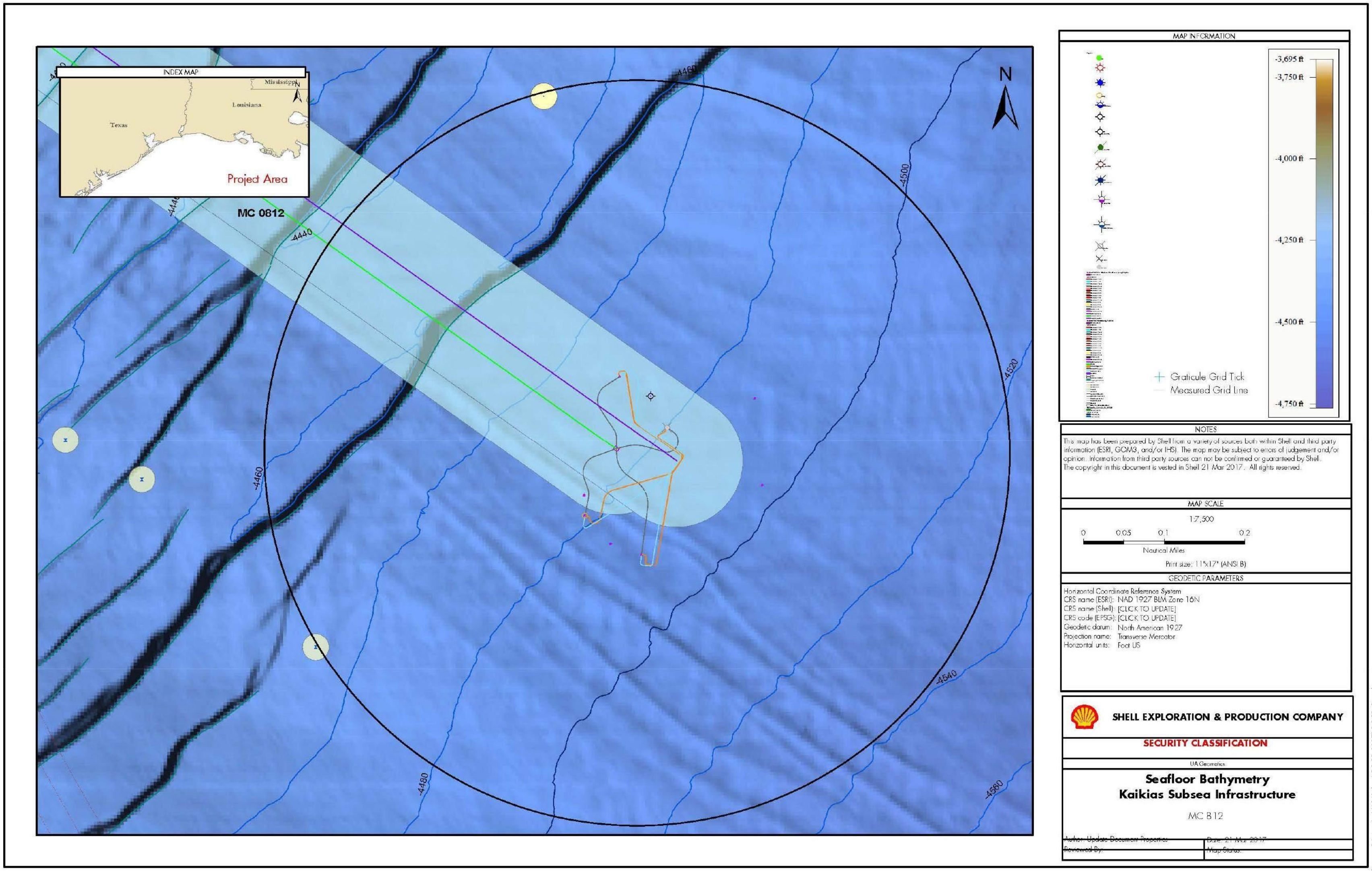
   - the regulatory Affairs Duty Phone 504-782-7823,
   - Mr. Broussard of the BOEM (504-736-3245) and
   - BOEM New Orleans District Manager

   to report the event. The call should include the lat/long and any circumstances of note.

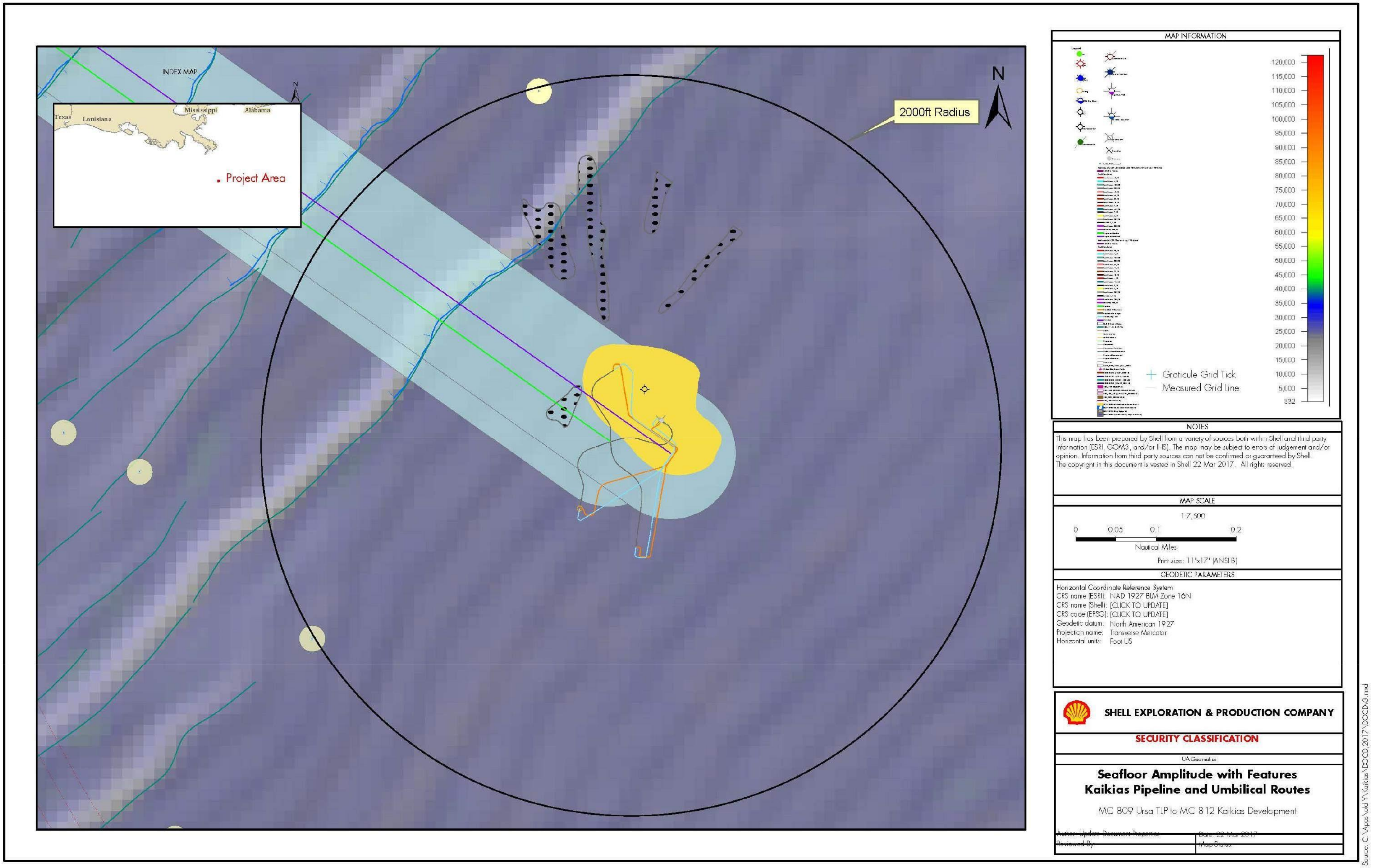
3. Follow-up Reporting
   The SEPCO Environmental Duty Engineer or Joshua O'Brien follows up with an email to Mr. Broussard of BOEM.

   The BOEM have requested submission of a copy of whatever relevant video is available for the event period. *No dedicated* video survey is required for a barrel rupture (i.e. just be prepared to submit whatever video was obtained as normal part of the activities). BOEM has agreed we can submit any video after the project is completed.

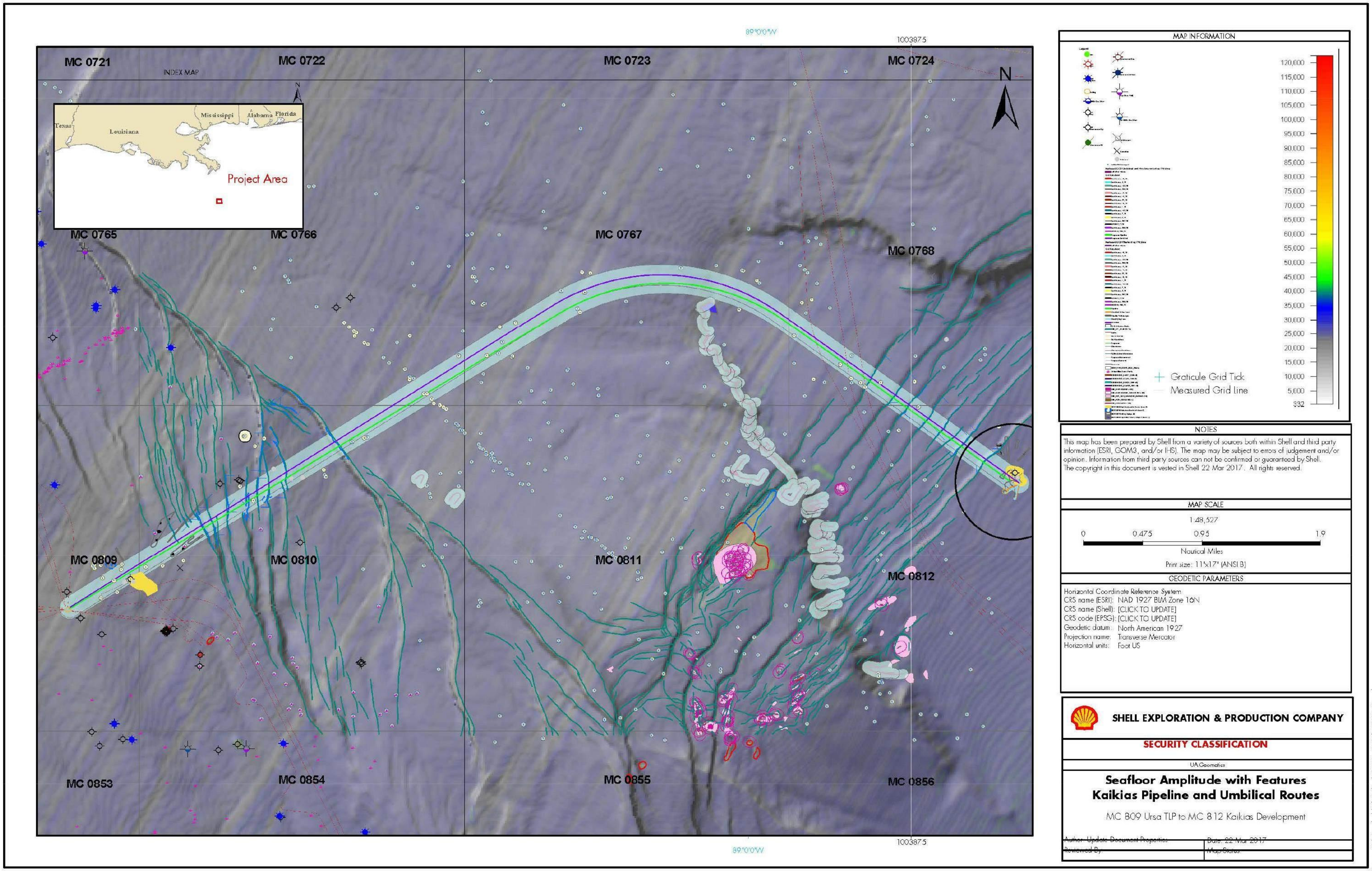
Attachment 6B – Bathemetry



Atttachment 6C – Enhanced Sefloor Rendering



Attachment 6D – Flowline Enhanced Seafloor Rendering


MC 0721
MC 0722
MC 0723
MC 0724
INDEX MAP
Texas
Louisiana
Mississippi
Alabama
Florida
Project Area
MC 0765
MC 0766
MC 0767
MC 0768
MC 0809
MC 0810
MC 0811
MC 0812
MC 0853
MC 0854
MC 0855
MC 0856
N
89°0'0"W
1003875
MAP INFORMATION
Graticule Grid Tick
Measured Grid line
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115,000
110,000
105,000
100,000
95,000
90,000
85,000
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60,000
55,000
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332
NOTES
This map has been prepared by Shell from a variety of sources both within Shell and third party information (ESRI, GOM3, and/or IHS). The map may be subject to errors of judgement and/or opinion. Information from third party sources can not be confirmed or guaranteed by Shell.
The copyright in this document is vested in Shell 22 Mar 2017. All rights reserved.
MAP SCALE
1:48,527
0
0.475
0.95
1.9
Nautical Miles
Print size: 11x17" (ANSI B)
GEODETIC PARAMETERS
Horizontal Coordinate Reference System
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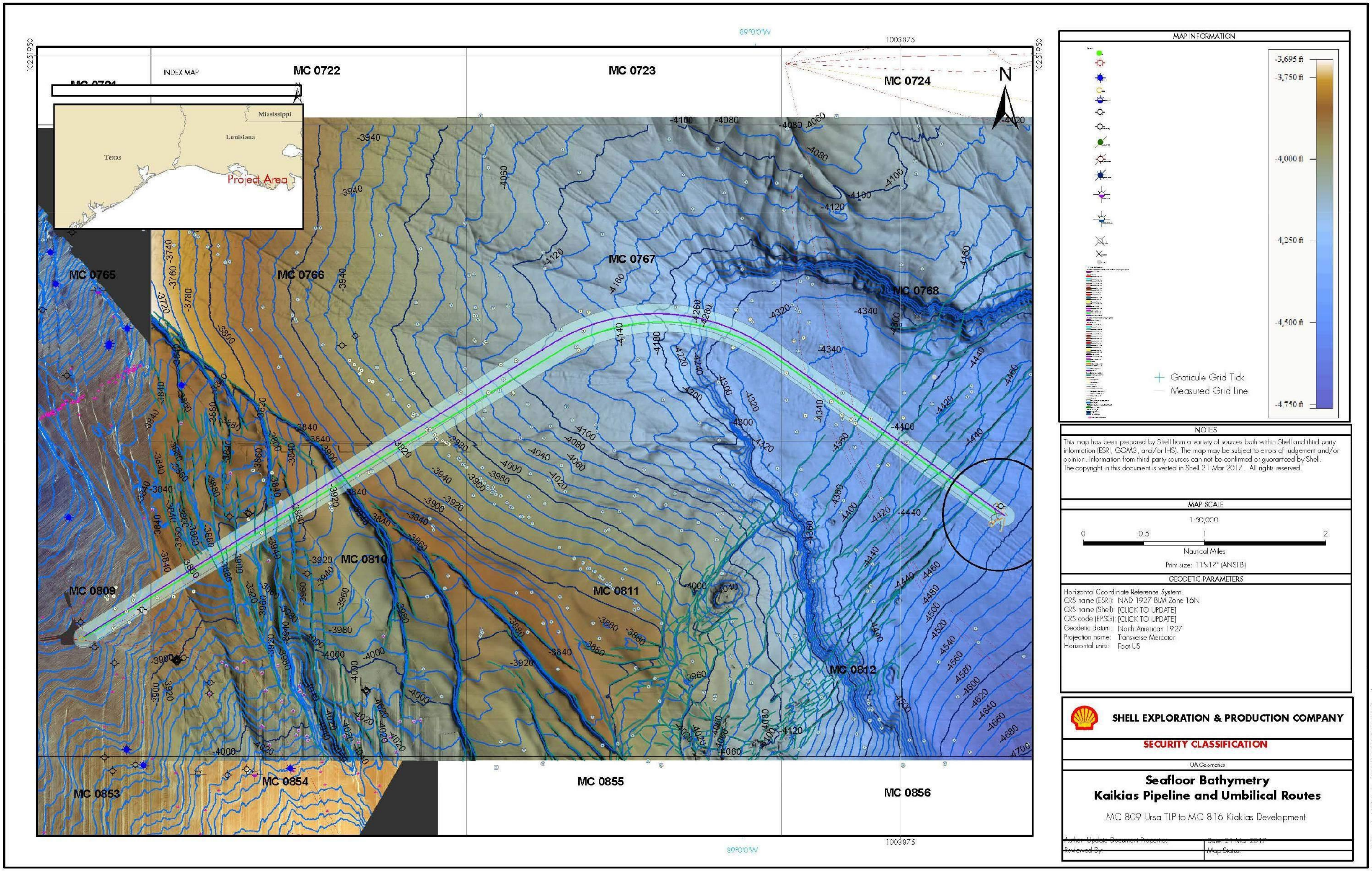
CRS name (Shell): [CLICK TO UPDATE]
CRS code (EPSG): [CLICK TO UPDATE]
Geodetic datum: North American 1927
Projection name: Transverse Mercator
Horizontal units: Foot US
SHELL EXPLORATION & PRODUCTION COMPANY
SECURITY CLASSIFICATION
UA Geomatics
Seafloor Amplitude with Features
Kaikias Pipeline and Umbilical Routes
MC 809 Ursa TLP to MC 812 Kaikias Development
Author: Update Document Properties
Reviewed By:
Date: 22 Mar 2017
Map Status:

Attachment 6E – Bathemetry for Flowline Route



SECTION 7: WASTE AND DISCHARGE INFORMATION

Projected Ocean Discharges

TABLE 7A: WASTES YOU WILL GENERATE, TREAT AND DOWNHOLE DISPOSE OR DISCHARGE TO THE GOM

Note: Please specify if the amount reported is a total or per well amount

Projected generated waste			Projected ocean discharges		Projected Downhole Disposal
Type of Waste and Composition	**Composition**	**Projected Amount**	**Discharge rate**	**Discharge Method**	**Answer yes or no**
Will drilling occur ? If yes, you should list muds and cuttings					
EXAMPLE: Cuttings wetted with ynthetic based fluid	*Cuttings generated while using synthetic based drilling fluid.*	*X bbl/well*	*X bbl/day/well*	*discharge pipe*	*No*
Water-based drilling fluid	barite, additives, mud	85,000 bbl/well	13,000 bbls /day	discharge overboard	No
Cuttings wetted with water-based fluid	Cuttings coated with water based drilling mud	66,600 bbls / well	444 bbls /day	discharge overboard	No
Cuttings wetted with synthetic-based fluid	Cuttings generated while using synthetic based drilling fluid.	7,800 bbls/well	52 bbls /day	discharge overboard	No
Synthetic based drilling fluid adhering to washed drill cuttings	Synthetic based drilling fluid adhering to washed drill cuttings	450 bbls/well	3 bbl/day	Overboard discharge line below the water level	No
Will humans be there? If yes, expect conventional waste					
EXAMPLE: Sanitary waste water		*X liter/person/day*	*NA*	*chlorinate and discharge*	*No*
Domestic waste (kitchen water, shower water)	grey water	30,000 bbls/well	200 bbls/day/well	Grinded to less than 25 mm mesh size and discharge overboard	No
Sanitary waste (toilet water)	treated sanitary waste	22,500 bbls/well	150 bbls/day/well	Treated in the MSD** prior to discharge to meet NPDES limits	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Contaminated wash and rainwater	3,000 bbls / well	20 bbls / day	Drained overboard through deck scuppers	No
Will you conduct well treatment, completion, or workover?					
well treatment fluids	Linear Frac Gel Flush Fluids, Crosslinked Frac Fluids carrying ceramic proppant and acidic breaker fluid	1,500 bbls/well	10 bbls/day	Overboard discharge line below the water level if oil and greese free and meets LC50 requirements.	No
well completion fluids	Completion brine contaminated with WBDM and displacement spacers	2,000 bbls/well	15 bbls/day	Overboard discharge line below the water level if oil and greese free and meets LC50 requirements.	No
workover fluids	NA	NA	NA	NA	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization unit discharge	Rejected water from watermaker unit	60,000 bbls/well	400 bbls/day/well	RO Desalinization Unit Discharge Line directly Ovbd,	No
Blowout prevent fluid	Water based	30 bbls/well	0.2 bbls /day	seafloor	No
Ballast water	Uncontaminated seawater	491,400 bbls / well	3,276 bbls / day	Ballast Pm. discharge line overboard	No
Bilge water	Bilge and drainage water will be treated to MARPOL standards (< 15ppm oil in water).	231,450 bbls / well	1,543 bbls / day	Bilge and drainage water will be treated to MARPOL standards (< 15ppm oil in water).	No
Excess cement at seafloor	Cement slurry	30,000 bbls/well (assume planned 100% excess is discharged)	200 bbls /day	Discharged at seafloor.	No
Fire water	Treated seawater	10,000 bbls / well	2,000 bbls / month	discharged @ Ea. Quadrant Disch. Ln. , 77' below waterline	No
Cooling water	Treated seawater	68,451,450 bbls / well	456,343 bbl/day/well	discharged @ Ea. Quadrant Disch. Ln. , 77' below waterline	No
Untreated or treated seawater	Treated Seawater	2300 bbls / flowline	300 gpm	Discharged at seafloor.	No
Hydrate Inhibitor	Hydrate Inhibitor	20 bbl glycol plug	300 gpm	Discharged at seafloor.	No
Sub sea Production Control Fluid	Water-based	18 bbls / well	75 bbls / year	Discharged at seafloor.	No
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	NA	NA	NA	NA	
Will you be covered by an individual or general NPDES permit ?			GENERAL PERMIT	GMG290103	
NOTE: If you will not have a type of waste, enter NA in the row.					

Projected Generated Wastes

TABLE 7B. WASTES YOU WILL TRANSPORT AND/OR DISPOSE OF ONSHORE

Note: Please specify whether the amount reported is a total or per well

Projected generated waste		Solid and Liquid Wastes transportation	Waste Disposal		
Type of Waste	**Composition**	**Transport Method**	**Name/Location of Facility**	**Amount**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.					
EXAMPLE: Oil-based drilling fluid or mud	*NA*	*NA*	*NA*	*NA*	*NA*
Synthetic-based drilling fluid or mud	used SBF and additives	Drums on barges	Ecoserv (Fourchon, La.), R360 Environmental Solutions (Fourchon, La.), or FCC Environmental (Fourchon, LA)	6,500 bbls/well	Recycled or Injected
Cuttings wetted with Synthetic-based fluid	Drill cuttings from synthetic based interval.	storage tank on supply boat.	Ecoserv (Fourchon, La.), R360 Environmental Solutions (Fourchon, La.), or FCC Environmental (Fourchon, LA)	300 bbls / well	Recycled or Injected
Cuttings wetted with oil-based fluids	NA	NA	NA	NA	NA
Will you produce hydrocarbons? If yes fill in for produced sand.					
Produced sand	NA	NA	NA	NA	NA
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.					
EXAMPLE: trash and debris	*cardboard, aluminum,*	*barged in a storage bin*	*shorebase*	*z tons total*	*recycle*
Trash and debris - recyclables	trash and debris	various storage containers on supply boat	Omega Waste Managment, W. Patterson, LA; Lamp Environmental, Hammond, LA	200 lbs/month	Recycled
Trash and debris - non-recyclables	trash and debris	various storage containers on supply boat	Republic/BFI landfill, Sorrento, LA or the parish landfill, Avondale, LA	400 lbs/month	Landfill
Used oil and glycol	used oil, oily rags and pads, empty drums and cooking oil	various storage containers on supply boat	Omega Waste Managment, W. Patterson, LA	20 bbls/month	Recycled
E&P Wastes	Completion and treatment wastes	various storage containers on supply boat	Ecoserv (Fourchon, La.), R360 Environmental Solutions (Fourchon, La.), or FCC Environmental (Fourchon, LA)	200 bbls / well	Recycled or Deep Well Injected
Non-Hazardous Waste	paints, solvents, chemicals, completion and treatment fluids	various storage containers on supply boat	Republic/BFI landfill, Sorrento, LA Lamp Environmental, Hammond, LA	60 bbls/mo	Incineration or RCRA Subtitle C landfill
Non-Hazardous Oilfield Waste	Chemicals, completion and treatment fluids	various storage containers on supply boat	Ecoserv (Port Arthur, TX)	60 bbls/mo	Deep Well Injected
Hazardous Waste	paints, solvents, chemicals, completion and treatment fluids	various storage containers on supply boat	Omega Waste Managment, W. Patterson, LA; Lamp Environmental, Hammond, LA	60 bbls/mo	Recycled, incineration, or landfill
Universal Waste Items	Batteries, lamps, glass and mercury-contaminated waste	various storage containers on supply boat	Lamp Environmental, Independence, LA	50 bbls/mo	Recycled or landfill
NOTE: If you will not have a type of waste, enter NA in the row.					

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 plan.

SECTION 8: AIR EMISSIONS INFORMATION

A. Emissions Worksheet and Screening Questions

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

If you answer *no* to all of the above screening questions from the appropriate table, provide:

(1) Summary information regarding the peak year emissions for both Plan Emissions and Complex Total Emissions, if applicable. This information is compiled on the summary form of the two sets of worksheets. You can submit either these summary forms or use the format below. You do not need to include the entire set of worksheets.

Note: There are no collocated wells, activities or facilitates associated with this plan. The complex total is the same as Plan Emissions.

Air Pollutant		Plan Emission Amounts (tons)	Calculated Exemption Amounts (tons)		Calculated Complex Total Emission Amounts (tons)
PM					
SO_x					
NOx					
VOC					
CO					

(2) Contact: Sylvia Bellone, 504.425.7215, Sylvia.bellone@shell.com

B. Worksheets

See attached worksheets.

***Note: The following Kaikias Subsea AQR is using fuel limitations and Shell will perform fuel monitoring for this project.**

COMPANY	Shell Offshore Inc
AREA	Mississippi Canyon
BLOCK	812
LEASE	OCS-G-34461
PLATFORM	Drillship or DP Semi or DP MODU OR Installation Vessel
WELL	SS wells, SS Installation, well work (incl. workover)
DISTANCE TO LAND	56
COMPANY CONTACT	Josh O'Brien
TELEPHONE NO.	504-425-9097
REMARKS	Kaikias DOCD AQR INST DP MODU 04122017 BOEM SUBMITTAL.xlsx Proposed "Pipelines" include 1 flowline and 4 jumpers

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:		
YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2018	5	51
2019		
2020		
2021		
2022		
2023		
2024		
2025		
2026		
2027		
2028		

Attachment 8A – Air Quality Report

Purpose

Shell has reviewed engine information for its GOM fleet of Drillship and DP semi-sub MODUs. The single MODU with the largest power profile is the Noble Don Taylor, which has six main engines of 10,728 hp/engine. The projected fuel usages presented below would therefore be conservative across the fleet of Drillships and DP Semi-subs.

Step 1 - Determine Typical Operating Loads

Description	Value	Notes
Actual average daily fuel use (gal/day)	16128	Based on daily fuel records for the Noble Don Taylor from January1, 2015 to December 31, 2015.
Contingency factor	1.55	The contingency factor is used to allow for more usage if need be.
Campaign Average Daily Fuel Use (gal/day)	25,000	Calculated Value - PTE fuel use * Proposed Operating Load and rounded up to nearest thousand (for additional conservatism).
Y1 Fuel Limits MMGals	5.00	Calculated Value - Campaign Average Daily Fuel Use * Campaign Days

Step 3 - Support Vessel Fuel Loads

Description	Value	Notes
Proposed Operating Loads	50%	Shell policy restricts D/P to < 50% near rig. When in standby away from rig but within 25 miles load will be < 50% (conserve fuel). When transiting through field (25 nm), traveling at economical speeds.
OSV - PTE Fuel Use (gal/day)	11,349	Offshore Support Vessels are rated at 9790 hp. The PTE fuel use is then estimated using the AQR conversion factor of 0.0483 gal/hp-hr.
Campaign Average Daily Fuel Use (gal/day)	5,674	Calculated Value - PTE fuel use * Proposed Operating Load.
Crew Vessel - PTE Fuel Use (gal/day)	6,260	Crew Vessels are rated at 5400 hp. The PTE fuel use is then estimated using the AQR conversion factor of 0.0483 gal/hp-hr.
Crew Vessel - Campaign Average Daily Fuel Use (gal/day)	939	Calculated Value - PTE fuel use * Proposed Operating Load. Note that Crew Vessels are only in field 30% of campaign and daily average value has been
Proposed Campaign Average Daily Fuel Use (gal/day)	6,613	Calculated Value - Average fuel use * Contigency Factor and rounded up to nearest thousand (for additional conservatism).
Total Vessel Activity		
Y1 Fuel Limits MMGals	1.30	Sum of (vessel daily fuel use * corresponding campaign days)

Additional Notes

1 - Operating loads are campaign specific and may change in future AQRs depending on the future fuel usage tracking. Fuel levels depicted in this AQR does not restrict Shell from using a different value in future AQRs.

2 - If tracked fuel usage associated with this activity indicates emissions may exceed the approved emissions, Shell will submit revised AQR calculations.

Fuel Usage Conversion Factors	Natural Gas Turbines		Natural Gas Engines		Diesel Recip. Engine		REF.	DATE
	SCF/hp-hr	9.524	SCF/hp-hr	7.143	GAL/hp-hr	0.0483	AP42 3.2-1	4/76 & 8/84

Equipment/Emission Factors	units	PM	SOx	NOx	VOC	CO	REF.	DATE
NG Turbines	gms/hp-hr		0.00247	1.3	0.01	0.83	AP42 3.2-1& 3.1-1	10/96
NG 2-cycle lean	gms/hp-hr		0.00185	10.9	0.43	1.5	AP42 3.2-1	10/96
NG 4-cycle lean	gms/hp-hr		0.00185	11.8	0.72	1.6	AP42 3.2-1	10/96
NG 4-cycle rich	gms/hp-hr		0.00185	10	0.14	8.6	AP42 3.2-1	10/96
Diesel Recip. < 600 hp.	gms/hp-hr	1	0.1835	14	1.12	3.03	AP42 3.3-1	10/96
Diesel Recip. > 600 hp.	gms/hp-hr	0.32	0.1835	11	0.33	2.4	AP42 3.4-1	10/96
Diesel Boiler	lbs/bbl	0.084	0.3025	0.84	0.008	0.21	AP42 1.3-12,14	9/98
NG Heaters/Boilers/Burners	lbs/mmscf	7.6	0.593	100	5.5	84	?42 1.4-1, 14-2, & 14	7/98
NG Flares	lbs/mmscf		0.593	71.4	60.3	388.5	AP42 11.5-1	9/91
Liquid Flaring	lbs/bbl	0.42	6.83	2	0.01	0.21	AP42 1.3-1 & 1.3-3	9/98
Tank Vapors	lbs/bbl				0.03		E&P Forum	1/93
Fugitives	lbs/hr/comp.				0.0005		API Study	12/93
Glycol Dehydrator Vent	lbs/mmscf				6.6		La. DEQ	1991
Gas Venting	lbs/scf				0.0034			

Sulphur Content Source	Value	Units
Fuel Gas	3.33	ppm
Diesel Fuel	0.05	% weight
Produced Gas(Flares)	3.33	ppm
Produced Oil (Liquid Flaring)	1	% weight

Per 40 CFR 80.510(a)(1), Locomotive and Marine (LM) diesel fuels are limited to 500 ppm maximum sulfur, effective June 1, 2007

Miscellaneous Constants and Conversions

365	days/yr - Follows FLAG 2010 Guidance
2000	lb/ton conversion factor
454	g/lb conversion factor
1000	SCF/MSCF conversion factor
1.341	hp/kW conversion factor

AIR EMISSION FACTORS

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL			CONTACT		PHONE	REMARKS					
Shell Offshore Inc	Mississippi Canyon	812	OCS-G-34461		SS wells, SS Installation, well work (incl.			Josh O'Brien		504-425-9097						
OPERATIONS	EQUIPMENT	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR					ESTIMATED TONS				
	Diesel Engines	HP	GAL/HR	GAL/D												
	Nat. Gas Engines	HP	SCF/HR	SCF/D												
	Burners	MMBTU/HR	SCF/HR	SCF/D	HR/D	DAYS	PM	SOx	NOx	VOC	CO	PM	SOx	NOx	VOC	CO
PIPELINE	PIPELINE LAY BARGE diesel	46400	2241	53787	24	17	32.70	18.75	1124.23	33.73	245.29	6.67	3.83	229.34	6.88	50.04
INSTALLATION	SUPPORT VESSEL diesel	9790	473	11349	24	34	6.90	3.96	237.20	7.12	51.75	2.82	1.61	96.78	2.90	21.12
	SUPPORT VESSEL diesel	14751	712	17099	24	42	10.40	5.96	357.40	10.72	77.98	5.24	3.00	180.13	5.40	39.30
	INSTALLATION VESSEL diesel	14751	712	17099	24	12	10.40	5.96	357.40	10.72	77.98	1.50	0.86	51.47	1.54	11.23
	UMBILICAL LAY VESSEL diesel	21389	1033	24794	24	22	15.08	8.65	518.24	15.55	113.07	3.98	2.28	136.81	4.10	29.85
	SUPPORT VESSEL diesel	9790	473	11349	24	12	6.90	3.96	237.20	7.12	51.75	0.99	0.57	34.16	1.02	7.45
	VESSELS>600hp diesel(crew)	0	0	0	24	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS>600hp diesel(supply)	9790	473	11349	24	6	6.90	3.96	237.20	7.12	51.75	0.50	0.28	17.08	0.51	3.73
	2018 TOTAL						89.28	51.19	3068.88	92.07	669.57	21.70	12.44	745.77	22.37	162.71
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES											1864.80	1864.80	1864.80	1864.80	49766.56
	56.0															

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL		CONTACT			PHONE	REMARKS					
Shell Offshore Inc	Mississippi Canyon	812	OCS-G-34461		SS wells, SS Installation, well work (incl.			504-425-9097		Josh O'Brien						
OPERATIONS	EQUIPMENT	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR					ESTIMATED TONS				
	Diesel Engines	HP	GAL/HR	GAL/D												
	Nat. Gas Engines	HP	SCF/HR	SCF/D												
	Burners	MMBTU/HR	SCF/HR	SCF/D	HR/D	DAYS	PM	SOx	NOx	VOC	CO	PM	SOx	NOx	VOC	CO
Well Work	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	PRIME MOVER>600hp diesel	10728	518	4167	24	200	7.56	4.34	259.93	7.80	56.71	6.08	3.49	209.02	6.27	45.60
	Energency Generator>600hp diese	2547	123	2952	1	200	1.80	1.03	61.71	1.85	13.46	0.18	0.10	6.17	0.19	1.35
	Emergency Air Compressor< 600h	26	1	30	1	200	0.06	0.01	0.80	0.06	0.17	0.01	0.00	0.08	0.01	0.02
	All other rig-equipment is electric (e.g cranes) or negligible in emissions potential (e.g. life boats, welding equipment, etc.)															
	Supply Vessel>600hp diesel (gene	9790	473	5674	24	200	6.90	3.96	237.20	7.12	51.75	8.28	4.75	284.64	8.54	62.10
	Supply Vessel>600hp diesel (riser	9790	473	5674	24	10	6.90	3.96	237.20	7.12	51.75	0.41	0.24	14.23	0.43	3.11
	Supply Vessel>600hp diesel (riser	9790	473	5674	24	10	6.90	3.96	237.20	7.12	51.75	0.41	0.24	14.23	0.43	3.11
	Crew Vessel>600hp diesel	5400	261	939	24	60	3.81	2.18	130.84	3.93	28.55	0.41	0.24	14.13	0.42	3.08
	2019 - 2040 TOTAL						71.73	41.11	2464.54	73.98	537.72	46.19	26.48	1587.58	47.63	346.38
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES											1864.80	1864.80	1864.80	1864.80	49766.56
	56.0															

COMPANY	AREA	BLOCK	LEASE	PLATFORM	WELL
Shell Offshore Inc	Mississippi Canyon	812	OCS-G-34461	Drillship or DP Semi or DP MODU OR Installation Vessel	SS wells, SS Installation, well work (incl. workover)
Year	**Emitted**			**Substance**	
	PM	**SOx**	**NOx**	**VOC**	**CO**
			AQR Emissions if DP MODU(Semi-sub or Drillship) is Utilized		
2018	**21.70**	**12.44**	**745.77**	**22.37**	**162.71**
2019-2040	**46.19**	**26.48**	**1587.58**	**47.63**	**346.38**
Allowable	**1864.80**	**1864.80**	**1864.80**	**1864.80**	**49766.56**

Notes

The Campaign Average Daily Fuel Use (gal/day) is 25,000 gallons/day and represents total fuel use on the MODU. Since the Prime Movers would be the primary diesel users, the 25,000 gal/day is allocated equally amongst the six prime movers (4,167 gal/day for each Prime Mover). Fuel tracking mitigations should be applied to the total MODU fuel use of 25,000 gal/day.

SECTION 9: OIL SPILL INFORMATION

A. Oil Spill Response Planning

All the proposed activities and facilities in this plan will be covered by the Regional OSRP filed by Shell Offshore Inc. (0689) in accordance with 30 CFR 254.47 and NTL 2013-N02. Shell's regional OSRP was approved by BSEE in December 2014 and the bi-annual review was found to be in compliance on July 17, 2015 and modified August 5, 2015, and revised January 17, 2017, accepted January 30, 2017 and found to be in compliance June 29, 2017.

Primary Response Equipment Locations	Preplanned Staging Location(s)
Ingleside, TX; Galveston, TX; Venice, LA; Ft Jackson, LA; Harvey, LA; Stennis, MS; Pascagoula, MS; Theodore, AL; Tampa, FL	Galveston, TX; Port Fourchon; Venice, LA; Pascagoula, MS ; Mobile, AL; Tampa, FL

Table 9.1 – Response Equipment and Staging Areas

OSRO Information:
The names of the oil spill removal organizations (OSRO's) under contract include Clean Gulf Associates (CGA), Marine Spill Response Company (MSRC) and Oil Spill Response Limited (OSRL). These OSRO's provide equipment and will in some cases provide trained personnel to operate their response equipment (OSRVs, etc.) and Shell also has the option to pull from their trained personnel as needed for assistance/expertise in the Command Post and in the field.

Category	Regional OSRP	DOCD
Type of Activity	Production >10 miles to shore	Kaikias Subsea Facility
Facility Location (area/block)	MC 812	MC 812
Facility Designation	Subsea Well B◊	Subsea Well B◊
Distance to Nearest Shoreline (miles)	59	59
Volume Storage tanks (total) Flowlines (on facility) Pipelines Uncontrolled blowout (volume per day) Total Volume	 16,600 Bbls 100 Bbls 27,428,Bbls 468,000 BOPD* 512,128	 16,600 Bbls 100 Bbls 27,428,Bbls 468,000 BOPD* 512,128
Type of Oil(s) - (crude oil, condensate, diesel)	Crude oil	Crude oil
API Gravity(s)	31°	31°

Table 9.2 - Worst Case Scenario Determination

* 24 hour rate (432,000 BOPD 30-day average)

◊ This well was reviewed and accepted by BOEM in plan N-9840.

Certification:
Shell Offshore Inc. has the capability to respond to the appropriate worst-case spill scenario included in its regional OSRP that was approved by BSEE in December 2014 and the bi-annual review was found to be in compliance on July 17, 2015 and modified August 5, 2015, revised January 17, 2017, accepted January 30, 2017 and found to be in compliance June 29, 2017.

I hereby certify that Shell Offshore Inc. 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 plan.

Modeling:
Based on the requirement per BSEE NTL 2008-G04 and the outcome of the OSRAM Model, Shell Offshore Inc. determined no additional modeling was needed for potential oil or hazardous substance spill for operations proposed in this exploration plan, as the current, approved OSRP adequately meets the necessary response capabilities.

B. Oil Spill Response Discussion

1. Volume of the Worst Case Discharge

Please refer to Section 2j and 9(iv) of this plan.

2. Trajectory Analysis

Trajectories of a spill and the probability of it impacting a land segment have been projected utilizing information in the BOEMRE Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEMRE website using 30 day impact. Offshore areas along the trajectory between the source and land segment contact could be impacted. The land segment contact probabilities are shown in Table 9.C.1.

Area/Block	OCS-G	Launch Area	Land Segment Contact	%
Exploratory MC 812		58	Galveston, TX	1
			Jefferson, TX	1
			Cameron, LA	3
			Vermillion, LA	2
			Iberia, LA	1
			Terrebonne, LA	3
			LaFourche, LA	3
			Jefferson, LA	1
			Plaquemines, LA	**8**
			St. Bernard, LA	1
			Okaloosa, FL	1

Table 9.C.1 Probability of Land Segment Impact

C. Resource Identification

The locations identified in Table 9.C.1 are the highest probable land segments to be impacted using the BOEMRE Oil Spill Risk Analysis Model (OSRAM). The environmental sensitivities are identified using the appropriate National Oceanic and Atmospheric Administration (NOAA) Environmental Sensitivity Index (ESI) maps for the given land segment. ESI maps provide a concise summary of coastal resources that are at risk if an oil spill occurs nearby. Examples of at-risk resources include biological resources (such as birds and shellfish beds), sensitive shorelines (such as marshes and tidal flats), and human-use resources (such as public beaches and parks).

In the event an oil spill occurs, ESI maps can help responders meet one of the main response objectives: reducing the environmental consequences of the spill and the cleanup efforts. Additionally, ESI maps can be used by planners to identify vulnerable locations, establish protection priorities, and identify cleanup strategies.

The following is a list of resources of special economic or environmental importance that potentially could be impacted by the Mississippi Canyon 812 WCD scenario.

Onshore/Nearshore: Plaquemines Parish has been identified as the most probable impacted Parish within the Gulf of Mexico for the Greater than 10 Mile Worst Case Discharge and the Exploratory Worst Case Discharge. Plaquemines Parish has a total area of 2,429 square miles of which, 845 square miles of it is land and 1,584 square miles is water. Plaquemines Parish includes two National Wildlife Refuges: Breton National Wildlife Refuge and Delta National Wildlife Refuge. This area is also a nesting ground for the brown pelican, an endangered species. Examples of Environmental Sensitivity maps for Plaquemines Parish are detailed in the following pages. Key ESI maps for Plaquemines Parish and the legend are shown in Figures 9.C.1 through 9.C.5.

Offshore: An offshore spill may require an Essential Fishing Habitat (EFH) Assessment. This assessment would include a description of the spill, analysis of the potential adverse effects on EFH and the managed species; conclusions regarding the effects on the EFH; and proposed mitigation, if applicable.

Significant pre-planning of joint response efforts was undertaken in response to provisions of the National Contingency Plan (NCP). Area Contingency Plans (ACPs) were developed to provide a well coordinated response to oil discharges and other hazardous releases. The One Gulf Plan is specific to the Gulf of Mexico to advance the unity of policy and effort in each of the Gulf Coast ACPs. Strategies used for the response to an oil spill regarding protection of identified resources are detailed in the One Gulf Plan and relevant Gulf Coast ACP.

D. Worst Case Discharge Response

Shell will make every effort to respond to the MC812 Worst Case Discharge as effectively as possible. Below is a table outlining the applicable evaporation and surface dispersion quantity:

	Mississippi Canyon Block 812	**Calculations (BBLS)**
i.	**TOTAL WCD (based on 30 day average (per day))**	**~433,470**
ii.	Approximate loss of volume of oil to natural surface dispersion and evaporation base (approximate bbls per day)* (13% Natural surface evaporation and dispersion in 24 hrs)	-56,351
	APPROXIMATE TOTAL REMAINING	**~377,119**

* As this scenario involves a surface blowout onboard the platform, an ADIOS 2 Model was ran to account for surface dispersion and evaporation.

Table 9.D.1 Oil Remaining After Surface Dispersion

Shell has contracted OSROs to provide equipment, personnel, materials and support vessels as well as temporary storage equipment to be considered in order to cope with a WCD spill. Under adverse weather conditions, major response vessels and Transrec skimmers are still effective and safe in sea states of 6-8 ft. If sea conditions prohibit safe mechanical recovery efforts, then natural dispersion and airborne chemical dispersant application (visibility & wind conditions permitting) may be the only safe and viable recovery option.

MSRC OSRV	8 foot seas
VOSS System	4 foot seas
Expandi Boom	6 foot seas, 20 knot winds
Dispersants	Winds more than 25 knots, Visibility less than 3 nautical miles, or Ceiling less than 1,000 feet.

Table 9.D.2 Operational Limitations of Response Equipment

Upon notification of the spill, Shell would request a partial or full mobilization of contracted resources, including, but not limited to, skimming vessels, oil storage vessels, dispersant aircraft, subsea dispersant, shoreline protection, wildlife protection, and containment equipment. Following is a list of the contracted resources including de-rated recovery capacity, personnel, and estimated response times (procurement, load out, travel time to the site, and deployment). The Incident Commander or designee may contact other service companies if the Unified Command deems such services necessary to the response efforts.

Based on the anticipated worst case discharge scenario, Shell can be onsite with dedicated, contracted on water oil spill recovery equipment with adequate response capacity to contain and recover surface oil, and prevent land impact, within approximately 60 hours (based on the equipment's Estimated Daily Response Capacity (EDRC) and storage capacity). Shell will continue to ramp up additional on-water mechanical recovery resources as well as apply dispersants and in-situ burning as needed and as approved under the supervision of the USCG Captain of the Port (COTP) and the Regional Response Team (RRT).

Subsea Control and Containment: Shell, as a founding member of the MWCC, will have access to the IRCS that can be rapidly deployed through the MWCC. The IRCS is designed to contain oil flow in the unlikely event of an underwater well blowout, and is designed, constructed, tested, and available for rapid response. Shell's specific containment response for MC 812 will be addressed in Shell's NTL 2010-N10 submission at the time the APD is submitted.

Table 9.D.9 Control, Containment, and Subsea Dispersant Package Activation List

Mechanical Recovery (skimming): Response strategies include skimming utilizing available OSROs Oil Spill Response Vessels (OSRVs), Oil Spill Response Barges (OSRBs), ID Boats, and Quick Strike OSRVs. There is a combined de-rated recovery rate capability of approximately 1,525,000 barrels/day. Temporary storage associated with the identified skimming and temporary storage equipment equals approximately 1,489,000 barrels.

	De-rated Recovery Rate (bopd)	Storage (bbls)
Offshore Recovery and Storage	1,180,434	1,474,402
Nearshore Recovery and Storage	344,578	15,279
Total	1,525,012	1,489,681

Table 9.D.3 Mechanical Recovery Combined De-Rated Capability

Table 9.D.4 Offshore On-Water Recovery and Storage Activation List
Table 9.D.5 Nearshore On-Water Recovery and Storage 5ctivation List

Oil Storage: The strategy for transferring, storing and disposing of oil collected in these recovery zones is to utilize two 150,000-160,000 ton (dead weight) tankers mobilized by Shell (or any other tanker immediately available). The recovered oil would be transferred to Motiva's Norco, LA storage and refining facility, or would be stored at Delta Commodities, Inc. Harvey, LA facility.

Aerial Surveillance: Aircraft can be mobilized to detect, monitor, and target response to oil spills. Aircraft and spotters can be mobilized within hours of an event.

Table 9.D.6 Aerial Surveillance Activation List

Aerial Dispersant: Depending on proximity to shore and water depth, dispersants may be a viable response option. If appropriate and approved, 4 to 5 sorties from three DC-3's can be made within the first 12 hour operating day of the response. These aerial systems could disperse approximately 7,704 to 9,630 barrels of oil per day. Additionally, 3 to 4 sorties from the BE90 King Air and 3 to 4 sorties from the Hercules C-130A within the first 12 hour operating day of the response could disperse 4,600 to 6,100 barrels of oil per day. For continuing dispersant operations, the CCA's Aerial Dispersant Delivery System (ADDS) would be mobilized. The ADDS has a dispersant spray capability of 5,000 gallons per sortie.

Table 9.D.7 Offshore Aerial Dispersant Activation List

Vessel Dispersant: Vessel dispersant application is another available response option. If appropriate, vessel spray systems can be installed on offshore vessels of opportunity using inductor nozzles (installed on fire-water monitors), skid mounted systems, or purpose-built boom arm spray systems. Vessels can apply dispersant within the first 12-24 hours of the response and continually as directed.

Table 9.D.8 Offshore Boat Spray Dispersant Activation List

Subsea Dispersant: Shell has contracted with Wild Well Control for a subsea dispersant package. Subsea dispersant application has been found to be highly effective at reducing the amount of oil reaching the surface. Additional data collection, laboratory tests and field tests will help in facilitating the optimal application rate and effectiveness numbers. For planning purposes, the system has the potential to disperse approximately 24,500 to 34,000 barrels of oil per day.

Table 9.D.9 Control, Containment, and Subsea Dispersant Package Activation List

In-Situ Burning: Open-water in-situ burning (ISB) also may be used as a response strategy, depending on the circumstances of the release. ISB services may be provided by the primary OSRO contractors. If appropriate conditions exist and approvals are granted, one or multiple ISB task forces could be deployed offshore. Task forces typically consist of two to four fire teams, each with two vessels capable of towing fire boom, guide boom or tow line with either a handheld or aerially-deployed oil ignition system. At least one support/safety boat would be present during active burning operations to provide logistics, safety and monitoring support. Depending upon a number of factors, up to 4 burns per 12-hour day could be completed per ISB fire team. Most fire boom systems can be used for approximately 8-12 burns before being replaced. Fire intensity and weather will be the main determining factors for actual burns per system. Although the actual amount of oil that will be removed per burn is dependent on many factors, recent data suggests that a typical burn might eliminate approximately 750 barrels. For planning purposes and based on the above assumptions, a single task force of four fire teams with the appropriate weather and safety conditions could complete four burns per day and remove up to ~12,000 bbls/day. In-situ burning nearshore and along shorelines may be a possible option based on several conditions and with appropriate approvals, as outlined in Section 19, In-situ Burn Plan (OSRP). In-situ burning along certain types of shorelines may be used to minimize physical damage where access is limited or if it is determined that mechanical/manual removal may cause a substantial negative impact on the environment. All safety considerations will be evaluated. In addition, Shell will assess the situation and can make notification within 48 hours of the initial spill to begin ramping up fire boom production through contracted OSRO(s). There are potential limitations that need to be assessed prior to ISB operations. Some limitations include atmospheric and sea conditions; oil weathering; air quality impacts; safety of response workers; and risk of secondary fires.

Table 9.D.10 In-Situ Burn Equipment Activation List

Shoreline Protection: If the spill went unabated, shoreline impact in Plaquemines Parish, LA would depend upon existing environmental conditions. Nearshore response may include the deployment of shoreline boom on beach areas, or protection and sorbent boom on vegetated areas. Strategies would be based upon surveillance and real time trajectories provided by The Response Group that depict areas of potential impact given actual sea and weather conditions. Strategies from the New Orleans, Louisiana Area Contingency Plan, Unified Command would be consulted to ensure that environmental and special economic resources would be correctly identified and prioritized to ensure optimal protection. Shell has access to shoreline response guides that depict the protection response modes applicable for oil spill clean-up operations. Each response mode is schematically represented to show optimum deployment and operation of the equipment in areas of environmental concern. Supervisory personnel have the option to modify the deployment and operation of equipment allowing a more effective response to site-specific circumstances.

Table 9.D.11 Shoreline Protection and Wildlife Support List

Wildlife Protection: If wildlife is threatened due to a spill, the contracted OSRO's have resources available to Shell, which can be utilized to protect and/or rehabilitate wildlife. The resources under contract for the protection and rehabilitation of affected wildlife are in Table 9.D.11.

New or unusual technology in regards to spill, prevention, control and clean-up:
Shell will use our normal well design and construction processes with multiple barrier approach as well as new stipulations mandated by NTL 2008-N05. Response techniques will utilize new learnings from Macondo response to include in-situ burning and subsea dispersant application. Mechanical recovery advancements are continuing to be made to incorporate utilization of Koseq arms outfitted on barges, conversion of Platform Support Vessels for Oil Spill Response, and inclusion of nighttime spill detection radar to improve tracking capabilities (X-Band radar, Infrared sensing, etc.). In addition, new response technologies/techniques are continuing to be considered by Shell and the appropriate government organizations for incorporation into our planned response. Any additional response technologies/techniques presented at the time of response will be used at the discretion of the Unified Command and USCG.

LOUISIANA

SHORELINE HABITATS (ESI)
2001 ESI Shoreline Classification

- 1B) EXPOSED, SOLID MAN-MADE STRUCTURES
- 2A) EXPOSED WAVE-CUT PLATFORMS IN CLAY
- 2B) EXPOSED SCARPS AND STEEP SLOPES IN CLAY
- 3A) FINE- TO MEDIUM-GRAINED SAND BEACHES
- 3B) SCARPS AND STEEP SLOPES IN SAND
- 4) COARSE-GRAINED SAND BEACHES
- 5) MIXED SAND AND GRAVEL BEACHES
- 6A) GRAVEL BEACHES
- 6B) RIPRAP
- 7) EXPOSED TIDAL FLATS
- 8A) SHELTERED ROCKY SHORES AND SHELTERED SCARPS IN MUD OR CLAY
- 8B) SHELTERED MAN-MADE STRUCTURES
- 8C) SHELTERED RIPRAP
- 9A) SHELTERED TIDAL FLATS
- 9B) SHELTERED, VEGETATED LOW BANKS
- 10A) SALT- AND BRACKISH-WATER MARSHES
- 10B) FRESHWATER MARSHES
- 10C) FRESHWATER SWAMPS
- 10D) SCRUB-SHRUB WETLANDS

COASTAL HABITATS
From 1988 Digital Shoreline

- 10A) SALT MARSH
- 10A) BRACKISH MARSH
- 10A) INTERMEDIATE MARSH
- 10B) FRESHWATER MARSH
- 10C) FORESTED WETLAND
- 10D) SCRUB-SHRUB WETLAND
- SEAGRASS

SENSITIVE BIOLOGICAL RESOURCES

BIRD
- DIVING BIRD
- GULL / TERN
- PASSERINE
- RAPTOR
- SHOREBIRD
- WADING BIRD
- WATERFOWL
- NESTING SITE

FISH
- FISH

TERRESTRIAL MAMMAL
- BAT
- BEAR
- SMALL MAMMAL

INVERTEBRATE
- BIVALVE
- CEPHALOPOD
- CRAB
- CRAYFISH
- INSECT
- SHRIMP

REPTILE / AMPHIBIAN
- ALLIGATOR
- TURTLE
- OTHER REPTILE / AMPHIBIAN

HABITAT
- PLANT
- SEAGRASS

MUTIPLE ELEMENTS
- THREATENED / ENDANGERED
- RAR NUMBER

HUMAN-USE FEATURES

- AIRPORT / HELIPORT
- BOAT RAMP
- INDIAN RESERVATION
- MARINA
- NATIONAL PARK / NATURE CONSERVANCY
- SENIC RIVER
- STATE PARK
- WILDLIFE REFUGE
- HUMAN-USE NUMBER
- PARISH BOUNDARY
- MANAGEMENT BOUNDARY
- MAJOR ROAD
- MINOR ROAD
- SHORELINE FROM 2001 PHOTO INTERPRETATION
- SHORELINE FROM 1988 DIGITAL DATA

ENVIRONMENTAL SENSITIVITY INDEX MAP

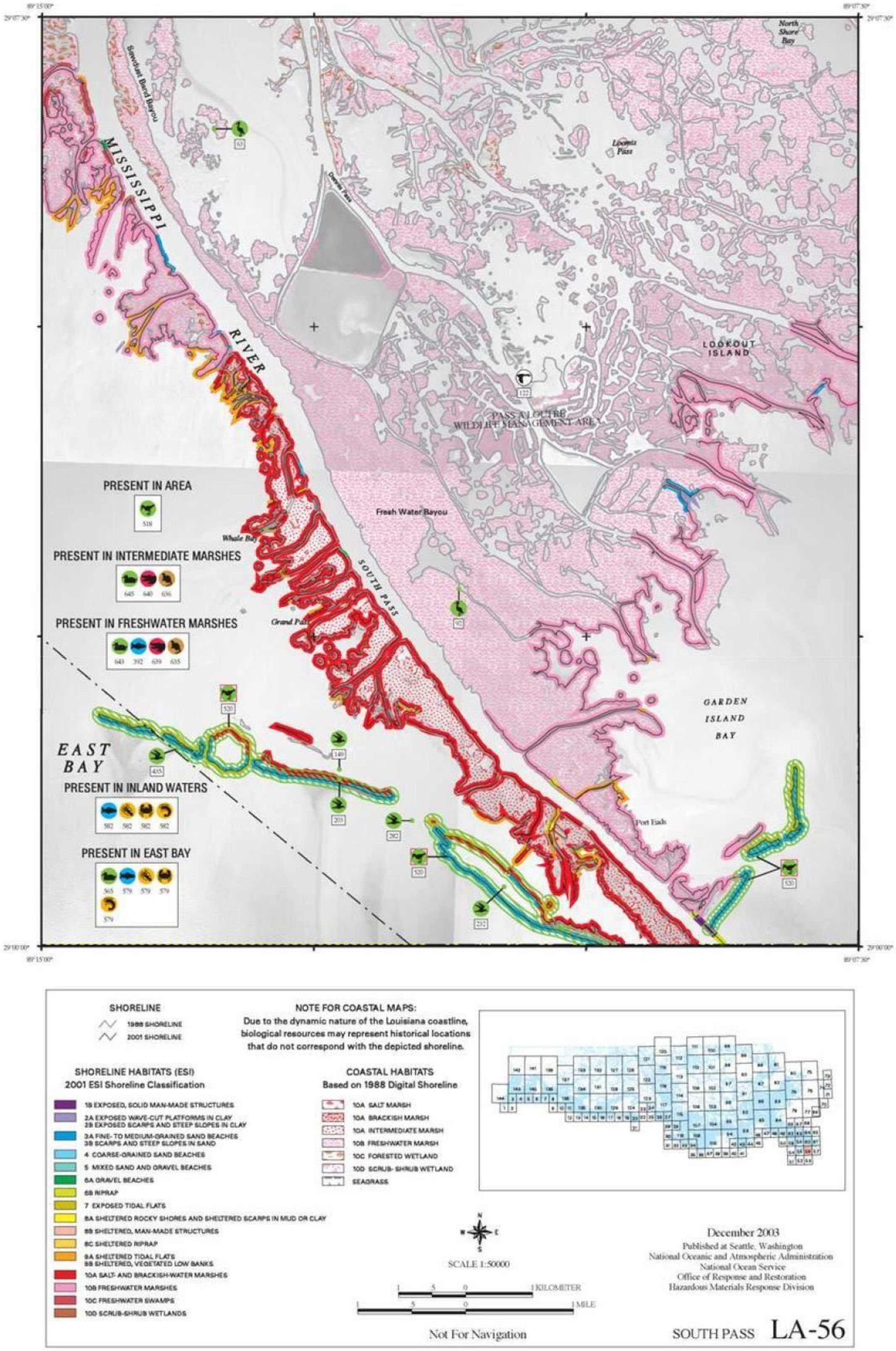


Figure 9.C.2 South Pass ESI Map

ENVIRONMENTAL SENSITIVITY INDEX MAP

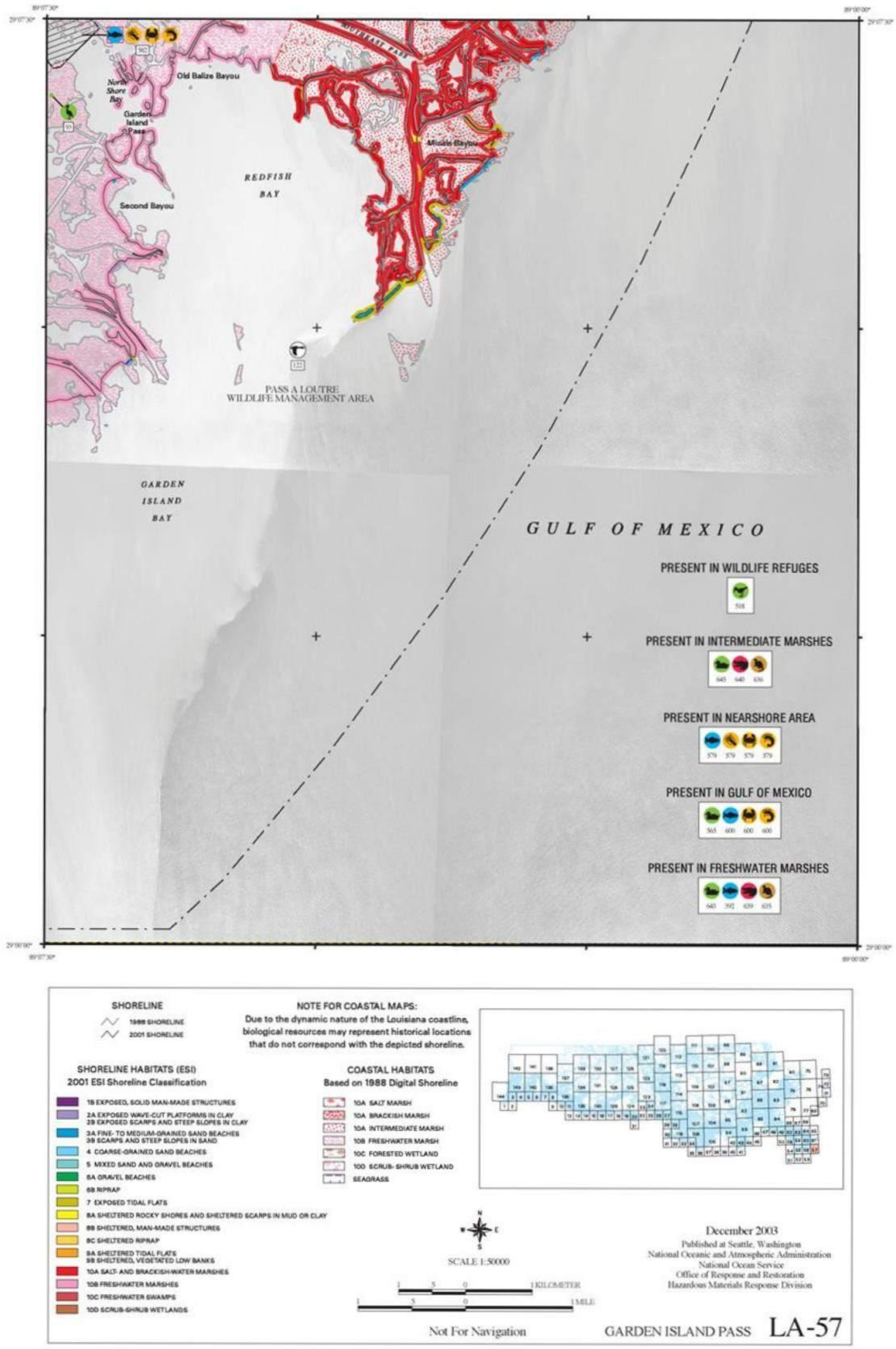


Figure 9.C.3 Garden Island Pass ESI Map

ENVIRONMENTAL SENSITIVITY INDEX MAP

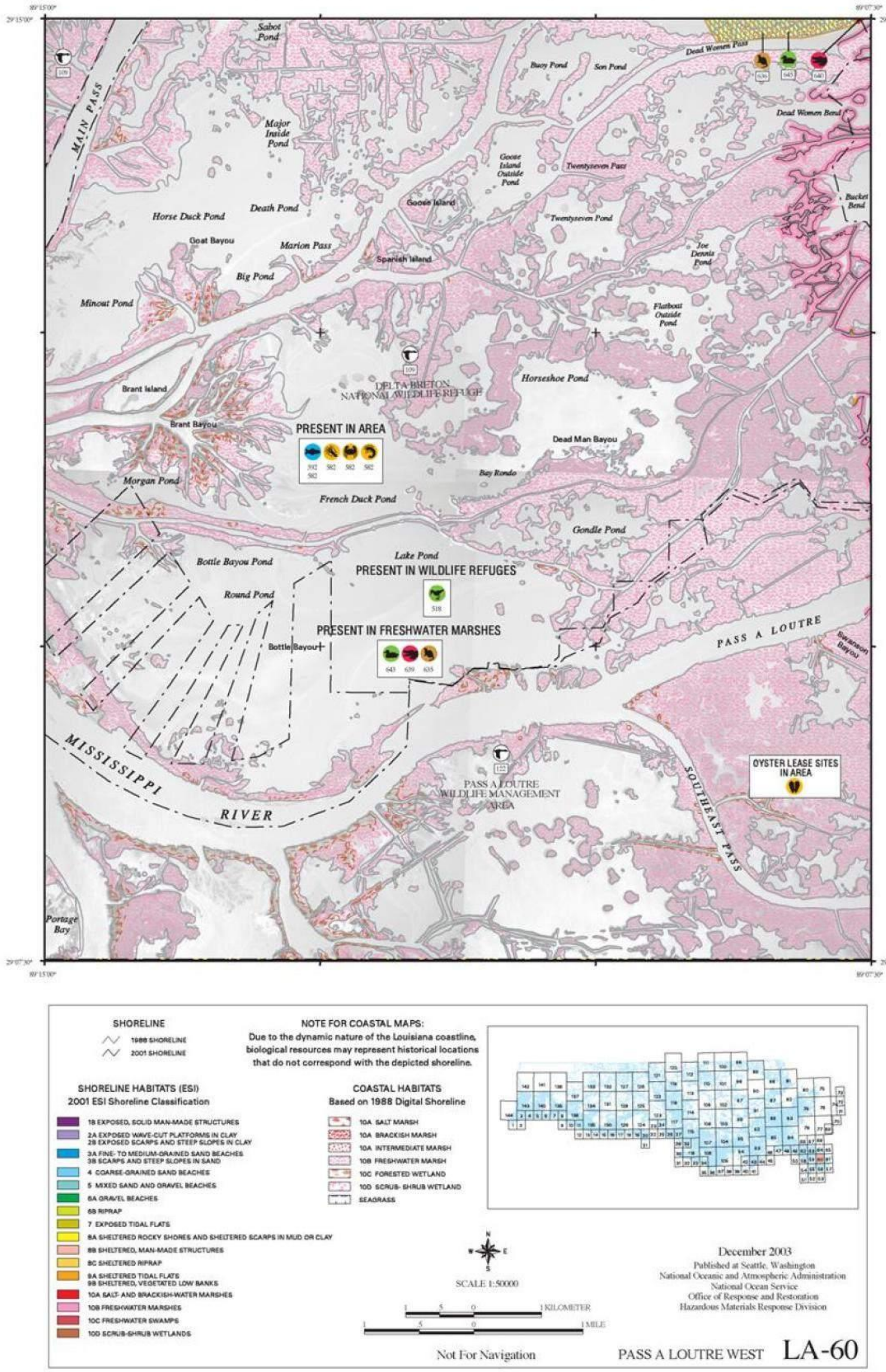


Figure 9.C.4 Pass a Loutre West ESI Map

ENVIRONMENTAL SENSITIVITY INDEX MAP

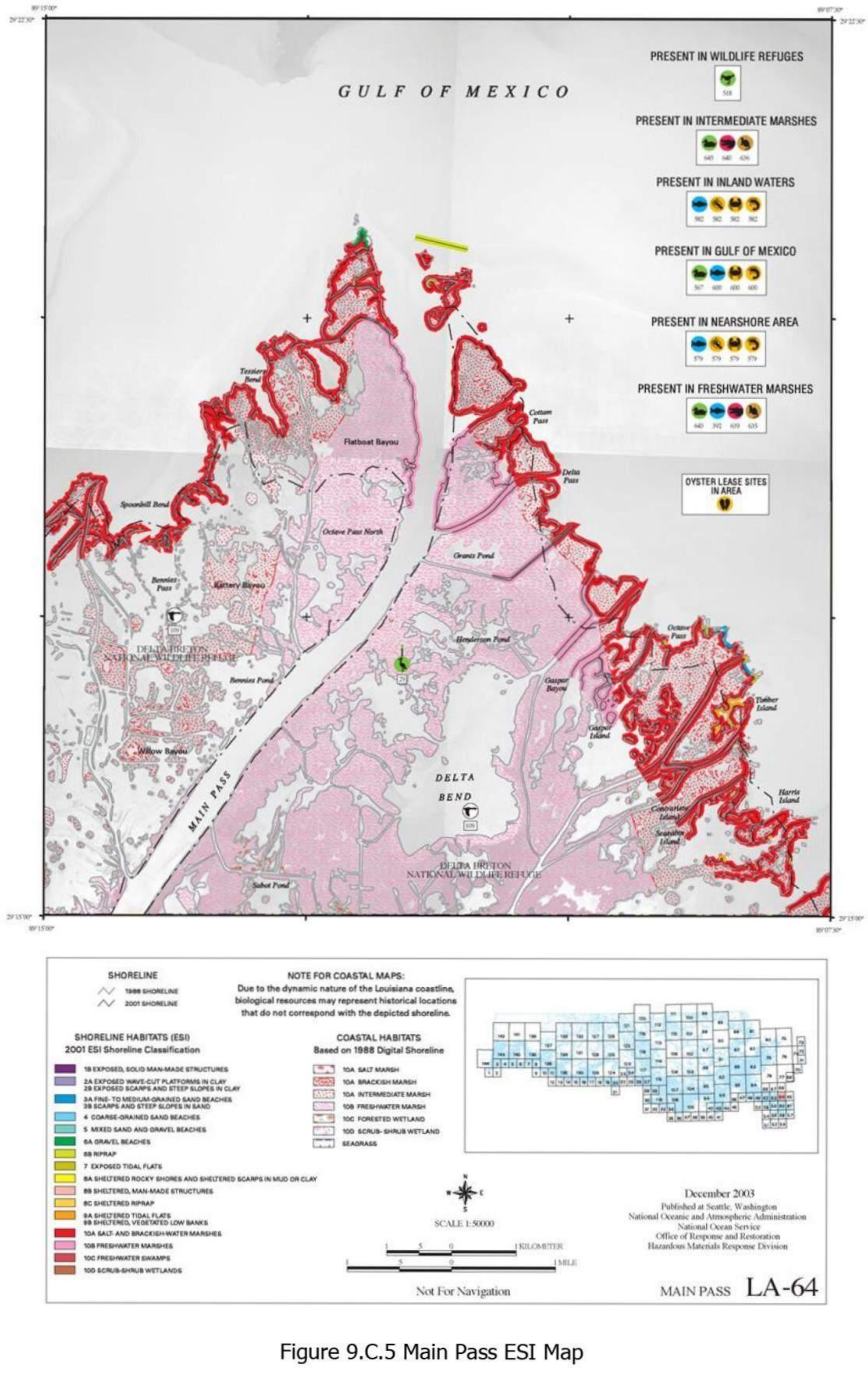


Figure 9.C.5 Main Pass ESI Map

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

* - These components are additional operational requirements that must be procured in addition to the system identified.
** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment.
*** - Specific barge name may vary.

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
FRV Breton Island	CGA (888) 242-2007	Venice, LA	Lamor Brush Skimmer	2	22,885	249	Venice, LA	88	2	0	5	1	8
			36" Boom	64									
			95' Vessel	1									
			X Band Radar	1									
			Personnel	6									
FRV JL O'Brien	CGA (888) 242-2007	Leeville, LA	Lamor Brush Skimmer	2	22,885	249	Leeville, LA	112	2	0	6.5	1	10
			36" Boom	64									
			95' Vessel	1									
			X Band Radar	1									
			Personnel	6									
Louisiana Responder Transrec 350	MSRC (800) OIL-SPIL	Fort Jackson, LA	Transrec	1	10,567	4,000	Fort Jackson, LA	97	2	1	7	1	11
			Backup- Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	1320'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
Deep Blue Responder LFF 100 Brush	MSRC (800) OIL-SPIL	Port Fourchon, LA	LFF 100 Brush Skimmer	1	18,086	4,000	Port Fourchon, LA	102	2	1	7.5	1	12
			Backup- Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	1320'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
Stress 1	MSRC (800) OIL-SPIL	Belle Chasse, LA	Offshore Skimmer	1	15,840	0	Venice, LA	88	4	1	6.5	1	13
			67" Pressure Inflatable Boom "Louisiana Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FOILEX 200	MSRC (800) OIL-SPIL	Belle Chasse, LA	Offshore Skimmer	1	1,989	0	Venice, LA	88	4	1	6.5	1	13
			67" Pressure Inflatable Boom "Lousiana Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Belle Chasse, LA	Offshore Skimmer	1	1,371	0	Venice, LA	88	4	1	6.5	1	13
			67" Pressure Inflatable Boom "Lousiana Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FOILEX 250	MSRC (800) OIL-SPIL	Belle Chasse, LA	Offshore Skimmer	1	3,977	0	Venice, LA	88	4	1	6.5	1	13
			67" Pressure Inflatable Boom "Lousiana Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Walosep W-4	MSRC (800) OIL-SPIL	Belle Chasse, LA	Offshore Skimmer	1	3,017	0	Venice, LA	88	4	1	6.5	1	13
			67" Pressure Inflatable Boom "Deep Blue Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 1	MSRC (800) OIL-SPIL	Pascagoula, MS	Offshore Skimmer	1	15,840	0	Venice, LA	88	5.5	1	6.5	1	14
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 2	MSRC (800) OIL-SPIL	Pascagoula, MS	Offshore Skimmer	1	3,017	0	Venice, LA	88	5.5	1	6.5	1	14
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
*- These components are additional operational requirements that must be procured in addition to the system identified. ** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment. *** - Specific barge name may vary.													
WP-1	MSRC (800) OIL-SPIL	Pascagoula, MS	Offshore Skimmer	1	3,017	0	Venice, LA	88	5.5	1	6.5	1	14
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FRU 3.0 - Foilex 150 TDS	CGA (888) 242-2007	Harvey, LA	Weir Skimmer	1	1,131	0	Venice, LA	88	4	1	9	1	15
			Personnel	4									
			* Utility Boat (<100')	1									
			50 bbl Portable tank	1		50							
PT 150 Aquaguard Skimmer (2)	CGA (888) 242-2007	Harvey, LA	Brush skimmer	1	22,323	0	Venice, LA	88	4	1	9	1	15
			Personnel	4									
			* Offshore Utility Boat	1									
			* Add'l Storage	2		1,000							
Stress 1	MSRC (800) OIL-SPIL	Port Fourchon, LA	Offshore Skimmer	1	15,840	0	Venice, LA	88	5.75	1	6.5	1	15
			67" Pressure Inflatable Boom "Deep Blue Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Venice, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	4	2	9	1	16
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Venice, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	4	2	9	1	16
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
Stress 1	MSRC (800) OIL-SPIL	Lake Charles, LA	Offshore Skimmer	1	15,840	0	Venice, LA	88	7	1	6.5	1	16
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FOILEX 250	MSRC (800) OIL-SPIL	Lake Charles, LA	Offshore Skimmer	1	3,977	0	Venice, LA	88	7	1	6.5	1	16
			67" Pressure Inflatable Boom "Deep Blue Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
DESMI OCEAN	MSRC (800) OIL-SPIL	Lake Charles, LA	Offshore Skimmer	1	3,017	0	Venice, LA	88	7	1	6.5	1	16
			67" Pressure Inflatable Boom "Deep Blue Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Mississippi Responder Transrec-350	MSRC (800) OIL-SPIL	Pascagoula, MS	Transrec Skimmer	1	10,567	4,000	Pascagoula, MS	160	2	1	11.5	1	16
			Backup- Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	2310'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Morgan City, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	5	2	9	1	17
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

** - These components are additional operational requirements that must be procured in addition to the system identified.*
*** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment.*
**** - Specific barge name may vary.*

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
GT-185	MSRC (800) OIL-SPIL	Port Arthur, TX	Offshore Skimmer	1	1,371	0	Venice, LA	88	8	1	6.5	1	17
			67" Pressure Inflatable Boom "Mississippi Responder"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
MSRC-452 Offshore Barge	MSRC (800) OIL-SPIL	Fort Jackson, LA	Offshore Barge	1	14,139	45,000	Fort Jackson, LA	97	4	1	11	1	17
			67" Pressure Inflatable Boom	2310'									
			Crucial Disc Skimmer	1									
			Desmi Ocean	1									
			*Appropriate Vessel	1									
			Personnel	9									
			* Offshore Tug	2									
			X Band Radar	1									
			Infrared Camera	1									
FRU 3.0 - Foilex 150 TDS	CGA (888) 242-2007	Lake Charles, LA	Weir Skimmer	1	1,131	0	Venice, LA	88	7	1	9	1	18
			Personnel	4									
			* Utility Boat (<100')	1									
			50 bbl Portable tank	1		50							
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Leeville, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	5.5	2	9	1	18
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Leeville, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	5.5	2	9	1	18
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
GT-185	MSRC (800) OIL-SPIL	Galveston, TX	Offshore Skimmer	1	1,371	0	Venice, LA	88	9.5	1	6.5	1	18
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Walosep W-4	MSRC (800) OIL-SPIL	Galveston, TX	Offshore Skimmer	1	3,017	0	Venice, LA	88	9.5	1	6.5	1	18
			67" Pressure Inflatable Boom "	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FOILEX 250	MSRC (800) OIL-SPIL	Galveston, TX	Offshore Skimmer	1	3,977	0	Venice, LA	88	9.5	1	6.5	1	18
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 1	MSRC (800) OIL-SPIL	Galveston, TX	Offshore Skimmer	1	15,840	0	Venice, LA	88	9.5	1	6.5	1	18
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FRV H.I. Rich	CGA (888) 242-2007	Vermilion, LA	Lamor Brush Skimmer	2	22,885	249	Vermilion, LA	270	2	0	16	1	19
			36" Boom	64									
			95' Vessel	1									
			X Band Radar	1									
			Personnel	6									
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Vermilion, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	6.25	2	9	1	19
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Lake Charles, LA	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	7	2	9	1	19
			Personnel	4									
			Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

** - These components are additional operational requirements that must be procured in addition to the system identified.*
*** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment.*
**** - Specific barge name may vary.*

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
FRU 3.0 - Foilex 150 TDS	CGA (888) 242-2007	Galveston, TX	Weir Skimmer	1	1,131	0	Venice, LA	88	9.5	1	9	1	**21**
			Personnel	4									
			* Utility Boat (<100')	1									
			50 bbl Portable tank	1		50							
PT 150 Aquaguard Skimmer (1)	CGA (888) 242-2007	Galveston, TX	Brush skimmer	1	22,323	0	Venice, LA	88	9.5	1	9	1	**21**
			Personnel	4									
			* Offshore Utility Boat	1									
			* Add'l Storage	2		1,000							
FOILEX 250	MSRC (800) OIL-SPIL	Ingleside, TX	Offshore Skimmer	1	3,977	0	Venice, LA	88	12.25	1	6.5	1	**21**
			67" Pressure Inflatable Boom										
			"MSRC 452 Offshore Barge"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 1	MSRC (800) OIL-SPIL	Ingleside, TX	Offshore Skimmer	1	15,840	0	Venice, LA	88	12.25	1	6.5	1	**21**
			67" Pressure Inflatable Boom										
			"MSRC 403"	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
WP-1	MSRC (800) OIL-SPIL	Tampa, FL	Offshore Skimmer	1	3,017	0	Venice, LA	88	13	1	6.5	1	**22**
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 1	MSRC (800) OIL-SPIL	Tampa, FL	Offshore Skimmer	1	15,840	0	Venice, LA	88	13	1	6.5	1	**22**
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
MSRC-402 Offshore Barge	MSRC (800) OIL-SPIL	Pascagoula, MS	Offshore Barge	1	22,244	40,300	Pascagoula, MS	160	4	1	18	1	**24**
			67" Pressure Inflatable Boom	2640'									
			Crucial Disc Skimmer	2									
			*Appropriate Vessel	1									
			Personnel	9									
			* Offshore Tug	2									
			X Band Radar	1									
			Infrared Camera	1									
FRV Galveston Island	CGA (888) 242-2007	Galveston, TX	Lamor Brush Skimmer	2	22,885	249	Galveston, TX	365	2	0	21.5	1	**25**
			36" Boom	64									
			95' Vessel	1									
			X Band Radar	1									
			Personnel	6									
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Aransas Pass, TX	Foilex 250 Skimmer	1	4,251	100	Venice, LA	88	12.25	2	9	1	**25**
			Personnel	4									
			* 100-140' Utility Boat	1									
			53" Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
DESMI OCEAN	MSRC (800) OIL-SPIL	Miami, FL	Offshore Skimmer	1	3,017		Venice, LA	88	16	1	6.5	1	**25**
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Walosep W-4	MSRC (800) OIL-SPIL	Miami, FL	Offshore Skimmer	1	3,017		Venice, LA	88	16	1	6.5	1	**25**
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185 w/ adapter	MSRC (800) OIL-SPIL	Miami, FL	Offshore Skimmer	1	1,371		Venice, LA	88	16	1	6.5	1	**25**
			67" Pressure Inflatable Boom	50'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Stress 1	MSRC (800) OIL-SPIL	Miami, FL	Offshore Skimmer	1	15,840	0	Venice, LA	88	16	1	6.5	1	**25**
			67" Pressure Inflatable Boom	330'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified. ** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment. *** - Specific barge name may vary.													
Gulf Coast Responder Transrec-350	MSRC (800) OIL-SPIL	Lake Charles, LA	Transrec Skimmer	1	10,567	4,000	Lake Charles, LA	312	2	1	22.5	1	27
			Backup - Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	2640'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
GT-185	MSRC (800) OIL-SPIL	Virginia Beach, VA	Offshore Skimmer	1	1,371		Venice, LA	88	19.5	1	6.5	1	28
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
CGA-200 HOSS Barge (OSRB)	CGA (888) 242-2007	Harvey, LA	Marco Skimmer	4	76,285	4,000	Harvey, LA	150	0	4	22.5	1	28
			67" Sea Sentry	2640'									
			Personnel	12									
			* Tug - 1,200 HP	2									
			X Band Radar	1									
			* Tug - 1,800 HP	1									
GT-185	MSRC (800) OIL-SPIL	Virginia Beach, VA	Offshore Skimmer	1	1,371		Venice, LA	88	19.5	1	6.5	1	28
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Baltimore, MD	Offshore Skimmer	1	1,371		Venice, LA	88	20.25	1	6.5	1	29
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Chesapeake City, MD	Offshore Skimmer	1	1,371		Venice, LA	88	21.25	1	6.5	1	30
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Chesapeake City, MD	Offshore Skimmer	1	1,371		Venice, LA	88	21.25	1	6.5	1	30
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
Texas Responder Transrec-350	MSRC (800) OIL-SPIL	Galveston, TX	Transrec Skimmer	1	10,567	4,000	Galveston, TX	365	2	1	26	1	30
			Backup - Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	2530'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
Desmi Ocean	MSRC (800) OIL-SPIL	Edison/Perth Amboy, NJ	Offshore Skimmer	1	3,017		Venice, LA	88	22.75	1	6.5	1	32
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Edison/Perth Amboy, NJ	Offshore Skimmer	1	1,371		Venice, LA	88	22.75	1	6.5	1	32
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
PSV-VOO Skimming System (Crucial Disc)	MSRC (800) OIL-SPIL	Fort Jackson, LA	Crucial Disc Skimmer	1	11,122	0	Fort Jackson, LA	97	24	1	7	1	33
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
PSV-VOO Skimming System (Crucial Disc)	MSRC (800) OIL-SPIL	Fort Jackson, LA	Crucial Disc Skimmer	1	11,122	0	Fort Jackson, LA	97	24	1	7	1	33
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

* - These components are additional operational requirements that must be procured in addition to the system identified.
** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment.
*** - Specific barge name may vary.

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours) Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
PSV-VOO Skimming System (Brush)	MSRC (800) OIL-SPIL	Port Fourchon, LA	Lamor Brush Skimmer	1	18,086	0	Port Fourchon, LA	102	24	1	7.5	1	34
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
PSV-VOO Skimming System (Brush)	MSRC (800) OIL-SPIL	Port Fourchon, LA	Lamor Brush Skimmer	1	18,086	0	Port Fourchon, LA	102	24	1	7.5	1	34
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
Desmi Ocean	MSRC (800) OIL-SPIL	Everett, MA	Offshore Skimmer	1	3,017		Venice, LA	88	26	1	6.5	1	35
			67" Pressure Inflatable Boom										
			"Texas Responder"	110'									
			*Appropriate Vessel	2									
			Personnel	5									
			*Temporary Storage	1		500							
Desmi 250	MSRC (800) OIL-SPIL	Portland, ME	Offshore Skimmer	1	2,112		Venice, LA	88	28	1	6.5	1	37
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
GT-185	MSRC (800) OIL-SPIL	Portland, ME	Offshore Skimmer	1	1,371		Venice, LA	88	28	1	6.5	1	37
			67" Pressure Inflatable Boom	110'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
PSV-VOO Skimming System (Transrec)	MSRC (800) OIL-SPIL	Houma, LA	Transrec 350 Skimmer	1	10,567	0	Houma, LA	157	24	1	11	1	37
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
Southern Responder Transrec-350	MSRC (800) OIL-SPIL	Ingleside, TX	Transrec Skimmer	1	10,567	4,000	Ingleside, TX	509	2	1	36.5	1	41
			Backup - Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	2640'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
Fast Response Unit "FRU" 1.0	CGA (888) 242-2007	Galveston, TX	Foilex 250 Skimmer	1	4,251	100	Galveston, TX	365	4	2	36.5	1	44
			Personnel	4									
			* 100-165' Utility Boat	1									
			53' Skimming Boom	75'									
			** 67" Sea Sentry	440'									
			** Crew Boat	1									
			** Add'l Storage	1		100							
MSRC-570 Offshore Barge	MSRC (800) OIL-SPIL	Galveston, TX	Offshore Barge	1	22,244	56,900	Galveston, TX	365	4	1	40.5	1	47
			67" Pressure Inflatable Boom	2640'									
			Crucial Disc Skimmer	2									
			*Appropriate Vessel	1									
			Personnel	9									
			* Offshore Tug	2									
			X Band Radar	1									
			Infrared Camera	1									
Koseq Skimming Arms (6) (Marilex Weir)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	36,326	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (7) (Marilex Weir)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	36,326	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

* - These components are additional operational requirements that must be procured in addition to the system identified.
** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment.
*** - Specific barge name may vary.

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
Koseq Skimming Arms (8) (Mariflex Weir)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	36,326	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (9) (Lamor Brush)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	45,770	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (10) (Mariflex Weir)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	36,326	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (11) (Mariflex Weir)	CGA (888) 242-2007	Harvey, LA	15m rigid skimming arm	2	36,326	0	Port Fourchon, LA	102	4	33	10	1	48
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
PSV-VOO Skimming System (Brush)	MSRC (800) OIL-SPIL	Lake Charles, LA	Lamor Brush Skimmer	1	18,086	0	Lake Charles, LA	312	24	1	22.5	1	49
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
PSV-VOO Skimming System (Brush)	MSRC (800) OIL-SPIL	Lake Charles, LA	Lamor Brush Skimmer	1	18,086	0	Lake Charles, LA	312	24	1	22.5	1	49
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
PSV-VOO Skimming System (Transrec)	MSRC (800) OIL-SPIL	Lake Charles, LA	Transrec 350 Skimmer	1	10,567	0	Lake Charles, LA	312	24	1	22.5	1	49
			67" Pressure Inflatable Boom	1320'									
			* PSV-VOO	1									
			Personnel	9									
			Thermal Infrared Camera	1									
			*Appropriate Vessel	1									
			* Marine Portable Tank	2		1,000							
Florida Responder Transrec-350	MSRC (800) OIL-SPIL	Miami, FL	Transrec Skimmer	1	10,567	4,000	Miami, FL	658	2	1	47	1	51
			Backup - Stress 1 Skimmer	1									
			67" Pressure Inflatable Boom	2640'									
			210' Vessel	1									
			Personnel	10									
			32' Support Boat	1									
			X Band Radar	1									
			Infrared Camera	1									
			FAES #4 "Buster"	1									
MSRC-360 Offshore Barge	MSRC (800) OIL-SPIL	Tampa, FL	Offshore Barge	1	11,122	36,000	Tampa, FL	407	4	1	45.5	1	52
			67" Pressure Inflatable Boom	1320'									
			Crucial Disc Skimmer	1									
			*Appropriate Vessel	1									
			Personnel	9									
			* Offshore Tug	2									
			X Band Radar	1									
			Infrared Camera	1									
MSRC-403 Offshore Barge	MSRC (800) OIL-SPIL	Ingleside, TX	Offshore Barge	1	11,122	40,300	Ingleside, TX	509	4	1	56.5	1	63
			67" Pressure Inflatable Boom	2640'									
			Crucial Disc Skimmer	1									
			*Appropriate Vessel	1									
			Personnel	9									
			* Offshore Tug	2									
			X Band Radar	1									
			Infrared Camera	1									
Koseq Skimming Arms (1) (Lamor Brush)	CGA (888) 242-2007	Galveston, TX	15m rigid skimming arm	2	45,770	0	Galveston, TX	365	4	24	36.5	1	66
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore On-Water Recovery & Storage Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified. ** - These components are additional operational requirements for the packages to be used in an enhanced skimming deployment. *** - Specific barge name may vary.													
Koseq Skimming Arms (2) (Lamor Brush)	CGA (888) 242-2007	Galveston, TX	15m rigid skimming arm	2	45,770	0	Galveston, TX	365	4	24	36.5	1	66
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (3) (Lamor Brush)	CGA (888) 242-2007	Galveston, TX	15m rigid skimming arm	2	45,770	0	Galveston, TX	365	4	24	36.5	1	66
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (4) (Lamor Brush)	CGA (888) 242-2007	Galveston, TX	15m rigid skimming arm	2	45,770	0	Galveston, TX	365	4	24	36.5	1	66
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
Koseq Skimming Arms (5) (Lamor Brush)	CGA (888) 242-2007	Galveston, TX	15m rigid skimming arm	2	45,770	0	Galveston, TX	365	4	24	36.5	1	66
			Personnel	5									
			* Offshore vessel (>200')	1									
			* 30T crane	1									
			* 500 bbl Portable tank	4		2,000							
***Moran/ Long Island	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	62,982	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Tennessee	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	82,022	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ New Hampshire	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	118,836	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***K-Sea DBL 101 Offshore Barge	CGA (888) 242-2007	Belle Chasse, LA	Offshore Barge	1	N/A	107,285	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	10									
			* Offshore Tug	1									
***K-Sea DBL 102 Offshore Barge	CGA (888) 242-2007	Belle Chasse, LA	Offshore Barge	1	N/A	107,285	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	10									
			* Offshore Tug	1									
***Moran/ Massachusetts	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	137,123	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Conneticut	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	41,454	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Portland	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	91,443	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Georgia	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	118,794	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Charleston	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	118,638	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***Moran/ Philadelphia	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	118,694	Houma, LA	157	24-72	0	20	1	45 to 93
			Personnel	4									
			Offshore Tug	1									
***CTCo-5001 Offshore Barge	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	47,000	Morgan City, LA	198	24-72	0	24.5	1	50 to 98
			Personnel	4									
			Offshore Tug	1									
***CTCo-2606 Offshore Barge	CGA (888) 242-2007	Houma, LA	Offshore Barge	1	N/A	20,000	Morgan City, LA	198	24-72	0	24.5	1	50 to 98
			Personnel	4									
			Offshore Tug	1									
DERATED RECOVERY RATE (BBLS/DAY)													1,180,434
STORAGE CAPACITY INCLUDING SKIMMING VESSELS (BARRELS)													1,474,402

Table 9.D.4 Offshore On-Water Recovery Storage Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Nearshore On-Water Recovery Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Nearshore Environment (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Nearshore Environment	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified.													
SWS CGA-77 FRV	CGA (888) 242-2007	Venice, LA	Lori Brush Skimmer	2	22,885	249	Venice, LA	88	2	0	5	1	8
			36" Boom	150									
			60' Vessel	1									
			X Band Radar	1									
			Personnel	4									
FRV M/V Grand Bay	CGA (888) 242-2007	Venice, LA	Lori Brush Skimmer	2	15,257	65	Venice, LA	88	2	0	5	1	8
			36" Boom	46'									
			46' Vessel	1									
			Personnel	4									
SWS CGA-76 FRV	CGA (888) 242-2007	Leeville, LA	Lori Brush Skimmer	2	22,885	249	Leeville, LA	112	2	0	6.5	1	10
			36" Boom	150									
			60' Vessel	1									
			X Band Radar	1									
			Personnel	4									
SWS CGA-52 MARCO Shallow Water Skimmer	CGA (888) 242-2007	Venice, LA	Marco Belt Skimmer	1	3,588	34	Venice, LA	88	4	1	5	1	11
			* 18" Boom (contractor)	100'									
			Personnel	3									
			36' Skimming Vessel	1									
			Shallow Water Barge	1		249							
SWS CGA-55 Egmopol Shallow Water Skimmer	CGA (888) 242-2007	Morgan City, LA	Marco Skimmer	1	1,810	100	Venice, LA	88	5	1	5	1	12
			* 18" Boom (contractor)	100'									
			Personnel	3									
			38' Skimming Vessel	1									
			Shallow Water Barge	1		249							
SWS CGA-53 MARCO Shallow Water Skimmer	CGA (888) 242-2007	Leeville, LA	Marco Belt Skimmer	1	3,588	34	Venice, LA	88	5.5	1	5	1	13
			* 18" Boom (contractor)	100'									
			Personnel	3									
			38' Skimming Vessel	1									
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Belle Chasse, LA	Skimmer	1	905	400	Venice, LA	88	4	1	6.5	1	13
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Belle Chasse, LA	Marco I Skimmer	1	3,588	24	Venice, LA	88	4	1	6.5	1	13
			Personnel	2									
			30' Shallow Water Vessel	1									
SWS CGA-51 MARCO Shallow Water Skimmer	CGA (888) 242-2007	Lake Charles, LA	Marco Belt Skimmer	1	3,588	20	Venice, LA	88	7	1	5	1	14
			* 18" Boom (contractor)	100'									
			Personnel	3									
			34' Skimming Vessel	1									
			Shallow Water Barge	1		249							
SBS w/ GT-185 w/adapter	MSRC (800) OIL-SPIL	Baton Rouge, LA	Skimmer	1	1,371	400	Venice, LA	88	5	1	6.5	1	14
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Pascagoula, MS	Marco I Skimmer	1	3,588	24	Venice, LA	88	5.5	1	6.5	1	14
			Personnel	2									
			30' Shallow Water Vessel	1									
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Pascagoula, MS	Skimmer	1	905	400	Venice, LA	88	5.5	1	6.5	1	14
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
SBS w/ AardVAC	MSRC (800) OIL-SPIL	Pascagoula, MS	Skimmer	1	3,840	400	Venice, LA	88	5.5	1	6.5	1	14
			18" Boom	50'									
			Personnel	4									
			Self-propelled barge	1									
GT-185	MSRC (800) OIL-SPIL	Pascagoula, MS	Skimmer	1	1,371	*500	Venice, LA	88	6	1	6.5	1	14
			18" Boom	50'									
			Personnel	5									
			*Appropriate Vessel	2									

Table 9.D.5 Nearshore On-Water Recovery Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Nearshore On-Water Recovery Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Nearshore Environment (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Nearshore Environment	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified.													
FRV M/V RW Armstrong	CGA (888) 242-2007	Morgan City, LA	Lori Brush Skimmer 36" Boom 46' Vessel Personnel	2 46' 1 4	15,257	65	Morgan City, LA	198	2	0	11.5	1	15
SW CGA-72 FRV	CGA (888) 242-2007	Morgan City, LA	Marco Belt Skimmer 36" Auto Boom Personnel 56' SWS Vessel * 14'-16' Alum. Flatboat	2 150' 4 1 2	21,500	249	Morgan City, LA	198	2	0	11.5	1	15
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Lake Charles, LA	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 50' 4 1 1	905	400	Venice, LA	88	7	1	6.5	1	16
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Lake Charles, LA	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 50' 4 1 1	905	400	Venice, LA	88	7	1	6.5	1	16
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Lake Charles, LA	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 50' 4 1 1	905	400	Venice, LA	88	7	1	6.5	1	16
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Lake Charles, LA	Skimmer 18" Boom Personnel Self-propelled barge	1 50' 4 1	905	400	Venice, LA	88	7	1	6.5	1	16
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Lake Charles, LA	Skimmer 18" Boom Personnel Self-propelled barge	1 50' 4 1	905	400	Venice, LA	88	7	1	6.5	1	16
CGA-54 Egmopol Shallow Water Skimmer	CGA (888) 242-2007	Galveston, TX	Marco Belt Skimmer * 18" Boom (contractor) Personnel 34' Skimming Vessel Shallow Water Barge	1 100' 3 1 1	1,810	100 249	Venice, LA	88	10	1	5	1	17
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Galveston, TX	Marco I Skimmer Personnel 30' Shallow Water Vessel	1 2 1	3,588	24	Venice, LA	88	9.5	1	6.5	1	18
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Galveston, TX	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 50' 4 1 1	905	400	Venice, LA	88	9.5	1	6.5	1	18
SBS w/ GT-185 w/adapter	MSRC (800) OIL-SPIL	Galveston, TX	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 50' 4 1 1	1,371	400	Venice, LA	88	9.5	1	6.5	1	18
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Memphis, TN	Skimmer 18" Boom Personnel Non-self-propelled barge Push Boat	1 60' 4 1 1	905	400	Venice, LA	88	9.5	1	6.5	1	18
SW CGA-74 FRV	CGA (888) 242-2007	Vermilion, LA	Marco Belt Skimmer 36" Auto Boom Personnel 56' SW Vessel * 14'-16' Alum. Flatboat	2 150' 4 1 2	21,500	249	Vermilion, LA	270	2	0	16	1	19
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Ingleside, TX	Marco I Skimmer Personnel 30' Shallow Water Vessel	1 2 1	3,588	24	Venice, LA	88	12.25	1	6.5	1	21

Table 9.D.5 Nearshore On-Water Recovery Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Nearshore On-Water Recovery Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Nearshore Environment (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Nearshore Environment	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified.													
SBS w/ GT-185 w/adapter	MSRC (800) OIL-SPIL	Ingleside, TX	Skimmer	1	1,371	400	Venice, LA	88	12.25	1	6.5	1	21
			18" Boom	50'									
			Personnel	4									
			Self-propelled barge	1									
GT-185	MSRC (800) OIL-SPIL	Jacksonville, FL	Skimmer	1	1,371		Venice, LA	88	12	1	6.5	1	21
			18" Boom	60'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
FRV M/V Bastian Bay	CGA (888) 242-2007	Lake Charles, LA	Lori Brush Skimmer	2	15,257	65	Lake Charles, LA	312	2	0	18.5	1	22
			36" Boom	46'									
			46' Vessel	1									
			Personnel	4									
SW CGA-73 FRV	CGA (888) 242-2007	Lake Charles, LA	Marco Belt Skimmer	2	21,500	249	Lake Charles, LA	312	2	0	18.5	1	22
			36" Auto Boom	150'									
			Personnel	5									
			56' SWS Vessel	1									
			* 14'-16' Alum. Flatboat	2									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Savannah, GA	Marco I Skimmer	1	3,588	24	Venice, LA	88	13.5	1	6.5	1	22
			Personnel	2									
			30' Shallow Water Vessel	1									
GT-185	MSRC (800) OIL-SPIL	Tampa, FL	Skimmer	1	1,371		Venice, LA	88	13	1	6.5	1	22
			18" Boom	50'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Roxana, IL	Skimmer	1	905	400	Venice, LA	88	14	1	6.5	1	23
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
WP-1	MSRC (800) OIL-SPIL	Miami, FL	Skimmer	1	3,017		Venice, LA	88	16	1	6.5	1	25
			18" Boom	50'									
			Personnel	5									
			*Appropriate Vessel	2									
			*Temporary Storage	1		500							
AARDVAC	MSRC (800) OIL-SPIL	Miami, FL	Skimmer	1	3,840		Venice, LA	88	16	1	6.5	1	25
			18" Boom	50'									
			Personnel	5									
			* Appropriate Vessel	2									
			*Temporary Storage	1		500							
SWS CGA-75 FRV	CGA (888) 242-2007	Galveston, TX	Lori Brush Skimmer	2	22,885	249	Galveston, TX	365	2	0	21.5	1	25
			36" Boom	150									
			60' Vessel	1									
			X Band Radar	1									
			Personnel	4									
AARDVAC	MSRC (800) OIL-SPIL	Miami, FL	Skimmer	1	3,840		Venice, LA	88	16	1	6.5	1	25
			18" Boom	50'									
			Personnel	5									
			* Appropriate Vessel	2									
			*Temporary Storage	1		500							
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Whiting, IN	Skimmer	1	905	400	Venice, LA	88	17.25	1	6.5	1	26
			18" Boom	60'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Toledo, OH	Skimmer	1	905	400	Venice, LA	88	18.5	1	6.5	1	27
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
MSRC "Quick Strike"	MSRC (800) OIL-SPIL	Lake Charles, LA	LORI Brush Skimmer	2	5,000	50	Lake Charles, LA	312	2	1	22.5	1	27
			Personnel	3									
			47' Fast Response Boat	1									

Table 9.D.5 Nearshore On-Water Recovery Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Nearshore On-Water Recovery Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Effective Daily Recovery Capacity (EDRC in Bbls/Day)	Storage (Barrels)	Staging Area	Distance to Nearshore Environment (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Nearshore Environment	Deployment Time	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified.													
SBS w/ AardVAC	MSRC (800) OIL-SPIL	Virginia Beach, VA	Skimmer	1	3,840	400	Venice, LA	88	20	1	6.5	1	28
			18" Boom	50'									
			Personnel	4									
			Self-propelled barge	1									
SBS w/ Stress 1	MSRC (800) OIL-SPIL	Chesapeake City, MD	Skimmer	1	15,840	400	Venice, LA	88	21.25	1	6.5	1	30
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
SBS w/ Stress 1	MSRC (800) OIL-SPIL	Edison/Perth Amboy, NJ	Skimmer	1	15,840	400	Venice, LA	88	23	1	6.5	1	32
			18" Boom	50'									
			Personnel	4									
			Self-propelled barge	1									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Edison/Perth Amboy, NJ	Marco I Skimmer	1	3,588	24	Venice, LA	88	22.75	1	6.5	1	32
			Personnel	2									
			30' Shallow Water Vessel	1									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Edison/Perth Amboy, NJ	Marco I Skimmer	1	3,588	24	Venice, LA	88	22.75	1	6.5	1	32
			Personnel	2									
			30' Shallow Water Vessel	1									
SBS w/ GT-185	MSRC (800) OIL-SPIL	Bayonne, NJ	Skimmer	1	1,371		Venice, LA	88	22.75	1	6.5	1	32
			18" Curtain Internal Foam	60'									
			Personnel	4									
			Non-self-propelled barge	1		400							
			*Appropriate Vessel	1									
FRV CGA 58 Timbalier Bay	CGA (888) 242-2007	Aransas Pass, TX	Lori Brush Skimmer	2	15,257	65	Aransas Pass, TX	502	2	0	29.5	1	33
			36" Boom	46'									
			46' Vessel	1									
			Personnel	4									
MSRC "Lightning"	MSRC (800) OIL-SPIL	Tampa, FL	LORI Brush Skimmer	2	5,000	50	Tampa, FL	407	2	1	29	1	33
			Personnel	3									
			47' Fast Response Boat	1									
SW CGA-71 FRV	CGA (888) 242-2007	Aransas Pass, TX	Marco Belt Skimmer	2	21,500	249	Aransas Pass, TX	502	4	0	29.5	1	35
			36" Auto Boom	150'									
			Personnel	5									
			56' SWS Vessel	1									
			* 14'-16' Alum. Flatboat	2									
SBS w/ GT-185	MSRC (800) OIL-SPIL	Providence, RI	Skimmer	1	1,371		Venice, LA	88	26	1	6.5	1	35
			18" Curtain Internal Foam	60'									
			Personnel	4									
			Non-self-propelled barge	1		400							
			Push Boat	1									
SBS w/ Queensboro	MSRC (800) OIL-SPIL	Everett, MA	Skimmer	1	905	400	Venice, LA	88	26	1	6.5	1	35
			18" Boom	50'									
			Personnel	4									
			Non-self-propelled barge	1									
			Push Boat	1									
MSRC "Kvichak"	MSRC (800) OIL-SPIL	Portland, ME	Marco I Skimmer	1	3,588	24	Venice, LA	88	28	1	6.5	1	37
			Personnel	2									
			30' Shallow Water Vessel	1									
SBS w/ WP-1	MSRC (800) OIL-SPIL	Portland, ME	Skimmer	1	3,017	400	Venice, LA	88	28	1	6.5	1	37
			18" Boom	50'									
			Personnel	4									
			Self-propelled barge	1									
DERATED RECOVERY RATE (BBLS/DAY)													344,578
SKIMMING VESSEL STORAGE CAPACITY (BARRELS)													15,279

Table 9.D.5 Nearshore On-Water Recovery Activation List (continued)

Mississippi Canyon 812 - Production > 10 Miles
Sample Aerial Surveillance Activation List

Aerial Surveillance System	Supplier & Phone	Airport/City, State	Aerial Surveillance Package	Quantity	Staging Location	Distance to Site from Staging (nautical miles)	Response Times (Hours)			
							Staging ETA	Loadout Time	ETA to Site	Total ETA
* - These components are additional operational requirements that must be procured in addition to the system identified.										
Twin Commander Air Speed - 260 Knots	Airborne Support (985) 851-6391	Houma, LA	Surveillance Aircraft	1	Houma, LA	141	1	0.25	0.47	1.75
			Spotter Personnel	2						
			Crew- Pilots	1						
Aztec Piper Air Speed - 150 Knots	Airborne Support (985) 851-6391	Houma, LA	Surveillance Aircraft	1	Houma, LA	141	1	0.25	0.82	2.10
			Spotter Personnel	2						
			Crew- Pilots	1						
Eurocopter EC-135 Helicopter Air Speed - 141 knots	PHI (800) 235-2452	Houma, LA	Surveillance Aircraft	1	Houma, LA	141	1	0.25	0.87	2.15
			Spotter Personnel	2						
			Crew- Pilots	1						
Sikorsky S-76 Helicopter Air Speed - 141 knots	PHI (800) 235-2452	Houma, LA	Surveillance Aircraft	1	Houma, LA	141	1	0.25	0.87	2.15
			Spotter Personnel	2						
			Crew- Pilots	1						

Table 9.D.6 Aerial Surveillance Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore Aerial Dispersant Activation List

Aerial Dispersant System	Supplier & Phone	Airport/ City, State	Aerial Dispersant Package	Quantity	Staging Location	Distance to Site from Staging (Miles)	Response Times (Hours) Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
NOTE: Planholder has access to additional dispersant assets. For a comprehensive list of assets, see Section 18. * - These components are additional operational requirements that must be procured in addition to the system(s) identified. ** The second flight times listed are to demonstrate subsequent sortie and application timeframes. *** The dispersants listed is for gallon capacity only not amount stored at each location.											
Twin Commander Air Speed - 300 MPH	CGA/Airborne Support (985) 851-6391	Houma, LA	Aero Commander	1	Houma, LA	141	1	0	0.47	0	**1.50**
			Spotter Personnel	2							
			Crew- Pilots	1							
BT-67 (DC-3 Turboprop) Aircraft Air Speed - 194 MPH	CGA/Airborne Support (985) 851-6391	Houma, LA	DC-3 Dispersant Aircraft	1	Houma, LA **1st Flight**	141	2	0.5	0.73	0.5	**3.75**
			Dispersant - Gallons	2000							
			Spotter Aircraft	1							
			Spotter Personnel	2	Houma, LA **2nd Flight**	141	0.73	0.5	0.73	0.3	**2.30**
			Crew- Pilots	2							
DC-3 Aircraft Air Speed - 150 MPH	CGA/Airborne Support (985) 851-6391	Houma, LA	DC-3 Dispersant Aircraft	1	Houma, LA **1st Flight**	141	2	0.5	0.94	0.5	**3.95**
			Dispersant - Gallons	1200							
			Spotter Aircraft	1							
			Spotter Personnel	2	Houma, LA **2nd Flight**	141	0.94	0.5	0.94	0.3	**2.70**
			Crew- Pilots	2							
DC-3 Aircraft Air Speed - 150 MPH	CGA/Airborne Support (985) 851-6391	Houma, LA	DC-3 Dispersant Aircraft	1	Houma, LA **1st Flight**	141	2	0.5	0.94	0.5	**3.95**
			Dispersant - Gallons	1200							
			Spotter Aircraft	1							
			Spotter Personnel	2	Houma, LA **2nd Flight**	141	0.94	0.5	0.94	0.3	**2.70**
			Crew- Pilots	2							
BE-90 King Air Aircraft Air Speed - 213 MPH	MSRC (800) OIL-SPIL	Kiln, MS	BE-90 Dispersant Aircraft	1	Stennis INTL., MS **1st Flight**	154	3	0.00	0.72	0.20	**3.95**
			Dispersant - Gallons	250							
			* Spotter Aircraft	1							
			*Spotter Personnel	2	Stennis INTL., MS **2nd Flight**	154	0.72	0.20	0.72	0.20	**1.85**
			Crew- Pilots	2							
C130-A Aircraft Air Speed - 342 MPH	MSRC (800) OIL-SPIL	Kiln, MS	C130-A Disp Aircraft	1	Stennis INTL., MS **1st Flight**	154	3	0.0	0.45	0.5	**4.00**
			Dispersant - Gallons	4125							
			*Spotter Aircraft	1							
			*Spotter Personnel	2	Stennis INTL., MS **2nd Flight**	154	0.50	0.3	0.45	0.5	**1.80**
			Crew- Pilots	2							
C130-A Aircraft Air Speed - 342 MPH	MSRC (800) OIL-SPIL	Mesa, AZ	C130-A Disp. Aircraft	1	Stennis INTL., MS **1st Flight**	154	7	0.3	0.45	0.5	**8.30**
			Dispersant - Gallons	4125							
			*Spotter Aircraft	1							
			*Spotter Personnel	2	Stennis INTL., MS **2nd Flight**	154	0.50	0.3	0.45	0.5	**1.80**
			Crew- Pilots	2							
BE-90 King Air Aircraft Air Speed - 213 MPH	MSRC (800) OIL-SPIL	Concord, CA	BE-90 Dispersant Aircraft	1	Stennis INTL., MS **1st Flight**	154	15	0.30	0.72	0.20	**16.25**
			Dispersant - Gallons	330							
			* Spotter Aircraft	1							
			*Spotter Personnel	2	Stennis INTL., MS **2nd Flight**	154	0.72	0.20	0.72	0.20	**1.85**
			Crew- Pilots	2							

Table 9.D.7 Offshore Aerial Dispersant Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Offshore Boat Spray Dispersant Activation List

Boat Spray Dispersant System	Supplier & Phone	Warehouse	Boat Spray Dispersant Package	Quantity	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours) Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
NOTE: Planholder has access to additional dispersant assets. For a comprehensive list of assets, see Section 18. * - These components are additional operational requirements that must be procured by OSROs in addition to the system(s) identified.											
Fire Monitor Induction Dispersant Spray System	AMPOL (800) 482-6765	Port Fourchon, LA	Dispersant Spray System Dispersant (Gallons) Personnel * 110' Utility Boat * Crew Boat	1 500 4 1 1	Venice, LA	88	5.75	0.5	6.5	1	13.75
USCG SMART Team	USCG	Mobile, AL	Personnel * Crew Boat	4 1	Venice, LA	88	6	1	6.5	0.5	14
Vessel Based Dispersant Spray System	CGA (888) 242-2007	Harvey, LA	Dispersant Spray System Dispersant (Gallons) Personnel * Utility Boat	1 330 4 1	Venice, LA	88	4	0.5	9	1	14.5
Fire Monitor Induction Dispersant Spray System	AMPOL (800) 482-6765	Cameron, LA	Dispersant Spray System Dispersant (Gallons) Personnel * 110' Utility Boat * Crew Boat	1 500 4 1 1	Venice, LA	88	7.75	0.5	6.5	1	15.75
Vessel Based Dispersant Spray System	CGA (888) 242-2007	Aransas Pass, TX	Dispersant Spray System Dispersant (Gallons) Personnel * Utility Boat	1 330 4 1	Venice, LA	88	12.25	0.5	9	1	22.75

Table 9.D.8 Offshore Boat Spray Dispersant Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Control, Containment and Subsea Dispersant Package Activation List

Containment System	Supplier & Phone	Warehouse	Package	Quantity	Staging Area	Distance to Site from Staging (Miles)	Response Times (Days) Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
* - Response time may vary depending on Drill Ship's operations and location at the time of deployment.											
Site Assessment and Surveillance	RP	Port Fourchon, LA	Multi-Service Vessel ROV's	1 2	Port Fourchon, LA	102	0	1.5	7.5	0.5	9.5
Subsea Dispersant Application	RP / MWCC	Port Fourchon, LA Houston, TX	Multi-Service Vessel ROV's Coil Tubing Unit Dispersant Manifold Subsea Dispersant Injection System	1 2 1 200,000 gal 1 1	Port Fourchon, LA	102	1.5	1.5	7.5	2	12.5
Capping Stack	RP / MWCC	Port Fourchon, LA Houston, TX	Anchor Handling Tug Supply Vessel ROV's Hydraulic System Capping Stack	1 1 1 1	Port Fourchon, LA	102	2*	1.5	7.5	3	14*
"Top Hat" Unit	RP / MWCC	Port Fourchon, LA Houston, TX	Anchor Handling Tug Supply Vessel ROV's Multi-Purpose Supply Vessel Drill Ship (Processing Vessel) "Top Hat" Containment Chamber Shuttle Barge	1 2 1 1 1 1 1	Port Fourchon, LA	102	13*	1	7.5	3	25*

Table 9.D.9 Subsea Control, Containment, and Subsea Dispersant Package Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample In-Situ Burn Equipment Activation List

Skimming System	Supplier & Phone	Warehouse	Skimming Package	Quantity	Staging Area	Distance to Site from Staging (Miles)	Response Times (Hours): Staging ETA	Loadout Time	ETA to Site	Deployment Time	Total ETA
NOTE: Planholder has access to additional ISB assets. For a comprehensive list of those assets, see Section 19. * - These components are additional operational requirements that must be procured in addition to the system identified. ** - Teams will deploy in sections of 500' at any given time											
ISB Fire-Fighting Team	TBD	TBD	* Offshore Firefighting Vessels	2	Venice, LA	88	4	1	6.5	1	12.5
			* Cranes	2							
			* Roll-off Boxes	2							
			Personnel	8							
			* Air Monitoring Equipment	2							
SMART In-Situ Burn Monitoring Team	USCG	Mobile, AL	* Air Monitoring Equipment	1	Venice, LA	88	4	1	6.5	1	12.5
			* Offshore Vessel	1							
			Personnel	4							
Safety Monitoring Team	TBD	TBD	* Air Monitoring Equipment	1	Venice, LA	88	4	1	6.5	1	12.5
			* Offshore Vessel	1							
			Personnel	4							
Wildlife Monitoring Team	TBD	TBD	* Air Monitoring Equipment	1	Venice, LA	88	4	1	6.5	1	12.5
			* Offshore Vessel	1							
			Personnel	4							
Aerial Spotting Team (per 2 ISB Task Forces)	TBD	TBD	Fixed Wing Aircraft	1	Venice, LA	88	4	1	6.5	1	12.5
			Trained ISB Spotter	2							
			ISB Documenter	1							
Fire Team (In-Situ Burn Fire System)	MSRC (800) OIL-SPIL	Lake Charles, LA	**Fire Boom (ft)	2,000	Venice, LA	88	7	1	6.5	1	15.5
			TowLine (ft)	600							
			* Appropriate Vessel	2							
			Personnel	2							
			Ignition Device	25							
Fire Team (In-Situ Burn Fire System)	MSRC (800) OIL-SPIL	Houston, TX	**Fire Boom (ft)	16,000	Venice, LA	88	9	1	6.5	1	17.5
			TowLine (ft)	600							
			* Appropriate Vessel	2							
			Personnel	2							
			Ignition Device	155							
Fire Team (In-Situ Burn Fire System)	MSRC (800) OIL-SPIL	Galveston, TX	**Fire Boom (ft)	1,000	Venice, LA	88	9.5	1	6.5	1	18
			TowLine (ft)	600							
			* Appropriate Vessel	2							
			Personnel	2							
			Ignition Device	10							
Supply Team (Supply Vessel System)	MSRC (800) OIL-SPIL	Venice, LA	*Offshore Vessel 110' - 310'	1	Venice, LA	88	4	1	17.5	1	23.5
			Personnel	6							
Fire Team (In-Situ Burn Fire System)	CGA (888) 242-2007	Harvey, LA	Fire Boom (ft)	500	Venice, LA	88	0	24	9	1	34
			Guide Boom/TowLine (ft)	400							
			* Offshore Vessel (0.5 kt capability)	3							
			Personnel	20							
			Ignition Device	10							
Fire Team (In-Situ Burn Fire System)	CGA (888) 242-2007	Harvey, LA	Fire Boom (ft)	500	Venice, LA	88	0	24	9	1	34
			Guide Boom/TowLine (ft)	400							
			* Offshore Vessel (0.5 kt capability)	3							
			Personnel	20							
			Ignition Device	10							
Fire Team (In-Situ Burn Fire System)	MSRC (800) OIL-SPIL	Portland, ME	**Fire Boom (ft)	1,000	Venice, LA	88	28	1	6.5	1	36.5
			TowLine (ft)	600							
			* Appropriate Vessel	2							
			Personnel	2							
			Ignition Device	10							
								TOTAL FIRE BOOM AVAILABLE (FEET)		21,000	

Table 9.D.10 In-Situ Burn Equipment Activation List

Mississippi Canyon 812 - Production > 10 Miles
Sample Shoreline Protection & Wildlife Support List

Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Response Times (Hours)			
					Staging ETA	Loadout Time	Deployment Time	Total ETA
AMPOL (800) 482-6765	Harvey, LA	Containment Boom - 18" to 24"	8,000'	Venice, LA	4	1	1	6
		Containment Boom - 6" to 10"	3,000'					
CGA (888) 242-2007	Harvey, LA	Wildlife Rehab Trailer	1	Venice, LA	4	1	1	6
		Wildlife Husbandry Trailer	1					
		Support Trailer	3					
		Bird Scare Cannons	120					
		Contract Truck (Third Party)	3					
		Personnel (Responder/Mechanic)	4					
AMPOL (800) 482-6765	Venice, LA	Containment Boom - 18" to 24"	2,250'	Venice, LA	4	1	1	6
		Response Boats - 14' to 20'	2					
		Response Boats - 21' to 36'	1					
		Portable Skimmers	2					
ES&H Environmental (877) 437-2634	Belle Chasse, LA	Containment Boom - 10"	1,500'	Venice, LA	4	1	1	6
		Containment Boom - 18"	15,500'					
		Containment Boom - 24"	5,000'					
		Jon Boat - 12' to 16'	4					
		Response Boats - 18' to 21'	1					
		Response Boats - 22' to 25'	1					
		Response Boats - 26' to 29'	3					
		Portable Skimmers	10					
		Wildlife Hazing Cannon	50					
ES&H Environmental (877) 437-2634	Venice, LA	Containment Boom - 10"	2,000'	Venice, LA	4	1	1	6
		Containment Boom - 18"	13,000'					
		Containment Boom - 24"	10,000					
		Jon Boat - 12' to 16'	4					
		Response Boats - 22' to 25'	1					
		Response Boats - 26' to 29'	2					
		Portable Skimmers	5					
		Wildlife Hazing Cannon	25					
OMI (800) 645-6671	Belle Chasse, LA	Containment Boom - 18" to 24"	4,500'	Venice, LA	4	1	1	6
		Containment Boom - 6" to 10"	500'					
		Response Boats - 20'	1					
		Response Boats - 25' to 28'	2					
		Portable Skimmers	12					
		ShallowWater Skimmers	1					
		Bird Scare Cannons	12					
		Response Personnel	24					
OMI (800) 645-6671	Venice, LA	Containment Boom - 18" to 24"	1,500'	Venice, LA	4	1	1	6
		Response Boats - 16'	4					
		Response Boats (Barge) - 25' to 33'	1					
		Response Boats - 25' to 28'	2					
		Response Boats - (Cabin Boat) 27' to 30'	1					
		ShallowWater Skimmers	3					
		Portable Skimmers	2					
USES Environmental (888) 279-9930	Meraux, LA	Containment Boom - 18"	6,000'	Venice, LA	4	1	1	6
		Containment Boom - 10"	1,000'					
		Response Boats - 16'	23					
		Response Boats - 18'	1					
		Response Boats - 24'	1					
		Response Boats - 26'	2					
		Response Boats - 28'	1					
		Portable Skimmers	2					
USES Environmental (888) 279-9930	Marrero, LA	Containment Boom - 18"	600'	Venice, LA	4	1	1	6
USES Environmental (888) 279-9930	Venice, LA	Containment Boom - 18"	10,000'	Venice, LA	4	1	1	6
		Response Boats - 16'	15					
		Response Boats - 26'	2					
		Response Boats - 30'	1					
		Portable Skimmers	2					
		ShallowWater Skimmers	1					

Table 9.D.11 Shoreline Protection and Wildlife Support List

Mississippi Canyon 812 - Production > 10 Miles Sample Shoreline Protection & Wildlife Support List								
					Response Times (Hours)			
Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Staging ETA	Loadout Time	Deployment Time	Total ETA
USES Environmental (888) 279-9930	Hahnville, LA	Containment Boom - 18"	500'	Venice, LA	4.25	1	1	7
USES Environmental (888) 279-9930	Amelia, LA	Containment Boom - 18"	500'	Venice, LA	5	1	1	7
USES Environmental (888) 279-9930	Lafitte, LA	Containment Boom - 18"	1,000'	Venice, LA	4.25	1	1	7
		Response Boats - 18'	2					
USES Environmental (888) 534-2744	Geismar, LA	Containment Boom - 18"	1,000'	Venice, LA	4.75	1	1	7
		Response Boats - 16'	2					
		Portable Skimmers	1					
OMI (800) 645-6671	Galliano, LA	Containment Boom - 18" to 24"	2,000'	Venice, LA	5	1	1	7
		Containment Boom - 6" to 10"	500'					
		Response Boats - 16'	1					
		Response Boats (Barge) - 25' to 33'	1					
		Response Boats - 25' to 28'	1					
		Portable Skimmers	3					
Lawson Environmental Service (985) 876-0420	Houma, LA	Containment Boom - 18"	30,000'	Venice, LA	4.75	1	1	7
		Containment Boom - 12"	2,000'					
		Containment Boom - 10"	9,500'					
		Response Boats - 14'	10					
		Response Boats - 16'	6					
		Response Boats - 20'	5					
		Response Boats - 24'	8					
		Response Boats - 26'	4					
		Response Boats - 28'	7					
		Response Boats - 32'	4					
		Portable Skimmers	6					
OMI (800) 645-6671	Port Allen, LA	Containment Boom - 18" to 24"	2500'	Venice, LA	5	1	1	7
		Containment Boom - 6" to 10"	500'					
		Response Boats - 16'	2					
		Response Boats - 25 to 33'	1					
		ShallowWater Skimmers	1					
		Response Personnel	6					
OMI (800) 645-6671	Morgan City, LA	Containment Boom - 18" to 24"	2,500	Venice, LA	5	1	1	7
		Containment Boom - 6" to 10"	400'					
		Response Boats - 16'	2					
		Response Boats - 25' to 28'	1					
		Portable Skimmers	3					
		Response Personnel	3					
OMI (985) 798-1005	Houma, LA	Containment Boom - 18" to 24"	2,000'	Venice, LA	4.75	1	1	7
		Containment Boom - 6" to 10"	500'					
		Response Boats - 16'	2					
		Response Boats - 25' to 28'	1					
		Response Boats - (Cabin Boat) 27' to 30'	1					
		ShallowWater Skimmers	3					
Wildlife Ctr. of Texas (713) 861-9453	Baton Rouge, LA	Wildlife Specialist - Personnel	6 to 20	Venice, LA	5	1	1	7
Clean Harbors (800) 645-8265	Baton Rouge, LA	Containment Boom - 18" to 24"	14,000'	Venice, LA	5	1	1	7
		Response Boats - 14' to 20'	1					
		Portable Skimmers	3					
		Response Personnel	13					
ES&H Environmental (877) 437-2634	Houma, LA	Containment Boom - 10"	2,000'	Venice, LA	4.75	1	1	7
		Containment Boom - 18"	20,000'					
		Containment Boom - 24"	5,000'					
		Jon Boat - 12' to 16'	30					
		Response Boats - 22' to 25'	2					
		Response Boats - 26' to 29'	4					
		Portable Skimmers	23					
		ShallowWater Skimmers	2					
		Wildlife Hazing Cannon	57					

Table 9.D.11 Shoreline Protection and Wildlife Support List (cont.)

Mississippi Canyon 812 - Production > 10 Miles
Sample Shoreline Protection & Wildlife Support List

Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Response Times (Hours) Staging ETA	Loadout Time	Deployment Time	Total ETA
ES&H Environmental (877) 437-2634	Morgan City, LA	Containment Boom - 10"	2,000'	Venice, LA	5	1	1	7
		Containment Boom - 18"	500'					
		Jon Boat - 12' to 16'	3					
		Response Boats - 18' to 21'	2					
		Response Boats - 22' to 25'	1					
		Portable Skimmers	2					
		Wildlife Hazing Cannon	12					
SWS Environmental (877) 742-4215	Baton Rouge, LA	Containment Boom - 18"	1,000'	Venice, LA	5	1	1	7
		Response Boats - 25' to 42'	2					
		ShallowWater Skimmers	1					
		Response Personnel	6					
USES Environmental (888) 279-9930	Biloxi, MS	Containment Boom - 18"	2,000'	Venice, LA	5	1	1	7
		Response Boats - 16'	1					
USES Environmental (888) 279-9930	Mobile, AL	Containment Boom - 10"	800'	Venice, LA	6	1	1	8
		Containment Boom - 18"	5,000'					
		Response Boats - 16'	1					
		Response Boats - 18'	1					
		Response Boats - 20'	1					
		Response Boats - 26'	1					
		Portable Skimmers	2					
Clean Harbors (800) 645-8265	NewIberia, LA	Containment Boom - 18" to 24"	33,800'	Venice, LA	6	1	1	8
		Containment Boom - 6" to 10"	500'					
		Response Boats - 21' to 36'	4					
AMPOL (800) 482-6765	NewIberia, LA	Containment Boom - 6" to 10"	4,150'	Venice, LA	6	1	1	8
		Containment Boom - 18" to 24"	34,050'					
		Response Boats - 14' to 20'	3					
		Response Boats - 21' to 36'	3					
		Portable Skimmers	27					
ES&H Environmental (877) 437-2634	Port Fourchon, LA	Containment Boom - 18"	1000'	Venice, LA	5.75	1	1	8
		Response Boats - 22' to 25'	1					
		Portable Skimmers	1					
ES&H Environmental (877) 437-2634	Golden Meadow, LA	Containment Boom - 10"	1,000'	Venice, LA	5.25	1	1	8
		Containment Boom - 18"	13,000					
		Jon Boat - 12' to 16'	2					
		Response Boats - 18' to 21'	1					
		Response Boats - 22' to 25'	1					
		Response Boats - 26' to 29'	1					
		Portable Skimmers	5					
		Wildlife Hazing Cannon	12					
OMI (800) 645-6671	NewIberia, LA	Containment Boom - 18" to 24"	12,000'	Venice, LA	6	1	1	8
		Containment Boom - 6" to 10"	300'					
		Response Boats - 16'	3					
		Response Boats (Barge) - 25' to 33'	1					
		Response Boats - 25' to 28'	1					
		Portable Skimmers	8					
		Response Personnel	8					
ES&H Environmental (877) 437-2634	Lafayette, LA	Containment Boom - 10"	500'	Venice, LA	6	1	1	8
		Containment Boom - 18"	13,000'					
		Jon Boat - 12' to 16'	3					
		Response Boats - 18' to 21'	1					
		Response Boats - 22' to 25'	1					
		Response Boats - 26' to 29'	1					
		Portable Skimmers	4					
		Wildlife Hazing Cannon	12					

Table 9.D.11 Shoreline Protection and Wildlife Support List (cont.)

Mississippi Canyon 812 - Production > 10 Miles
Sample Shoreline Protection & Wildlife Support List

Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Response Times (Hours) Staging ETA	Loadout Time	Deployment Time	Total ETA
ES&H Environmental (877) 437-2634	Lake Charles, LA	Containment Boom - 10"	500'	Venice, LA	7	1	1	9
		Containment Boom - 18"	15,000'					
		Containment Boom - 24"	5,000'					
		Jon Boat - 12' to 16'	3					
		Response Boats - 18' to 21'	2					
		Response Boats - 26' to 29'	2					
		Portable Skimmers	13					
		Wildlife Hazing Cannon	40					
Miller Env. Services (800) 929-7227	Sulphur, LA	Containment Boom - 10"	600'	Venice, LA	7	1	1	9
		Containment Boom - 18"	14,000'					
		Jon Boats - 14' to 16'	2					
		Jon Boats - 16' w/25hp HP Outboard Motor	2					
		Air Boat - 18'	1					
		Work Boat - 18'	2					
		Response Boats - 24' - 28'	4					
		Portable Skimmers	5					
		ShallowWater Skimmers	1					
		Response Personnel	49					
SWS Environmental (877) 742-4215	Pensacola, FL	Containment Boom - 18"	2,500'	Venice, LA	6.75	1	1	9
		Response Boats - 16' to 25'	2					
		ShallowWater Skimmers	1					
		Response Personnel	2					
USES Environmental (888) 279-9930	Lake Charles, LA	Containment Boom - 10"	100'	Venice, LA	7	1	1	9
		Containment Boom - 18"	7,700'					
		Response Boats - 16'	3					
		Response Boats - 27'	1					
		Response Boats - 37'	1					
AMPOL (800) 482-6765	Port Arthur, TX	Containment Boom - 18" to 24"	16,000'	Venice, LA	8	1	1	10
		Response Boats - 14' to 20'	2					
		Response Boats - 21' to 36'	1					
		Portable Skimmers	3					
Clean Harbors (800) 645-8265	Port Arthur, TX	Containment Boom - 18" to 24"	3,000'	Venice, LA	8	1	1	10
		Response Boats - 21' to 36'	2					
		Portable Skimmers	2					
		Response Personnel	54					
Garner Environmental (800) 424-1716	Port Arthur, TX	Containment Boom - 6"	22,000'	Venice, LA	8	1	1	10
		Response Boats - 14' to 20'	8					
		Response Boats - 21' to 36'	1					
		Portable Skimmers	3					
Miller Env. Services (800) 929-7227	Beaumont, TX	Containment Boom - 18"	14,000'	Venice, LA	7.75	1	1	10
		Response Boats - 18'	2					
		Response Boats - 24'	2					
		ShallowWater Skimmers	1					
		Response Personnel	47					
OMI (800) 645-6671	Port Arthur, TX	Containment Boom - 18" to 24"	4000'	Venice, LA	8	1	1	10
		Response Boats - 14' to 20'	6					
		Response Boats - 21' to 36'	2					
		ShallowWater Skimmers	1					
OMI (800) 645-6671	Houston, TX	Containment Boom - 18" to 24"	4000'	Venice, LA	9	1	1	11
		Response Boats - 16'	3					
		Response Boats - 25' to 28'	1					
		Portable Skimmers	1					
Miller Env. Services (800) 929-7227	Houston, TX	Containment Boom - 18"	12,000'	Venice, LA	9	1	1	11
		ShallowWater Skimmers	1					
		Response Boats - 28'	1					
		Responder Personnel	38					
Clean Harbors (800) 645-8265	Houston, TX	Containment Boom - 18" to 24"	4,500'	Venice, LA	9	1	1	11
		Response Boats - 14' to 20'	2					
		Response Boats - 21' to 36'	3					
		Portable Skimmers	1					
		Response Personnel	14					

Table 9.D.11 Shoreline Protection and Wildlife Support List (cont.)

Mississippi Canyon 812 - Production > 10 Miles
Sample Shoreline Protection & Wildlife Support List

Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Response Times (Hours)			
					Staging ETA	Loadout Time	Deployment Time	Total ETA
ES&H Environmental (877) 437-2634	Houston, TX	Containment Boom - 10"	500'	Venice, LA	9	1	1	11
		Containment Boom - 18"	13,000'					
		Containment Boom - 24"	5,000'					
		Jon Boat - 12' to 16'	2					
		Response Boats - 26' to 29'	2					
		Portable Skimmers	2					
		Wildlife Hazing Cannon	12					
Garner Environmental (800) 424-1716	Deer Park, TX	Containment Boom - 6"	18,900'	Venice, LA	8.75	1	1	11
		Response Boats - 12'	2					
		Response Boats - 16' to 20'	5					
		Respons Boats - 30'	2					
		Portable Skimmers	25					
		ShallowWater Skimmers	3					
SWS Environmental (877) 742-4215	Panama City, FL	Containment Boom - 18"	7,000'	Venice, LA	8.75	1	1	11
		Response Boats - 16' to 25'	3					
		Response Boats - 25' to 42'	1					
		Portable Skimmers	6					
		Response Personnel	10					
SWS Environmental (877) 742-4215	Houston, TX	Containment Boom - 18"	20,000	Venice, LA	9	1	1	11
		Response Boats - 16' to 25'	1					
		Response Boats - 25' to 42'	2					
		Portable Skimmers	2					
		Response Personnel	19					
USES Environmental (888) 279-9930	Houston, TX	Containment Boom - 6"	500'	Venice, LA	9	1	1	11
		Containment Boom - 20"	10,000'					
		Response Boats - 16'	4					
		Response Boats - 26'	1					
		Portable Skimmers	1					
Wildlife Ctr. of Texas (713) 861-9453	Houston, TX	Wildlife Specialist - Personnel	6 to 20	Venice, LA	9	1	1	11
Phoenix Pollution Control & Environmental Services (281) 838-3400	Baytown, TX	Containment Boom - 18"	13,000'	Venice, LA	8.75	1	1	11
		Containment Boom - 10"	1,150'					
		Response Boats - 16'	6					
		Response Boats - 20'	3					
		Response Boats - 24'	1					
		Response Boats - 35'	2					
		Portable Skimmers	24					
USES Environmental (888) 279-9930	Memphis, TN	Containment Boom - 6"	850'	Venice, LA	9.5	1	1	12
		Containment Boom - 12"	300'					
		Containment Boom - 18"	5,000'					
		Response Boats - 12'	3					
		Response Boats - 14'	5					
		Response Boats - 16'	2					
		Response Boats - 24'	1					
		Response Boats - 28'	1					
		Portable Skimmers	2					
Garner Environmental (800) 424-1716	La Marque, TX	Containment Boom - 6"	9,500'	Venice, LA	9.25	1	1	12
		Response Boats - 16'	5					
		Response Boats - 24'	1					
		Portable Skimmers	7					
SWS Environmental (877) 742-4215	Memphis, TN	Containment Boom - 6"	100'	Venice, LA	9.5	1	1	12
		Containment Boom - 12"	800'					
		Containment Boom - 18"	800'					
		Response Boats - 25' to 42'	1					
		ShallowWater Skimmers	1					
		Response Personnel	9					
SWS Environmental (877) 742-4215	Jacksonville, FL	Containment Boom - 18"	1,500'	Venice, LA	11.75	1	1	14
		Response Boats - 16' to 25'	2					
		ShallowWater Skimmers	1					
		Response Personnel	8					

Table 9.D.11 Shoreline Protection and Wildlife Support List (cont.)

Mississippi Canyon 812 - Production > 10 Miles Sample Shoreline Protection & Wildlife Support List								
					Response Times (Hours)			
Supplier & Phone	Warehouse	Equipment Listing	Quantity	Staging Area	Staging ETA	Loadout Time	Deployment Time	Total ETA
SWS Environmental (877) 742-4215	Tampa, FL	Containment Boom - 18"	2,000'	Venice, LA	13	1	1	15
		Response Boats - 16' to 25'	2					
		Response Boats - 25' to 42'	1					
		ShallowWater Skimmers	1					
		Response Personnel	10					
Miller Env. Services (800) 929-7227	Corpus Christi, TX	Containment Boom - 10"	2,000'	Venice, LA	12.25	1	1	15
		Containment Boom - 18"	30,000'					
		Jon Boats - 14' to 16' w/25hp motor	4					
		Jon Boats - 16' to 18' w/Outboard motor	4					
		Air Boat - 14'	1					
		Response Boats - 24' to 26'	4					
		Portable Skimmers	6					
		ShallowWater Skimmers	2					
		Response Personnel	142					
SWS Environmental (877) 742-4215	Tampa, FL	Containment Boom - 18"	2,000'	Venice, LA	13	1	1	15
		Response Boats - 16' to 25'	2					
		Response Boats - 25' to 42'	1					
		Portable Skimmers	1					
		Response Personnel	10					
SWS Environmental (877) 742-4215	St. Petersburg, FL	Containment Boom - 18"	10,800	Venice, LA	13.5	1	1	16
		Response Boats - 16' to 25'	1					
		Response Boats - 25' to 42'	1					
		Portable Skimmers	1					
		Response Personnel	8					
SWS Environmental (877) 742-4215	Savannah, GA	Containment Boom - 18"	1,400'	Venice, LA	13.5	1	1	16
		Response Boats - 16' to 25'	3					
		ShallowWater Skimmers	1					
		Response Personnel	7					
SWS Environmental (877) 742-4215	Fort Lauderdale, FL	Containment Boom - 18"	1,000'	Venice, LA	15.75	1	1	18
		Response Boats - 16' to 25'	2					
		Response Boats - 25' to 42'	1					
		ShallowWater Skimmers	1					
		Response Personnel	8					
Tri-State Bird Rescue & Research, Inc. (800) 261-0980	Newark, DE	Wildlife Specialist - Personnel	6 to 12	Venice, LA	21	1	1	23

Table 9.D.11 Shoreline Protection and Wildlife Support List (cont.)

SECTION 10: ENVIRONMENTAL MONITORING INFORMATION

A. Monitoring Systems

A rig based Acoustic Doppler Current Profiler (ADCP) is used to continuously monitor the current beneath the rig. Metocean conditions such as sea states, wind speed, ocean currents, etc. will also be continuously monitored. Shell will comply with NTL 2015-G04.

B. Incidental Takes

No incidental takes are anticipated. Although marine mammals may be seen in the area, Shell does not believe that its operations proposed under this EP will result Shell implements the mitigation measures and monitors for incidental takes of protected species according to the following notices to lessees and operators from the BOEM/BSEE:

NTL 2015-BSEE-G03	"Marine Trash and Debris Awareness and Elimination"
NTL 2016-BOEM-G01	"Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
NTL 2016-BOEM-G02	"Implementation of Seismic Survey Mitigation Measures & Protected Species Observer Program"

C. Flower Garden Banks National Marine Sanctuary

The operations proposed in this EP will not be conducted within the Protective Zones of the Flower Garden Banks and Stetson Bank.

SECTION 11: LEASE STIPULATIONS INFORMATION

Mississippi Canyon Block 768:

Lease OCS-G 34458 was acquired in Lease Sale #222 held on June 20, 2012 and has an expected expiration date of October 31, 2019. Shell earned an additional 3 years, resulting in a 10-year extended initial period, by spudding a well within the first 7 years of the lease and request wass made to BSEE district manager for extension.

This lease is not part of a biological sensitive area, known chemosynthetic area, or shipping fairway. See Section 6 of this plan for site specific archeological information. The following stipulations are associated with this lease:

Stipulation No. 8 – Protected Species
This Stipulation is addressed in the following sections of this plan:
Section 6, Threatened or endangered species, critical habitat and marine mammal information
Section 10, Environmental Monitoring Information, Incidental takes
Section 12, Environmental Mitigation Measures Information, Incidental takes
Section 18, Environmental Impact Assessment

Mississippi Canyon Block 811:

Lease OCS-G 34460 was acquired in Lease Sale #222 held on June 20, 2012 and has an expected expiration date of September 30, 2019. Shell earned an additional 3 years, resulting in a 10-year extended initial period, by spudding a well within the first 7 years of the lease and request wass made to BSEE district manager for extension.

This lease is not part of a biological sensitive area, known chemosynthetic area, or shipping fairway. See Section 6 of this plan for site specific archeological information. The following stipulations are associated with this lease:

Stipulation No. 8 – Protected Species
This Stipulation is addressed in the following sections of this plan:
Section 6, Threatened or endangered species, critical habitat and marine mammal information
Section 10, Environmental Monitoring Information, Incidental takes
Section 12, Environmental Mitigation Measures Information, Incidental takes
Section 18, Environmental Impact Assessment

Mississippi Canyon Block 812:

Lease OCS-G 34461 was acquired in Lease Sale #222 held on June 20, 2012 and has an expected expiration date of September 30, 2019. Shell did earn an additional 3 years, resulting in a 10-year extended initial period, because a well is spud within the first 7 years of the lease and request was made to BSEE district manager for extension.

This lease is not part of a biological sensitive area, known chemosynthetic area, or shipping fairway. See Section 6 of this plan for site specific archeological information. The following stipulations are associated with this lease:

Stipulation No. 8 – Protected Species
This Stipulation is addressed in the following sections of this plan:
Section 6, Threatened or endangered species, critical habitat and marine mammal information
Section 10, Environmental Monitoring Information, Incidental takes
Section 12, Environmental Mitigation Measures Information, Incidental takes
Section 18, Environmental Impact Assessment

SECTION 12: ENVIRONMENTAL MITIGATION MEASURE INFORMATION

A. Impacts to Marine and coastal environments

The proposed action will implement mitigation measures required by laws and regulations, including all applicable Federal & State requirements concerning air emissions, discharges to water and solid waste disposal, as well as any additional permit requirements and Shell policies. Project activities will be conducted in accordance with the Regional OSRP. Section 18 of this plan discusses impacts and mitigation measures, including Coastal Habitats and Protected Areas.

B. Incidental Takes

We do not anticipate any incidental takes related to the proposed operations. Shell implements the mitigation measures and monitors for incidental takes of protected species according to the following notices to lessees and operators from the BOEM/BSEE:

NTL 2015-BSEE-G03	"Marine Trash and Debris Awareness and Elimination"
NTL 2016-BOEM-G01	"Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
NTL 2016-BOEM-G02	"Implementation of Seismic Survey Mitigation Measures & Protected Species Observer Program"

SECTION 13: RELATED FACILITIES AND OPERATIONS INFORMATION

A. Related OCS Facilities and Operations

The Kaikias Development consists of a subsea tieback of four new production wells to the existing Ursa Tension Leg Platform (TLP) host facility located in MC 809 via a new production flowline and steel catenary riser.

It will utilize a Pipeline End Manifold (PLEM) to both terminate the single production flowline and commingle production from the four wells. The PLEM includes four hubs, one for each Kaikias well, and one flowline header. The four subsea production wells will be completed with subsea trees. Production will flow from each well through a dedicated flexible jumper to the subsea PLEM. From the PLEM, production will flow via the single flowline and its associated steel catenary riser to the host for processing.

This Development Operations Coordination Document (DOCD) is specifically for the installation of subsea equipment located at the Kaikias drill center to tie the Kaikias production into the existing Ursa production system. Three of the four wells have been drilled and completed by the Noble Don Taylor drillship. The fourth well will commence drilling and completion as early as third quarter 2017.

Attached Figure 13-1 is a diagram of the Kaikias subsea Layout.

Pipelines proposed in Section 1a

Size*	Length	Route	Product	Shut-in Time in the event of a leak
10"	650'	MC 812 – MC 812	Crude	45 seconds
10"	650'	MC 812 – MC 812	Crude	45 seconds
10"	650'	MC 812 – MC 812	Crude	45 seconds
10"	875'	MC 812 – MC 812	Crude	45 seconds
8.625"	52,955'	MC 809 – MC 812	Crude	45 seconds

*Note: Flexible jumper diameter is approximate, as outer diameter will be dependent on the final flexible pipe cross-section provided by the manufacturer.

B. Transportation System

Oil Transportation – From Ursa liquid hydrocarbons leave via an 18" oil pipeline via West Delta Block 143 A Platform to Fourchon, Louisiana

Gas Transportation – From Ursa gas production leaves via a 20" gas line via West Delta Block 143 A Plaform to Venice, Louisiana.

C. Produced liquid hydrocarbons transportation vessels

Not applicable.

SECTION 14: SUPPORT VESSELS AND AIRCRAFT INFORMATION

A. General

Type	Maximum Fuel Tank Storage Capacity (Gals)	Maximum No. In Area at Any Time	Trip Frequency or Duration
Crew Boats	8,000	1	Twice per week
Offshore Support Vessels	120,000/5000	2/3	6 weeks Insallation/Twice per week well work
Helicopter	760	1	Once per day
Pipeline Lay Barge	1,113,034	1	Three weeks
Installation Vessel	8,944	1	Eight weeks
Offshore Supply Vessel	1,222	1	One biweekly for eitght weeks
Umbilical Reel Lay	319,900	1	Two weeks

B. Diesel Oil Supply Vessels

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
280-foot length	100,000 gals.	1 week	6 miles from Port Fourchon to the mouth of Bayou Lafourche, then to MC 812

C. Drilling Fluids Transportation

According to NTL 2008-G04, this information in only required when activities are proposed in the State of Florida.

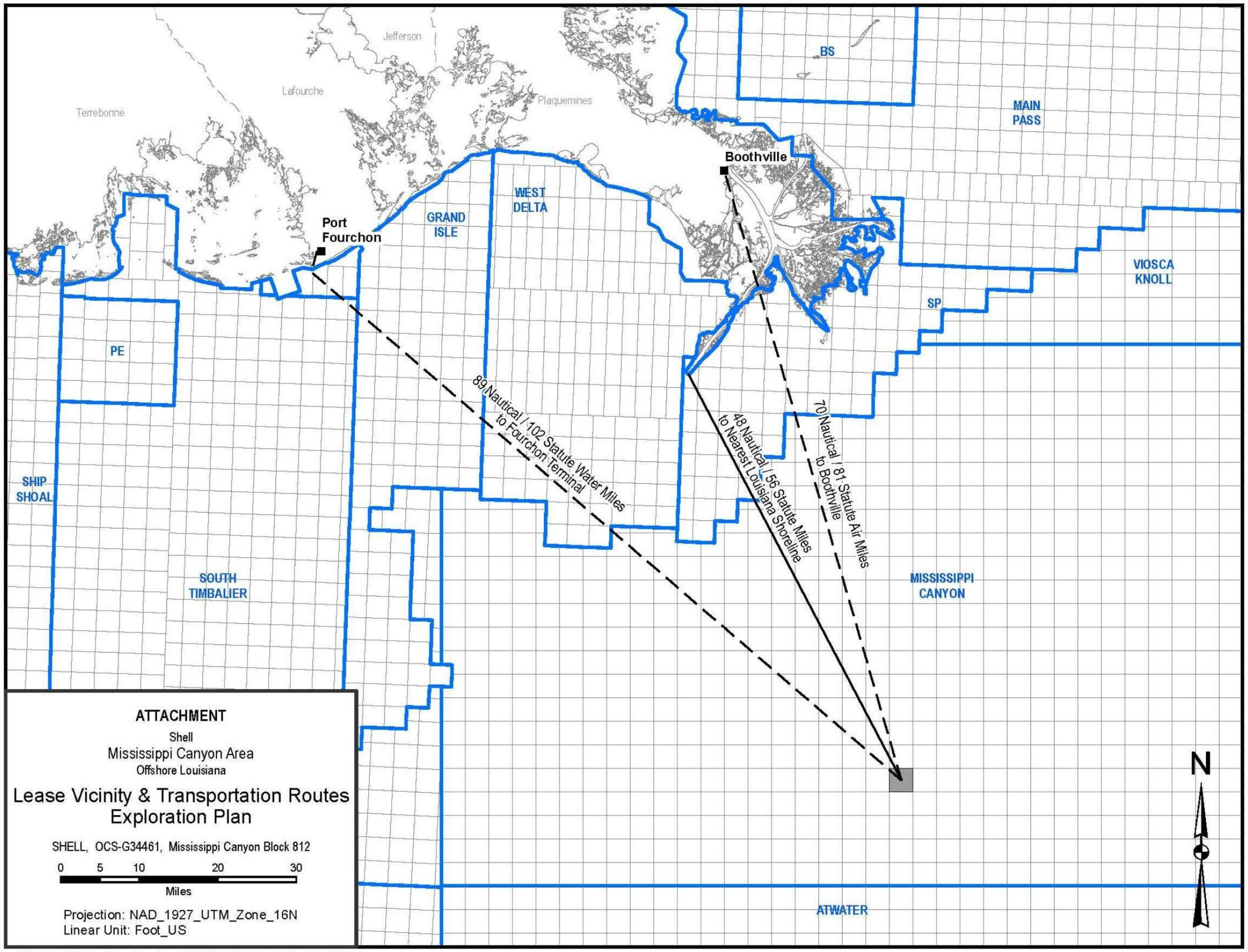
D. Solid and Liquid Wastes Transportation

See Section 7, Table 7B.

E. Vicinity Map

See Attachment 14A for Vicinity Map.

Attachment 14A – Vicinity Map



G:\30_Project\CAD_NewOrleans\Maps\Permit Plats\Kaikias\Kaikias Vicinity Map March 2014.mxd

SECTION 15: ONSHORE SUPPORT FACILITIES INFORMATION

A. General

Name	Location	Existing/New/Modified
Fourchon	Port Fourchon, LA	Existing
Boothville Heliport	Boothville, LA	Existing

The onshore support bases for water and air transportation will be the existing terminals in Boothville and Fourchon, Louisiana. The Fourchon boat facility is operated by Shell and is located on Bayou Lafourche, south of Leeville, LA approximately 3 miles from the Gulf of Mexico. The existing onshore air support base in Boothville, LA is located at 38963 Hwy. 23, Boothville, LA 70041.

B. Support Base Construction or Expansion

This does not apply to this plan as Shell does not plan to construct a new onshore support base or expand an existing one to accommodate the activities proposed in this DOCD.

C. Support Base Construction or Expansion Timetable

Since no onshore support base construction or expansion is planned for these activities, a timetable for land acquisition and construction or expansion is not applicable.

D. Waste Disposal

See Section 7, Tables 7A and 7B.

E. Air emissions

Not required by BOEM GOM.

F. Unusual solid and liquid wastes

Not required by BOEM GOM.

SECTION 16: SULPHUR OPERATIONS INFORMATION

Information regarding Sulphur Operations is not included in this DOCD as we are not proposing to conduct sulphur operations.

SECTION 17: COASTAL ZONE MANAGEMENT ACT (CZMA) INFORMATION

LOUISIANA
COASTAL ZONE MANAGEMENT
CONSISTENCY CERTIFICATION

DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
Type of Plan

MISSISSIPPI CANYON BLOCK 768
MISSISSIPPI CANYON BLOCK 811
MISSISSIPPI CANYON BLOCK 812

Area and Blocks

OCS-G 34458
OCS-G 34460
OCS-G 34461
Lease Number

The proposed activities described in detail in this Plan will comply with Louisiana's State and Local Coastal Resources Management Act of 1978, Coastal Resources Program and Coastal Area Management Enforceable Policies.

We have considered all of Louisiana's Enforceable Policies in making this certification of consistency.

SHELL OFFSHORE INC.
Operator

Sylvia Bellone
Certifying Official

06/07/17
Date

MISSISSIPPI
COASTAL ZONE MANAGEMENT
CONSISTENCY CERTIFICATION

DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
Type of Plan

MISSISSIPPI CANYON BLOCK 768
MISSISSIPPI CANYON BLOCK 811
MISSISSIPPI CANYON BLOCK 812

Area and Blocks

OCS-G 34458
OCS-G 34460
OCS-G 34461
Lease Number

The proposed activities described in detail in this Plan will comply with Mississippi's approved Coastal Resources Program and Coastal Area Management Program Policies.

SHELL OFFSHORE INC.
Operator

____
Sylvia A. Bellone
Certifying Official

06/07/17
____
Date

Coastal Zone Management Consistency Information
For the State of Mississippi

Goal 1. To provide for reasonable industrial expansion in the Coastal Area and to insure the efficient utilization of waterfront industrial sites so that suitable sites are conserved for the water dependent industry.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 2. To favor the preservation of the coastal wetlands and ecosystems, except where a specific alternation of specific coastal wetlands would serve a higher public interest in compliance with the public purposes of the public trust in which the coastal wetlands are held.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 3. To protect, propagate, and conserve the State's seafood and aquatic life in connection with the revitalization, and conserve the State's seafood and aquatic life in connection with the revitalization of the seafloor industry of the State of Mississippi.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 4. To conserve the air and waters of the State, and to protect, maintain and improve the quality thereof for public use, for the prorogation of wildlife, fish and aquatic life, and for domestic, agricultural, industrial, recreational and other legitimate beneficial uses.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 5. To put the benefit use to the fullest extent of which they are capable to water resources of the State, and to prevent the waste, unreasonable use, or unreasonable method of use of water.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 6. To preserve the State's historical and archaeological resources, to prevent their destruction, and to enhance these resources whenever possible.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 7. To encourage the preservation of natural scenic qualities in the coastal area.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

Goal 8. To assist local government in the provision of public facilities services in a manner consistent with the coastal program.

The proposed activities are located in OCS Federal Waters, Gulf of Mexico, approximately 59 miles from the nearest Louisiana shoreline. Shell will utilize existing facilities in Fourchon and Boothville, Louisiana; therefore, there should not be any adverse impacts to the Mississippi coastal areas.

TEXAS
COASTAL ZONE MANAGEMENT
CONSISTENCY CERTIFICATION

Development Operations Coordination Document
Type of Plan

Mississippi Canyon 768
Mississippi Canyon 811
Missssissippi Canyon 812
Area and Block(s)

OCS-G 34458
OCS-G 34460
OCS-G 34461
Lease Number(s)

The proposed activities described in detail in this Plan will comply with Texas' State and Local Coastal Resources Management Act of 1978, Coastal Resources Program, and Coastal Area Management Enforceable Policies.

SHELL OFFSHORE INC.
Operator

Sylvia A. Bellone
Certifying Official

July 11, 2017
Date

Coastal Zone Management Consistency Information
For the State of Texas

In accordance with Subpart E of 15 CFR 903 "Consistency for Outer Continental Shelf (OCS) Exploration, Development and Production Activities" and as required by 15 CFR 930.58, Shell is hereby providing the following information in support of the Environmental Impact Analysis submitted as Section 18 of this plan.

15 CFR 930.58 identifies necessary data and information to be furnished to the State agency. The information is as follows:

(a) CONSISTENCY CERTIFICATION

A Coastal Zone Consistency Certification for activities that affect the State of Texas is provided in Section 17 of the DOCD.

OTHER INFORMATION

A detailed description of the proposed activities, coastal effects, and comprehensive information sufficient to support this Consistency Certification is presented in Section 17 of the DOCD. As per NTL 2008-G04, the following items have been identified as being required:

- A discussion of the method of disposal of wastes and discharges is provided in Section 7 of the DOCD.

- Oil Spill Information is provided in Section 9 of the DOCD. All operations are covered by Shell's Regional Oil Spill Response Plan. The Plan is available upon request.

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

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

No operations are proposed in or near any critical areas. The proposed activities are of a development in nature, but no facility construction is proposed. The proposed activities are located approximately 314 miles from the Texas shoreline; therefore we expect no adverse impacts to CNRAs or beach access and use rights of the public. All activities shall be conducted in a manner that minimizes significant impacts to coastal resources. No adverse effects to Texas' coastal area are expected in association with the proposed activities.

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

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

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

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

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

The proposed activities will be covered under an approved Regional Oil Spill Response Plan. The plan is in place, practiced, and updated as necessary. The best practical techniques shall be utilized to prevent the release of pollutants or toxic substances into the environment. All involved vessels and facilities are designed to be capable of prompt response and adequate removal of accidental discharges of oil. In addition, the proposed activities are 63 miles from shore; therefore no damages to natural resources are expected as the result of an unauthorized discharge of oil into coastal waters.

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

No discharges from the proposed activities will occur in coastal waters. The proposed activities are 314 miles from shore, therefore there will be no effect on coastal waters.

(Category 8)
Development in Critical Areas

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

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

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

(Category 10)
Dredging and Dredged Material Disposal and Placement

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

(Category 11)
Construction in the Beach / Dune System

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

(Category 15)
Alteration of Coastal Historic Areas

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

(Category 16)
Transportation

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

(Category 17)
Emission of Air Pollutants

The proposed activities shall be carried out in conformance with applicable air quality laws, standards, and regulations. Emissions from the proposed activities are not expected to have significant impacts on onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline. The proposed activities will occur approximately 314 miles from shore and will be within the exemption limits set by BOEM, therefore, no impacts to Texas' coastal zone is expected.

(Category 18)
Appropriations of Water

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

(Category 20)
Marine Fishery Management

The proposed activities are located approximately 63 miles from shore and are not expected to have any effect on marine fishery management or fishery migratory patterns within waters in the coastal zone of Texas.

(Category 22)
Administrative Policies

The necessary information for applicable agencies to make an informed decision on the proposed activities has been provided

In conclusion, all activities shall be consistent with Texas' coastal management program and shall comply with all relevant rules and regulations. No activities are planned within any critical areas. Activities will be carried out avoiding unnecessary conflicts with other uses of the vicinity.

<u>SECTION 18: ENVIRONMENTAL IMPACT ANALYSIS (EIA)</u>

Environmental Impact Analysis

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

for

Mississippi Canyon Block 768 (OCS-G 34458)
Mississippi Canyon Block 811 (OCS-G 34460)
Mississippi Canyon Block 812 (OCS-G 34461)

Offshore Louisiana
June 2017

Prepared for:

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Telephone: (772) 219-3000

CSA Ocean Sciences Inc.

ENVIRONMENTAL IMPACT ANALYSIS

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

Mississippi Canyon Block 768 (OCS-G 34458)
Mississippi Canyon Block 811 (OCS-G 34460)
Mississippi Canyon Block 812 (OCS-G 34461)

OFFSHORE LOUISIANA

DOCUMENT NO. CSA-SHELL-FL-17-3144-01-REP-01-FIN

VERSION	DATE	DESCRIPTION	PREPARED BY:	REVIEWED BY:	APPROVED BY:
01	04/24/17	Initial draft for review	K. Gifford	P. Connelly	K. Gifford
02	5/11/17	Draft	K. Gifford	M. Barkaszi	K. Gifford
FIN	06/01/17	Final	K. Gifford	N/A	K. Gifford

Acronyms and Abbreviations

ABS	American Bureau of Shipping
ac	acre
ADIOS	Automated Data Inquiry for Oil Spills
AQR	Air Quality Emissions Report
AUV	autonomous underwater vehicle
bbl	barrel
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
BOPD	barrels of oil per day (bbl/d)
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
dB	decibel
DOCD	Development Operations Coordination Document
DNV	Det Norske Veritas
DP	dynamically positioned
DPS	distinct population segment
EFH	Essential Fish Habitat
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAD	fish-attracting device
FR	Federal Register
GMFMC	Gulf of Mexico Fishery Management Council
H_2S	hydrogen sulfide
ha	hectare
HAPC	Habitat Area of Particular Concern
Hz	hertz
IPF	impact-producing factor
LARS	Launch and Recovery System
MARPOL	International Convention for the Prevention of Pollution from Ships
MC	Mississippi Canyon
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MODU	mobile offshore drilling unit
MWCC	Marine Well Containment Company
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OSRA	Oil Spill Risk Analysis
OSRP	Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbon
PLEM	pipeline end manifold
PM	particulate matter
Shell	Shell Offshore Inc.
SO_x	sulfur oxides
TLP	tension leg platform
U.S.C	United States Code
USCG	U.S. Coast Guard
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UTH	umbilical termination hub
VOC	volatile organic compound
WCD	worst case discharge
WMA	Wildlife Management Area

Introduction

Project Summary

Shell Offshore Inc. (Shell) is submitting an initial Development Operations Coordination Document (DOCD) for Mississippi Canyon (MC) Blocks 768, 811, and 812 for seafloor equipment installation (flying leads and jumpers) in 2018, and well work for 200 days per year from 2019 to 2040. The DOCD will cover the installation of subsea equipment to tieback four new production wells (KA001, KA003, KA004, and F) to the existing Ursa Tension Leg Platform (TLP) in Block MC 809. This Environmental Impact Analysis (EIA) provides information on potential impacts on environmental resources that could be affected by Shell's proposed activities in the lease area. Environmental impacts associated with drilling and completion of KA001, KA003, KA004, and F wells were previously evaluated in Initial Exploration Plan Nos. N-9840 and N-9727 and Supplemental Exploration Plan Nos. S-7801 and S-7826.

The lease area is in the Central Planning Area, 56 miles (90 km) from the nearest shoreline (Louisiana), 102 miles (164 km) from the onshore support base at Port Fourchon, Louisiana, and 81 miles (130 km) from the helicopter base at Boothville, Louisiana. All miles in this EIA are statute miles. Water depth at the project area ranges from approximately 3,808 to 4,504 ft (1,161 to 1,373 m).

Installation of subsea equipment and well work will be accomplished with a dynamically positioned (DP) installation vessel or mobile offshore drilling unit (MODU), as detailed in **Section 14** of the DOCD. The installation of the proposed umbilical, flowline, flying leads, and jumpers are estimated to be completed in 2018. The well work is estimated to take 200 days per year over a 21-year period from 2019 to 2040. There are no anchors associated with the proposed work in this plan.

Purpose of the Environmental Impact Analysis

This EIA was prepared pursuant to the requirements of the Outer Continental Shelf Lands Act (OCSLA), 43 United States Code (U.S.C.) §§ 1331-1356, and Bureau of Ocean Energy Management (BOEM) regulations, including 30 Code of Federal Regulations (CFR) 550. The EIA is a project- and site-specific analysis of Shell's planned activities under the DOCD.

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

Potential impacts have been analyzed at a broader level in the Programmatic Environmental Impact Statements (EISs) for the OCS Oil and Gas Leasing Program (BOEM, 2012a) and in multi-sale EISs for the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012b, 2013, 2014, 2015, 2016).

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

OCS Regulatory Framework

The regulatory framework for OCS activities in the Gulf of Mexico is summarized by BOEM (2012a). Under the OCSLA, the U.S. Department of the Interior (USDOI) is responsible for the administration of mineral exploration and development of the OCS. Within the USDOI, BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) are responsible for managing and regulating the development of OCS oil and gas resources in accordance with the provisions of the OCSLA. The BSEE offshore regulations are in 30 CFR Chapter II, Subchapter B. BOEM offshore regulations are in 30 CFR Chapter V, Subchapter B.

In implementing its responsibilities under the OCSLA and NEPA, BOEM consults numerous federal departments and agencies that have the authority to govern and maintain ocean resources pursuant to other federal laws. Among these are the U.S. Coast Guard (USCG), U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), and the National Oceanic and Atmospheric Administration (NOAA) through the National Marine Fisheries Service (NMFS). Federal regulations establish consultation and coordination processes with federal, state, and local agencies (e.g., the ESA, MMPA, Coastal Zone Management Act of 1972, and the Magnuson-Stevens Fishery Conservation and Management Act).

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

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

NTL	Title	Summary
BOEM-2016-G01	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 striking protected species; and requires operators to report sightings of any injured or dead protected species. Supersedes NTL 2012-JOINT-G01.

Table 1. (Continued).

NTL	Title	Summary
BSEE-2015-G03	Marine Trash and Debris Awareness and Elimination	Instructs operators to exercise caution in the handling and disposal of small items and packaging materials; requires the posting of placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process. Supersedes and replaces NTL 2012-G01.
BOEM 2015-N02	Elimination of Expiration Dates on Certain Notice to Lessees and Operators Pending Review and Reissuance	Eliminates the expiration dates on past or upcoming expiration dates from BOEM NTLs currently posted.
BOEM 2015-N01	Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge Blowout Scenarios	Provides guidance regarding information required in worst-case discharge (WCD) descriptions and blowout scenarios. Supersedes NTL 2010-N06.
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-2012-N06	Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans	Provides clarification, guidance, and information for preparation of regional Oil Spill Response Plans. Recommends description of response strategy for WCD scenarios to ensure capability to respond to oil discharges is both efficient and effective.
2011-JOINT-G01	Revisions to the List of OCS Blocks Requiring Archaeological Resource Surveys and Reports	Provides new information on which OCS blocks require archaeological surveys and reports and line spacing required in each block. This NTL augments NTL 2005-G07.
2010-N10	Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources	Informs operators using subsea blowout preventers (BOPs) or surface BOPs on floating facilities that applications for well permits must include a statement signed by an authorized company official stating that the operator will conduct all activities in compliance with all applicable regulations, including the increased safety measures regulations (75 *Federal Register* [FR] 63346). Informs operators that BOEM will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to promptly respond to a blowout or other loss of well control.
2009-G40	Deepwater Benthic Communities	Provides guidance for avoiding and protecting high-density deepwater benthic communities (including chemosynthetic and deepwater coral communities) from damage caused by OCS oil and gas activities in water depths greater than 984 ft (300 m). Prescribes separation distances of 2,000 ft (610 m) from each mud and cuttings discharge location and 250 ft (76 m) from all other seafloor disturbances.

Table 1. (Continued).

NTL	Title	Summary
2009-G39	Biologically Sensitive Underwater Features and Areas	Provides guidance for avoiding and protecting biologically sensitive features and areas (i.e., topographic features, pinnacles, low-relief live bottom areas, and other potentially sensitive biological features) when conducting OCS operations in water depths less than 984 ft (300 m) in the Gulf of Mexico.
2009-N11	Air Quality Jurisdiction on the OCS	Clarifies jurisdiction for regulation of air quality in the Gulf of Mexico Outer Continental Shelf (OCS).
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on the information requirements for OCS plans, including EIA requirements and information regarding compliance with the provisions of the ESA and MMPA.
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.

Oil Spill Prevention and Contingency Planning

Shell has an approved Gulf of Mexico Regional Oil Spill Response Plan (OSRP) as a fundamental component of the planned subsea equipment installation program that certifies Shell's capability to respond to a WCD (30 CFR 254.2) to the maximum extent practicable (see **DOCD Section 9**). The OSRP demonstrates Shell's capabilities to rapidly and effectively manage oil spills that may result from drilling operations; in this case, Shell's OSRP is applicable to proposed installation of subsea umbilical, flowline, flying leads, and jumpers. Despite the extremely low likelihood of a large oil spill occurring during the project, Shell has designed its response program based on a regional capability of responding to a range of spill volumes that increase from small operational spills to a WCD from a well blowout. Shell's program is intended to meet the response planning requirements of the relevant coastal states and federal oil spill planning regulations. The OSRP includes information regarding Shell's regional oil spill organization and dedicated response assets, potential spill risks, and local environmental sensitivities. The OSRP presents specific information on the response program that includes a description of personnel and equipment mobilization, the incident management team organization, and the strategies and tactics used to implement effective and sustained spill containment and recovery operations.

EIA Organization

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

A. Impact-Producing Factors

Table 2 is a matrix of IPFs and potentially affected environmental resources adapted from Form BOEM-142. An “X” indicates that an IPF could reasonably be expected to affect a certain resource, and a dash (--) indicates no impact or negligible impact is anticipated. Numbers in parentheses refer to the table footnotes on the following page. Where there may be an effect, an analysis is provided in **Section C**. Potential IPFs for the proposed activity are listed below and briefly discussed in the following subsections:

- Vessel presence (including noise and lights);
- Physical disturbance to the seafloor;
- Air pollutant emissions;
- Effluent discharges;
- Water intake;
- Onshore waste disposal;
- Marine debris;
- Support vessel and helicopter traffic; and
- Accidents.

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

Environmental Resources	Impact-producing Factors									
	Vessel Presence (incl. noise & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helicopter Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Physical/Chemical Environment										
Air quality	--	--	**X**(5)	--	--	--	--	--	**X**(6)	**X**(6)
Water quality	--	--	--	**X**	--	--	--	--	**X**(6)	**X**(6)
Seafloor Habitats and Biota										
Soft bottom benthic communities	--	**X**	--		--	--	--	--	--	**X**(6)
High-density deepwater benthic communities	--	--(4)	--	--(4)	--	--	--	--	--	**X**(6)
Designated topographic features	--	--(1)	--	--(1)	--	--	--	--	--	--
Pinnacle trend area live bottoms	--	--(2)	--	--(2)	--	--	--	--	--	--
Eastern Gulf live bottoms	--	--(3)	--	--(3)	--	--	--	--	--	--
Threatened, Endangered, and Protected Species and Critical Habitat										
Sperm whale (endangered)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
West Indian manatee (endangered)	--	--	--	--	--	--	--	**X**(8)	--	**X**(6,8)
Non-endangered marine mammals (protected)	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Sea turtles (endangered/threatened)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Piping Plover (threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Whooping Crane (endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Gulf sturgeon (threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Beach mice (endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Coastal and Marine Birds										
Marine and pelagic birds	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Shorebirds and coastal nesting 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**(7)
Prehistoric archaeological sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Coastal Habitats and Protected Areas										
Beaches	--	--	--	--	--	--	--	--	--	**X**(6)
Wetlands and seagrass beds	--	--	--	--	--	--	--	**X**	--	**X**(6)
Coastal wildlife refuges and wilderness areas	--	--	--	--	--	--	--	--	--	**X**(6)
Socioeconomic and Other Resources										
Recreational and commercial fishing	**X**	--	--	--	--	--	--	--	**X**(6)	**X**(6)
Public health and safety	--	--	--	--	--	--	--	--	--	**X**(6)
Employment and infrastructure	--	--	--	--	--	--	--	--	--	**X**(6)
Recreation and tourism	--	--	--	--	--	--	--	--	--	**X**(6)
Land use	--	--	--	--	--	--	--	--	--	**X**(6)
Other marine uses	--	--	--	--	--	--	--	--	--	**X**(6)

Numbers in parentheses refer to table footnotes on the following page. MODU = mobile offshore drilling unit.

Table 2 Footnotes and Applicability:

(1) *Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well, platform site, or any anchors will be on the seafloor within the following:*
   (a) *4-mile zone 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 from any no-activity zone; or*
   (d) *Proximity of any submarine bank (500-ft buffer zone) with relief greater than 2 m that is not protected by the Topographic Features Stipulation attached to an OCS lease.*
      - Not applicable. The lease is not within the given ranges (buffer zone) of any marine sanctuary, topographic feature, or no-activity zone. There are no submarine banks in the lease block.

(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 lease area.

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

(4) *Activities on blocks designated by BOEM as being in water depths 300 m or greater.*
   - No impacts on high-density deepwater benthic communities are anticipated. Geohazards assessments found that no features indicative of high-density chemosynthetic communities or coral communities were identified within 2,000 ft (610 m) of the proposed subsea installation and within 250 ft (76 m) of the proposed umbilical and flowline route (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).

(5) *Exploration or production activities where hydrogen sulfide (H_2S) concentrations greater than 500 ppm might be encountered.*
   - Development Operations Coordination Document (DOCD) **Section 4** contains Shell's request for classification as an area absent of H_2S.

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

(7) *All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which 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 on archaeological resources are expected from routine activities. Although the lease area is on BOEM's list of archaeology survey blocks (BOEM, 2011), water depths are well beyond the 60-m (197 ft) depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. As discussed in **Section C.6,** the shallow hazard assessment (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016) did not identify any archaeologically significant sonar contacts within 2,000 ft (610 m) of the proposed subsea installation or within 500 ft (152 m) of the proposed umbilical and flowline route.

(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 or sea turtles include DP installation vessel or Mobile Drilling Unit (MODU) presence and emissions, support vessel and helicopter traffic, and accidents. See **Section C**.

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

A.1 Vessel Presence (including noise and lights)

Installation of subsea equipment and well work will be accomplished with a DP installation vessel or a MODU. DP MODUs, as well as DP installation vessels, are self-propelled and maintain position using a global positioning system, specific computer software, and sensors in conjunction with a series of thrusters. Potential impacts to marine resources from the installation of subsea equipment include the physical presence of the installation and support vessels in the ocean, increased light from working and safety lighting on the vessels, and noise audible above and below the water surface.

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

The DP installation vessel or MODU will maintain exterior lighting for working at night and navigational and aviation safety in accordance with federal regulations. Artificial lighting may attract and directly or indirectly impact natural resources, particularly birds, as discussed in **Section C.4**.

MODUs can be expected to produce noise from station keeping, drilling, and maintenance operations. The noise levels produced by DP vessels largely depend on the level of thruster activity required to keep position and, therefore, vary based on environmental site conditions and operational requirements. Representative source levels for vessels in DP mode range from 184 to 190 decibels (dB) relative to one micropascal (re 1 µPa) at 1 m from the source, with a primary frequency below 600 hertz (Hz) (Blackwell and Greene Jr., 2003, Kyhn et al., 2011, McKenna et al., 2012). Drilling operations produce noise that includes strong tonal components at low frequencies (Minerals Management Service [MMS], 2000). When drilling, the drill string represents a long vertical sound source (McCauley, 1998). Sound pressure levels associated with drilling activities have a maximum broadband (10 Hz to 10 kilohertz [kHz]) energy of approximately 190 dB re 1 µPa at 1 m (Hildebrand, 2005). Based on available data, marine sound generated from MODUs during drilling and in the absence of thrusters can be expected to range between 154 and 176 dB re 1 µPa at 1 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 at 1 m (Nedwell and Howell, 2004).

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

A.2 Physical Disturbance to the Seafloor

Installation of subsea equipment and well work will be accomplished with a DP installation vessel or MODU; no vessel will use anchors. There will be minimal disturbance to the seafloor and soft bottom communities during positioning of the equipment. Physical disturbance of the seafloor will be limited to the proximal area where the subsea equipment is placed on the substrate. The following subsea equipment will be installed on the seafloor:

- (4) Flexible jumpers from Well KA001, KA003, KA004, and F to subsea pipeline end manifold (PLEM) hub (Total Length: 2,825 ft [861 m]; three at 650 ft [198 m] and one at 875 ft [267 m])
- (4) Electric Flying Leads (EFLs) from Wells KA001, KA003, KA004, and F to umbilical termination hub (UTH) (Total Length: 3,250 ft [991 m]);
- (4) Steel Flying Leads (SFLs) from Wells KA001, KA003, KA004, and F to UTH (Total Length: 3,270 ft [997 m]);
- (1) Umbilical from the UTH to the Ursa TLP within MC809 (Length: 53,598 ft [16,337 m]); and
- (1) Production Flowline from the PLEM to the Ursa TLP (Length: 52,995 ft [16,153 m]).

BOEM (2012b) estimated an area of seafloor disturbance between 1.2 acres (ac) (0.5 hectares [ha]) and 2.5 ac (1.0 ha) per kilometer of pipeline or flowline installation. Due to the water depth in the lease area, it is anticipated that the umbilical, flowline, flying leads, and jumpers will not be buried by trenching, but will instead be placed on the seafloor, decreasing the area of impact. Using BOEM's (2012b) lower range value of 1.2 ac (0.5 ha) per kilometer of flowline as an estimate for the proposed subsea installation, the estimated area disturbed by the flying leads and jumpers is 3.4 ac (1.4 ha) and by the umbilical and flowline is 39 ac (16 ha).

A.3 Air Pollutant Emissions

Estimates of air pollutant emissions are provided in **DOCD Section 8**. Offshore air pollutant emissions will result from operations of the DP installation vessel or MODU as well as service vessels and helicopters. These emissions occur mainly from combustion of diesel and aviation fuel (Jet-A). Primary air pollutants typically associated with OCS activities are suspended particulate matter (PM), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and carbon monoxide (CO).

The project area is located westward of 87.5° W longitude; thus, air quality is under BOEM jurisdiction as explained in NTL 2009-N11. Anticipated emissions from the proposed project activities are calculated in the Air Quality Emissions Report (AQR) (see **DOCD Section 8**) prepared in accordance with BOEM requirements provided in 30 CFR 550 Subpart C. The AQR shows that the projected emissions associated with the proposed activities meet BOEM's exemption criteria. Based on calculated emissions and the location of the project area relative to shore, it can be concluded that project emissions will not significantly affect onshore air quality for any of the criteria pollutants. No further analysis or control measures are required.

A.4 Effluent Discharges

Effluent discharges from the DP installation vessel or MODUs are summarized in **DOCD Section 7**. Discharges from the DP installation vessel or MODUs are required to comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for oil and gas activities (GMG290103). The support vessels' discharges are expected to be in accordance with USCG regulations.

Other effluent discharges from the DP installation vessel or MODU and support vessels are expected to include non-contact cooling water, treated sanitary and domestic wastes, deck drainage, desalination unit brine, uncontaminated fire water, bilge water, and ballast water. The installation vessel, MODU, and support vessel discharges are expected to be in accordance with NPDES permit and/or USCG regulations, as applicable, and, therefore, are not expected to cause significant impacts on water quality.

A.5 Water Intake

Seawater will be drawn from several meters below the ocean surface for various services, including firewater and once-through non-contact cooling of machinery on the DP installation vessel or MODU (**DOCD Table 7a**).

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 NPDES General Permit No. GMG290103 specifies requirements for new facilities for which construction commenced after July 17, 2006, with a cooling water intake structure having a design intake capacity of greater than 2 million gallons of water per day, of which at least 25% is used for cooling purposes.

The DP installation vessel or the MODU selected for this project meets the described applicability for new facilities, and the vessels' water intakes are expected to be in compliance with the design, monitoring, and recordkeeping requirements of the NPDES permit.

A.6 Onshore Waste Disposal

Wastes generated during exploration activities are tabulated in **DOCD Section 7**. Recyclable trash and debris and used oil will be generated during the proposed project and will be recycled at Omega Waste Management in West Patterson, Louisiana; Lamp Environmental, Hammond, Louisiana; or at a similarly permitted facility. Non-recyclable trash and debris will be transported to the Republic/BFI landfill in Sorrento, Louisiana; the parish landfill in Avondale, Louisiana; or to a similarly permitted facility. Hazardous waste will be sent to Omega Waste Management in West Patterson, Louisiana; Lamp Environmental Services in Hammond, Louisiana; or a similarly permitted facility for processing. Universal waste items such as batteries, lamps, glass, and mercury contaminated waste will be sent to Lamp Environmental in Independence, Louisiana. Used oil will be sent to Omega Waste Management in Patterson, Louisiana. Non-hazardous oilfield waste will be transported to Ecoserv in Port Arthur, Texas. Non-hazardous waste will be transported to the Republic/BFI landfill in Sorrento, Louisiana; Lamp Environmental in Hammond, Louisiana; or a similarly permitted facility. Exploration and Production waste such as completion and treatment wastes will be transported to Ecoserv in Port Fourchon, Louisiana; R360 Environmental Solutions in Port Fourchon, Louisiana; FCC Environmental in Port Fourchon, Louisiana; or a similarly permitted facility. Wastes will be recycled or disposed according to applicable regulations at the respective onshore facilities.

A.7 Marine Debris

Trash and debris released into the marine environment can harm marine animals through entanglement and ingestion. Shell will adhere to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex V requirements, USEPA and USCG regulations, and BSEE regulations and NTLs regarding solid wastes. BSEE regulations at 30 CFR 250.300(a) and (b)(6) prohibit operators from deliberately discharging containers and other similar materials (e.g., trash and debris) into the marine environment, and 30 CFR 250.300(c) requires durable identification markings on equipment, tools and containers (especially drums), and other material. USCG and USEPA regulations require operators to become proactive in avoiding accidental loss of solid waste items 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. Shell complies with NTL BSEE-2015-G03, which instructs operators to exercise caution in the handling and disposal of small items and packaging materials, requires the posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly marine trash and debris awareness training and certification process.

A.8 Support Vessel and Helicopter Traffic

Shell will use existing shore-based facilities at Port Fourchon and Boothville, Louisiana, for onshore support for water and air transportation, respectively. No terminal expansion or construction is planned at either location.

The supply base at Port Fourchon is operated by Shell and located on Bayou Lafourche, approximately 3 miles (5 km) from the Gulf of Mexico. There will likely be at least one support vessel in the field at all times during installation activities. Supply vessels will normally move to the project area via the most direct route from the shorebase. Helicopters transporting personnel and small supplies will normally take the most direct route of travel between the helicopter base in Boothville and the lease area when air traffic and weather conditions permit. Helicopters typically maintain a minimum altitude of 700 ft (213 m) while in transit offshore; 1,000 ft (305 m) over unpopulated areas or across coastlines; and 2,000 ft (610 m) over populated areas and sensitive habitats such as wildlife refuges and park properties. Additional guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 300 ft (91 m) of marine mammals (BOEM, 2012b).

Vessel noise is one of the main contributors to overall noise in the sea (National Research Council, 2003b, Jasny et al., 2005) Offshore supply and service vessels associated with the proposed project would contribute to the overall noise environment by transmitting noise through both air and water. 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 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 auxiliary engine noise, flow noise from water dragging along the hull, and bubbles breaking in the vessel's wake while moving through the water (Richardson et al., 1995). Propeller cavitation is usually the dominant underwater noise source. The intensity of noise from service vessels is roughly related to ship size, weight, and speed. Large ships tend to be noisier than small ones, and ships underway with a full load (or towing or pushing a load) produce more noise than unladen vessels. For any given vessel, relative noise tends to increase with increased speed, and propeller cavitation is usually the dominant noise source. Broadband source levels for smaller boats (a category that would include supply and other service vessels) are in the range of 150 to 170 dB re 1 µPa at 1 m (Richardson et al., 1995, Hildebrand, 2009, McKenna et al., 2012).

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

A.9 Accidents

A.9.1 Types of Accidents Evaluated

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

- a small fuel spill (<1,000 barrels [bbl]), which is the most likely type of spill during OCS activities; and
- an oil spill resulting from an uncontrolled blowout. A blowout resulting in a large oil spill (>1,000 bbl) is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures detailed in **DOCD Section 2j**.

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

Recent EISs (BOEM, 2012b, 2013, 2014, 2015, 2016) analyzed five other types of accidents, including loss of well control, pipeline failures, vessel collisions, chemical and drilling fluid spills, and hydrogen sulfide (H_2S) release. These types of accidents are discussed briefly in **Section A.9.4**.

A.9.2 Small Fuel Spill

Spill Size. According to the analysis by BOEM (2012b), the most likely type of small spill as a result of OCS activities is a minor diesel fuel spill. Historically, most diesel spills have been <1 bbl, and this volume is predicted to be the most common in ongoing and future OCS activities in the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012b). The median volume for spills <1 bbl is 0.024 bbl, and the median volume for spills of 1 to 10 bbl is 3 bbl (BOEM, 2012b). For this analysis, a small diesel fuel spill of 3 bbl is assumed. Operational experience suggests that the most likely cause of such a spill would be a hose rupture resulting in the loss of the contents of a fuel transfer hose, which is typically <3 bbl.

Spill Fate. The fate of a small fuel spill in the lease 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 lease area and the short duration of a small spill, it is expected that the opportunity for impacts to occur would be very brief.

The water-soluble fractions of diesel are dominated by two- and three-ringed polycyclic aromatic hydrocarbons (PAHs), which are moderately volatile (National Research Council, 2003a). The constituents of these oils are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. Diesel density is such that it will not sink to the seafloor. Diesel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high-suspended solids loads (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico. Diesel oil is readily and completely degraded by naturally occurring microbes (NOAA, 2006).

The fate of a small diesel fuel spill was estimated using NOAA's Automated Data Inquiry for Oil Spills (ADIOS) 2 model (NOAA, 2016a). This model uses the physical properties of oils in its database to predict the rate of evaporation and dispersion over time, as well as changes in the density, viscosity, and water content of the product spilled. It is estimated that more than 90% of a small diesel spill would evaporate or naturally disperse within 24 hours. 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.

The ADIOS 2 model results, coupled with spill trajectory information discussed in the next section for a large spill, indicate that a small fuel spill would not affect coastal or shoreline resources. The lease area is 56 miles (90 km) from the nearest shoreline (Louisiana). Slicks from 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, 2012b). Because of the distance of these potential spills on the OCS and their lack of persistence, it is unlikely that a small diesel spill would make landfall prior to dissipation (BOEM, 2012b).

Spill Response. In the unlikely event of a fuel spill, response equipment and trained personnel would be available to ensure that spill effects are localized and would result only in short-term, localized environmental consequences. **DOCD Section 9b** provides a detailed discussion of Shell's response to a spill.

A.9.3 Large Oil Spill

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures detailed in **DOCD Section 2j**. Blowouts are rare events and most do not result in oil spills (BOEM, 2012a).

Spill Size. Shell has calculated the WCD for the DOCD using the requirements prescribed by NTL 2015-N01 as 468,000 barrels of oil per day (BOPD) for the initial release and 432,000 BOPD 30-day average. The detailed analysis of this calculation can be found in **DOCD Section 2j**. The WCD scenario for the DOCD has a low probability of being realized. Some of the factors that are likely to reduce rates and volumes, which are not included in the WCD calculation, include, but are not limited to, obstructions or equipment in the wellbore, well bridging, and early intervention such as containment.

Shell has a robust system in place to prevent blowouts. Included in **DOCD Sections 2j** and **9b** is Shell's response to NTL 2015-N01, which includes descriptions of measures to prevent a blowout, reduce the likelihood of a blowout, and conduct effective and early intervention in the event of a blowout. Shell will also comply with NTL 2010-N10 and the Final Drilling Safety Rule, which specify additional safety measures for OCS activities.

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

The results for Launch Area C058 (the launch area which includes the lease area) are presented in **Table 3**. The model predicts less than 0.5% probability of shoreline contact within the first 3 days following a spill. Within 10 days, the model predicts a 1% chance of shoreline contact in Terrebonne Parish, Louisiana, 2% chance of shoreline contact in Lafourche Parish, Louisiana, and 4% chance of shoreline contact in Plaquemines Parish, Louisiana. Within 30 days, shorelines in two Texas counties, eight Louisiana parishes, and one Florida county could be contacted, with probabilities greater than 1%. Plaquemines Parish, Louisiana, is predicted to have an 8% probability of being contacted within 30 days. All other shorelines are predicted to have a 3% or less probability of contact within 30 days.

Table 3. Conditional probabilities of a spill in the lease area contacting shoreline segments based on a 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004). Values are conditional probabilities that a hypothetical spill in the lease area (represented by OSRA Launch Area C058) could contact shoreline segments within 3, 10, or 30 days.

Shoreline Segment	County or Parish, State	Conditional Probability of Contact[1] (%)		
		3 Days	10 Days	30 Days
C10	Galveston, TX	--	--	1
C12	Jefferson, TX	--	--	1
C13	Cameron, LA	--	--	3
C14	Vermilion, LA	--	--	2
C15	Iberia, LA	--	--	1
C17	Terrebonne, LA	--	1	3
C18	Lafourche, LA	--	2	3
C19	Jefferson, LA	--	--	1
C20	Plaquemines, LA	--	4	8
C21	St. Bernard, LA	--	--	1
C28	Okaloosa, FL	--	--	1

[1] Conditional probability refers to the probability of contact within the stated time period, assuming that a spill has occurred. -- indicates less than 0.5% probability of contact.

The OSRA model does not evaluate the fate of a spill over time periods longer than 30 days, nor does it predict the fate of a release that continues over a period of weeks or months. Also as noted in Ji et al. (2004), the OSRA model does not take into account the chemical composition or biological weathering of oil spills, the spreading and splitting of oil spills, or spill response activities. The model does not assume a particular spill size but has generally been used by BOEM to evaluate contact probabilities for spills greater than 1,000 bbl. Thus, OSRA is a preliminary risk assessment model. In the event of an actual oil spill, trajectory modeling would be conducted using the location and estimated amount of spilled oil, as well as current and wind data.

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

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 the slick on the water surface. Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of oil on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics from the oil. Other petroleum components are biodegraded more slowly. Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface.

Spill Response. Shell is a founding member of the Marine Well Containment Company (MWCC) and has access to an integrated subsea well control and containment system that can be rapidly deployed through the MWCC. The MWCC is a non-profit organization that assists with the subsea containment system during a response. The near-term containment response capability will be specifically addressed in Shell's NTL 2010-N10 submission at the time an Application for Permit to Drill is submitted and will include equipment and services available to Shell through MWCC's development of near-term capability and other industry sources. Shell is a member of Clean Caribbean & Americas, Marine Preservation Association (which funds Marine Spill Response Corporation), Clean Gulf Associates, and Oil Spill Response Limited, organizations that are committed to providing the resources necessary to respond to a spill as outlined in Shell's OSRP.

MWCC also 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 (LARS), which enables water sampling and monitoring to water depths of 3,000 m. The two 8 ft × 20 ft containers have been certified for offshore use by Det Norske Veritas (DNV) and the American Bureau of Shipping (ABS). The LARS is a combined winch, A-frame, and 3,000-m long cable customized for instruments in the containers. The containers are designed to enable rapid mobilization of equipment to an incident site. The required equipment includes 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.

Mechanical recovery capabilities are addressed in the OSRP. The mechanical recovery response equipment that could be mobilized to the spill location in normal and adverse weather conditions is included in the Offshore On-Water Recovery Activation List in the OSRP.

Chemical dispersion capabilities are also readily available from resources identified in the OSRP. Available equipment for surface and subsea application of dispersants, response times, and support resources are identified in the OSRP.

Open-water *in situ* burning may also be used as a response strategy, depending on the circumstances of the release. If appropriate conditions exist and approval from the Unified Command is received, one or multiple *in situ* burning task forces could be deployed offshore.

See **DOCD Section 9b** for a detailed description of spill response measures.

A.9.4 Other Accidents Not Analyzed in Detail

The lease sale EISs (BOEM, 2012b, c, 2013, 2014, 2015, 2016) discuss other types of accidents: chemical and drilling fluid spills, pipeline failures, vessel collisions, loss of well control, and H_2S release. Three of these types of accidents considered relevant to the DOCD are briefly discussed in this section. Other than the presence of H_2S, which is addressed below, no other site-specific issues have been identified for the DOCD. The analysis in the lease sale EISs for these topics is incorporated by reference.

Chemical Spill. The following chemicals are likely to be used on the vessels involved in this project: ethylene glycol (used in closed cooling loops for crane and main engines and brake coolers), solvents (used in painting operations), hydraulic fluids (used in cranes and other hydraulic rig equipment), lubricating oil and grease (used in reciprocating and electrical equipment), and sodium hypochlorite (dilute, used as laundry bleach and disinfectant). Supplies are renewed on a regular basis by transfer in containers from supply boats (Boehm et al., 2001).

A study of environmental risks of chemical products used in OCS activities determined that only two chemicals could potentially affect the marine environment in the concentrations typically used: zinc bromide and ammonium chloride (Boehm et al., 2001). The project addressed by the DOCD does not anticipate the use of either zinc bromide or ammonium chloride. Most other chemicals are either nontoxic or used in small quantities (BOEM, 2012b, c, 2013). No significant impacts are expected from chemical spills.

Vessel Collisions. As summarized by BOEM (2012b), vessel collisions occasionally occur during routine operations. Most collision mishaps are the result of service vessels colliding with platforms or vessel collisions with pipeline risers. About 10% of these collisions have caused spills of diesel fuel or chemicals (BOEM, 2012b). Shell will comply with USCG- and BOEM-mandated safety requirements to minimize the potential for vessel collisions.

Loss of Well Control. A loss of well control is the uncontrolled flow of a reservoir fluid that may result in the release of gas, condensate, oil, drilling fluids, sand, or water. Loss of well control is a broad term that includes minor to serious well control incidents, while blowouts, discussed in **Section A.9.3**, are considered to be a more serious subset of loss of well control incidents with greater risk of oil spill or human injury (BOEM, 2012b). Not all loss of well control events result in blowouts (BOEM, 2012b, c, 2013). In addition to the potential release of gas, condensate, oil, sand, or water, the loss of well control can also resuspend and disperse bottom sediments (BOEM, 2012b).

Shell has a robust system in place to prevent loss of well control. Included in the DOCD is Shell's response to NTL BOEM 2015-N01 which includes descriptions of measures to prevent a blowout, reduce the likelihood of a blowout, and conduct effective and early intervention in the event of a blowout. Shell will also comply with NTL 2010-N10, as extended under NTL 2015-N02, and the Final Drilling Safety Rule, which specify additional safety measures for OCS activities. See **DOCD Sections 2j** and **9b** for further information.

H_2S Release. Shell is requesting a classification of H_2S absent for MC 768, 811 and 812. Based on the H_2S absent classification, no further discussion on H_2S impacts is warranted.

B. Affected Environment

The lease area is in the Central Planning Area in the Gulf of Mexico, 56 miles (90 km) from the nearest shoreline, 102 miles (164 km) from the onshore support base at Port Fourchon, Louisiana, and 81 miles (130 km) from the helicopter base at Boothville, Louisiana.

Water depth in the project area is approximately 3,808 to 4,504 ft (1,161 to 1,373 m).

Seafloor faulting was identified approximately 1,690 ft (515 m) west-northwest of the project area. No seafloor anomalies were identified within 2,000 ft (610 m) of the proposed subsea installation and 250 ft (76 m) of the umbilical and flowline route area that could indicate potential for chemosynthetic or high-density deepwater benthic communities (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).

A detailed description of the regional affected environment is provided by BOEM (2012b, 2013, 2014, 2015, 2016), including meteorology, oceanography, geology, air and water quality, benthic communities, threatened and endangered species, biologically sensitive resources, archaeological resources, socioeconomic conditions, and other marine uses. These regional descriptions are based on extensive literature reviews and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource are presented in **Section C**, including site-specific or new information if available.

The local environment in the lease area is not known to be unique with respect to physical/chemical, biological, or socioeconomic conditions found in this region of the Gulf of Mexico. The baseline environmental conditions in the lease area are expected to be consistent with the regional description of the locations evaluated by BOEM (2012b, 2013, 2014, 2015, 2016).

C. Impact Analysis

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

Impacts have been analyzed extensively in lease sale EISs for the Central and Western Gulf of Mexico Planning Areas (BOEM, 2012b, 2013, 2014, 2015, 2016). Site-specific issues are addressed in this section as appropriate.

C.1 Physical/Chemical Environment

C.1.1 Air Quality

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

In general, ambient air quality on coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012b). As of February 13, 2017, Mississippi and Alabama coastal counties are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2017). 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. One coastal metropolitan area in Florida (Tampa area) is a nonattainment area for lead, based on the 2008 Standard, and for sulfur dioxide, based on the 2010 standard (USEPA, 2017).

Winds in the region are driven by the clockwise circulation around the Bermuda High (BOEM, 2012b). The Gulf of Mexico is located to the southwest of this center of circulation, resulting in a prevailing southeasterly to southerly flow, which is conducive to transporting emissions toward shore. However, circulation is also affected by tropical cyclones (hurricanes) during summer and fall and by extratropical cyclones (cold fronts) during winter.

BOEM (2016) has reexamined its previous analysis for air quality (BOEM, 2012b) based on additional information and in consideration of the Macondo oil spill event. BOEM (2014) reported that it is not likely that air quality continues to be affected by the spill within the Central Planning Area, where the event occurred. BOEM (2016) determined that no substantial new information was found that would alter the potential impacts on air quality previously presented by BOEM (2012b).

IPFs that could potentially affect air quality are air pollutant emissions associated with both types of accidents—a small fuel spill (<1,000 bbl) and a large oil spill (≥1,000 bbl).

Impacts of Air Pollutant Emissions

Air pollutant emissions are the only routine IPF anticipated to affect air quality. Offshore air pollutant emissions will result from the operation of the MODU, installation and service vessels, and helicopters, as described in **Section A.3**. These emissions occur mainly from combustion or burning of diesel and Jet-A aircraft fuel. Additionally, exhaust emissions from tanker and barge loadings and transfers would be anticipated, though these would be relatively small (BOEM, 2012b). Primary air pollutants typically associated with OCS activities are suspended PM, SO_x, NO_x, VOCs, and CO.

Due to the distance from shore, routine operations in the project area are not expected to impact air quality along the coast. As noted in the lease sale EISs (BOEM, 2012b, 2013, 2014, 2015, 2016), emissions of air pollutants from routine activities in the project area are projected to have minimal impacts on onshore air quality because of the prevailing atmospheric conditions, emission heights, emission rates, and the distance of these emissions from the coastline.

MC 768, 811, and 812 are located west of 87.5° W longitude; thus, air quality is under BOEM jurisdiction as explained in NTL 2009-N11. The BOEM implementing regulations are provided in 30 CFR 550 Subpart C. The Air Quality Emissions Report (see **DOCD Section 8**) prepared in accordance with BOEM requirements shows that the projected emissions from emission sources associated with the proposed activities meet the BOEM exemption criteria. Therefore, the DOCD is exempt from further air quality review pursuant to 30 CFR 550.303(d).

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. The BOEM coordinates with the USFWS if emissions from proposed projects may affect the Breton Class I area. The lease area is approximately 89 miles (143 km) from the Breton Wilderness Area. Shell will comply with emissions requirements as directed by the BOEM.

Greenhouse gas emissions contribute to climate change, with impacts on temperature, rainfall, frequency of severe weather, ocean acidification, and sea level rise (Intergovernmental Panel on Climate Change, 2014). Carbon dioxide (CO_2) and methane (CH_4) emissions from the project would constitute a very small incremental contribution to greenhouse gas emissions from all OCS activities. According to Programmatic and OCS lease sale EISs (BOEM, 2012a, b), estimated CO_2 emissions from OCS oil and gas sources are 0.4% of the U.S. total. OCS activities in the Central Planning Area contribute approximately 0.005% to total global CO_2 emissions (BOEM, 2012b). Greenhouse gas emissions from the proposed project represent a negligible contribution to the total greenhouse gas emissions from reasonably foreseeable activities in the Gulf of Mexico area and would not significantly alter any of the climate change impacts evaluated in the Programmatic EIS (BOEM, 2012a).

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 (2012b, 2013, 2014, 2015, 2016). The probability of a small spill would be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures.

A small fuel spill would likely affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The ADIOS 2 model (see **Section A.9.2**) indicates that more than 90% of a small diesel spill would evaporate or disperse within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions. Given the open ocean location of the lease area, the extent and duration of air quality impacts from a small spill would not be significant.

A small fuel spill would not affect coastal air quality because the spill would not be expected to make landfall or reach coastal waters prior to breaking up (see **Section A.9.2**).

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 (2012b, 2013, 2014, 2015, 2016).

A large oil spill would likely affect air quality by introducing VOCs into the atmosphere through evaporation from the slick. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. Additional air quality impacts could occur if response measures approved by the Unified Command included *in situ* burning of the floating oil. *In situ* burning would generate a plume of black smoke offshore and result in emissions of NO_x, SO_x, CO, and PM, as well as greenhouse gases.

Due to the lease area location, most air quality impacts would occur in offshore waters. Depending on the spill trajectory and the effectiveness of spill response measures, coastal air quality could also be affected. Based on the OSRA modeling predictions (**Table 3**), Plaquemines Parish in Louisiana is the coastal area most likely to be affected (4% probability within 10 days and 8% probability within 30 days). Two Texas counties, eight Louisiana parishes, and one Florida county have a 15% to 3% probability of shoreline contact within 30 days of a spill. A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on air quality are expected.

C.1.2 Water Quality

There are no site-specific baseline water quality data for the lease area. Due to the lease location in deep, offshore waters, water quality is expected to be good, with low levels of contaminants. As noted by BOEM (2012b), deepwater areas in the northern Gulf of Mexico are relatively homogeneous with respect to temperature, salinity, and oxygen. Kennicutt (2000) noted that the deepwater region has little evidence of contaminants in the dissolved or particulate phases of the water column. IPFs that could potentially affect water quality are effluent discharges and two types of accidents – a small fuel spill and a large oil spill.

Impacts of Effluent Discharges

As described in **Section A.4**, NPDES General Permit GMG290103 establishes permit limits and monitoring requirements for effluent discharges from the DP installation vessel or the MODU. NPDES permit limits and requirements will be met, and little or no impact on water quality is anticipated.

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

Deck drainage includes 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 DP installation vessel or MODU will flow overboard without treatment. However, rainwater that falls on the DP installation vessel or MODU deck and other areas such as chemical storage areas and places where equipment is exposed will be collected and oil and water separated to meet NPDES permit requirements. Negligible impact on water quality is anticipated.

Other discharges from the DP installation vessel or MODU will be in accordance with the NPDES permit. Discharges include desalination unit brine and non-contact cooling water, fire water, bilge water, and ballast water and are expected to dilute rapidly and have little or no impact on water quality. The DP installation vessel or MODU, and support vessel discharges are expected to be in compliance with NPDES permit and USCG regulations, as applicable, and therefore are not expected to cause significant impacts on water quality (BOEM, 2012b).

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 (2012b, 2012c, 2013, 2014, 2015, 2016). The probability of a small spill would be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area, the extent and duration of water quality impacts from a small spill would not be significant.

The water-soluble fractions of diesel are dominated by two- and three-ringed PAHs, which are moderately volatile (National Research Council, 2003a). The constituents of these oils are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. Diesel oil is much lighter than water (specific gravity is between 0.83 and 0.88, compared to 1.03 for seawater). When spilled on water, diesel oil spreads very quickly to a thin film of rainbow and silver sheens, except for marine diesel, which may form a thicker film of dull or dark colors. However, because diesel oil has a very low viscosity, it is readily dispersed into the water column when winds reach 5 to 7 knots or with breaking waves (NOAA, 2017a). It is possible for the diesel oil that is dispersed by wave action to form droplets that are small enough be kept in suspension and moved by the currents. Diesel fuel density is such that it will not sink and pool on the seafloor. Diesel fuel dispersed in the water column can adhere to suspended sediments, but this generally occurs only in coastal areas with high suspended solids loads (National Research Council, 2003a) and would not be expected to occur to any appreciable degree in offshore waters of the Gulf of Mexico.

The extent and persistence of water quality impacts from a small diesel fuel spill would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. It is estimated that more than 90% of a small diesel spill would evaporate or disperse within 24 hours (see **Section A.9.2**). The sea surface area covered with a very thin layer of diesel fuel would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel oil are readily and completely degraded by naturally occurring microbes (NOAA, 2006). Given the open ocean location of the lease area, the extent and duration of water quality impacts from a small spill would not be significant.

A small fuel spill would not affect coastal water quality because the spill would not be expected to make landfall or reach coastal waters due to response efforts that would be undertaken as well as natural degradation and dilution (see **Section A.9.2**).

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 (2012b, 2012c, 2013, 2014, 2015, 2016). A large spill would likely affect water quality by producing a slick on the water surface and increasing the concentrations of petroleum hydrocarbons and their degradation products. 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. Most of the spilled oil would be expected to form a slick at the surface, although observations following the Macondo spill indicate that plumes of 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). Recent analyses of the full set of samples associated with the Macondo spill have confirmed that the application of subsurface dispersants resulted in subsurface hydrocarbon plumes (Spier et al., 2013). A report by Kujawinski et al. (2011) indicates that chemical components of subsea dispersants used during the Macondo spill persisted for up to 2 months and were detectable up to 186 miles (300 km) from the wellsite at water depths of 3,280 to 3,937 ft (1,000 to 1,200 m). While dispersants were detectable in <9% of the samples (i.e., 353 of the 4,114 total water samples), concentrations in the samples were significantly below the chronic screening level for dispersants (BOEM, 2012c).

Once oil enters the ocean, a variety of physical, chemical, and biological processes act to disperse the oil slick. These processes include spreading, evaporation of the more volatile constituents, dissolution into the water column, emulsification of small droplets, agglomeration sinking, microbial modification, photochemical modification, and biological ingestion and excretion (National Research Council, 2003a). Marine water quality would be temporarily affected by the dissolved components and small oil droplets that do not rise to the surface or are mixed down by surface turbulence. A combination of dispersion by currents that dilute the constituents and microbial degradation that removes the oil from the water column reduces concentrations to background levels. Most crude oil blends will emulsify quickly when spilled, creating a stable mousse that presents a more persistent cleanup and removal challenge (NOAA, 2017b).

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

Due to the lease area location, most water quality impacts would occur in offshore waters. Depending on the spill trajectory and the effectiveness of spill response measures, coastal water quality could be affected. Based on the OSRA modeling predictions (**Table 3**), nearshore waters and embayments of Plaquemines Parish in Louisiana is the coastal area most likely to be affected, with a 4% probability of shoreline contact within 10 days and an 8% probability of shoreline contact within 30 days.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on water quality are expected.

C.2 Seafloor Habitats and Biota

Water depth at the project area is approximately 3,808 to 4,504 ft (1,161 to 1,373 m). See **DOCD Section 6a** for further information.

According to BOEM (2012b, 2013, 2014, 2015, 2016), existing information for the deepwater Gulf of Mexico indicates that the seafloor is composed primarily of soft sediments; hard bottom communities are rare. Geoscience Earth and Marine Services, Inc. (2013) and Fugro Geoservices, Inc. (2016) conducted shallow hazard assessment surveys of MC 768, 811, and 812. No features or areas that could support significant, high-density benthic communities were found within 2,000 ft (610 m) of the subsea installation and within 250 ft (76 m) of the umbilical and flowline route.

C.2.1 Soft Bottom Benthic Communities

There are no site-specific benthic community data from the lease area. However, data from various gulf-wide studies have been conducted to regionally characterize the continental slope habitats and benthic ecology (Wei, 2006, Rowe and Kennicutt, 2009, Wei et al., 2010, Carvalho et al., 2013) , which can be used to describe typical baseline benthic communities that occur at similar water depths elsewhere in the region.. **Table 4** summarizes data from two nearby stations within the same faunal zone as the lease area. Station MT3 was predominantly clay (53%) and silt (42%). Sediments at Station MT4 had even proportions of clay (46%) and silt (46%) (Rowe and Kennicutt, 2009).

Table 4. Baseline benthic community data from stations nearest to the lease area in similar water depths sampled during the Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study (From: Wei, 2006, Rowe and Kennicutt, 2009).

Station	Location Relative to Lease Area	Water Depth (m)	Abundance		
			Meiofauna (individuals m^{-2})	Macroinfauna (individuals m^{-2})	Megafauna (individuals ha^{-1})
MT3	33 mi (53 km) NNW	987	885,995	4,924	1,034
MT4	21 mi (33 km) SSW	1,401	246,058	3,262	1,548

Meiofaunal and megafaunal abundance from Rowe and Kennicutt (2009); macroinfaunal abundance from Wei (2006).

Densities of meiofauna (animals that pass through a 0.5-mm sieve but are retained on a 0.062-mm sieve) in sediments collected at water depths representative of the lease area typically range from about 246,000 to 886,000 individuals m^{-2} (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant groups in the meiofauna, accounting for about 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the intrinsically low primary production in surface waters of the Gulf of Mexico surface waters (Wei, 2006). Densities decrease exponentially with water depth (Carvalho et al., 2013). Based on an equation presented by Wei (2006), macroinfaunal densities in the water depth of the project area are expected to range from approximately 2,457 to 2,875 individuals m^{-2}; however, actual densities are unknown and often highly variable.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods. Carvalho et al. (2013) found polychaete abundance to be higher in the central region of the northern Gulf of Mexico when compared to the eastern and western regions. Wei (2006) recognized four depth-dependent faunal zones (1 through 4), two of which (Zones 2 and 3) are divided horizontally. The project area is in Zone 2E, which consists of stations ranging in depth from 625 to 1,828 m (2,050 to 5,998 ft) and extends from the Texas-Louisiana slope to the west Florida Terrace. The most abundant species in this zone were the polychaetes *Aricidea suecica*, *Litocorsa antennata*, *Paralacydonia paradoxa*, and *Tharyx marioni* and the bivalve *Heterodonta* sp. D. (Wei, 2006, Wei et al., 2010).

Megafaunal density from nearby stations ranged from 1,034 to 1,548 individuals ha^{-1} (**Table 4**). Common megafauna included motile groups such as decapods, ophiuroids, holothurians, and demersal fishes, as well as sessile groups such as sponges and anemones (Rowe and Kennicutt, 2009).

Bacteria are the foundation of deep-sea chemosynthetic communities (Ross et al., 2012) and are an important component in terms of biomass and cycling of organic carbon (Cruz-Kaegi, 1998). 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 lease area typically is about 1 to 2 grams of carbon per square meter ($g\ C\ m^{-2}$) in the top 6 in. (15 cm) of sediments (Rowe and Kennicutt, 2009).

IPFs that could potentially affect benthic communities are physical disturbance and a large oil spill resulting 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.

Impacts of Physical Disturbance to the Seafloor

The subsea installation of flying leads and jumpers is anticipated to disturb approximately 3.4 ac (1.4 ha) and by the umbilical and flowline approximately 39 ac (16 ha) as described in **Section A.2**. The areal extent of these impacts is relatively small compared to the lease block areas itself. Soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway et al., 2003, Rowe and Kennicutt, 2009). Physical disturbance to the seafloor during this project will be localized and are likely to have no significant impact on soft bottom benthic communities on a regional basis.

Impacts of a Large Oil Spill

Potential impacts of a large oil spill on the benthic community are expected to be consistent with those analyzed and discussed by BOEM (2012b, 2013, 2014, 2015, 2016). Likely impacts from a subsea blowout include smothering and exposure to toxic hydrocarbons from oiled sediment settling to the seafloor. The most likely effects of a subsea blowout on benthic communities would be within a few hundred meters of the wellsites. BOEM (2012b) estimates 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 much wider area. A previous study characterized surface sediments at the sampling station nearest to the subsea installation (Station MT4), were equal parts clay and silt (46%) (Rowe and Kennicutt, 2009). At another station slightly farther from the project area (Station MT3), sediments were predominantly clay (53%) and silt (42%).

Previous analyses by BOEM (2012b, 2013, 2014, 2015, 2016) concluded that oil spills would be unlikely to affect benthic communities beyond the immediate vicinity of the wellhead (i.e., due to physical impacts of a blowout) because the oil would rise quickly to the sea surface directly over the spill location. During the Macondo spill, the use of subsea dispersants at the wellhead caused the formation of subsurface plumes (NOAA, 2011b). While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could contact the seafloor and affect benthic communities beyond the 984 ft (300 m) radius (BOEM, 2012b), depending on its extent, trajectory, and persistence (Spier et al., 2013). This contact could result in smothering and/or toxicity to benthic organisms. The subsurface plumes observed following the Macondo spill were reported in water depths of approximately 3,600 ft (1,100 m), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). The subsurface plumes apparently resulted from the use of subsea dispersants at the wellhead (NOAA, 2011b, Spier et al., 2013). Montagna et al. (2013) estimated that the most severe impacts to soft bottom benthic communities (e.g., reduction of faunal abundance and diversity) from the Macondo spill extended 2 miles (3 km) from the wellhead in all directions, covering an area of approximately 9 mi^2 (24 km^2). Moderate impacts were observed up to 11 miles (17 km) to the southwest and 5 miles (8.5 km) to the northeast of the wellhead, covering an area of 57 mi^2 (148 km^2). NOAA (2016b) documented a footprint of over 772 mi^2 (2,000 km^2) of impacts to benthic habitats surrounding the Macondo spill site. The analysis also identified a larger area of approximately 3,552 mi^2 (9,200 km^2) of potential exposure and uncertain impacts to benthic communities (NOAA, 2016b).

Baguley et al. (2015) noted that nematode abundance increased significantly with proximity to the Macondo wellhead, and copepod abundance, relative species abundance, and diversity decreased. The increase in nematode abundance with the proximity to the spill location could potentially represent a balance between organic enrichment and toxicity. The affected area would be recolonized by benthic organisms over a period of months to years (National Research Council, 2003a).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on soft bottom communities are expected.

C.2.2 High-Density Deepwater Benthic Communities

As defined in NTL 2009-G40, high-density deepwater benthic communities are features or areas that could support high-density chemosynthetic communities, high-density deepwater corals, or other associated high-density hard bottom communities. Chemosynthetic communities were discovered in the central Gulf of Mexico in 1984 and have been studied extensively (MacDonald, 2002). Deepwater coral communities are also known from numerous locations in the Gulf of Mexico (Brooke and Schroeder, 2007, CSA International, 2007, Brooks et al., 2012). These communities occur almost exclusively on exposed authigenic carbonate rock created by a biogeochemical (microbial) process, and on shipwrecks.

Monitoring programs on the Gulf of Mexico continental slope have shown that benthic impacts from drilling discharges typically are concentrated within approximately 1,640 ft (500 m) of the wellsite, although detectable deposits may extend beyond this distance (Continental Shelf Associates, 2004, Neff et al., 2005, Continental Shelf Associates, 2006). The nearest known high-density deepwater benthic communities include those in MC 969. The community in MC 969, located approximately 57 miles (92 km) west-southwest from the project area, includes vesicomyid or lucinid clams (BOEM, nd).

High-resolution geophysical surveys, including autonomous underwater vehicle (AUV) multibeam echo sounder, re-processed three-dimensional seismic, enhanced surface renderings, enhanced surface renderings with amplitudes applied, sub-bottom profiler, and side-scan sonar data, have been conducted in the project area as part of the assessment of archaeological resources and shallow hazards (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016). Based on these surveys, features or areas that could support high-density chemosynthetic or other benthic communities are not anticipated in the project area.

The only IPF identified for this project that could potentially affect high-density deepwater benthic communities is a large oil spill from a well blowout at the seafloor. Physical disturbance and effluent discharge are not likely to affect high-density deepwater benthic communities since these are generally limited to localized impacts. A small fuel spill would not affect benthic communities because the diesel fuel would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

The geohazards assessment did not identify high-density deepwater benthic communities within 2,000 ft (610 m) of the proposed flying leads and jumpers and within 250 ft (76 m) of the proposed umbilical and flowline route (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).

BOEM (2012b, 2013, 2014, 2015, 2016) concluded that oil spills would be unlikely to affect benthic communities beyond the immediate vicinity of the wellhead (i.e., due to physical impacts of a blowout) because the oil would rise quickly to the sea surface directly over the spill location. However, subsea oil plumes resulting from a seafloor blowout could affect sensitive deepwater communities (BOEM, 2016). During the Macondo spill, subsurface plumes were reported at a water depth of approximately 3,600 ft (1,100 m), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). The subsurface plumes apparently resulted from the use of subsea dispersants at the wellhead (NOAA, 2011c). Chemical components of subsea dispersants used during the Macondo spill persisted for up to 2 months and were detectable up to 186 miles (300 km) from the wellsite at a water depths of 3,280 to 3,937 ft (1,000 to 1,200 m) (Kujawinski et al., 2011). However, estimated dispersant concentrations in the subsea plume were below levels known to be toxic to marine life. While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could have the potential to contact high-density deepwater benthic communities beyond the 984 ft (300 m) radius estimated by BOEM (2012a), depending on its extent, trajectory, and persistence (Spier et al., 2013). Potential impacts on sensitive resources would be an integral part of the decision and approval process for the use of dispersants.

Potential impacts of oil on high-density deepwater benthic communities are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). Oil plumes that directly contact localized patches of sensitive benthic communities before degrading could potentially impact the resource. However, the potential impacts would be localized due to the directional movement of oil plumes by the water currents and because the sensitive habitats have a scattered, patchy distribution. The more likely result would be exposure to widely dispersed, biodegraded particles that “rain” down from a passing oil plume. While patches of habitat may be affected, the Gulf-wide ecosystem of live bottom communities would be expected to suffer no significant effects (BOEM, 2016).

Although chemosynthetic communities live among hydrocarbon seeps, natural seepage occurs at a relatively constant low rate compared with the potential rates of oil release from a blowout. In addition, seep organisms require unrestricted access to oxygenated water at the same time as exposure to hydrocarbon energy sources (MacDonald, 2002). Oil droplets or oiled sediment particles could come into contact with chemosynthetic organisms. As discussed by BOEM (2012b), impacts could include loss of habitat and biodiversity; destruction of hard substrate; change in sediment characteristics; and reduction or loss of one or more commercial and recreational fishery habitats.

Sublethal effects are possible for deepwater coral communities that receive a lower level of interaction with oil. Effects to deepwater coral communities could be temporary (e.g., lack of feeding and loss of tissue mass) or long lasting and affect the resilience of coral colonies to natural disturbances (e.g., elevated water temperature and diseases) (BOEM, 2012b, c, 2013, 2014, 2015, 2016). The potential for a spill to affect deepwater corals was observed during an October 2010 survey of deepwater coral habitats in water depths of 4,600 ft (1,400 m) approximately 7 miles (11 km) southwest of the Macondo wellhead. Much of the soft coral observed in a location measuring approximately 50 by 130 ft (15 by 40 m) was covered by a brown flocculent material (Bureau of Ocean Energy Management, Regulation, and Enforcement [BOEMRE], 2010) with signs of stress, including varying degrees of tissue loss and excess mucous production (White et al., 2012a, White et al., 2012b). Hopanoid petroleum biomarker analysis of the flocculent material indicated that it contained oil from the Macondo spill. The injured and dead corals were in an area in which a subsea plume of oil had been documented during the spill in June 2010. The deepwater coral at this location showed signs of tissue damage that was not observed elsewhere during these surveys or in previous deepwater coral studies in the Gulf of Mexico. The team of researchers concluded that the observed coral injuries likely resulted from exposure to the subsurface oil plume (White et al., 2012a, White et al., 2012b).

Fisher et al. (2014) studied five previously unknown deepwater coral communities in the vicinity of the Macondo spill from 2010 to 2011. Two of the communities demonstrated impacts similar to the observations by White et al. (2012a), White et al. (2012b), with one community in a water depth from 6,070 to 6,398 ft (1,850 to 1,950 m). This community extends the depth range of significant impact to coral communities and distance from the Macondo spill (14 miles [22 km] away) (Fisher et al., 2014). However, Fisher et al. (2014) stated no acute impacts were observed more than 19 miles (30 km) from the spill, based on other observations from different coral communities in the Northern Gulf of Mexico.

Although no known deepwater coral communities are likely to be impacted by a subsurface plume, previously unidentified communities may be encountered if a large subsurface oil spill occurs. However, because of the scarcity of deepwater hard bottoms communities, their comparatively low surface area, and the distancing requirements set by BOEM in NTL 2009-G40, it is unlikely that a sensitive habitat would be located adjacent to a seafloor blowout or that concentrated oil would contact the site (BOEM, 2012b).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Potential impacts on sensitive resources would be an integral part of the decision and approval process for the use of dispersants. Therefore, no significant spill impacts on deepwater benthic communities are expected.

C.2.3 Designated Topographic Features

The blocks are 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 West Delta Block 147, located 43 miles (69 km) northwest of the lease area. There are no IPFs associated with either routine operations or accidents that could cause impacts to designated topographic features due to the distance from the lease area.

C.2.4 Pinnacle Trend Area Live Bottoms

The lease area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined in NTL 2009-G39, the nearest pinnacle trend blocks are located about 77 miles (1240 km) north-northeast of the lease area in Main Pass Block 290.

There are no IPFs associated with either routine operations or accidents that could cause impacts to pinnacle trend area live bottoms due to the distance from the lease area.

C.2.5 Eastern Gulf Live Bottoms

The lease area is not covered by the Live Bottom (Low-Relief) Stipulation, which pertains to seagrass communities and low-relief hard-bottom reef within the Gulf of Mexico Eastern Planning Area blocks in water depths of 328 ft (100 m) or less and portions of Pensacola and Destin Dome Area Blocks in the Central Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined in NTL 2009-G39, is Destin Dome Block 573, located approximately 109 miles (175 km) northeast of the lease area.

There are no IPFs associated with either routine operations or accidents that could cause impacts to eastern Gulf of Mexico live bottom areas due to the distance from the lease area.

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

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

Endangered, threatened, or species of concern that may occur in the project area or along the northern and eastern Gulf Coast are listed in **Table 5**. The table also indicates the location of designated critical habitat in the Gulf of Mexico. Critical habitat is defined as (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. The NMFS has jurisdiction over ESA-listed marine mammals (cetaceans) and fishes in the Gulf of Mexico. The USFWS has jurisdiction over ESA-listed birds and the West Indian manatee. These two agencies share federal jurisdiction over sea turtles, with NMFS having lead responsibility at sea and USFWS on nesting beaches.

Table 5. Listed endangered, threatened, and candidate species in the lease area and along the U.S. Gulf Coast. dash (--) = not found in the area.

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in Gulf of Mexico
			Lease Area	Coastal	
Marine Mammals					
Sperm whale	*Physeter macrocephalus*	E	X	--	None
Bryde's whale	*Balaenoptera edeni*[a]	C	X	--	
West Indian manatee	*Trichechus manatus latirostris*	E[b]	--	X	Florida (Peninsular)
Sea Turtles					
Loggerhead turtle	*Caretta caretta*	T, E[c]	X	X	Nesting beaches and nearshore reproductive habitat in Mississippi, Alabama, and Florida (Panhandle); Sargassum habitat including most of the central and western Gulf of Mexico
Green turtle	*Chelonia mydas*	T[d]	X	X	None
Leatherback turtle	*Dermochelys coriacea*	E	X	X	None
Hawksbill turtle	*Eretmochelys imbricata*	E	X	X	None
Kemp's ridley turtle	*Lepidochelys kempii*	E	X	X	None
Birds					
Piping Plover	*Charadrius melodus*	T	--	X	Coastal Texas, Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Whooping Crane	*Grus americana*	E	--	X	Coastal Texas (Aransas National Wildlife Refuge)
Fishes					
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	--	X	Coastal Louisiana, Mississippi, Alabama, and Florida (Panhandle)
Invertebrates					
Elkhorn coral	*Acropora palmata*	T	--	X	Florida Keys and the Dry Tortugas
Lobed star coral	*Orbicella annularis*	T	--	X	None
Mountainous star coral	*Orbicella faveolata*	T	--	X	None
Boulder star coral	*Orbicella franksi*	T	--	X	None
Terrestrial Mammals					
Beach mice (subspecies: Alabama, Choctawhatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	--	X	Alabama and Florida (Panhandle) beaches

E = endangered; T = threatened.

a Gulf of Mexico Bryde's whales are protected by the Marine Mammal Protection Act (MMPA). There is currently a proposed rule to list this stock as 'endangered' under the Endangered Species Act (ESA).

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

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

d Effective May 6, 2016, the entire North Atlantic DPS of green sea turtle is listed as threatened, including the Florida breeding population that was previously listed as endangered (81 FR 20057).

Coastal endangered or threatened species that may occur along the U.S. Gulf Coast include the West Indian manatee, Piping Plover, Whooping Crane, Gulf sturgeon, and four subspecies of beach mouse. Critical habitat has been designated for all of these species as indicated in **Table 5** and discussed in individual sections.

In 2007, NMFS and the USFWS issued a Biological Opinion in response to ESA consultations with MMS for previous EISs (NMFS, 2007). Following the Macondo spill on July 30, 2010, BOEM reinitiated ESA consultation with NMFS and the USFWS. BOEM, NMFS, and USFWS are currently in the process of collecting and awaiting additional information, which is being gathered as part of the Natural Resource Damage Assessment process, in order to update the environmental baseline information as needed for the reinitiated Section 7 consultation. Consultation is ongoing, and BOEM is acting as lead agency in the reinitiated consultation, with BSEE's involvement (BOEM, 2015, 2016). BOEM and BSEE have developed an interim coordination and review process with NMFS and the USFWS for specific activities leading up to or resulting from upcoming lease sales. The purpose of this coordination is to ensure that NMFS and the USFWS have the opportunity to review post-lease exploration, development, and production activities prior to BOEM's approval to ensure that all approved plans and permits contain any necessary measures to avoid jeopardizing the existence of ESA-listed species or precluding the implementation of any reasonable and prudent alternative measures. This interim coordination program remains in place while formal consultation and the development of a Biological Opinion are ongoing (BOEM, 2015, 2016).

Two other coastal species (Bald Eagle and Brown Pelican) are no longer federally listed as endangered or threatened; these are discussed in **Section C.4.2**.

Five sea turtle species and one marine mammal species known to occur within OCS and slope waters of the Gulf of Mexico are currently listed as endangered or threatened by the ESA. The listed sea turtles include the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, loggerhead turtle, and green turtle (Pritchard, 1997). Effective August 11, 2014, NMFS has designated certain marine areas as critical habitat for the northwest Atlantic distinct population segment (DPS) of the loggerhead sea turtle (see **Section C.3.4**). No critical habitat has been designated in the Gulf of Mexico for the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, or the green turtle. Listed marine mammal species include one odontocete (sperm whale) which is known to occur in the Gulf of Mexico (Würsig et al., 2000); no critical habitat has been designated for the sperm whale. The Bryde's whale exists in the Gulf of Mexico as a small, resident population. It is the only baleen whale known to be resident to the Gulf. The genetically distinct Northern Gulf of Mexico stock is severely restricted in range, being found only in the northeastern Gulf, more specifically in the waters of the DeSoto Canyon and therefore not likely to occur within the lease area (Waring et al., 2016)

Five endangered mysticete whales (blue whale, fin whale, humpback whale, North Atlantic right whale, and sei whale) have been reported from the Gulf of Mexico but are considered rare or extralimital and, therefore, are not considered further in this EIA (Würsig et al., 2000, BOEM, 2012b).

There are no other endangered animals or plants in the Gulf of Mexico that are reasonably likely to be affected by either routine or accidental events. Other species occurring at certain locations in the Gulf of Mexico, such as the smalltooth sawfish (*Pristis pectinata*) and Florida salt marsh vole (*Microtus pennsylvanicus dukecampbelli*), are remote from the lease area and highly unlikely to be affected. Four threatened coral species are known from the northern Gulf of Mexico: elkhorn coral (*Acropora palmata*), lobed star coral (*Orbicella annularis),* mountainous star coral (*Orbicella faveolata*), and boulder star coral (*Orbicella franksi*). None of these species are expected to be present in the lease area (see **Section C.3.9**).

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 (*Physeter macrocephalus*). Resident populations of sperm whales occur within the Gulf of Mexico. A species description is presented by BOEM (2012b). Gulf of Mexico sperm whales are classified as an endangered species and a "strategic stock" 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 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.

According to the recovery plan, the main threats to sperm whale populations include collisions with vessels, direct harvest, loss of prey base because of climate change, disturbance from anthropogenic noise, and possibly competition for resources (NMFS, 2010). No critical habitat for the sperm whale has been designated in the Gulf of Mexico.

The distribution of sperm whales in the Gulf of Mexico is correlated with mesoscale physical features such as eddies associated with the Loop Current (Jochens et al., 2008). Sperm whale populations in the north-central Gulf of Mexico are present there throughout the year (Davis et al., 2000a). Results of a multi-year tracking study show female sperm whales 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 consisted of mixed-sex groups comprising adult females and immatures, 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 cetacean encountered. Results of the Sperm Whale Seismic Study showed that sperm whales transit through the vicinity of the lease area. Movements of satellite-tracked individuals suggest that this area of the Gulf continental slope is within the home range of the Gulf of Mexico population (within the 95% utilization distribution) (Jochens et al., 2008).

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

IPFs that could potentially affect sperm whales include DP installation vessel or MODU presence, noise, and lights; support vessel and helicopter traffic noise; support vessel strikes; and both types of spill accidents – a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on sperm whales due to rapid dispersion, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these marine mammals. Compliance with NTL BSEE 2015-G013 and NTL 2012-JOINT-G01 will minimize the potential for marine debris-related impacts and vessel strikes on sperm whales, respectively.

Impacts of Vessel Presence, Noise, and Lights

Some sounds produced by the DP installation vessel or MODU 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 rig operations is relatively weak in intensity, and an individual animal's noise exposure would be transient. As discussed in **Section A.1**, sounds generated by an actively drilling MODU are maximum broadband (10 Hz to 10 kHz) energy of about 190 dB re 1 μPa at 1 m (Hildebrand, 2005).

NMFS (2016a) lists sperm whales in the same functional hearing group (i.e., mid-frequency cetaceans) as most dolphins and other toothed whales, with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, vessel-related noise is likely to be heard by sperm whales. Generally, most of the acoustic energy produced by sperm whales is present at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with source levels up to 236 dB re 1 μPa at 1 m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the MODU operations, sperm whales would move away from the proposed operations area, and noise levels that could cause auditory injury would be avoided. Noise associated with proposed vessel operations may cause behavioral (disturbance) effects to sperm whales. Observations of sperm whales near offshore oil and gas operations suggest an inconsistent response to anthropogenic marine sound (Jochens et al., 2008). Most observations of behavioral responses of marine mammals to anthropogenic sounds, in general, have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions (NMFS, 2009a). 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 most recent acoustic criteria (NMFS, 2016b) are based on received sound level accumulations that equate to the onset of marine mammal auditory threshold shifts. For mid frequency cetaceans exposed to a non-impulsive source (such as DP installation vessel operations), permanent threshold shifts are estimated to occur when the mammal has received a cumulative exposure level of 198 dB re 1 $\mu Pa^2 \cdot s$ over a 24 hour period. Similarly, temporary threshold shifts are estimated to occur when the mammal has received a cummulative noise exposure level of 178 dB re 1 $\mu Pa^2 \cdot s$ over a 24 hour period. Based on transmission loss calculations, open water propagation of noise produced by typical sources with DP thrusters are not expected to produce received levels greater than 160dB re 1 µPa beyond 25m from the source. Due to the short propagation distance of high sound pressure levels, the transient nature of sperm whales, and the stationary nature of the proposed activites, it is not expected that any sperm whales will receive exposure levels necessary for the onset of auditory threshold shifts.

The DP installation vessel or MODU will be located within a deepwater, open ocean environment. Noise produced during installation of subsea equipment will not be as continuous, or produced for as long a duration, as sound produced by drilling operations, therefore the impact of sounds produced during the implementation of this project are also expected to be insignificant. This analysis assumes that the continuous nature of sounds produced during equipment installation will provide individual whales with cues relative to the direction and relative distance (sound intensity) of the sound source, and the fixed position of the DP installation vessel or MODU and slow movement of the DP installation vessel will provide multiple options for active avoidance of potential physical impacts. Subsea installation-related noise associated with this project will contribute to increases in the ambient noise environment of the Gulf of Mexico, but it is not expected in amplitudes sufficient enough to cause hearing effects to sperm whales.

DP installation vessel or MODU lighting and rig presence are not identified as IPFs for sperm whales (NMFS, 2007, BOEM, 2012b, 2013, 2014, 2015, 2016).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sperm whales. There is also a risk of vessel strikes, which are identified as a threat in the recovery plan for this species (NMFS, 2010). Data concerning the frequency of vessel strikes are presented by BOEM (2012b). To reduce the potential for vessel strikes, BOEM has issued NTL 2012-JOINT-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species, and requires operators to report sightings of any injured or dead protected species. When whales are sighted, vessel operators and crews are required to attempt to maintain a distance of 300 ft (91 m) or greater whenever possible. Vessel operators are required to reduce vessel speed to 10 knots or less, when safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel. Compliance with this NTL will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing sperm whales.

NMFS (2007) analyzed the potential for vessel strikes and harassment of sperm whales in its Biological Opinion for the Five-Year Oil and Gas Leasing Program in the Central and Western Planning Areas of the Gulf of Mexico. With implementation of the mitigation measures in NTL 2012-JOINT-G01, NMFS concluded that the likelihood of collisions between vessels and sperm whales would be reduced to insignificant levels. NMFS concluded that the observed avoidance of passing vessels by sperm whales is an advantageous response to avoid a potential threat and is not expected to result in any significant effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the level of the population. With implementation of the vessel strike avoidance measures requirement to maintain a distance of 300 ft (91 m) from sperm whales, NMFS concluded that the potential for harassment of sperm whales would be reduced to discountable levels.

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 (12%) of 24 sightings. All three reactions consisted of a hasty dive and occurred at less than 1,180 ft (360 m) lateral distance from the aircraft. Additional reactions were seen when aircraft circled certain whales to make further observations. Based on other studies of cetacean responses to sound, the authors concluded that the observed reactions to brief overflights by the aircraft were short-term and limited to behavioral disturbances.

Helicopters maintain altitudes above 700 ft (213 m) during transit to and from the offshore working area. In the event that a whale is seen during transit, the helicopter will not approach or circle the animal(s). In addition, guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 300 ft (91 m) of marine mammals (BOEM, 2012a, b). Although whales may respond to helicopters (Smultea et al., 2008), NMFS (2007) and BOEM (2012a) 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 BOEM (2012b, 2013, 2014, 2015, 2016) and the Biological Opinion for the Five-Year Oil and Gas Leasing Program in the Central and Western Planning Areas of the Gulf of Mexico (NMFS, 2007). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990). For the DOCD, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill will be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the potential for impacts on sperm whales. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area and the duration of a small spill, the opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill, as well as the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft (Marine Mammal Commission [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 are expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals including sperm whales are discussed by BOEM (2012b, 2013, 2014, 2015, 2016), and NMFS (2007). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990). For the DOCD, there are no unique site-specific issues with respect to spill impacts on these animals.

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, noise, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and 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 (Waring et al., 2016). 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 sperm whales and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels would operate in accordance with NTL 2012-JOINT-G01 to reduce the potential for striking or disturbing these animals.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on sperm whales are expected.

C.3.2 West Indian Manatee (Endangered)

Most of the Gulf of Mexico manatee population is located in peninsular Florida (USFWS, 2001). Manatees regularly migrate farther west of Florida in the warmer months (Wilson, 2003) into Alabama and Louisiana coastal environs, with some individuals traveling as far west as Texas (Fertl et al., 2005). A species description is presented by BOEM (2012b) and in the recovery plan for this species (USFWS, 2001).

IPFs that could potentially affect manatees include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the lease area would be unlikely to affect manatees because the lease area is approximately 56 miles (90 km) from the nearest shoreline (Louisiana). As explained in **Section A.9.2**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to breaking up. Compliance with NTL BSEE 2015-G013 will minimize the potential for marine debris-related impacts on manatees. Consistent with the analysis by BOEM (2012a), impacts of routine project-related activities on the manatee would be negligible.

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, 2001). Manatees are expected to be limited to inner shelf and coastal waters, and impacts are expected to be limited to transits of these vessels and helicopters through these waters. To reduce the potential for vessel strikes, the BOEM has issued NTL 2012-JOINT-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 NTL 2012-JOINT-G01 will minimize the likelihood of vessel strikes, and no significant impacts on manatees are expected.

Helicopter traffic, if present, also has the potential to disturb manatees. Rathbun (1988) reported that manatees were disturbed more by helicopters than by fixed-wing aircraft; however, the helicopter was flown at relatively low altitudes of 66 to 525 ft (20 to 160 m). Helicopters used in support operations maintain a minimum altitude of 700 ft (213 m) while in transit offshore, 1,000 ft (305 m) over unpopulated areas or across coastlines, and 2,000 ft (610 m) 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 300 ft (91 m) of marine mammals (BOEM, 2012b, c). This mitigation measure will minimize the potential for disturbing manatees, and no significant impacts are expected.

Impacts of a Large Oil Spill

The OSRA results summarized in **Table 3** predict that shorelines in Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted by a large oil spill within 10 days. Other Texas, Louisiana, and Florida panhandle shorelines could be contacted by a large oil spill within 30 days. There is no critical habitat designated in these areas, and the number of manatees potentially present is a small fraction of the population in peninsular 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, noise, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey (or contaminated vegetation, in the case of manatees); and stress from the activities and noise of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event that a large spill reached coastal waters where manatees were present, the level of vessel and aircraft activity associated with spill response could disturb manatees and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels would operate in accordance with NTL 2012-JOINT-G01 to reduce the potential for striking or disturbing these animals, and therefore no significant impacts are expected.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on manatees are expected.

C.3.3 Non-Endangered Marine Mammals (Protected)

In addition to the two endangered species of marine mammals that were cited in **Section C.3**, 21 additional species of marine mammals may be found in the Gulf of Mexico, including 1 species of mysticete whale; the dwarf and pygmy sperm whales; 4 species of beaked whales; and 14 species of delphinid whales (dolphins) (see **DOCD Section 6h**). The minke whale (*Balaenoptera acutorostrata*) is considered rare in the Gulf of Mexico, and is therefore not considered further in this EIA (BOEM, 2012b). All marine mammals are protected species under the MMPA. The most common non-endangered cetaceans in the deepwater environment are odontocetes such as the pantropical spotted dolphin, spinner dolphin, and Clymene dolphin. A brief summary is presented in this section, and additional information on these groups is presented by BOEM (2012b).

Bryde's whale. Bryde's whale (*Balaenoptera edeni*) is the only year-round resident baleen whale in the northern Gulf of Mexico. 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 (NRDC, 2014). This petition received a 90-day positive finding by NMFS in 2015 and is currently under consideration for listing. The Bryde's whale is sighted most frequently along the 328-ft (100-m) isobath (Davis and Fargion, 1996, Davis et al., 2000a). Most sightings have been made in the DeSoto Canyon region and off western Florida, although there have been some in the west-central portion of the northeastern Gulf of Mexico. Based on the available data, it is possible that Bryde's whales could occur in the lease area.

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

Beaked whales. Four species of beaked whales are known from the Gulf of Mexico. They are Blainville's beaked whale (*Mesoplodon densirostris*), Sowerby's beaked whale (*Mesoplodon bidens*), Gervais' beaked whale (*Mesoplodon europaeus*), and Cuvier's beaked whale (*Ziphius cavirostris*). Stranding records (Würsig et al., 2000), as well as passive acoustic monitoring in the Gulf of Mexico (Hildebrand et al., 2015), suggest that Gervais' beaked whale and Cuvier's beaked whale are the most common species in the region. The Sowerby's beaked whale is considered extralimital, with only one documented stranding in the Gulf of Mexico (Bonde and O'Shea, 1989). Blainville's beaked whales are rare, with only four documented strandings in the northern Gulf of Mexico (Würsig et al., 2000). 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 waters greater than 3,281 ft (1,000 m) over lower slope and abyssal landscapes (Davis et al., 2000a). Any of these species could occur in the lease area (Waring et al., 2016).

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

Bottlenose dolphins. The bottlenose dolphin (*Tursiops truncatus*) is a common inhabitant of the northern Gulf of Mexico, particularly within continental shelf waters. There are two ecotypes of bottlenose dolphins, a coastal form and an offshore form, which are genetically isolated from each other (Waring et al., 2016). The offshore form of the bottlenose dolphin inhabits waters seaward from the 200-m isobath and may occur within the lease area. Inshore populations of coastal bottlenose dolphins in the northern Gulf of Mexico are separated by the NMFS into 36 geographically distinct population units, or stocks, for management purposes (Waring et al., 2016).

Bottlenose dolphins in the Northern Gulf of Mexico are categorized into three stocks by NMFS (2016a): Bay, Sound, and Estuary; Continental Shelf; and Coastal and Oceanic. The Bay, Sound, and Estuary Stocks are considered to be strategic stocks. The strategic stock designation in this case was based primarily on the occurrence of an "Unusual Mortality Event" of unprecedented size and duration that has affected these stock areas. This Unusual Mortality Event began in April 2010 and ended in July 2014 (NOAA, 2016c). Carmichael et al. (2012) hypothesized that the unusual number of bottlenose dolphin strandings in the northern Gulf of Mexico during this time may have been associated with environmental perturbations, including sustained cold weather and the Macondo spill in 2010 as well as large volumes of cold freshwater discharge in the early months of 2011.

IPFs that could potentially affect non-endangered marine mammals include DP installation vessel or MODU presence, noise, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on 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-G013 will minimize the potential for marine debris-related impacts on marine mammals.

Impacts of Vessel Presence, Noise, and Lights

Noise from routine activities involved in the installation of subsea equipment has the potential to disturb marine mammals. Most odontocetes (toothed whales and dolphins) use higher frequency sounds than those produced by OCS drilling activities (Richardson et al., 1995). Three functional hearing groups are represented in the 21 non-endangered cetaceans found in the Gulf of Mexico (NMFS, 2016a). Eighteen of the 20 odonotocete species are considered to be in the mid-frequency functional hearing group, 2 species (*Kogia*) are in the high frequency functional hearing group, and 1 species (Bryde's whale) is in the low frequency functional hearing group. (NMFS, 2016a). Thruster and installation noise will affect each group differently depending on the frequency bandwiths produced by operations.

For mid frequency cetaceans exposed to a non-impulsive source (like installation operations), permanent threshold shifts are estimated to occur when the mammal has received a cumulative exposure level of 198 dB re 1 $\mu Pa^2 \cdot s$ over a 24 hour period. Similarly, temporary threshold shifts are estimated to occur when the mammal has received a cummulative noise exposure level of 178 dB re 1 $\mu Pa^2 \cdot s$ over a 24 hour period. For low frequency cetaceans, specifically the Brydes whale, permant and temporary threshold shift onset is estimated to occur at 199 dB re 1 $\mu Pa^2 \cdot s$ and 179 re 1 $\mu Pa^2 \cdot s$, repectively. Based on transmission loss calculations, open water propagation of noise produced by typical sources with intermittent use of DP thrusters during offshore operations, are not expected to produce received levels greater than 160dB re 1 µPa beyond 25m from the source. Due to the short propagation distance of high sound pressure levels, the transient nature of marine mammals and the stationary nature of the proposed activites, it is not expected that any marine mammals will receive exposure levels necessary for the onset of auditory threshold shifts.

Behavioral criteria are currently being updated; therefore, the NOAA (2005) criteria are used in the interim to determine behavioral disturbance thresholds for marine mammals and are applied equally across all functional hearing groups. Received sound pressure levels of 120 dB re 1 µPa from a non-impulsive source are considered high enough to illicit a behavioral reaction in some marine mammal species (NOAA, 2005). The 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 lease area, and the region as a whole has a large number of similar sources. Marine mammal species in the northern Gulf of Mexico have been exposed to noise from anthropogenic sources for a long period of time and over large geographic areas and likely do not represent a naïve population with regard to sound (National Research Council, 2003b). It is expected that marine mammals within or near the lease area would be able to detect the presence of the DP installation vessel or MODU and avoid exposure to higher energy sounds, particularly within an open ocean environment.

Some odontocetes have shown increased feeding activity around lighted platforms at night (Todd et al., 2009). Even temporary drilling rigs present an attraction to pelagic food sources that may attract cetaceans (and sea turtles). 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.

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

DP Installation vessel or MODU lighting and presence are not identified as IPFs for marine mammals by BOEM (2012b, 2013, 2014, 2015, 2016). DP installation vessel characteristics are expected to be similar to a drilling rig in terms of lighting and presence. Therefore, no significant impacts are expected.

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 (2012b). To reduce the potential for vessel strikes, the BOEM and BSEE have issued NTL 2012-JOINT-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel to avoid striking protected species, and requires operators to report sightings of any injured or dead protected species. Vessel operators and crews are required to attempt to maintain a distance of 300 ft (91 m) or greater when whales are sighted and 150 ft (45 m) when small cetaceans are sighted. 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. Compliance with this NTL will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

Aircraft traffic also has the potential to disturb marine mammals (Würsig et al., 1998). However, while flying offshore, helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. In addition, guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 300 ft (91 m) of marine mammals (BOEM, 2012a, b). This altitude will minimize the potential for disturbing marine mammals, and no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012b, 2013, 2014, 2015, 2016), and oil impacts on marine mammals in general are discussed by Geraci and St. Aubin (1990). For the DOCD, there are no unique site-specific issues with respect to spill impacts on these animals.

The probability of a fuel spill will be minimized by Shell's preventative measures, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP is expected to mitigate and reduce the potential for impacts on marine mammals. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area and the duration of a small spill, the opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that over 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

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

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012b, 2013, 2014, 2015, 2016), and Geraci and St. Aubin (1990). For the 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, noise, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey (or contaminated vegetation, in the case of manatees); and stress from the activities and noise of response vessels and aircraft. Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat; disruption of social structure; changing prey availability and foraging distribution and/or patterns; changing reproductive behavior/productivity; and changing movement patterns or migration (MMC, 2011).

Data from the Macondo spill, as analyzed and summarized by NOAA (2016b) indicate the scope of potential impacts from a large spill. Tens of thousands of marine mammals were exposed to oil, where they likely inhaled, aspirated, ingested, physically contacted, and absorbed oil components (NOAA, 2016b). Nearly all of the marine mammal stocks in the northern Gulf of Mexico were affected. The oil's physical, chemical, and toxic effects damaged tissues and organs, leading to a constellation of adverse health effects, including reproductive failure, adrenal disease, lung disease, and poor body condition (NOAA, 2016b). According to the National Wildlife Federation (2016a), approximately 100 marine mammals were collected within the spill area during the 6 months following the Macondo spill, most of which were bottlenose dolphins. NMFS (2014a) documented 13 dolphins and whales stranded alive, and over 150 dolphins and whales were found dead during the oil spill response. Other affected species included dwarf/pygmy sperm whales, melon-headed whales, and spinner dolphins. Because of known low detection rates of carcasses, it is possible that the number of marine mammal deaths is underestimated (Williams et al., 2011). Schwacke et al. (2014) reported that 1 year after the spill, many dolphins in Barataria Bay, Louisiana, showed evidence of disease conditions associated with petroleum exposure and toxicity. BOEM (2012b) concluded that potential effects from a low probability large spill could potentially contribute to more significant and longer lasting impacts, including mortality and longer lasting chronic or sublethal effects than a small, but severe accidental spill. Venn-Watson et al. (2015) found evidence that exposure to petroleum compounds during and after the Macondo spill may lead to increased primary bacterial pneumonia and thin adrenal cortices in bottlenose dolphins.

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic, use of dispersants, and remediation activities (e.g., controlled burns, skimmers, boom) (BOEM, 2012b). 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 would operate in accordance with NTL 2012-JOINT-G01 to reduce the potential for striking or disturbing these animals, and therefore no significant impacts are expected.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on marine mammals are expected.

C.3.4 Sea Turtles (Endangered/Threatened)

As listed in **DOCD Section 6h**, five species of endangered or threatened sea turtles may be found near the lease area. Endangered species include the leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtles. As of May 6, 2016, the entire North Atlantic DPS of the green turtle (*Chelonia mydas*) is listed as threatened (81 *Federal Register* [FR] 20057). The DPS of loggerhead turtle (*Caretta caretta*) that occurs in the Gulf of Mexico is listed as threatened, although other DPSs are endangered. Of the sea turtle species that may be found in the lease area, only the Kemp's ridley relies on the Gulf of Mexico as its sole breeding ground. Species descriptions are presented by (BOEM, 2012b).

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. A much smaller, but growing, population nests in Padre Island National Seashore, mostly as a result of reintroduction efforts (NMFS et al., 2011). Sporadic nesting takes place elsewhere along the southern Texas and northern Mexican coasts. Of the sea turtle species that may be found in the lease area, only the Kemp's ridley relies on the Gulf of Mexico as its sole breeding ground.

Loggerhead turtles in the Gulf of Mexico are part of the Northwest Atlantic Ocean DPS (NMFS, 2014b). Effective August 11, 2014, NMFS and the USFWS designated critical habitat for this DPS, as shown in **Figure 1**. The USFWS designation (79 FR 39755) 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 39855) includes nearshore reproductive habitat within 0.99 miles (1.6 km) seaward of the mean high water line along these same nesting beaches. NMFS also designated a large area of shelf and oceanic waters, termed *Sargassum* habitat in the Gulf of Mexico (and Atlantic Ocean) as critical habitat. *Sargassum* is a genus of brown alga (Class Phaeophyceae) that takes on a planktonic, often pelagic existence after being removed from reefs during rough weather. Rafts of Sargassum serve as important foraging and developmental habitat for numerous fishes, and young sea turtles, including loggerhead turtles. Additionally, 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.

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 141 miles (227 km) north of the lease area. The lease block is located within the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 1**).

On February 17, 2010, NOAA Fisheries and the USFWS were jointly petitioned to designate critical habitat for the Kemp's ridley turtle for nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean (WildEarth Guardians, 2010). As of February 2017, critical habitat has not been designated for the Kemp's ridley sea turtle (NMFS, 2015).

Leatherbacks and loggerheads are the species most likely to be present near the lease area as adults. Green, hawksbill, and Kemp's ridley turtles are typically inner shelf and nearshore species, unlikely to occur near the lease area as adults. Hatchlings or juveniles of any of the sea turtles may be present in deepwater areas, including the lease area, where they may be associated with *Sargassum* 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, Kemp's ridley, and loggerhead turtles forage primarily in shallow, benthic habitats. Leatherbacks are the most pelagic of the sea turtles, feeding primarily on jellyfish.

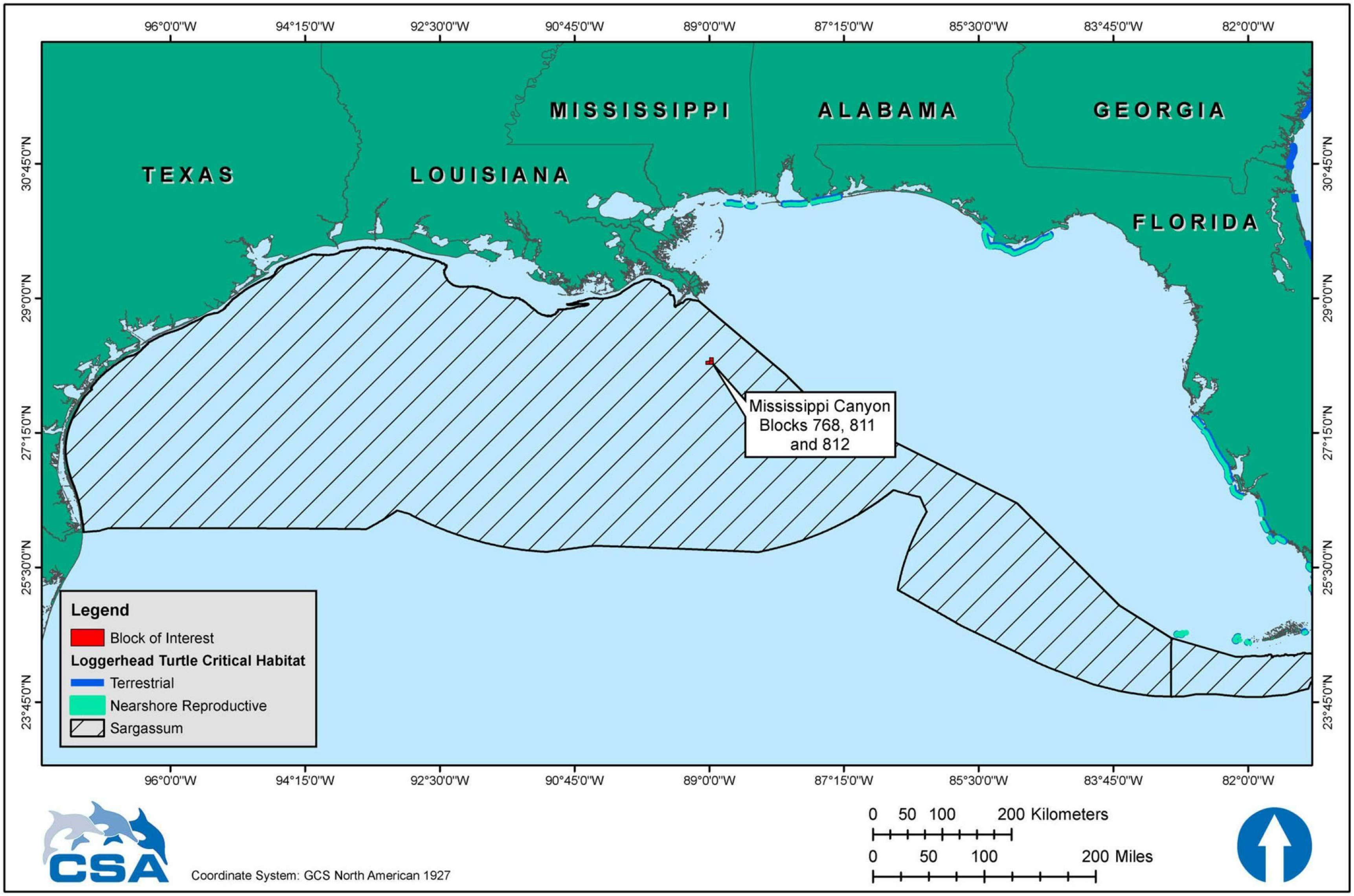

Figure 1. Location of loggerhead turtle designated critical habitat in relation to the lease area.

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

- Loggerhead turtles—Loggerhead turtles nest in significant numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, 2016a) 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, 2016b, c).
- Kemp's ridley turtles—The main nesting site of the Kemp's ridley turtle is Rancho Nuevo beach in Tamaulipas, Mexico (NMFS et al., 2011). A total of 185 Kemp's Ridley turtles have nested on Texas beaches in 2016 (Turtle Island Restoration Network, 2016) an increase from 159 counted in 2015. Padre Island National Seashore, along the coast of Willacy, Kenedy, and Kleberg Counties in southern Texas, is the most important nesting location for this species in the U.S.
- Hawksbill turtles—Hawksbill turtles typically do not nest anywhere near the project area (USFWS, 2015a).

IPFs that could potentially affect sea turtles include DP installation vessel or MODU presence, noise, and lights; support vessel and helicopter traffic; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges are likely to have negligible impacts on sea turtles due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges. Compliance with NTL BSEE 2015-G013 will minimize the potential for marine debris-related impacts on sea turtles.

Impacts of Vessel Presence, Noise, and Lights

Offshore 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 could include behavioral disruption and displacement from the area near the sound source. There is scarce information regarding hearing and acoustic thresholds for marine turtles. 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 Opinions (NMFS, 2015b) list sea turtle underwater acoustic injury and behavioral thresholds at 207 dB re 1 μPa and 166 dB re 1 μPa, respectively for non-impulsive sources and have set regulatory thresholds of 180 dB re 1 μPa and 166 dB re 1 μPa for physiological and behavior, respectively for impulsive sources. Based on transmission loss calculations, open water propagation of noise produced by typical sources with DP thrusters in use during drilling, are not expected to produce received levels greater than 160dB re 1 μPa beyond 25m from the source. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997) and thus may be more susceptible to impacts from sounds produced during routine operations. Helicopters and service vessels may also affect sea turtles because of machinery noise or visual disturbances. Any impacts would likely be short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope 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 (Witherington, 1997, Tuxbury and Salmon, 2005). 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. 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). 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 and BSEE have issued NTL 2012-JOINT-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for sea turtles and slow down or stop their vessel to avoid striking protected species, and requires operators to report sightings of any injured or dead protected species. When sea turtles are sighted, vessel operators and crews are required to attempt to maintain a distance of 150 ft (45 m) or greater whenever possible. Compliance with this NTL will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing sea turtles (NMFS, 2007). Therefore, no significant impacts are expected.

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

Impacts of a Small Fuel Spill

Potential spill impacts on sea turtles are discussed by BOEM (2012b, 2013, 2014, 2015, 2016) and NMFS (2007). For the DOCD, there are no unique site-specific issues with respect to spill impacts on sea turtles.

The probability of a spill will be minimized by Shell's preventative measures, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP is expected to mitigate and reduce the potential for impacts on sea turtles. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the spill, as well as the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft (BOEM, 2012b, NOAA, nd). However, due to the limited areal extent and short duration of water quality impacts from a small fuel spill, no significant impacts would be expected.

Effects of a small spill on *Sargassum* critical habitat for loggerhead turtles would be limited to the small area (1.2 to 12 ac [0.5 to 5 ha]) likely to be impacted by a small spill. A 12 ac (5 ha) impact would represent a negligible portion of the approximately 100,480,000 ac (40,662,810 ha) designated *Sargassum* critical habitat for loggerhead turtles in the northern Gulf of Mexico.

A small fuel spill in the lease area would be unlikely to affect sea turtle nesting beaches because the lease area is 56 miles (90 km) from the nearest shoreline (Louisiana), 141 miles (227 km) from the nearest designated loggerhead nearshore reproductive critical habitat, and approximately 520 miles (837 km) from Padre Island National Seashore, which is the primary Kemp's ridley nesting beach in the U.S. As explained in **Section A.9.2**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to breaking up.

Impacts of a Large Oil Spill

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

Studies of oil effects on loggerheads in a controlled setting (Lutcavage et al., 1995, NOAA, 2010) suggest that sea turtles show no avoidance behavior when they encounter an oil slick, and any sea turtle in an affected area would be expected to be exposed. Sea turtles' diving behaviors also put them at risk. Sea turtles rapidly inhale a large volume of air before diving and continually resurface over time, which may result in repeated exposure to volatile vapors and oiling (NMFS, 2007).

Results of the Macondo spill provide an indication of potential effects of a large oil spill on sea turtles. NOAA (2016b) estimates that between 4,900 and 7,600 large juvenile and adult sea turtles (Kemp's ridleys, loggerheads, and hardshelled sea turtles not identified to species) and between 56,000 and 166,000 small juvenile sea turtles (Kemp's ridleys, green turtles, loggerheads, hawksbills, and hardshelled sea turtles not identified to species) were killed by the Macondo spill.

Nearly 35,000 hatchling sea turtles (loggerheads, Kemp's ridleys, and green turtles) were also injured by response activities (NOAA, 2016b). Spill response activities could also kill sea turtles and interfere with nesting. NOAA (2016b) concluded that after the Macondo spill, hundreds of sea turtles were likely killed by response activities such as increased boat traffic, dredging for berm construction, increased lighting at night near nesting beaches, and oil cleanup operations on nesting beaches. In addition, it is estimated that oil cleanup operations on Florida Panhandle beaches following the spill deterred adult female loggerheads from coming ashore and laying their eggs, resulting in a decrease of approximately 250 loggerhead nests in 2010 (NOAA, 2016b).

The OSRA results summarized in **Table 3** predict less than a 0.5% probability of contact to any terrestrial or nearshore reproductive critical habitat for the loggerhead sea turtle, or to Padre Island National Seashore within 30 days of a spill. Oil could reach areas that support small numbers of loggerhead nests in Louisiana; portions of the Breton NWR in Plaquemines Parish, Louisiana, have a 4% probability of being contacted within 10 days and an 8% probability of being contacted within 30 days. Spilled oil reaching sea turtle nesting beaches could have effects on nesting sea turtles and egg development (NMFS, 2007). An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions (NMFS, 2007).

The lease area is within the loggerhead turtle critical habitat designated as *Sargassum* habitat (**Figure 1**), 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 (NMFS, 2014b). In the event of a large spill, parts of the *Sargassum* habitat would likely come into contact with spilled oil. Because *Sargassum* is a floating and pelagic species, it would only be affected by impacts that occur near the surface.

Due to the large area covered by the designated *Sargassum* habitat for loggerhead turtles, a large spill could result in the oiling of a substantial part of the *Sargassum* habitat in the northern Gulf of Mexico. However, the catastrophic 2010 Macondo spill affected approximately one-third of the *Sargassum* habitat in the northern Gulf of Mexico (BOEM, 2016). It is unlikely that the entire *Sargassum* critical habitat would be affected by a large spill. Because *Sargassum* is a floating and pelagic species, it would only be affected by impacts that occur near the surface.

The effects of oiling on *Sargassum* vary with severity, but moderate to heavy oiling that could occur during a large spill could cause complete mortality to *Sargassum* and its associated communities (BOEM, 2016). *Sargassum* also has the potential to sink during a large spill; thus temporarily removing the habitat and possibly being an additional pathway of exposure to the benthic environment (Powers et al., 2013). Lower levels of oiling may cause sublethal affects, including reduced growth, productivity, and recruitment of organisms associated with *Sargassum.* The *Sargassum* 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, 2016). *Sargassum* 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* community would be expected to occur within 1 to 2 years (BOEM, 2016).

Impacts to sea turtles from a large oil spill and associated cleanup activities would depend on spill extent, duration, and season (relative to turtle nesting season); the amount of oil reaching the shore; the importance of specific beaches to sea turtle nesting; and the level of cleanup vessel and beach crew activity required. A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j.** In the unlikely event of a spill, implementation of Shell's OSRP would mitigate and reduce direct and indirect impacts to turtles from oil exposure and response activities and materials. **DOCD Section 9b** provides detail on spill response measures.

C.3.5 Piping Plover (Threatened)

The Piping Plover (*Charadrius melodus*) is a migratory shorebird that overwinters along the southeastern U.S. and Gulf of Mexico coasts. This threatened species is in decline as a result of hunting, habitat loss and modification, predation, and disease (USFWS, 2003). Critical overwintering habitat has been designated, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 2**). Piping Plovers inhabit coastal sandy beaches and mudflats, feeding by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening (USFWS, 2010). A species description is presented by BOEM (2012b).

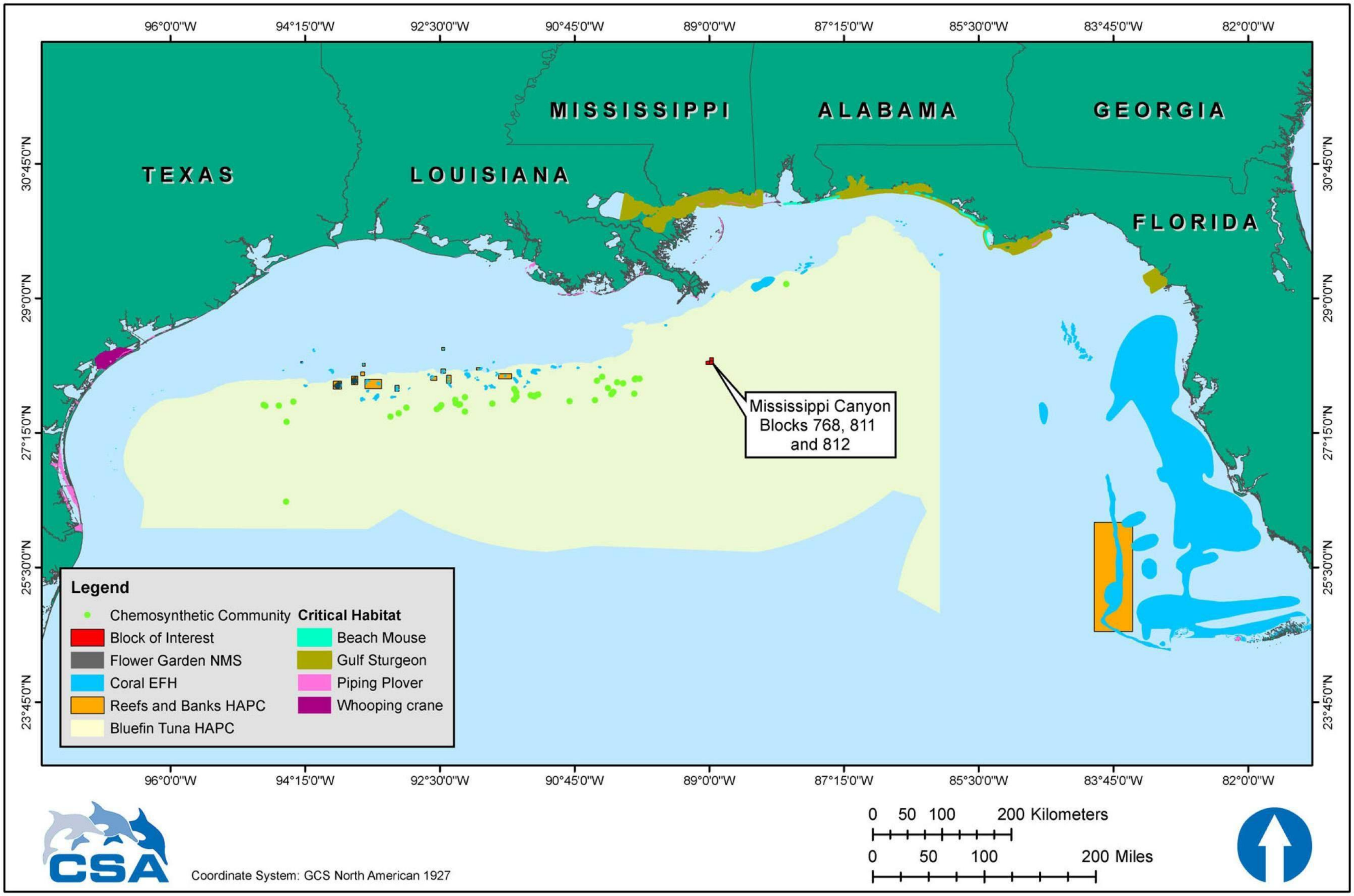

Figure 2. Location of selected environmental features in relation to the lease area. (EFH = Essential Fish Habitat; HAPC = Habitat Area of Particular Concern.)

A large oil spill is the only IPF that could potentially affect Piping Plovers. There are no IPFs associated with routine project activities that could affect these birds. A small fuel spill in the lease 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 breaking up (see explanation in **Section A.9.2**).

Impacts of a Large Oil Spill

The lease area is 57 miles (92 km) from the nearest shoreline designated as Piping Plover critical habitat. The OSRA results summarized in **Table 3** predict that Louisiana shorelines designated as critical habitats for the wintering Piping Plover could be contacted by a spill within 10 days (Terrebonne, Lafourche, Plaquemines, and St. Bernard Parishes) or 30 days (Cameron, Vermilion, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard Parishes).

Plovers could become externally oiled while foraging on oiled shores or be exposed internally through ingestion of oiled intertidal sediments and prey (BOEM, 2012b). Plovers congregate and feed along tidally exposed banks and shorelines, following the tide out 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. Shell has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on Piping Plovers are expected.

C.3.6 Whooping Crane (Endangered)

The Whooping Crane (*Grus americana*) is a large omnivorous wading bird listed as an endangered species. Three wild populations live in North America (National Wildlife Federation, 2016b). One population winters along the Texas coast at Aransas NWR and summers at Wood Buffalo National Park in Canada. This population represents the majority of the world's population of free-ranging Whooping Cranes, reaching a record estimated population of 329 during the 2015 2016 winter (USFWS, 2016b). Another reintroduced population summers in Wisconsin and migrates to the southeastern U.S. for the winter. Non-migrating populations were reintroduced in central Florida and southern Louisiana (USFWS, 2015b). Whooping Cranes breed, migrate, winter, and forage in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields (USFWS, 2007). About 22,240 ac (9,000 ha) of salt flats 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 (**Figure 2**). A species description is presented by (BOEM, 2012b).

A large oil spill is the only IPF that could potentially affect Whooping Cranes due to the distance from Aransas NWR.

Impacts of a Large Oil Spill

OSRA results summarized in **Table 3** predict that a large oil spill has a less than 0.5% probability of reaching Whooping Crane critical habitat in the Aransas NWR located in Aransas and Calhoun Counties in Texas within 30 days of a spill. The nearest Whooping Crane critical habitat is approximately 455 miles (732 km) from the lease area.

In the event of oil exposure, Whooping Cranes could become externally oiled while foraging in oiled areas or internally exposed to oil through ingestion of contaminated crustaceans, shellfish, frogs, and fishes. It is possible that some death of Whooping Cranes could occur. Shell has extensive resources available to protect and rehabilitate wildlife in the event of a spill reaching the shoreline, as detailed in the OSRP.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on Whooping Cranes are expected.

C.3.7 Gulf Sturgeon (Threatened)

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is a threatened fish species that inhabits major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida (Barkuloo, 1988, Wakeford, 2001). The Gulf sturgeon is anadromous, migrating from the sea 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). Today, 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, 2014c) (**Figure 2**). A species description is presented by (BOEM, 2012b) and in the recovery plan for this species (USFWS et al., 1995).

A large oil spill is the only IPF that could potentially affect Gulf sturgeon. There are no IPFs associated with routine project activities that could affect this species. A small fuel spill in the lease 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 breaking up (see explanation in **Section A.9.2**).

Impacts of a Large Oil Spill

Potential spill impacts on Gulf sturgeon are discussed by BOEM (2012b, 2013, 2014, 2015, 2016), and NMFS (2007). For the DOCD, there are no unique site-specific issues with respect to this species.

The lease area is approximately 138 miles (222 km) from the nearest Gulf sturgeon critical habitat. OSRA modeling (**Table 3**) predicts that a spill in the lease area would have a 1% or lower probability of contacting Gulf sturgeon critical habitat in St. Bernard Parish, Louisiana, or Okaloosa County, Florida, within 30 days of a spill. In the event of oil reaching Gulf sturgeon habitat, the fish could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Based on the life history of this species, subadult and adult Gulf sturgeon would be most vulnerable to a marine oil spill, and would be vulnerable only during winter months (from September 1 through April 30) when this species is foraging in estuarine and marine habitats (NMFS, 2007).

NOAA (2016b) estimated that 1,100 to 3,600 Gulf sturgeon were exposed to oil from the Macondo spill. Overall, 63% of the Gulf sturgeon from six river populations were potentially exposed to the spill. Although the number of dead or injured Gulf sturgeon was not estimated, laboratory and field tests indicated that Gulf sturgeon exposed to oil displayed both genotoxicity and immunosuppression, which can lead to malignancies, cell death, susceptibility to disease, infections, and a decreased ability to heal (NOAA, 2016b).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. Shell has extensive resources available to protect coastal and estuarine wildlife and habitats in the event of a spill reaching the shoreline, as detailed in the OSRP. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on Gulf sturgeon are expected.

C.3.8 Beach Mice (Endangered)

Four subspecies of endangered beach mouse (*Peromyscus polionotus*) occur on the barrier islands of Alabama and the Florida Panhandle (BOEM, 2012b). They are the Alabama, Choctawhatchee, Perdido Key, and St. Andrew beach mouse. Critical habitat has been designated for all four subspecies; **Figure 2** shows the critical habitat combined for all four subspecies. Species descriptions are provided by BOEM (2012b).

A large oil spill is the only IPF that could potentially affect subspecies of beach mouse. There are no IPFs associated with routine project activities that could affect these animals due to the distance from shore and the lack of onshore support activities near their habitat.

Impacts of a Large Oil Spill

Potential spill impacts on beach mice are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to these species.

The lease area is approximately 151 miles (243 km) from the nearest beach mouse critical habitat. The OSRA results summarized in **Table 3** predict a 1% or lower probability that a spill in the lease area would contact beach mouse critical habitat in Okaloosa County, Florida, within 30 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 (BOEM, 2012b).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on beach mice are expected.

C.3.9 Threatened Coral Species

Four threatened coral species are known from the northern Gulf of Mexico: elkhorn coral (*Acropora palmata*), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), and boulder star coral (*Orbicella franksi*). These species have been reported from the coral cap region of the Flower Garden Banks (NOAA, 2014), but are unlikely to be present as regular residents in the northern Gulf of Mexico because they typically inhabit coral reefs in shallow, clear tropical, or subtropical waters. 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. Critical habitat has been designated for elkhorn corals in the Florida Keys, but none has been designated for the other threatened coral species included here.

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

A large oil spill would be unlikely to reach coral reefs at the Flower Garden Banks or elkhorn coral critical habitat in the Florida Keys (Monroe County, Florida). The 30-day OSRA modeling (**Table 3**) predicts the conditional probability of oil contacting the Florida Keys is less than 0.5%. The nearest coral HAPC is approximately 46 miles (74 km) northwest of the lease block. A surface slick would not contact corals on the seafloor. If a subsurface plume were to occur, impacts on the Flower Garden Banks would be unlikely due to the difference in water depth. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge. Valentine et al. (2014) observed the spatial distribution of excess hopane, a crude oil tracer from Macondo spill sediment core samples, to be in the deeper waters and not transported up the shelf, thus confirming near-bottom currents flow along the isobaths. Therefore, no significant impacts on threatened coral species are expected.

C.4 Coastal and Marine Birds

C.4.1 Marine and Pelagic Birds

A variety of seabirds may occur in the pelagic environment of the project areas (Clapp et al., 1982a, Clapp et al., 1982b, 1983, Peake, 1996, Hess and Ribic, 2000). Seabirds spend much of their lives offshore over the open ocean, except during breeding season when they nest on islands and along the coast. Other waterbirds, such as waterfowl, marsh birds, and shorebirds may occasionally be present over open ocean areas. No endangered or threatened bird species are likely to occur at the project area. For a discussion of 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., 2000b). Hess and Ribic (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater area. From these surveys, four ecological categories of seabirds were documented in the deepwater areas of the Gulf: summer migrants (shearwaters, storm petrels, boobies); summer residents that breed in the Gulf (Sooty Tern, Least Tern, Sandwich Tern, Magnificent Frigatebird); winter residents (gannets, gulls, jaegers); and permanent resident species (Laughing Gull, Royal Tern, Bridled Tern) (Hess and Ribic, 2000).

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

Relationships with hydrographic features were found for several seabird species, possibly due to effects of hydrography on nutrient levels and productivity of surface waters where birds forage. GulfCet II (Davis et al., 2000b) did not estimate bird densities; however, Powers (1987) indicates that seabird densities over the open ocean typically are <10 birds km^{-2}.

Trans-Gulf migrant birds including shorebirds, wading birds, and terrestrial birds may also be present in the lease area. Migrant birds may use offshore structures and vessels for resting, feeding, or as temporary shelter from inclement weather (Russell, 2005). Some birds may be attracted to offshore structures and vessels because of the lights and the fish populations that aggregate around these structures.

IPFs that could potentially affect marine and pelagic birds include DP installation vessel or MODU presence, noise, and lights; support vessel and helicopter traffic; and two types of accidents – a small fuel spill and a large oil spill. Effluent discharges permitted under the NPDES general permit 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-G013 will minimize the potential for marine debris-related impacts on birds.

Impacts of Vessel Presence, Noise, and Lights

Birds that frequent platforms may be exposed to contaminants including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion of effluents and air pollutants. Birds migrating over water have been known to strike offshore structures, resulting in death or injury (Wiese et al., 2001, Russell, 2005). Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in platform collisions appear to be similar. In some cases, migrants simply do not see a part of the platform until it is too late. In other cases, navigation may be disrupted by noise (Russell, 2005). Conversely, offshore structures may in some cases serve as suitable stopover habitats for trans-Gulf migratory species, particularly in spring (Russell, 2005).

Overall, potential negative impacts to birds from DP installation vessel or MODU lighting, potential collisions, or other adverse effects are highly localized, relatively short term and temporary in nature, and may be expected to affect only individual birds during migration periods. Therefore, these potential impacts may be adverse, but are not expected to affect birds at the population or species level and are not significant (BOEM, 2012b).

Impacts of Support Vessel and Helicopter Traffic

Support vessels and helicopters are unlikely to significantly disturb pelagic birds in open, offshore waters. 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 (2012b, 2012c, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to spill impacts on marine and pelagic birds.

The probability of a fuel spill will be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the potential for impacts on marine and pelagic birds. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area and the short duration of a small spill, the potential exposure for pelagic marine birds would be brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within

24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

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

Impacts of a Large Oil Spill

Potential spill impacts on marine and pelagic birds are discussed by BOEM (2012b, 2012c, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to spill impacts on marine and pelagic birds.

Pelagic seabirds could be exposed to oil from a spill at the project area. Hess and Ribic (2000) reported that terns, storm-petrels, shearwaters, and jaegers were the most frequently sighted seabirds in the deepwater Gulf of Mexico. Powers (1987) indicates that seabird densities over the open ocean typically are <10 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 Macondo spill provide relevant information about the species of pelagic birds that may be affected in the event of a large oil spill. Birds that have been treated for oiling include several pelagic species such as the Northern Gannet, Magnificent Frigatebird, and Masked Booby. The Northern Gannet is among the species with the largest numbers of birds affected by the spill (USFWS, 2011).

However, a blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on marine and pelagic birds are expected.

C.4.2 Shorebirds and Coastal Nesting Birds

Threatened and endangered bird species (Piping Plover and Whooping Crane) are discussed in **Section C.3**. 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 grounds and nesting habitats. Species that nest on beaches, flats, dunes, bars, barrier islands, and similar coastal and nearshore habitats include the Sandwich Tern, Wilson's Plover, Black Skimmer, Forster's Tern, Gull-Billed Tern, Laughing Gull, Least Tern, and Royal Tern (USFWS, 2010). Additional information is presented by BOEM (2012b).

The Brown Pelican (*Pelecanus occidentalis*) was delisted from federal endangered status in 2009 (USFWS, 2016a) and was delisted from state species of special concern status by the State of Florida in 2017 (Florida Fish and Wildlife Conservation Commission, 2017). However, this species remains listed as endangered by both Louisiana (State of Louisiana Department of Wildlife and Fisheries, 2005; Louisiana Department of Wildlife and Fisheries, 2017) and Mississippi (Mississippi Natural Heritage Program, 2015). 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 over deep offshore waters (Fritts and Reynolds, 1981, Peake, 1996, Hess and Ribic, 2000). Nearly half the southeastern population of Brown Pelicans lives in the northern Gulf Coast, generally nesting on protected islands (USFWS, 2010).

The Bald Eagle (*Haliaeetus leucocephalus*) was delisted from its threatened status in the lower 48 states in June of 2007 (BOEM, 2014). However, this species is listed as a state species of conservation concern in Louisiana (State of Louisiana Department of Wildlife and Fisheries, 2005) and as threatened in Texas (Texas Parks and Wildlife Department, nd). The Bald Eagle still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940 (USFWS, 2015c). 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 (Proctor and Lynch, 2012).

IPFs that could potentially affect shorebirds and coastal nesting birds include support vessel and helicopter traffic and a large oil spill. As explained in **Section A.9.2**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to breaking up. Compliance with NTL BSEE 2015-G013 will minimize the potential for marine debris-related impacts on shorebirds.

Impacts of Support Vessel and Helicopter Traffic

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

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

Aircraft traffic can cause some disturbance to birds on shore and off shore. Responses are highly dependent on the type of aircraft, bird species, activities that animals were previously engaged in, and previous exposures to overflights (Efroymson et al., 2000). Helicopters seem to cause the most intense responses over other human disturbances for some species (Bélanger and Bédard, 1989). However, Federal Aviation Administration Advisory Circular No. 91-36D recommends that pilots maintain a minimum altitude of 2,000 ft (610 m) when flying over noise-sensitive areas such as wildlife refuges, parks, and areas with wilderness characteristics. This is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied in Efroymson et al. (2000). With these guidelines in effect, it is likely that individual birds would experience, at most, only short-term behavioral disruption. The potential impacts are not expected to be significant to bird populations or species in the project area.

Impacts of Large Oil Spill

Coastal birds can be exposed to oil as they float on the water surface, dive during foraging, or wade in oiled coastal waters. The Brown Pelican and Bald Eagle could be impacted by the ingestion of contaminated fish or birds (BOEM, 2012b, 2016). In the event of a large oil spill reaching coastal habitats, cleanup personnel and equipment could create short-term disturbances to coastal birds. Indirect effects could occur from restoration efforts, resulting in habitat loss, alteration, or fragmentation (BOEM, 2012b, 2016). The OSRA results summarized in **Table 3** predict that Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted within 10 days of a spill; and shorelines of Texas, Louisiana, and Florida that include habitat for shorebirds and coastal nesting birds could be affected within 30 days of a spill.

Studies concerning the Macondo spill provide additional information regarding impacts on shorebirds and coastal nesting birds that may be affected in the event that a large oil spill reaches coastal habitats. According to NOAA (2016b), an estimated 51,600 to 84,500 birds were killed by the spill, and the reproductive output lost as a result of breeding adult bird mortality was estimated to range from 4,600 to 17,900 fledglings that would have been produced in the absence of premature deaths of adult birds (NOAA, 2016b). Species with the largest numbers of estimated mortalities were American White Pelican, Black Skimmer, Black Tern, Brown Pelican, Laughing Gull, Least Tern, Northern Gannet, and Royal Tern (NOAA, 2016b). A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on shorebirds and coastal nesting birds are expected.

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). Pelagic eggs and larvae become part of the planktonic community for various lengths of time (10 to 100 days, depending on the species) (BOEM, 2012b). 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 numerical abundance was dominated by relatively few families and species.

IPFs that could potentially affect pelagic communities and ichthyoplankton include DP installation vessel or MODU presence, noise, and lights; effluent discharges; water intakes; and two types of accidents – a small fuel spill and a large oil spill.

Impacts of Vessel Presence, Noise, and Lights

The DP installation vessel or MODU, as a floating structure in the deepwater environment, will act as a fish-attracting device (FAD). In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks that are commonly attracted to fixed and drifting surface structures (Holland, 1990, Higashi, 1994, Relini et al., 1994). This FAD effect could possibly enhance the feeding of epipelagic predators by attracting and concentrating smaller fish species. MODU noise could potentially cause masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Noise may also influence fish behaviors, such as predator-avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010, Bruintjes and Radford, 2013, McLaughlin and Kunc, 2015). Because the DP installation vessel or

MODU are a single, temporary structure, impacts on fish populations, whether beneficial or adverse, are considered minor.

Very 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 cumulative exposures of 206 dB re 1 $\mu Pa^2 \cdot s$ but resulted in no increased mortality between the exposure and control groups. Non-impulsive noise sources (such as MODU operations) are expected to be far less injurious than impulsive noise. Based on transmission loss calculations, open water propagation of noise produced by typical sources with DP thrusters in use during drilling, are not expected to produce received levels greater than 160dB re 1 µPa beyond 25m from the source. Because of the limited propagation distances of high sound pressure levels and the periodic and transient nature of ichthyoplankton, no impacts to these life stages are expected.

Impacts of Effluent Discharges

Effluents discharged during the course of normal subsea equipment installation activities are not expected to have a significant impact on water column biota. NPDES permit limits and requirements will be met.

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 will dilute 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 will dilute rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine and non-contact cooling water, fire water, bilge water, and ballast water, are expected to dilute rapidly and have little or no impact on water column biota. The DP installation or MODU, and support vessel discharges are expected to be in accordance with NPDES permit and USCG regulations, as applicable, and therefore are not expected to cause significant impacts on water quality (BOEM, 2012b).

Impacts of Water Intakes

Seawater will be drawn from several meters below the ocean surface for various services including firewater and once-through non-contact cooling of machinery on the DP installation vessel or MODU (**DOCD Table 7a**). 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 current general NPDES Permit No. GMG290103 specifies requirements for new facilities for which construction commenced after July 17, 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.

If the DP installation vessel or MODU selected for this project meets the described applicability for new facilities, the vessels' water intakes are expected to be in compliance with the design, monitoring, and recordkeeping requirements of the NPDES permit.

Impacts of a Small Fuel Spill

Potential spill impacts on fisheries resources are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to spill impacts.

The probability of a spill will be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the potential for impacts on pelagic communities, including ichthyoplankton. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

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

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). BOEM (2016) analyzed information that has become available since the Macondo spill and determined that no new significant information would alter the impact conclusions presented in the multisale EIS (BOEM, 2012b). For the DOCD, there are no unique site-specific issues.

A large oil spill could directly 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, planktonic eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes in the upper layers of the water column are especially vulnerable to oiling; certain toxic fractions of spilled oil may be lethal to these life stages. Impacts would be potentially greater if local scale currents retained planktonic larval assemblages (and the floating oil slick) within the same water mass. Impacts to ichthyoplankton from a large spill would be greatest during spring and summer when concentrations of ichthyoplankton on the continental shelf peak (BOEM, 2014, 2015, 2016). Adult and juvenile fishes could also be impacted through the ingestion of oiled prey (USFWS, 2017). It is expected that impacts to pelagic communities and ichthyoplankton from a large oil spill resulting in the death of individual fishes would be adverse but not significant at population levels.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on pelagic communities and ichthyoplankton are expected.

C.5.2 Essential Fish Habitat

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

The Gulf of Mexico Fishery Management Council (GMFMC) has prepared Fishery Management Plans for corals and coral reefs, shrimps, spiny lobster, reef fishes, coastal migratory pelagic fishes, and red drum. 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 GMFMC-managed species is on the continental shelf in waters shallower than 600 ft (183 m). The shelf edge is the outer boundary for coastal migratory pelagic fishes, reef fishes, and shrimps. EFH for corals and coral reefs includes some shelf-edge topographic features on the Texas-Louisiana OCS, the nearest of which is located 46 miles (74 km) northwest of the lease area.

BOEM (2016) has reexamined the analysis for fish resources and EFH presented in the multisale EIS (BOEM, 2012b) in consideration of the Macondo event. No substantial new information was found that would alter the impact conclusions for fish resources and EFH presented by BOEM (2012b).

EFH has been identified in the deepwater Gulf of Mexico for highly migratory pelagic fishes, which occur as transients in the lease area. Species in this group, including tunas, swordfishes, billfishes, and sharks, are managed by NMFS. Highly migratory species with EFH at or near the lease area include the following (NMFS, 2009b):

- Bigeye thresher shark (all)
- Bigeye tuna (juveniles, adults)
- Blue marlin (juveniles, adults)
- Bluefin tuna (spawning, eggs, larvae, adults)
- Common Thresher Shark (all)
- Longbill spearfish (juveniles, adults)
- Longfin mako shark (all)
- Oceanic whitetip shark (all)
- Sailfish (juveniles, adults)
- Shortfin mako shark (all)
- Silky shark (all)
- Skipjack tuna (spawning, adult)
- Swordfish (larvae, juveniles, adults)
- White marlin (juveniles, adults)
- Yellowfin tuna (spawning, juveniles, adults)

Research indicates the central and western Gulf of Mexico may be important spawning habitat for Atlantic bluefin tuna, and NMFS (2009b) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, including the lease area (**Figure 2**). The areal extent of the HAPC is approximately 115,830 mi^2 (300,000 km^2). The prevailing assumption is that Atlantic bluefin tuna follow an annual cycle of foraging in June through March off the eastern United States and Canadian coasts, followed by migration to the Gulf of Mexico to spawn in April, May, and June NMFS (2009b).

Other HAPCs have been identified in the Gulf of Mexico by the Gulf of Mexico Fishery Management Council (2005), including 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 (**Figure 2**). The GMFMC is currently considering options on protecting deep-sea corals to add to the HAPCs previously identified (Fisheries Leadership and Sustainability Forum, 2015). The nearest of these is Jakkula Bank, located 157 miles (253 km) west of the lease area.

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

Impacts of Vessel Presence, Noise, and Lights

The DP installation vessel or MODU, as a floating structure in the deepwater environment, will act as an FAD. In oceanic waters, the FAD effect would be most pronounced for epipelagic fishes such as tunas, dolphin, billfishes, and jacks that are commonly attracted to fixed and drifting surface structures (Holland, 1990, Higashi, 1994, Relini et al., 1994). This FAD effect would possibly enhance feeding of epipelagic predators by attracting and concentrating smaller fish species. MODU noise could potentially cause masking in fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Noise may also influence fish behaviors such as predator avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010, Bruintjes and Radford, 2013, McLaughlin and Kunc, 2015). Any impacts on EFH for highly migratory pelagic fishes are not expected to be significant.

Very 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 cumulative exposures of 206 dB re 1 $\mu Pa^2 \cdot s$ but resulted in no increased mortality between the exposure and control groups. Non-impulsive noise sources (such as MODU operations) are expected to be far less injurious than impulsive noise. Based on transmission loss calculations, open water propagation of noise produced by typical sources with DP thrusters in use during drilling, are not expected to produce received levels greater than 160 dB re 1 μPa beyond 25m from the source. Because of the limited propagation distances of high sound pressure levels and the periodic and transient nature of ichthyoplankton, no impacts to these life stages are expected.

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 and non-contact cooling water, fire water, bilge water, and ballast water. Impacts on EFH from effluent discharges are anticipated to be similar to those described in **Section C.5.1** for pelagic communities. No significant impacts on EFH for highly migratory pelagic fishes are expected from these discharges.

Impacts of Water Intakes

As noted previously, cooling water intake will cause entrainment and impingement of plankton, including fish eggs and larvae (ichthyoplankton). Due to the limited scope, timing, and geographic extent of installation activities, any short-term impacts on EFH for highly migratory pelagic fishes are not expected to be biologically significant.

Impacts of a Small Fuel Spill

Potential spill impacts on EFH are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to spill impacts.

The probability of a spill will be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the potential for impacts on EFH. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area, the duration of a small spill and opportunity for impacts to occur would be very brief.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce concentrations of petroleum hydrocarbons and their degradation products. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. **Section A.9.2** discusses the likely fate of a small fuel spill and indicates that more than 90% would evaporate or disperse naturally within 24 hours. The area of diesel fuel on the sea surface would range from 1.2 to 12 ac (0.5 to 5 ha), depending on sea state and weather conditions.

A small fuel spill could have localized impacts on EFH for highly migratory pelagic fishes, including tunas, swordfishes, billfishes, and sharks. These species occur as transients in the lease area. A spill would also produce short-term impact on surface and near-surface water quality in the HAPC for spawning Atlantic bluefin tuna, which covers much of the deepwater Gulf of Mexico. The affected area would represent a negligible portion of the HAPC, which covers approximately 115,830 mi^2 (300,000 km^2) of the Gulf of Mexico. Therefore, no significant spill impacts on EFH for highly migratory pelagic fishes are expected.

A small fuel spill would not affect EFH for corals and coral reefs; the nearest coral EFH is located 46 miles (74 km) northwest of the lease area. A small fuel spill would float and dissipate on the sea surface and would not contact these features. Therefore, no significant spill impacts on EFH for corals and coral reefs are expected.

Impacts of a Large Oil Spill

Potential spill impacts on EFH are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). BOEM (2016) analyzed information that has become available since the Macondo spill and determined that no new significant information would alter the impact conclusions presented in the multisale EIS (BOEM, 2012b). For the DOCD, there are no unique site-specific issues with respect to EFH.

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

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

The lease area is within the HAPC for spawning Atlantic bluefin tuna (NMFS, 2009b). 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 offspring. Potential impacts would depend in part on the timing of a spill, as this species migrates to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009b).

The nearest feature designated as EFH for corals is located 46 miles (74 km) northwest of the lease area. An accidental spill would be unlikely to reach or affect this feature. Near-bottom currents in the region are expected to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on EFH are expected.

C.6 Archaeological Resources

C.6.1 Shipwreck Sites

BOEM (2016) reexamined the analyses for archaeological resources presented in the multisale EIS (BOEM, 2012b) and the Western and Central Planning Areas Supplemental EISs (BOEM, 2012c, 2013, 2014, 2015). Based on additional information available following the Macondo oil spill, BOEM (2016) determined that no new significant information would alter the impact conclusions previously presented by BOEM (2012b).

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

The lease area is on the list of archaeological survey blocks determined to have a high potential for containing archaeological properties (BOEM, 2011). The shallow hazard assessment (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016) identified two sonar contacts within 2,000 ft (610 m) of the proposed subsea installation and 41 sonar contacts within 500 ft (152 m) of the proposed umbilical and flowline route. These contacts were tentatively identified as industrial waste barrels or debris and are not archaeologically significant. If the sonar contacts are confirmed as waste barrels during operations, Shell will follow its Waste Barrel Avoidance Plan. No archaeological impacts are expected from routine activities in the lease area.

Because no historic shipwreck sites are present in the lease area (see **DOCD Section 6**), there are no routine IPFs that are likely to affect these resources. A small fuel spill would not affect shipwrecks in adjoining blocks because the oil would float and dissipate on the sea surface. The only IPF considered would be the impact from a large oil spill that could contact shipwrecks in other blocks.

Impacts of a Large Oil Spill

BOEM (2012b) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 984 ft (300 m) radius. Because there are no historic shipwrecks in the lease area, this impact would not be relevant.

Beyond this radius, there is the potential for impacts from oil, dispersants, and depleted oxygen levels (BOEM, 2012b). These impacts could include chemical contamination as well as alteration of the rates of microbial activity (BOEM, 2012b). During the Macondo spill, subsurface plumes were reported at a water depth of approximately 3,600 ft (1,100 m), extending at least 22 miles (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). The subsurface plumes apparently resulted from the use of dispersants at the wellhead (NOAA, 2011b). While the behavior and impacts of subsurface plumes are not well known, a subsurface plume could contact shipwreck sites beyond the 984-ft (300-m) radius estimated by BOEM (2012b), depending on its extent, trajectory, and persistence (Spier et al., 2013). If oil from a subsea spill should come in contact with wooden shipwrecks on the seafloor, it could adversely affect their condition or preservation.

Although there are no known historic shipwrecks in the lease area, an archaeological review did detect two sonar targets within 2,000 ft (610 m) of the proposed subsea installation and 41 sonar contacts within 500 ft (152 m) of the proposed umbilical and flowline route. These contacts were tentatively identified as industrial waste barrels or debris and are not archaeologically significant. If the sonar contacts are confirmed as waste barrels during operations, Shell will follow its Waste Barrel Avoidance Plan (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016). No archaeological impacts are expected from routine activities in the lease area.

A spill entering shallow coastal waters could conceivably contaminate undiscovered or known historic shipwreck sites. The OSRA modeling summarized in **Table 3** predicts that Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted within 10 days of a spill and other Texas, Louisiana, and Florida shorelines could be contacted by a spill within 30 days. If an oil spill contacted a coastal historic site, such as a fort or a lighthouse, the major impact would be a temporary, reversible visual impact from oil contact of the site and its environment (BOEM, 2012b).However, more recent studies suggest that the impacts could be longer term and not easily reversible (BOEM, 2014, 2015, 2016).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on historic shipwrecks are expected.

C.6.2 Prehistoric Archaeological Sites

With a water depth of approximately 3,808 to 4,504 ft (1,161 to 1,373 m), the project area is well beyond the 197 ft (60 m) depth contour used by the BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. Because prehistoric archaeological sites are not found in the lease area, the only relevant IPF is a large oil spill that would reach coastal waters within the 197 ft (60 m) depth contour.

Impacts of a Large Oil Spill

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

Along the northern Gulf Coast, prehistoric sites occur frequently along the barrier islands and mainland coast and along the margins of bays and bayous BOEM (2012b). The OSRA modeling summarized in **Table 3** predicts that Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted within 10 days of a spill and other Texas, Louisiana, and Florida shorelines could be contacted by a spill within 30 days. A spill reaching a prehistoric site along these shorelines could coat fragile artifacts or site features and compromise the potential for radiocarbon dating organic materials in a site (although other dating methods are available and it is possible to decontaminate an oiled sample for radiocarbon dating). Coastal prehistoric sites could also be damaged by spill cleanup operations (e.g., by destroying fragile artifacts and disturbing the provenance of artifacts and site features). BOEM (2012b) notes that some unavoidable direct and indirect impacts on coastal historic resources could occur, resulting in the loss of information.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on archaeological resources are expected.

C.7 Coastal Habitats and Protected Areas

Coastal habitats in the northern Gulf of Mexico that may be affected by oil and gas activities are described in previous EISs (BOEM, 2012b, 2013, 2014, 2015, 2016) and in a literature review by Collard and Way (1997). Sensitive coastal habitats are also tabulated in the OSRP. Coastal habitats inshore of the project area include coastal and barrier island beaches and dunes, wetlands, and submerged seagrass beds. Generally, most of the northern Gulf of Mexico is fringed by coastal and barrier island beaches, with wetlands and/or submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

Due to the distance from shore, there are no IPFs associated with routine activities occurring in the lease area that are likely to affect beaches and dunes, wetlands, seagrass beds, coastal wildlife refuges, wilderness areas, or any other managed or protected coastal area. The support bases are not located in a wildlife refuge or a wilderness area. Potential impacts of support vessel traffic are briefly addressed in this section.

A large oil spill is the only accidental impact analyzed. A small fuel spill in the lease area would be unlikely to affect coastal habitats due to the lease area's distance from the nearest shoreline. As explained in **Section A.9.2**, a small fuel spill in the lease area would be unlikely to affect coastal habitats, because it would not be expected to make landfall or reach coastal waters prior to natural dispersion.

Impacts of Support Vessel Traffic

For OCS activities in general, support operations, including the crew boat and supply boats, may have a minor incremental impact on coastal habitats. Over time with a large number of vessel trips, vessel wakes can erode shorelines along inlets, channels, and harbors. Support operations, including the crew boat and supply boats as detailed in **DOCD Section 14**, may have a minor incremental impact on coastal habitats, seagrass beds, wetlands, or protected areas. Impacts will be minimized by following the speed and wake restrictions in harbors and channels.

Impacts of a Large Oil Spill

Potential spill impacts on coastal habitats are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). Coastal habitats inshore of the project area include coastal and barrier island beaches, wetlands, and submerged seagrass beds. For the DOCD, there are no unique site-specific issues with respect to coastal habitats.

The OSRA results summarized in **Table 3** predict that Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted within 10 days of a spill and other Texas, Louisiana, and Florida shorelines could be contacted by a spill within 30 days. Nearshore waters and embayments of Plaquemines Parish in Louisiana have the highest probability of contact within 10 days (4% probability) and 30 days (8% probability). Within 30 days, a total of 10 additional counties or parishes could be contacted in Texas, Louisiana, and Florida (1% to 3% probability).

The shorelines within the geographic range predicted by the OSRA modeling include extensive barrier beaches and wetlands, with submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries.

NWRs and other protected areas such as Wildlife Management Areas (WMAs) along the coast are discussed in the lease sale EIS (BOEM, 2012b) and Shell's OSRP. Coastal wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts within 30 days are listed in **Table 6**.

Table 6. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts within 30 days based on OSRA modeling.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Galveston, Texas	Anahuac National Wildlife Refuge
	Bolivar Flats Shorebird Sanctuary
	Fort Travis Seashore Park
	Galveston Island State Park
	Horseshoe Marsh Bird Sanctuary
	Mundy Marsh Bird Sanctuary
	R.A. Apffel Park
	Seawolf Park
Jefferson, Texas	McFaddin National Wildlife Refuge
	Sea Rim State Park
	Texas Point National Wildlife Refuge
Cameron, Louisiana	Sabine National Wildlife Refuge
	Rockefeller State Wildlife Refuge and Game Preserve
	Peveto Woods Sanctuary
Vermilion, Louisiana	Paul J. Rainey Wildlife Refuge and Game Preserve
	Rockefeller State Wildlife Refuge and Game Preserve
	State Wildlife Refuge
Iberia, Louisiana	Marsh Island Wildlife Refuge
	Shell Key National Wildlife Refuge
Terrebonne, Louisiana	Isles Dernieres Barrier Islands Refuge
	Pointe-aux-Chenes Wildlife Management Area
	Mandalay National Wildlife Refuge
Lafourche, Louisiana	Pointe-aux-Chenes Wildlife Management Area
	Wisner Wildlife Management Area (including Picciola Tract)
Jefferson, Louisiana	Grand Isle State Park
Plaquemines, Louisiana	Breton National Wildlife Refuge
	Delta National Wildlife Refuge
	Pass-a-Loutre Wildlife Management Area
St. Bernard, Louisiana	Biloxi National Wildlife Refuge
	Breton National Wildlife Refuge
	Saint Bernard State Park
Okaloosa, Florida	Eglin Beach Park
	Fred Gannon Rocky Bayou State Park
	Gulf Islands National Seashore
	Henderson Beach State Park
	Rocky Bayou Aquatic Preserve
	Yellow River Wildlife Management Area

The OSRA results in **Table 3** include only shoreline segments with contact probabilities greater than 0.5% within 30 days; other coastal areas could be affected at lower contact probabilities within 30 days, or beyond 30 days from the spill. Additional NWRs and managed wildlife areas occur along the Gulf Coast. These areas include habitats such as barrier beach and dune systems, wetlands, and submerged seagrass beds that support diverse wildlife, including endangered or threatened species.

The level of impacts from oil spills on coastal habitats depends on many factors, including the oil characteristics, the geographic location of the landfall, and the weather and oceanographic conditions at the time (BOEM, 2012b). Oil that makes it to beaches may be either liquid weathered oil, an oil-and-water mousse, or tarballs (BOEM, 2012b). Oil is generally deposited on beaches in lines defined by wave action at the time of landfall. Oil that remains on the beach will thicken as its volatile components are lost. Thickened oil may form tarballs or aggregations that incorporate sand, shell, and other materials into its mass. Tar may be buried to varying depths under the sand. On warm days, both exposed and buried tarballs may liquefy and ooze. Oozing may also serve to expand the size of a mass as it incorporates beach materials (BOEM, 2012b). Oil on beaches may be cleaned up manually, mechanically, or both. Some oil can remain on the beach at varying depths and may persist for several years as it slowly biodegrades and volatilizes.

Coastal wetlands are highly sensitive to oiling and can be significantly impacted because of the inherent toxicity of hydrocarbon and non-hydrocarbon components of the spilled substances (Mendelssohn et al., 2012). Numerous variables such as oil concentration and chemical composition, vegetation type and density, season or weather, preexisting stress levels, soil types, and water levels may influence the impacts of oil exposure on wetlands. Light oiling could cause plant die-back, followed by recovery in a fairly short time. Vegetation exposed to oil that persists in wetlands could take years to recover (BOEM, 2012b). In a study in Barataria Bay, Louisiana, after the *Deepwater Horizon* spill, Silliman et al. (2012) reported that previously healthy marshes largely recovered to a pre-oiling state within 18 months. Oiled marshes that had prior accelerated rates of erosion experienced a bio-geomorphological feedback that further increased marsh loss to erosion and did not experience regrowth (Silliman et al., 2012). In addition to the direct impacts of oil, cleanup activities in marshes may accelerate rates of erosion and retard recovery rates (BOEM, 2012b). Impacts associated with an extensive oiling of coastal wetland habitat are expected to be significant.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on coastal habitats are expected.

C.8 Socioeconomic and Other Resources

C.8.1 Recreational and Commercial Fishing

BOEM has reexamined the potential impacts of OCS activities on recreational and commercial fishing based on additional information and in consideration of the Macondo spill. No new information was found that would alter the potential impacts on commercial fishing (BOEM, 2016). 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). Pelagic longlining has occurred historically in the project area, primarily during spring and summer.

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). Tilefishes (primarily *Lophalotilus chamaeleonticeps*) are caught by bottom longlining in water depths from about 540 to 1,476 ft (165 to 450 m) (Continental Shelf Associates, 2002). The water depth at the proposed project area ranges approximately 3,808 to 4,504 ft (1,161 to 1,373 m). No conflict with commercial fishing activity other than longlining is expected to occur.

Most recreational fishing activity in the region occurs in water depths less than 656 ft (200 m) (Continental Shelf Associates, 1997, 2002). In deeper water, the main attraction to recreational fishers would be petroleum platforms in offshore waters of Texas and Louisiana.

The only routine IPF that could potentially affect fisheries is DP installation vessel or MODU presence (including noise and lights). Two types of potential accidents are also addressed in this section – a small fuel spill and a large oil spill.

Impacts of Vessel Presence

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

No adverse impacts on fishing activities are anticipated. Other factors such as effluent discharges are likely to have negligible impacts on commercial or recreational fisheries due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Impacts of a Small Fuel Spill

The probability of a fuel spill will be minimized by Shell's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the potential for impacts. **DOCD Section 9b** provides detail on spill response measures. Given the open ocean location of the lease area, the duration of a small spill and opportunity for impacts to occur would be very brief.

Pelagic longlining activities in the lease area, if any, could be interrupted in the event of a small fuel spill. 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. Fishing activities could be interrupted due to the activities of response vessels operating in the lease 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 breaking up (see **Section A.9.2**).

Impacts of a Large Oil Spill

Potential spill impacts on fishing activities are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to this activity.

Pelagic longlining activities in the lease 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, and the effectiveness of spill response measures. According to BOEM (2012a), 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).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on fishing activities are expected.

C.8.2 Public Health and Safety

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

Impacts of a Large Oil Spill

In the event of a large spill 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. The proposed activities will be covered by the OSRP, and, in addition, the DP installation vessel or MODU maintains a Shipboard Oil Pollution Emergency Plan as required under MARPOL 73/78.

Depending on the spill rate and duration, the physical/chemical characteristics of the oil, the meteorological and oceanographic conditions at the time, and the effectiveness of spill response measures, the public could be exposed to oil on the water and along the shoreline, through skin contact or inhalation of VOCs. Crude oil is a highly flammable material, and any smoke or vapors from a crude oil fire can cause irritation. Exposure to large quantities of crude oil may pose a health hazard.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on public health and safety are expected.

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 installation activities with support from existing shore-based 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). A small fuel spill that is dissipated within a few days would have little or no economic impact, as the spill response would use existing facilities, resources, and personnel. A large oil spill is the only IPF that has the potential to affect employment and infrastructure.

Impacts of a Large Oil Spill

Potential socioeconomic impacts of an oil spill are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to employment and coastal infrastructure. A large spill could cause several types of economic impacts: extensive fishery closures could put fishermen out of work; temporary employment could increase as part of the response effort; adverse publicity could reduce employment in coastal recreation and tourism industries; and OCS drilling and infrastructure installation activities, including service and support operations that are an important part of local economies, could be suspended.

The lease area is 56 miles (90 km) from the nearest shoreline. Based on the OSRA modeling predictions (**Table 3**), coastal areas of Plaquemines Parish, Louisiana, are the most likely to be contacted by a spill.

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on employment and infrastructure are expected.

C.8.4 Recreation and Tourism

BOEM has evaluated potential impacts of activities on recreation and tourism using available information, including results from studies of the Macondo spill event. No new information was found that would alter the potential impacts on recreation and tourism (BOEM, 2016). For the DOCD, there are no unique site-specific issues with respect to this activity.

There are no known recreational uses of the lease area. Recreational resources and tourism in coastal areas would not be affected by routine activities due to the distance from shore. Compliance with NTL BSEE-2015-G013 will minimize the chance of trash or debris being lost overboard from the DP installation vessel or MODU and subsequently washing up on beaches. There are no known recreational or tourism activities occurring in the lease area, and as explained in **Section A.9.2**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to breaking up. Therefore, a small fuel spill in the lease area would be unlikely to affect recreation and tourism. A large oil spill is the only IPF that has the potential to affect recreation and tourism.

Impacts of a Large Oil Spill

Potential impacts of an oil spill on recreation and tourism are discussed by BOEM (2012b, 2013, 2014, 2015, 2016). For the DOCD, there are no unique site-specific issues with respect to these impacts.

Impacts on recreation and tourism would vary depending on the duration of the spill and its fate including the effectiveness of response measures. A large spill that reached coastal waters and shorelines could adversely affect recreation and tourism by contaminating beaches and wetlands, resulting in negative publicity that encourages people to stay away. The OSRA results summarized in **Table 3** predict that Terrebonne, Lafourche, and Plaquemines Parishes, Louisiana, could be contacted within 10 days of a spill and other Texas, Louisiana, and Florida shorelines could be contacted by a spill within 30 days. Nearshore waters and embayments of Plaquemines Parish, Louisiana, have the highest probability of contact within 10 days (4% probability) and 30 days (8% probability).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on recreation and tourism are expected.

C.8.5 Land Use

Land use along the northern Gulf coast is discussed by BOEM (2012b, 2013, 2014, 2015, 2016). There are no routine IPFs potentially affecting land use. The project will use existing onshore support facilities in Louisiana. The land use at the existing shorebase sites is industrial. The project will not involve new construction or changes to existing land use and, therefore, will not have any impacts. Levels of boat and helicopter traffic, as well as demand for goods and services, including scarce coastal resources, will represent a small fraction of the level of activity occurring at the shorebases.

A large oil spill is the only relevant accident IPF. A small fuel spill would not have 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 effect 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 Macondo spill, 25 temporary staging areas were established in Louisiana, Mississippi, Alabama, and Florida for spill response and cleanup efforts (BOEM, 2012b). In the event of a large spill in the lease area, similar temporary staging areas could be needed. These areas would eventually return to their original use as the response is demobilized.

An oil spill is not likely to significantly affect land use and coastal infrastructure in the region, in part because an offshore spill would have a small probability of contacting onshore resources. BOEM (2014, 2015, 2016) state 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 Macondo spill and response, USEPA reported that existing landfills receiving oil spill waste had sufficient 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).

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on land use are expected.

C.8.6 Other Marine Uses

The lease area is not located within any USCG-designated fairway or shipping lane, or Military Warning Area. Shell will comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft.

The shallow hazard assessment (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016) identified existing wells, umbilical, and pipelines within the project area. The proposed umbilical and flowline route will cross two pipelines and one umbilical.

The archaeological surveys did detect two sonar targets within 2,000 ft (610 m) of the proposed subsea installation and 41 sonar contacts within 500 ft (152 m) of the proposed umbilical and flowline route. These contacts were tentatively identified as industrial waste barrels or debris and are not archaeologically significant. If the sonar contacts are confirmed as waste barrels during operations, Shell will follow its Waste Barrel Avoidance Plan (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).There are no IPFs from routine project activities that are likely to affect shipping or other marine uses. A large oil spill is the only relevant accident IPF. A small fuel spill would not have impacts on other marine uses, as the spill and response activities would be mainly within the lease area, and the duration would be brief.

Impacts of a Large Oil Spill

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

A blowout resulting in a large oil spill is a rare event, and the probability of such an event will be minimized by Shell's well control and blowout prevention measures as detailed in **DOCD Section 2j**. In the unlikely event of a spill, implementation of Shell's OSRP will mitigate and reduce the impacts. **DOCD Section 9b** provides detail on spill response measures. Therefore, no significant spill impacts on other marine uses are expected.

C.9 Cumulative Impacts

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

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

<u>Description of Activities Reasonably Expected to Occur in the Vicinity of Project Area</u>. Other exploration and development activities may occur in the vicinity of lease blocks MC 768, 811, and 812. Shell 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, 2012b, 2013, 2014, 2015, 2016).

<u>Cumulative Impacts of Activities in the DOCD</u>. The BOEM (2012b) Final EIS included a lengthy discussion of cumulative impacts, which analyzed the environmental and socioeconomic impacts from the incremental impact of the 11 proposed lease sales, in addition to all activities (including non-OCS activities) projected to occur from past, proposed, and future lease sales during the 40-year period of 2007 to 2046 (BOEM, 2012a). The EISs considered exploration, delineation, and

development wells; platform installation; service vessel trips; and oil spills. The EISs examined the potential cumulative effects on each specific resource for the entire Gulf of Mexico.

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

C.9.1 Cumulative Impacts to Physical/Chemical Resources

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

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

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

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

Archaeological Resources. The lease block is on the list of archaeology survey blocks (BOEM, 2011). The shallow hazards assessments (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016) did not identify any known shipwrecks or other archaeological artifacts on this lease block. The lease area is well beyond the 60-m (197-ft) depth contour used by the BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. Therefore, Shell's operations will have no cumulative impacts on historic shipwrecks or prehistoric archaeological resources.

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

C.9.2 Cumulative Impacts to Biological Resources

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

Seafloor Habitats and Biota. Effects on seafloor habitats and biota from bottom disturbance associated with installation activities are expected to be minor and limited to a small area. As described previously, the geophysical surveys did not identify any features that could support high-density deepwater benthic communities in the project area (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).

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

Threatened, Endangered, and Protected Species. Threatened, endangered, and protected species which could occur in the lease area include the sperm whale and five species of sea turtles. Potential impact sources include DP installation vessel or MODU presence including noise and lights, marine debris, and support vessel and aircraft traffic. Potential effects for these species would be limited and temporary, and would be reduced by Shell's compliance with BOEM-required mitigation measures, including NTLs BSEE-2015-G013 and 2012-JOINT-G01. No significant cumulative impacts are expected.

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

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

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

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

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

C.9.3 Cumulative Impacts to Socioeconomic Resources

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

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

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

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

D. Environmental Hazards

D.1 Geologic Hazards

The report identified seafloor faulting approximately 1,690 ft (515 m) west-northwest of the proposed project area. Also, the report noted five areas displaying drilling splays within 2,000 ft (610 m) of the project area. Based on the results of high-resolution geophysical surveys consisting of autonomous underwater vehicle (AUV) multibeam echo sounder, re-processed three-dimensional seismic, enhanced surface renderings, enhanced surface renderings with amplitudes applied, sub-bottom profiler, and side-scan sonar data, the proposed subsea equipment installation appear suitable for the planned activities (Geoscience Earth and Marine Services, Inc., 2013; Fugro Geoservices, Inc., 2016).

See **DOCD Section 6a** for supporting geological and geophysical information.

D.2 Severe Weather

Under most circumstances, weather is not expected to have any effect on the proposed activities. Extreme weather, including high winds, strong currents, and large waves, was considered in the design criteria for the DP installation vessel or MODU. High winds and limited visibility during a severe storm could disrupt communication and support activities (vessel and helicopter traffic) and make it necessary to suspend some activities on the DP installation vessel or MODU for safety reasons until the storm or weather event passes. In the event of a hurricane, procedures in Shell's Hurricane Evacuation Plan would be followed.

D.3 Currents and Waves

A rig-based acoustic Doppler current profiler will be used to continuously monitor the current beneath the rig. Metocean conditions such as sea states, wind speed, ocean currents, etc., will also be continuously monitored. Under most circumstances, physical oceanographic conditions are not expected to have any effect on the proposed activities. Strong currents (caused by Loop Current eddies and intrusions) and large waves were considered in the design criteria for the DP installation vessel or MODU. High waves during a severe storm could disrupt support activities (i.e., vessel and helicopter traffic) and make it necessary to suspend some activities on the DP installation vessel or MODU for safety reasons until the storm or weather event passes.

E. Alternatives

No formal alternatives were evaluated in the DOCD. However, various technical and operational options, including the location of the wellsites and the selection of a DP installation vessel or MODU, were considered by Shell in developing the proposed action. There are no other reasonable alternatives to accomplish the goals of this project.

F. Mitigation Measures

The proposed action includes numerous mitigation measures required by laws, regulations, and BOEM lease stipulations and NTLs. The project will comply with applicable federal, state, and local requirements concerning air pollutant emissions, discharges to water, and solid waste disposal. Project activities will be conducted under Shell's OSRP and will include the measures described in **DOCD Section 2f**.

G. Consultation

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

H. Preparers

This EIA was prepared for Shell Offshore Inc. by its contractor, CSA Ocean Sciences Inc. Contributors included the following:

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SECTION 19: ADMINISTRATIVE INFORMATION

A. Exempted Information Description (Public Information Copies Only)

The following attachments were excluded from the public information copies of this plan:

Section 1B OCS Plan Information form – Bottom hole locations & proposed total depth
Section 2C Production Rates and Life of Reserves
Section 2J Blowout Scenario – confidential information for NTL 2015 N01 calculation
Section 3A Geologic Description
Section 3B Structure Contour Maps
Section 3C Interpreted 2D or 3D seismic line(s)
Section 3D Cross Section(s)

B. Bibliography

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Shell's Regional OSRP

Shell's Initial EP N-9727 (2013)

Shell's Initial EP N9840 (2014)

Shell's Supplemental EP S-7801 (2016)

Shell's Supplemental EP R-6575 (2017 – approval pending)