UNITED STATES GOVERNMENT August 3, 2022
MEMORANDUM

To: Public Information (MS 5030)
From: Plan Coordinator, FO, Plans Section (MS 5231)

Subject: Public Information copy of plan

Control #	-	N-10177
Type	-	Initial Development Operations Coordinations Document
Lease(s)	-	OCS-G19619 Block - 689 Keathley Canyon Area OCS-G33335 Block - 642 Keathley Canyon Area OCS-G33341 Block - 686 Keathley Canyon Area OCS-G36077 Block - 736 Keathley Canyon Area
Operator	-	LLOG Exploration Offshore, L.L.C.
Description	-	Structure A, and Subsea Wells 002, 003, 4, 4 Alt, F, F Alt, G and G Alt
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.

Leslie Wilson
Plan Coordinator

Site Type/Name	**Botm Lse/Area/Blk**	**Surface Location**	**Surf Lse/Area/Blk**
FPSO/A		6820 FSL, 7080 FWL	G19619/KC/689
WELL/002	G33335/KC/642	881 FNL, 1173 FEL	G33341/KC/686
WELL/003	G33341/KC/686	938 FNL, 1192 FEL	G33341/KC/686
WELL/4	G33341/KC/686	927 FNL, 1001 FEL	G33341/KC/686
WELL/4 ALT	G33341/KC/686	902 FNL, 1001 FEL	G33341/KC/686
WELL/F	G36077/KC/736	2402 FSL, 6516 FWL	G36077/KC/736
WELL/F-ALT	G36077/KC/736	2402 FSL, 6516 FWL	G36077/KC/736
WELL/G	G36077/KC/736	2427 FSL, 6516 FWL	G36077/KC/736
WELL/G-ALT	G36077/KC/736	2502 FSL, 6516 FWL	G36077/KC/736

JOINT INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

PLAN CONTROL NUMBER N-10177

Keathley Canyon Blocks 642 / 686 / 736 & 689
OCS-G 33335 / OCS-G 33341 / OCS-G 36077 Leases

RECORD OF CHANGES

Date of Submittal	***Section/Page***	***Brief Synopsis***
7/21/2022	Appendix I – Section A	Updated approval date of OSRP.
7/25/2022	Appendix I – Section D	Updated approval date of OSRP.
9/7/2022	Appendix I – Section D	Updated API Gravity for WCD in plans

LLOG Exploration Offshore, L.L.C.
1001 Ochsner Blvd. Suite 100
Covington, Louisiana 70433

JOINT INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

Keathley Canyon Blocks 642/686/736 & 689
OCS-G 33335/OCS-G 33341/OCS-G 36077

Keathley Canyon 686 Unit
Unit No. 754319005

Salamanca

PUBLIC INFO

PREPARED BY:

Nelda Runyon
Regulatory Specialist
LLOG Exploration Offshore, L.L.C.
(985) 801-4300 Main
(985) 801-4389 Direct
neldar@llog.com

Dated: September 27, 2021

LLOG EXPLORATION OFFSHORE, L.L.C.
JOINT INITIAL
DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

TABLE OF CONTENTS

HISTORY OF THE LEASES

History of Leases

OCS-G 33335 Lease, Keathley Canyon Block 642 was acquired by Repsol E&P Inc. at the Gulf of Mexico Lease Sale 208 on March 18, 2009 with an effective date of August 1, 2009 with a 10 year lease term. LLOG Exploration Offshore was designated Operator June 4, 2019. This lease is part of the Keathley Canyon 686 Unit #754319005.

OCS-G 33341 Lease, Keathley Canyon Block 686 was acquired by Repsol E&P USA Inc. and Ecopetrol American Inc at the Gulf of Mexico Lease Sale No. 208 on March 18, 2009, with an effective date of August 1, 2009 with a 10 year lease term. LLOG Exploration Offshore, LLC was designated operator on June 4, 2019. This lease is part of the Keathley Canyon 686 Unit #754319005.

Keathley Canyon 686 UNIT

Unit Agreement No. 754319005 was approved July 1, 2019.

All of Block 686 (OCS-G 33341)
S/2 of Block 642 (OCS-G 33335)
SW/4 of Block 643 (OCS-G 33336)
W/2 of Block 687 (OCS-G 33918)

OCS-G 19619 Lease, Keathley Canyon Block 689 was acquired by Amoco Production Company at the Central Gulf of Mexico Sale N. 168 on August 27, 1997, with an effective date of January 1, 1998, and was relinquished on June 15, 2006. BP Exploration & Production, Inc. was designated Operator of all of Block 689 effective December 21, 2001. Keathley Canyon Block 689 is currently unleased.

OCS-G- 36077 Lease, Keathley Canyon Block 736 was acquired by LLOG Exploration Offshore, LLC at the Gulf of Mexico Lease Sale 247 on March 22, 2017, with an effective date of August 1, 2017.

LLOG Exploration Offshore, LLC has filed by letter dated September 22, 2021, an application for a Right-of-Use and Easement for the Keathley Canyon Block 689 Lease (currently unleased) to cover the installation of a semi-submersible Floating Platform (Platform A) in Keathley Canyon Block 689 and for those portions of the platform anchorage system which will extend into Keathley Canyon Blocks 689, 688, 690, 732, 733 and 734 all of which are currently unleased.

LLOG Exploration Offshore, L.L.C. filed a Suspension of Operations for the Keathley Canyon Block 686 Unit which was approved for the period September 29, 2020 through November 30, 2021. The Suspension of Operations was approved by BSEE on November 13, 2020.

LLOG Exploration Offshore, L.L.C. spud the OCS-G 33342 Lease, Keathley Canyon Block 686, Well No. 3 on August 2, 2019, and the well was temporarily abandoned on September 28, 2019.

APPENDIX A
PLAN CONTENTS
(30 CFR PART 550.211 AND 550.241)

A. Plan Contents

This Joint Initial Development Operations Coordination Document provides for the following operations:

Proposed operations consist of drilling and completion of one well in OCS-G 33341 Lease, Keathley Canyon Block 686 (No.4) and one well in OCS-G 33335 Lease, Keathley Canyon Block 642 Well No. 2 (surface location in Keathley Canyon Block 686) #2) and complete Well No. 3 in Keathley Canyon Block 686. Also propose to drill and complete two wells in OCS-G 36077 Lease, Keathley Canyon Block 736 (locations F (Well No. 3) F Alt, G (Well No. 4) and G Alt. **Locations No. 4 Alt, F Alt and G Alt are only to be used in the event of a failure if needed.**

The OCS-G 33341 Lease, Well No. 003 was drilled under LLOG's Supplemental Exploration Plan (S-7941) approved on May 3, 2019 which provided for the drilling, completion and wellhead installation. The OCS-G 33341 Lease, Well No. 003 was spud August 2, 2019, and the well was temporarily abandoned on September 28, 2019.

Install Platform Suction Piles and Preset Mooring lines for the installation of the Salamanca, Keathley Canyon Block 689 "A" Semi Submersible Floating Platform and associated anchor system.

Installation of two (2) ROW flowlines at Keathley Canyon Block 736 and two (2) LT rigid jumpers for Keathley Canyon Block 736 SS003 and SS004. Install one (1) ROW umbilical for Keathley Canyon Block 686 and install two (2) ROW flowlines at Keathley Canyon Block 686. Install three (3) LT rigid jumpers for Keathley Canyon Block 642 Well SS002 and Keathley Canyon 686 Well SS003 and SS004. Install one (1) ROW umbilical for Keathley Canyon Block 686 and two (2) ROW production export pipelines from Platform "A" in Keathley Canyon Block 689.

No additional pipelines, production equipment or facilities are proposed under this plan.

A Conservation Information Document (CID) that discusses the depletion plans of these additional wells will be filed under separate cover.

Included as ***Attachment A*** is Form BOEM 137 "OCS Plan Information Form", which provides for the installation of the floating production platform, installation of umbilicals/jumpers, lease term pipelines, and commence production from the associated wells.

B. Location

Included are the following attachments:

Attachment A-1: Form MMS 137 – OCS Plan Information Forms
Attachment A-2: Activity Schedule
Attachment A-2: Well Location Plats
Attachment A-3: Bathymetry Map
Attachment A-4: Cost Recovery Payment – Paygov receipt $21,190.00
Attachment A-5: Structure Elevation Drawings
Attachment A-6: Conceptual Field Development

C. Safety and Pollution Prevention Features

Safety of personnel and protection of the environment during the proposed operations is of primary concern with LLOG, and mandates regulatory compliance with the contractors and vendors associated with the proposed operations as follows:

Bureau of Ocean Energy Management, Regulation, and Enforcement mandates that the operations in this Plan comply with well control, pollution prevention, construction and welding procedures as described in Title 30 CFR Part 550, Subparts C, D, E, G and O; and as further clarified by Notices to Lessees.

Bureau of Ocean Energy Management, Regulation and Enforcement conducts periodic announced and unannounced onsite inspections of offshore facilities to confirm operators are complying with lease stipulations, operating regulations, approved plans, and other conditions; as well as to assure safety and pollution prevention requirements are being met. The National Potential Incident of Noncompliance (PINC) List serves as the baseline for these inspections supplemental with a civil penalties program.

U.S. Coast Guard regulations contained in Title 33 CFR mandate the appropriate life rafts, life jackets, ring buoys, etc. be maintained on the facility at all times.

U.S. Environmental Protection Agency regulations contained in the NPDES General Permit GMG290000 mandate that supervisory and certain designated personnel on-board the facility be familiar with the effluent limitations and guidelines for overboard discharge into the receiving waters.

D. Storage Tanks and Production Vessels

The following table details the storage tanks and/or production vessels that will store oil (capacity greater than 25 bbls. or more) and be used to support the proposed activities (MODU, barges, platforms, etc.):

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Production	Dry Oil Tank	900	1	900	Avg 37° API
Production	Flotation Cell	105	1	105	Avg 11° API
Production	Wet Oil Tank	100	1	100	Avg 37° API
Production	HP Flare Scrubber	321	1	321	Avg 26° API
Production	Production Separator 1 (MBD-1010)	137	1	137	Avg 46° API
Production	Production Separator 2 (MBD-1020)	137	1	137	Avg 48° API
Production	LP Flare Scrubber	51	1	51	Avg 26° API
Production	LP Separator (MBD-1055)	321	1	321	Avg 43° API
Production	LP Separator Degasser (MBD-1050)	219	1	219	Avg 43° API
Production	Oil Treater Degasser	219	1	219	Avg 39° API
Production	Oil Treater	471	1	471	Avg 39° API
Production	Test Separator (MBD-1000)	137	1	137	Avg 46° API
Production	Diesel Storage Tank	284	1	284	Avg 42° API

Type of Storage Tank	**Type of Facility**	**Tank Capacity (bbls)**	**Number of tanks**	**Total Capacity (bbls)**	**Fluid Gravity (API)**
Fuel Oil Storage Tank	**Drillship**	16,564	1	16,564	No. 2 Diesel - 43
Fuel Oil Storage Tank		16,685.5	1	16,685.5	No. 2 Diesel - 43
Fuel Oil Settleing Tank		836.6	2	1,673.2	No. 2 Diesel - 43
Fuel Oil Day Tanks		836.6	2	1,673.2	No. 2 Diesel - 43

Type of Storage Tank	**Type of Facility**	**Tank Capacity (bbls)**	**Number of tanks**	**Total Capacity (bbls)**	**Fluid Gravity (API)**
Fuel Oil (Marine Diesel)	**DP Semi-Submersible**	164	1	164	30
Fuel Oil Day		367	2	734	30
Emergency Generator		31	1	31	30
Forward Hull Fuel Oil		4634	2	9268	30
Lower Aft Hull Fuel Oil		3462	2	6924	30
Lube Oil Services		117 10.5 4.6	1 1 1	132.1	45
Dirty Lube Oil		38 28	1 1	66	45
Dirty Bilge		190	4	760	10

E. Pollution Prevention Measures

Not applicable. The State of Florida is not an affected State by the proposed activities in this plan.

F. Additional Measures

LLOG does not propose any additional safety, pollution prevention, or early detection measures, beyond those required in 30 CFR 550.

G. Cost Recovery Payment

Included as Attachment A-4 is the Pay.gov receipt in the amount of $21,190.00 for cost recovery fee associated with this plan.

OCS PLAN INFORMATION FORM

Attachment A-1
(Proprietary Information)

OCS PLAN INFORMATION FORM

General Information

Type of OCS Plan:		Exploration Plan (EP)	Development Operations Coordination Document (DOCD) Initial Joint DOCD	Initial

Company Name: LLOG Exploration Offshore, LLC	BOEM Operator Number: GOM 2058
Address:	Contact Person: Nelda Runyon, Regulatory Specialist
1001 Ochsner Boulevard, Suite 100	Phone Number: 985-801-4389
Covington, Louisiana 70433	E-Mail Address: neldar@llog.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$21,190.00	Receipt No.	76146685389

Project and Worst Case Discharge (WCD) Information

Lease(s): OCS-G 33335/G 33341/G 36077	Area: Keathley Canyon	Block(s): 31	Project Name (If Applicable): Salamanca

Objective(s)	X	Oil		Gas		Sulphur		Salt	Onshore Support Base(s): Fourchon, LA

Platform/Well Name: KC736 "E"	Total Volume of WCD: ~12.10 MMBO	API Gravity: 31.7°
Distance to Closest Land (Miles): 214 miles	Volume from uncontrolled blowout: 135,476 bbls	

Have you previously provided information to verify the calculations and assumptions for your WCD?	X	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-8023			
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?	X	Yes		No
Do you propose any facility that will serve as a host facility for deepwater subsea development?	X	Yes		No

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

Proposed Activity	Start Date	End Date	No. of Days
Exploration drilling			SEE ATTACHED SCHEDULE
Development drilling			
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 manifolds			
Installation of lease term pipelines			
Commence production			
Other (Specify and attach description)			

Description of Drilling Rig

	Jackup	X	Drillship		Caisson		Tension leg platform
	Gorilla Jackup		Platform rig		Fixed platform		Compliant tower
	Semisubmersible		Submersible		Spar		Guyed tower
X	DP Semisubmersible		Other (Attach Description)		Floating production system		Other (Attach Description)

Drilling Rig Name (If Known):

Description of Lease Term Pipelines

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): KC 689 "A"					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 45,260 bbls/day				For structures, volume of all storage and pipelines (Bbls): 2439 bbls		API Gravity of fluid		32.1°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS Unleased	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	689		
Blockline Departures (in feet)	N/S Departure: F S L 6820.00'	N/S Departure: F L	N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: F W L 7080.00'	E/W Departure: F L	E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 1,797,000.00	X:	X: X: X:
	Y: 9,542.500.00	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 17' 51.158"N	Latitude	Latitude Latitude Latitude
	Longitude 92° 31' 18.857"W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6405'		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): 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 supplied above, not necessary)

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. #2					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?			X	Yes			No		
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 102,017 bbls		For structures, volume of all storage and pipelines (Bbls): N/A		API Gravity of fluid	30.3°			

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 33341	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	686		
Blockline Departures (in feet)	N/S Departure: F N L 881' E/W Departure: F E L 1,173'	N/S Departure: F___ L E/W Departure: F___ L	N/S Departure: F___ L N/S Departure: F___ L N/S Departure: F___ L E/W Departure: F___ L E/W Departure: F___ L E/W Departure: F___ L
Lambert X-Y coordinates	X: 1,757,067.00 Y: 9,550,639.00	X: Y:	X: X: X: Y: Y: Y:
Latitude/ Longitude	Latitude 26° 19' 13.076" N Longitude 92° 38' 37.541" W	Latitude Longitude	Latitude Latitude Latitude Longitude Longitude Longitude
Water Depth (Feet): 6,147		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Well 003				Previously reviewed under an approved EP or DOCD?	X	Yes		No
Is this an existing well or structure?		Yes X		No	If this is an existing well or structure, list the Complex ID or API No. 608084006400	S-7941	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?					X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 102,017 bbls/day		For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid	30.3°	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 33341	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	686		
Blockline Departures (in feet)	N/S Departure: F N L 938.12'	N/S Departure: F L	N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: F E L 1,192.04'	E/W Departure: F E L	E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 1,757,047.96'	X:	X: X: X:
	Y: 9,550,581.88'	Y: 9	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 19' 12.510" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 38' 37.752" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,147		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. #4					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 102,017 bbls/day	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	30.3°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 33341	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	686		
Blockline Departures (in feet)	N/S Departure: F N L 927'	N/S Departure: F___ L	N/S Departure: F___ L N/S Departure: F___ L N/S Departure: F___ L
	E/W Departure: F E L 1,001'	E/W Departure: F___ L	E/W Departure: F___ L E/W Departure: F___ L E/W Departure: F___ L
Lambert X-Y coordinates	X: 1,757,239.00	X:	X: X: X:
	Y: 9,550,593.00	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 19' 12.615" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 38' 35.651" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,147		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. Alt #4					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 102,017 bbls/day	For structures, volume of all storage and pipelines (Bbls): N/A	API Gravity of fluid	30.3°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 33341	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	686		
Blockline Departures (in feet)	N/S Departure: F N L 902'	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 1,001'	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 1,757,239.00	X:	X: X: X:
	Y: 9,550,618.00	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 19' 12.863" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 38' 35.650" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,147'		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. F (#3)					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 135,476 bbls/day				For structures, volume of all storage and pipelines (Bbls): N/A		API Gravity of fluid		31.7°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 36077	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	736		
Blockline Departures (in feet)	N/S Departure: F S L 2,401.54	N/S Departure: F L	N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: F W L 6,516.19	E/W Departure: F L	E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 1,843,956.19	X:	X: X: X:
	Y: 9,522,241.54	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 14' 28.464" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 22' 43.811" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,688		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. Alt F					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 135,476 bbls/day		For structures, volume of all storage and pipelines (Bbls): N/A			API Gravity of fluid		31.7°	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 36077	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	736		
Blockline Departures (in feet)	N/S Departure: F S 2,451.54 L E/W Departure: F W 6,516.19 L	N/S Departure: F____ L E/W Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 1,843,956.19 Y: 9,522,291.54	X: Y:	X: X: X: Y: Y: Y:
Latitude/ Longitude	Latitude 26° 14' 28.959" N Longitude 92° 22' 43.808" W	Latitude Longitude	Latitude Latitude Latitude Longitude Longitude Longitude
Water Depth (Feet): 6,702		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. G					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 135,476 bbls/day				For structures, volume of all storage and pipelines (Bbls): N/A		API Gravity of fluid		31.7°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 36077	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	736		
Blockline Departures (in feet)	N/S Departure: F S L 2,426.54	N/S Departure: F____ L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 6,516.19	E/W Departure: F____ L	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 1,843,956.19	X:	X: X: X:
	Y: 9,522,266.54	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 14' 28.711" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 22' 43.809" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,689		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

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

Proposed Well/Structure Location

Well or Structure Name/Number (If renaming well or structure, reference previous name): Loc. Alt G					Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes		No X	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						X	Yes		No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 135,476 bbls/day				For structures, volume of all storage and pipelines (Bbls): N/A		API Gravity of fluid		31.7°

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS OCS-G 36077	OCS	OCS OCS
Area Name	Keathley Canyon		
Block No.	736		
Blockline Departures (in feet)	N/S Departure: F S L 2,501.54	N/S Departure: F L	N/S Departure: F L N/S Departure: F L N/S Departure: F L
	E/W Departure: F W L 6,516.19	E/W Departure: F L	E/W Departure: F L E/W Departure: F L E/W Departure: F L
Lambert X-Y coordinates	X: 1,843,956.19	X:	X: X: X:
	Y: 9,522,341.54	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude 26° 14' 29.454" N	Latitude	Latitude Latitude Latitude
	Longitude 92° 22' 43.805" W	Longitude	Longitude Longitude Longitude
Water Depth (Feet): 6,684		MD (Feet): / TVD (Feet):	MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet): MD (Feet): / TVD (Feet):
Anchor Radius (if applicable) in feet:		N/A	

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

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

JOINT INITIAL
DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

Keathley Canyono Blocks 642, 686, 736 and 689
OCS-G 33335, OCS-G 33341 and OCS-G 36077

ACTIVITY SCHEDULE

Drilling & Completion Schedule – wells drilled production

Leon & Castile Development		Planned Durations		
Well	**Ops**	**Start**	**Days**	**End**
Leon KC 686 #4	Drill TA	06/1/2023	77	08/16/2023
Leon KC 642 #2	Drill TA	09/01/2023	74	11/13/2023
Castile KC 736 #3	Drill TA	11/24/2023	72	02/04/2024
Leon KC 686 #4	Completion - 4FP	01/12/2024	60	03/12/2024
Leon KC 642 #2	Completion - 4FP	04/02/2024	60	06/01/2024
Castile KC 736 #3	Completion - 3FP IWS	06/01/2024	60	07/31/2024

Well drilled/completed post production

Leon KC 686 #3 – Completion only on 11/01/2027 – 12/31/2027 (60 days)
Castile KC 736 #4 – Drill 11/01/2025 – 01/12/2026 (72 days)
Castile KC 736 #4 – Completion 01/12/2026 – 03/11/2026 (60 days)

Proposed Activity	*Start Date*	*End Date*	*No. of Days*
Install Platform Suction Piles and Preset Mooring Lines	9/12/2023	10/12/2023	30
Pre Lay Manifolds, Suction Piles, Sleepers, Arrays, Prelay Survey	2/10/2024	3/11/2024	30
Sail away of Salamanca's Semi Submersible Floating Platform to KC 689 (Platform A)	3/9/2024	3/24/2024	15
Installation of Salamanca's Semi Submersible Floating Platform in KC 689 (Platform A)	3/24/2024	4/23/2024	30
Commence installation of two (2) ROW flowlines at KC 736 (Castille)	4/25/2024	5/25/2024	30
Commence installation of two (2) LT rigid jumpers for KC 736 SS003 and SS004	8/1/2024	8/11/2024	10
Commence installation of one (1) ROW umbilical for KC 736 (Castille)	3/24/2024	4/3/2024	10
Commence installation of two (2) ROW flowlines at KC 686 (Leon)	4/10/2024	5/10/2024	30
Commence installation of three (3) LT rigid jumpers for KC 642 Well SS002 and KC 686 Well SS003 and SS004 (Leon)	6/2/2024	6/17/2024	15
Commence installation of one (1) ROW umbilical for KC 686 (Leon)	3/9/2024	3/24/2024	15
Flying Leads, Hydro Support, Pile Anchoring, Jumpers, Dewatering Export	5/8/2024	6/22/2024	45
Commence installation of two (2) ROW production export pipelines from Platform A	5/25/2024	9/12/2024	110
Hook up and Commence Production from Platform A	4/20/2024	10/23/2024	186
Production Start Date	10/23/2024	10/23/2024	1

Castile DOCD
2 wells – KC 736 #3 and KC 736 #4
Single 8" flowline tieback to Salamanca in KC 689
3 hub PLET

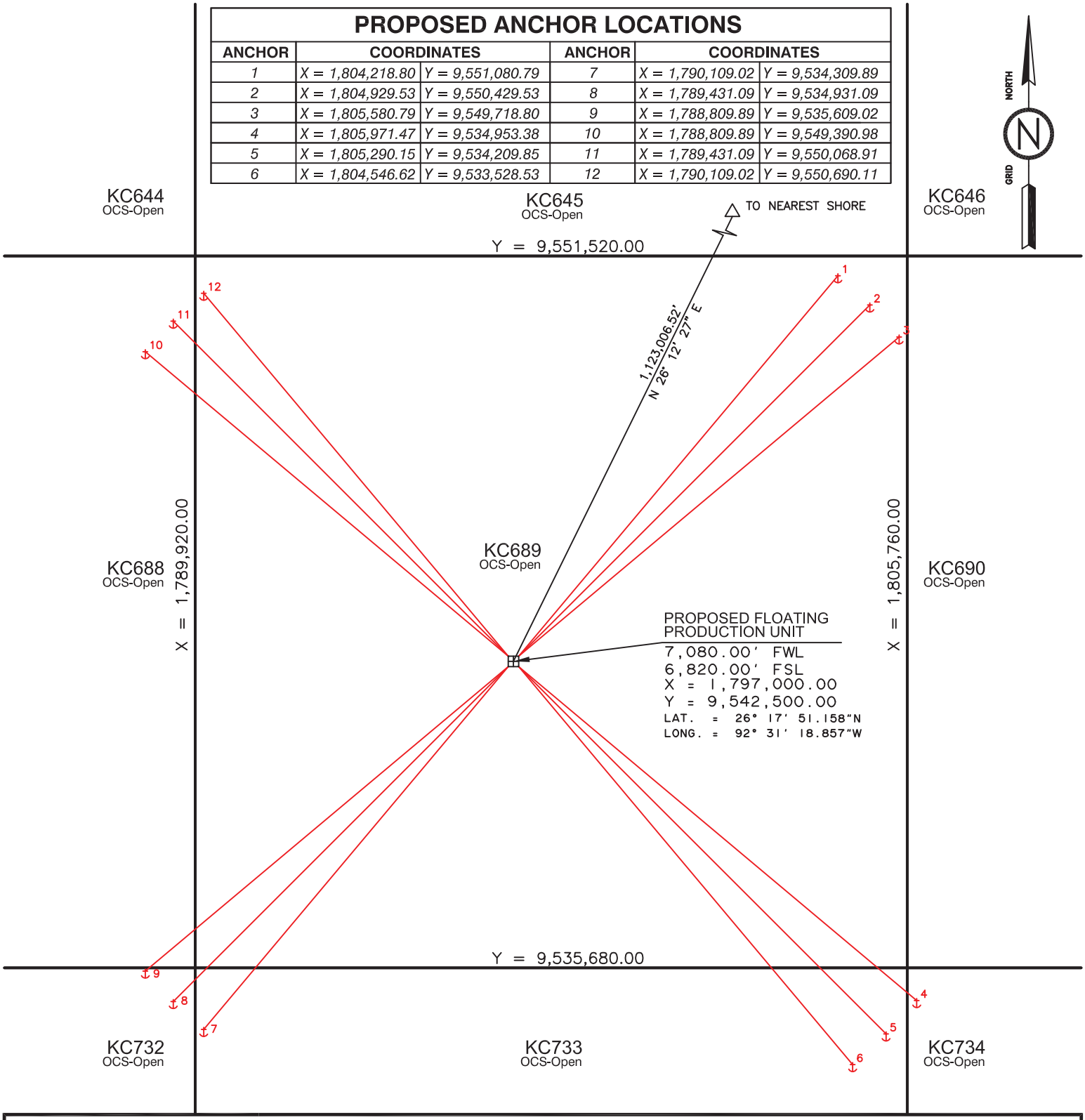
Leon DOCD
3 wells – KC 642 #2, KC 686 #3 and KC 686 #4
Dual 8" flowline tieback to Salamanca in KC 689
4-slot manifold

WELL LOCATION PLATS

Attachment A-2
(Proprietary Information)

PROPOSED ANCHOR LOCATIONS

ANCHOR	COORDINATES		ANCHOR	COORDINATES	
1	X = 1,804,218.80	Y = 9,551,080.79	7	X = 1,790,109.02	Y = 9,534,309.89
2	X = 1,804,929.53	Y = 9,550,429.53	8	X = 1,789,431.09	Y = 9,534,931.09
3	X = 1,805,580.79	Y = 9,549,718.80	9	X = 1,788,809.89	Y = 9,535,609.02
4	X = 1,805,971.47	Y = 9,534,953.38	10	X = 1,788,809.89	Y = 9,549,390.98
5	X = 1,805,290.15	Y = 9,534,209.85	11	X = 1,789,431.09	Y = 9,550,068.91
6	X = 1,804,546.62	Y = 9,533,528.53	12	X = 1,790,109.02	Y = 9,550,690.11



LLOG EXPLORATION OFFSHORE, L.L.C.

LLOG exploration

Echo OFFSHORE LLC
36499 Perkins Road
Prairieville, Louisiana 70769
Tel: 225-673-2163

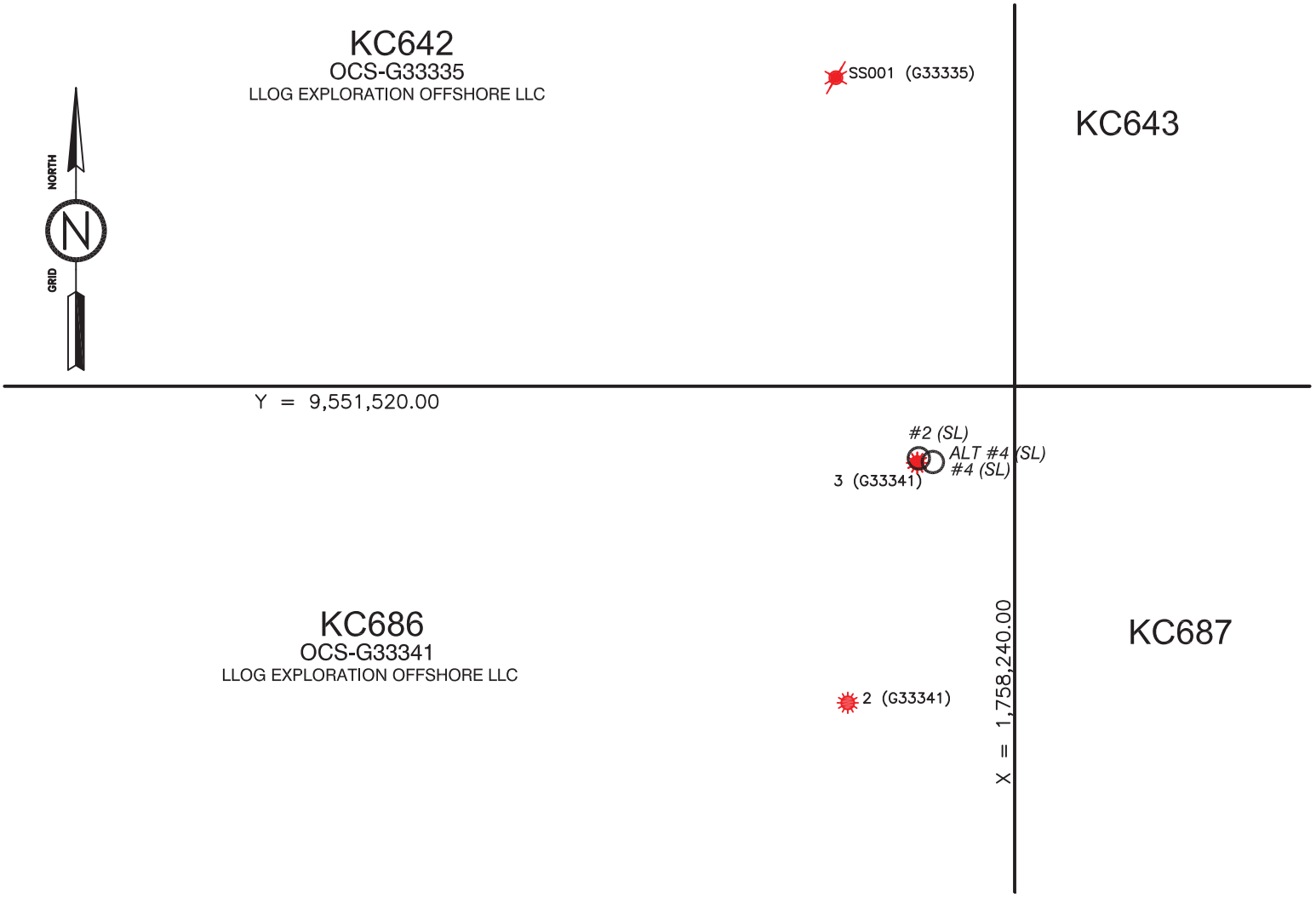
1,500 0 1,500 3,000
SCALE IN FEET

LOCATION PLAT

PROPOSED FLOATING PRODUCTION UNIT
BLOCK 689
KEATHLEY CANYON AREA

GULF OF MEXICO

DRAWN BY: RJN	CHK. BY.: MEK	REV. No.:	JOB No.: 21-024	DWG No.: 21-024-PLAT
DATUM: NAD 27	SPHEROID: CLARKE 1866	PROJECTION: U.T.M.	ZONE: 15	DATE: 9/14/2021	REV. DATE:	SCALE: 1"=3,000'	SHEET 1 OF 1



PROPOSED WELL LOCATIONS

LOCATION	BLOCK	CALLS		COORDINATES		LATITUDE	LONGITUDE	WD	MD	TVD
#2 (SL)	*KC/686*	*1,173.00' FEL*	*881.00' FNL*	*X = 1,757,067.00*	*Y = 9,550,639.00*	*26° 19' 13.076"N*	*92° 38' 37.541"W*	*6,147'*		
#4 (SL)	*KC/686*	*1,001.00' FEL*	*927.00' FNL*	*X = 1,757,239.00*	*Y = 9,550,593.00*	*26° 19' 12.615"N*	*92° 38' 35.651"W*	*6,147'*		
ALT #4 (SL)	*KC/686*	*1,001.00' FEL*	*902.00' FNL*	*X = 1,757,239.00*	*Y = 9,550,618.00*	*26° 19' 12.863"N*	*92° 38' 35.650"W*	*6,147'*		

PUBLIC INFORMATION

LLOG EXPLORATION OFFSHORE, L.L.C.

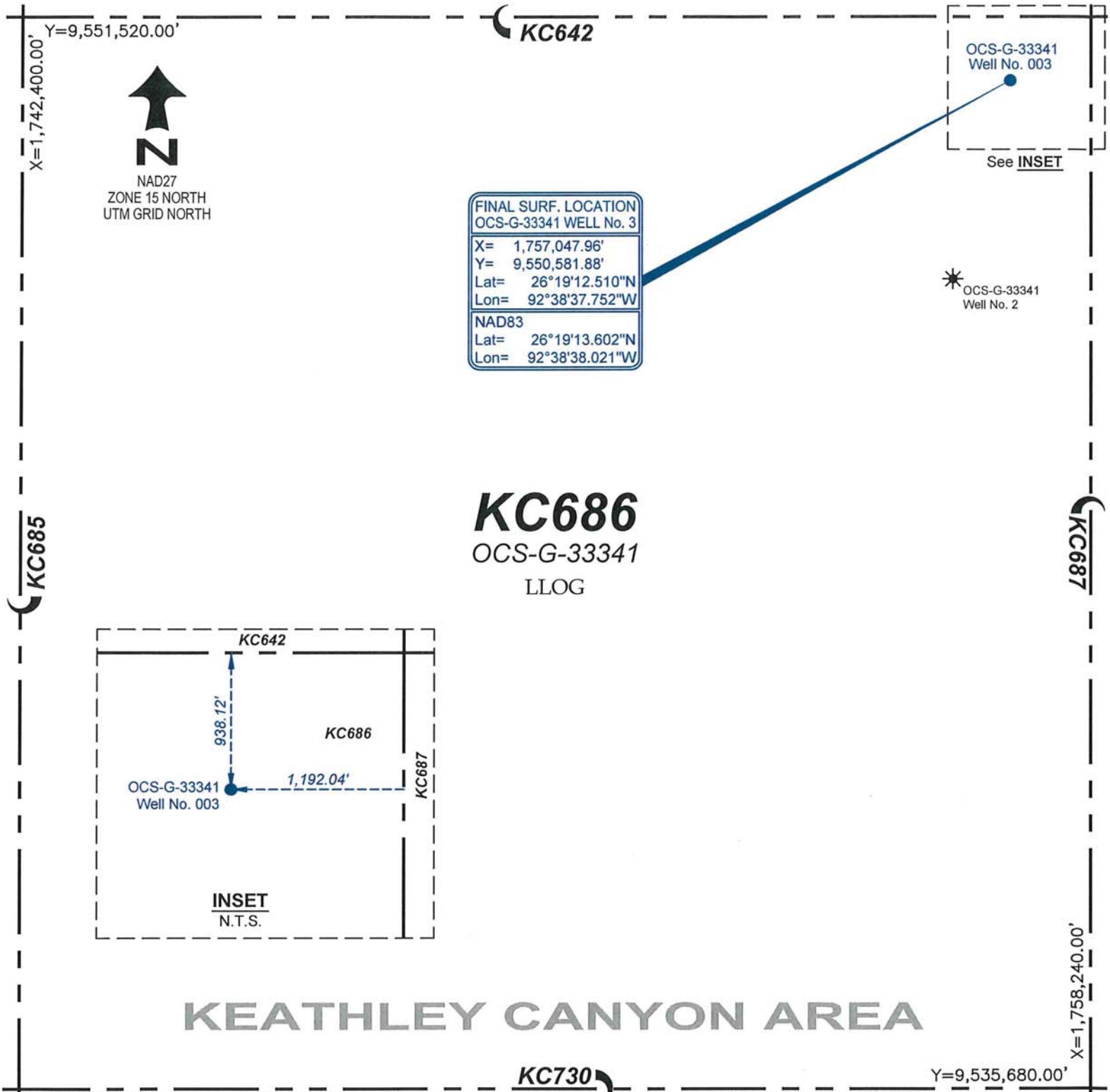
LLOG exploration

Echo OFFSHORE LLC
36499 Perkins Road
Prairieville, Louisiana 70769
Tel: 225-673-2163

1,000 0 1,000 2,000
SCALE IN FEET

DOCD PLAT
PROPOSED WELLS
KC642#2 (G33335), KC686#4 & ALT #4 (G33341)
BLOCKS 686 & 642
KEATHLEY CANYON AREA
GULF OF MEXICO

DRAWN BY: RJN	CHK. BY.: MEK	REV. No.: 2	JOB No.: 21-038	DWG No.: 21-038-EXP
DATUM: NAD 27	SPHEROID: CLARKE 1866	PROJECTION: U.T.M.	ZONE: 15	DATE: 9/8/2021	REV. DATE: 9/23/2021	SCALE: 1"=2,000'	SHEET 1 OF 1



THE RIG *WEST NEPTUNE* SPUD IN WELL AUGUST 2, 2019
TRANSFORMATION METHOD (WGS84 ≡ NAD83 to NAD27) = NADCON v2.1

PUBLIC INFORMATION

I, RALPH A. COLEMAN, HEREBY CERTIFY THAT THE ABOVE FINAL SURFACE LOCATION IS CORRECT.

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

RALPH A. COLEMAN
PROFESSIONAL LAND SURVEYOR
LOUISIANA REGISTRATION No. 4691

LLOG exploration

OCS-G-33341 Well No. 003 ST00BP00

BLOCK 686 - KEATHLEY CANYON AREA

2,000 0 2,000

U.S. SURVEY FEET (1"=2,000')

PREPARED BY: OCEANEERING®

OCEANEERING INTERNATIONAL, INC.
730 E. KALISTE SALOOM RD.
LAFAYETTE, LA 70508
(337) 210-0000
LA Reg. No. 747

JOB: 200138	DRW: JRD	DATE: AUGUST 2, 2019	
CKD: MCM	APP: RAC	SHEET 1 of 1	REV. 0
DOC: 200138-OII-DRW-ASD-001-01			

SIZE: 8.5" X 11" DATE: 08/02/2019 TIME: 13:29 FILENAME: M:\200138\MAPS\200138-OII-DRW-ASD-001.DWG

Y= 9,535,680

LLOG EXPLORATION OFFSHORE, INC.

OCS-G 36077

KC 736

X= 1,837,440

X= 1,853,280

Y= 9,519,840

Surface Location F:
X: 1,843,956.19 Y: 9,522,241.54
Lat: 26 deg, 14 min, 28.463 sec
Long: 92 deg, 22min, 43.810 sec
6516.19' FWL 2401.54' FSL
(NAD27)

Surface Location Alt F:
X: 1,843,956.19 Y: 9,522,291.54
Lat: 26 deg, 14 min, 28.959 sec
Long: 92 deg, 22min, 43.808 sec
6516.19' FWL 2451.54' FSL
(NAD27)

Surface Location G:
X: 1,843,956.19 Y: 9,522,266.54
Lat: 26 deg, 14 min, 28.711 sec
Long: 92 deg, 22min, 43.810 sec
6516.19' FWL 2426.54' FSL
(NAD27)

Surface Location Alt G:
X: 1,843,956.19 Y: 9,522,341.54
Lat: 26 deg, 14 min, 29.454 sec
Long: 92 deg, 22min, 43.809 sec
6516.19' FWL 2501.54' FSL
(NAD27)

Public

LLOG exploration

Keathley Canyon Block 736

Gulf of Mexico

Location Map

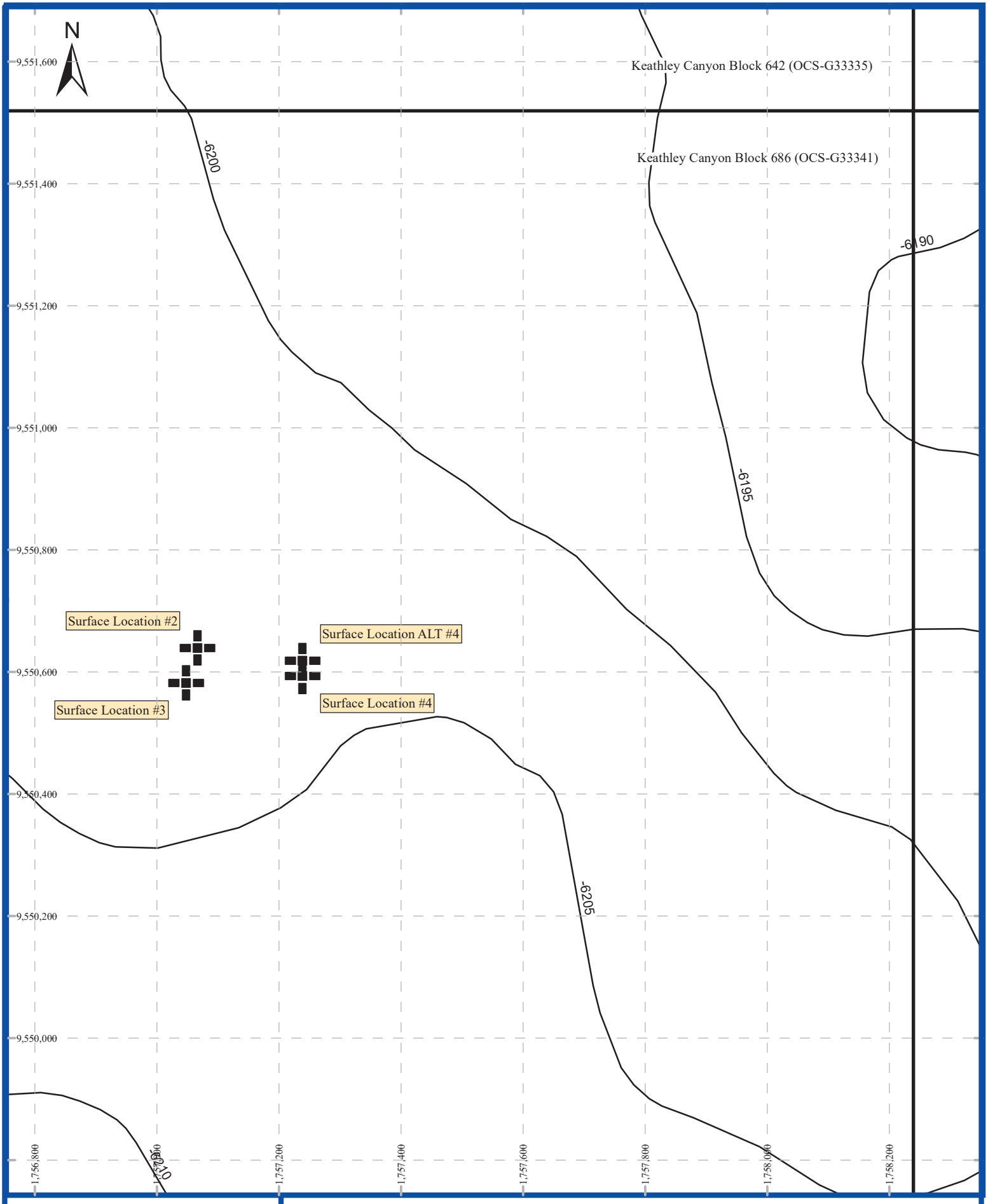
0' 1000' 2000'

8/21

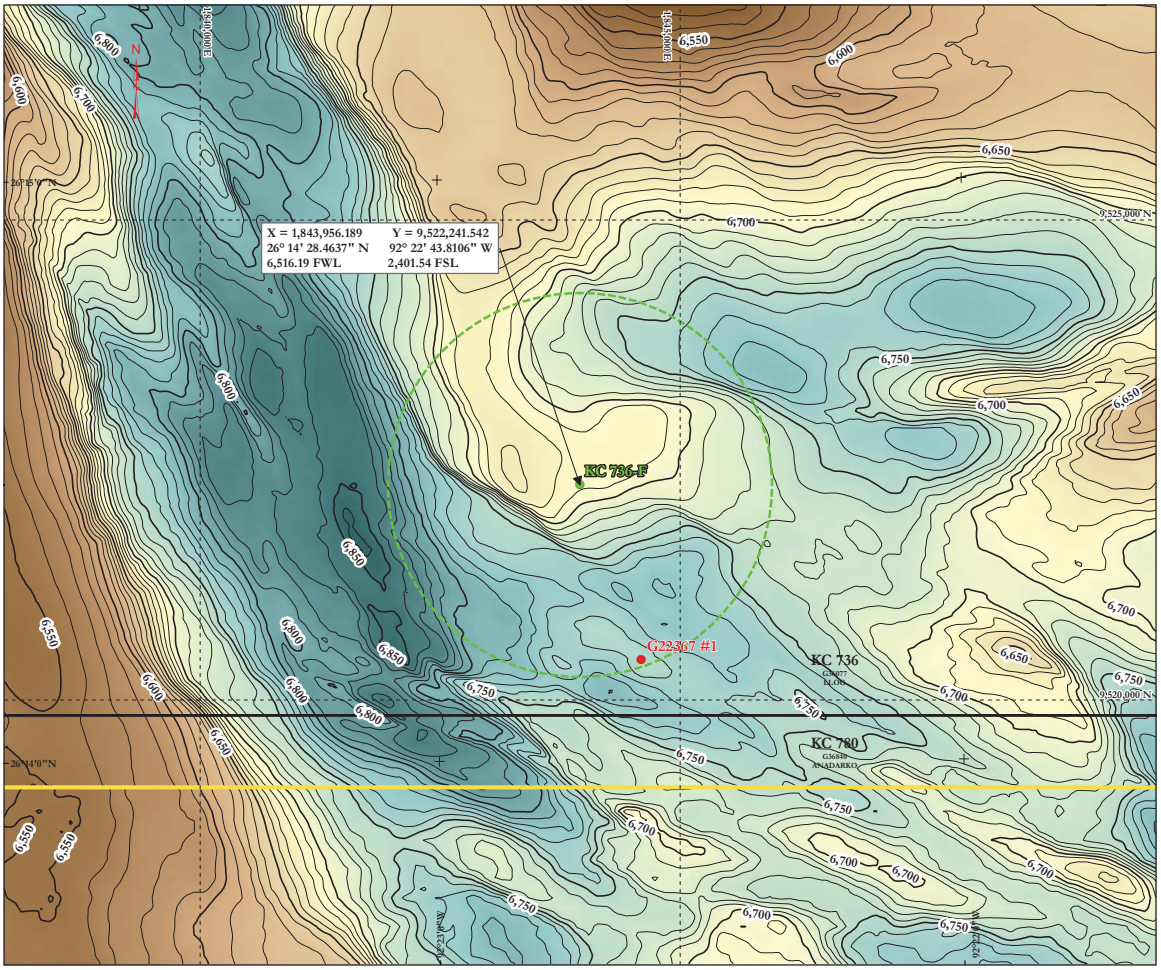
Geo: Cody Lewis

BATHYMETRY MAP

Attachment A-3
(Proprietary Information)



Bathymetry Plat



Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Lines
- Study Area
- Existing Well
- Proposed Well
- 2,000-ft Radius Circle
- 10-ft Contour
- 50-ft Contour

Depths
(Below Sea Level)

6,519 ft

6,862 ft

Grid Information:
Data Source:
AUV Multibeam
Method: Kriging
Spacing: 10 ft
Search Radius: 30 ft

Data Source: 3-D Seismic
Method: Kriging
Spacing: 100 ft
Search Radius: 150 ft

NOTE:
Bathymetry infromation were obtained from GEMS project number 0720-2977

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

Geodetic Datum: NAD27 Projection: UTM Zone: 15N Grid Units: Feet	Interpretation By: B. Berger Cartography: T. Nguyen Project No.: 21-06-11 Date: August 2021

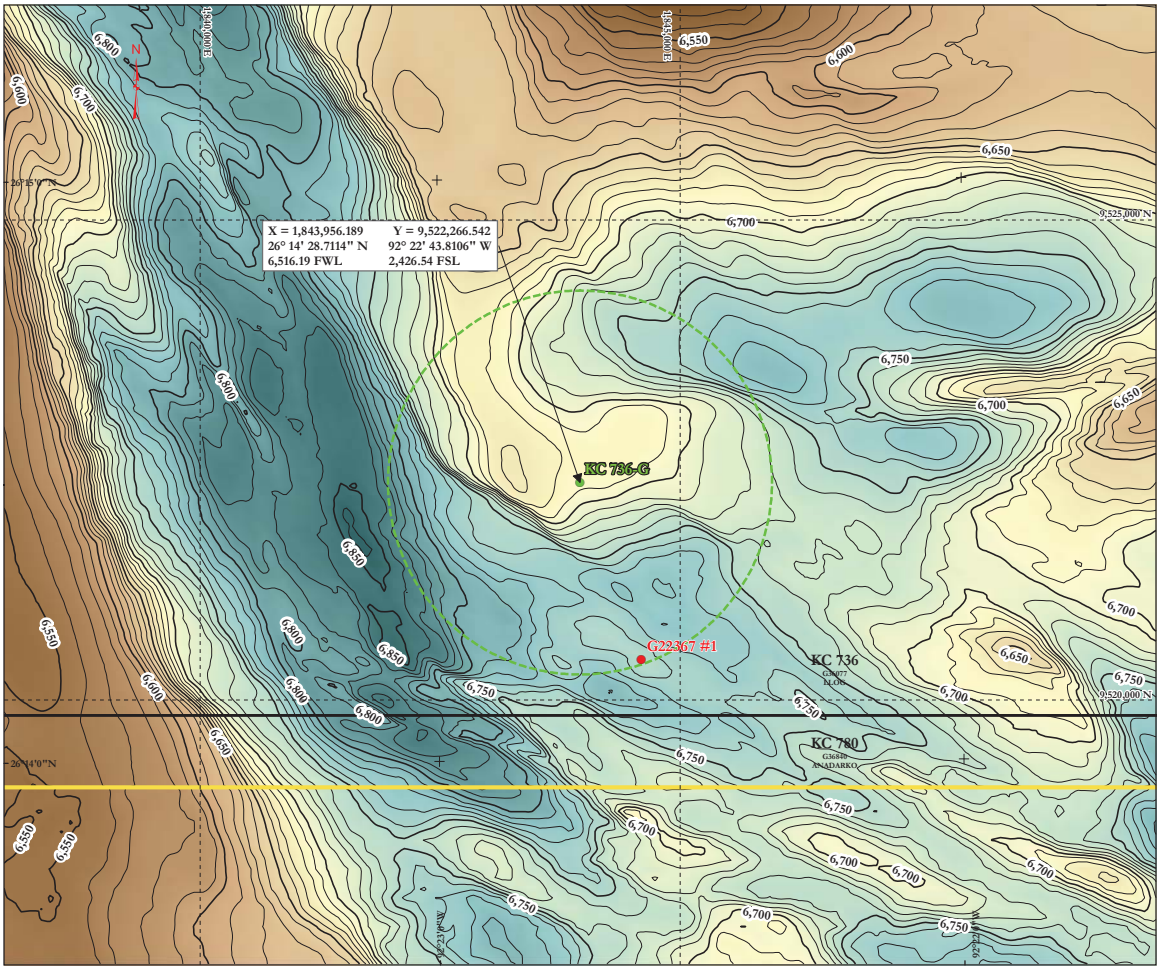
0 500 1,000 1,500 2,000 Feet

Scale = 1:12,000

Block 736
Keathley Canyon Area
Gulf of Mexico

Map W-1
Bathymetry
Proposed Well KC 736-F
Lease No. G36077

Map Prepared by:
Berger Geosciences, LLC.



Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Lines
- Study Area
- Existing Well
- Proposed Well
- 2,000-ft Radius Circle
- 10-ft Contour
- 50-ft Contour

Depths
(Below Sea Level)

6,519 ft

6,862 ft

Grid Information:
Data Source:
AUV Multibeam
Method: Kriging
Spacing: 10 ft
Search Radius: 30 ft

Data Source: 3-D Seismic
Method: Kriging
Spacing: 100 ft
Search Radius: 150 ft

NOTE:
Bathymetry infromation were obtained from GEMS project number 0720-2977

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

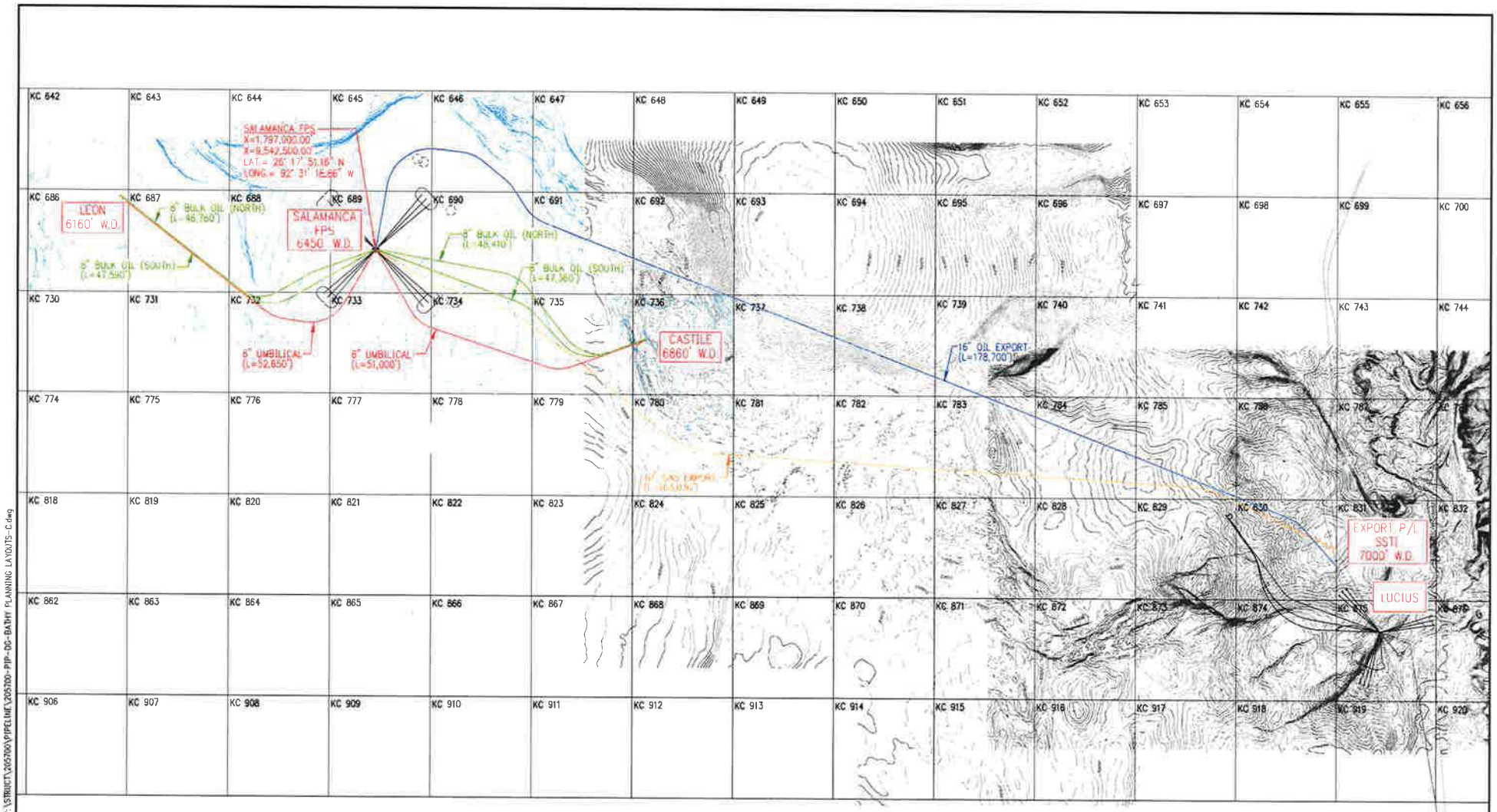
Geodetic Datum: NAD27 Projection: UTM Zone: 15N Grid Units: Feet	Interpretation By: B. Berger Cartography: T. Nguyen Project No.: 21-06-II Date: August 2021

0 500 1,000 1,500 2,000 Feet

Scale = 1:12,000

Block 736
Keathley Canyon Area
Gulf of Mexico

Map W-5
Bathymetry
Proposed Well KC 736-G
Lease No. G36077



SEP 10 2021

ISSUED FOR INFORMATION

NOTES

NO.	DATE	DESCRIPTION	BY	APP'D
C	9-10-21	ISSUED FOR INFORMATION	ROD	AAL
B	9-3-21	ISSUED FOR INFORMATION	ROD	AAL
A	9-1-21	ISSUED FOR INFORMATION	ROD	AAL

PINNACLE ENGINEERING

TX REGISTERED ENGR FIRM F-567

APPROVAL	
Drawn By	R. DITTCOFF
Date	9.1.21
Checked By	
Date	
Designed By	
Date	
Approved By	
Date	

LLOG exploration

LEON/CASTILE SUBSEA DEVELOPMENT

KEATHLY CANYON AREA

BATHYMETRY PLANNING MAP FOR LEON/CASTILE

DWG. NO. 205700-PIP-DG-BATHY PLAN-C

COST RECOVERY PAYMENT

Attachment A-4
(Public Information)

Your payment has been submitted to the designated government agency through Pay.gov and the details are below. Please note that this is just a confirmation of transaction submission. To confirm that the payment processed as expected, you may refer to your bank statement on the scheduled payment date. If you have any questions or wish to cancel this payment, you will need to contact the agency you paid at your earliest convenience.

Application Name: BOEM Development/DOCD Plan - BD
Pay.gov Tracking ID: 26TB2L5G
Agency Tracking ID: 76146685389

Account Holder Name: LLOG Exploration Offshore, LLC
Transaction Type: ACH Debit
Transaction Amount: $21,190.00
Payment Date: 09/15/2021

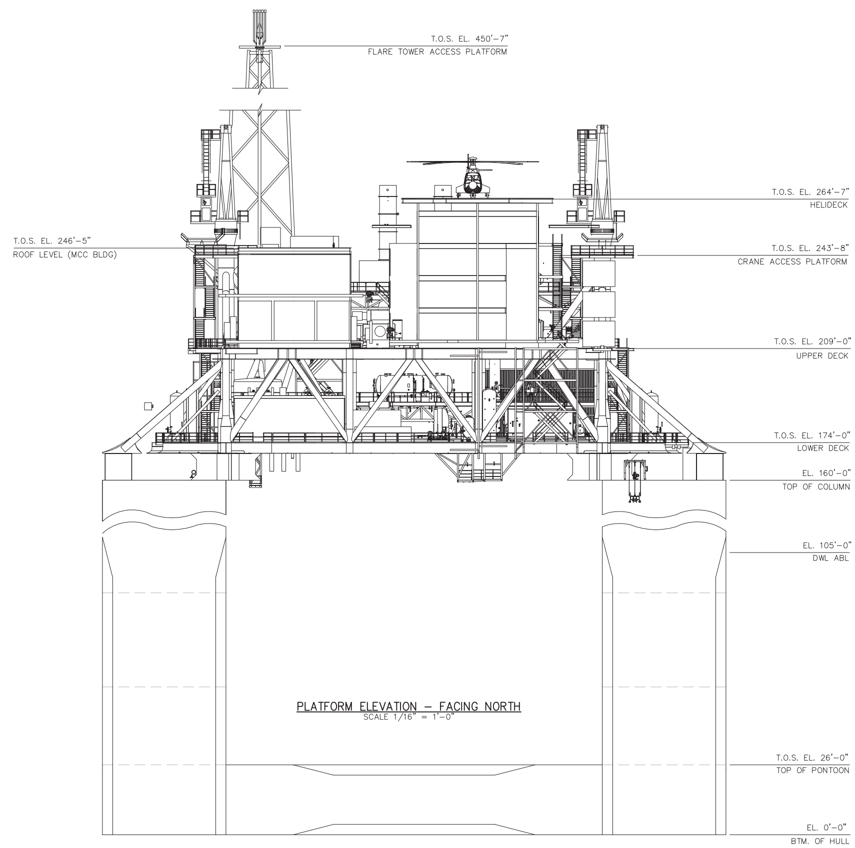
Account Type: Business Checking
Routing Number: 065403626
Account Number: **********8323

Transaction Date: 09/14/2021 04:49:34 PM EDT
Total Payments Scheduled: 1
Frequency: OneTime

Region: Gulf of Mexico
Contact: John Richard 9858014300
Company Name/No: LLOG Exploration Offshore, L.L.C., 02058
Lease Number(s): 33335, 33341, 35077, ,
Area-Block: Keathley Canyon KC, 642: Keathley Canyon KC, 686: Keathley Canyon KC, 736: , : ,
Type-Wells: Initial Plan, 5

STRUCTURE ELEVATION DRAWINGS

Attachment A-5
(Public Information)



PLATFORM ELEVATION – FACING NORTH
SCALE 1/16" = 1'-0"

ISSUE PURPOSE: **FOR REVIEW**
PROFESSIONAL ENGINEER: **SEAN CROSS LA PE 44570**
AUDUBON ENGINEERING: **LA REG NO. 0005005**
THIS PRELIMINARY DELIVERABLE IS RELEASED FOR THE PURPOSE SHOWN ABOVE, UNDER THE AUTHORITY OF THE STATE PROFESSIONAL ENGINEER. IT IS NOT TO BE USED FOR CONSTRUCTION, PERMITTING OR ANY OTHER PURPOSES.

ISSUED FOR REVIEW

NOTES

REFERENCE DRAWINGS

DWG. NO.	DESCRIPTION

REVISIONS

REV.	DESCRIPTION	DRWN	CHKD	APPRV	DATE
A	ISSUED FOR REVIEW	BEL	MAM	RTH	15SEP21

PROJECT INFO.

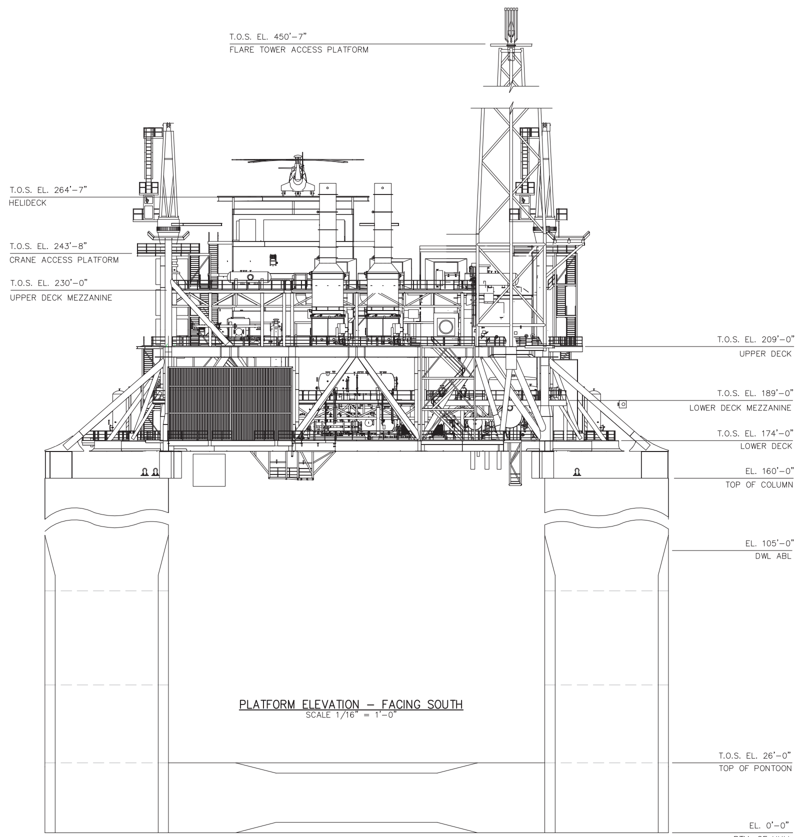
DRAWN BY: BEL	DATE: 15SEP21
AEC JOB NO.: 021488	
AFE/P.O. NO.:	
CLIENT FILE NO.:	
SCALE: NONE	

audubon Engineering
111 VETERANS BLVD.
SUITE 1200
METAIRIE, LA 70005
PHONE: (504) 833-5669
LA REG. NO. EF.0005005

LLOG exploration

TITLE: PLATFORM ELEVATION
FACING NORTH
SALAMANCA PRODUCTION FACILITY
PLATFORM "A" KEATHLEY CANYON BLOCK 689

DWG. NO.: KC689A-G1005 REV.: A



PLATFORM ELEVATION – FACING SOUTH
SCALE 1/16" = 1'-0"

ISSUE PURPOSE: **FOR REVIEW**
PROFESSIONAL ENGINEER: **SEAN CROSS LA PE 44570**
AUDUBON ENGINEERING: **LA REG NO. 0005005**
THIS PRELIMINARY DELIVERABLE IS RELEASED FOR THE PURPOSE SHOWN ABOVE, UNDER THE AUTHORITY OF THE STATE PROFESSIONAL ENGINEER. IT IS NOT TO BE USED FOR CONSTRUCTION, PERMITTING OR ANY OTHER PURPOSES.

ISSUED FOR REVIEW

NOTES

REFERENCE DRAWINGS

DWG. NO.	DESCRIPTION

REVISIONS

REV.	DESCRIPTION	DRWN	CHKD	APPRV	DATE
A	ISSUED FOR REVIEW	BEL	MAM	RTH	15SEP21

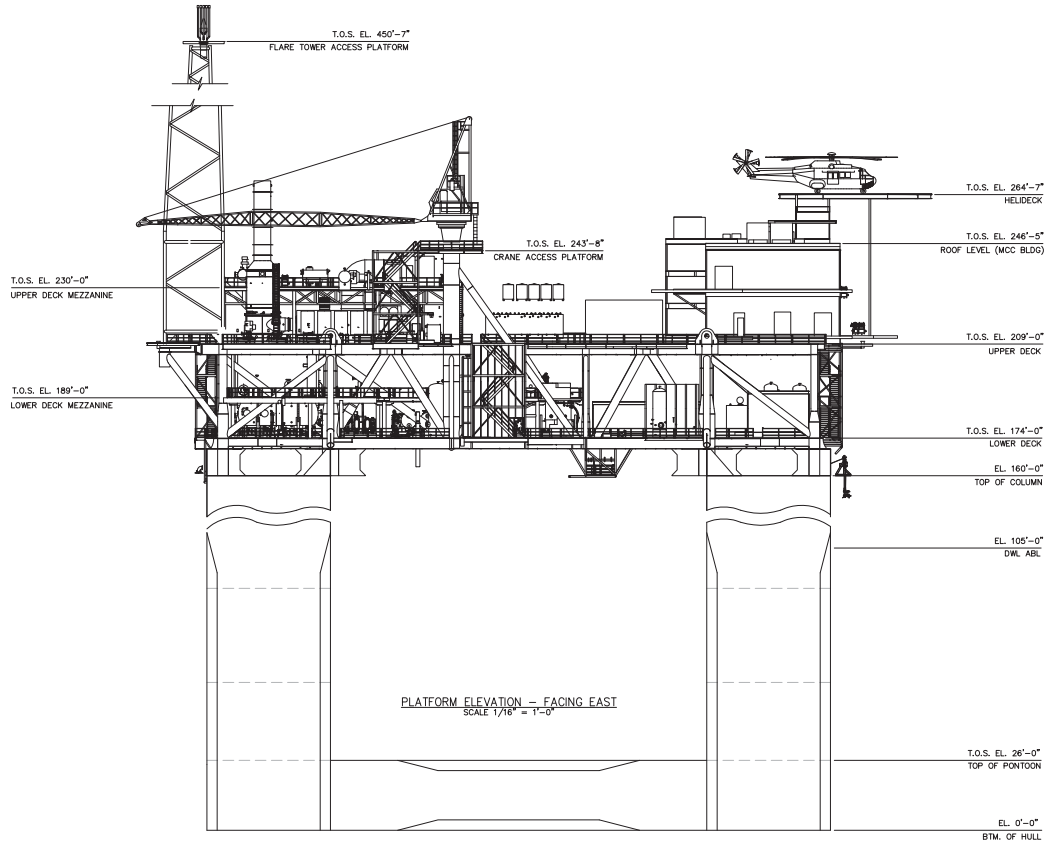
PROJECT INFO.

DRAWN BY: BEL	DATE: 15SEP21
AEC JOB NO.: 021488	
AFE/P.O. NO.:	
CLIENT FILE NO.:	
SCALE: NONE	

audubon Engineering
111 VETERANS BLVD.
SUITE 1200
METAIRIE, LA 70005
PHONE: (504) 833-5669
LA REG. NO. EF.0005005

LLOG exploration

TITLE: PLATFORM ELEVATION
FACING SOUTH
SALAMANCA PRODUCTION FACILITY
PLATFORM "A" KEATHLEY CANYON BLOCK 689
DWG. NO. KC689A-G1006
REV. A



PLATFORM ELEVATION – FACING EAST
SCALE 1/16" = 1'-0"

ISSUED FOR REVIEW

NOTES

REFERENCE DRAWINGS		REVISIONS						PROJECT INFO.	
DWG. NO.	DESCRIPTION	REV.	DESCRIPTION	DRWN	CHKD	APPRV	DATE	DRAWN BY	DATE
								BEL	15SEP21
								AEC JOB NO.	021488
								AFE/P.O. NO.	
								CLIENT FILE NO.	
		A	ISSUED FOR REVIEW	BEL	MAM	RTH	15SEP21	SCALE	NONE

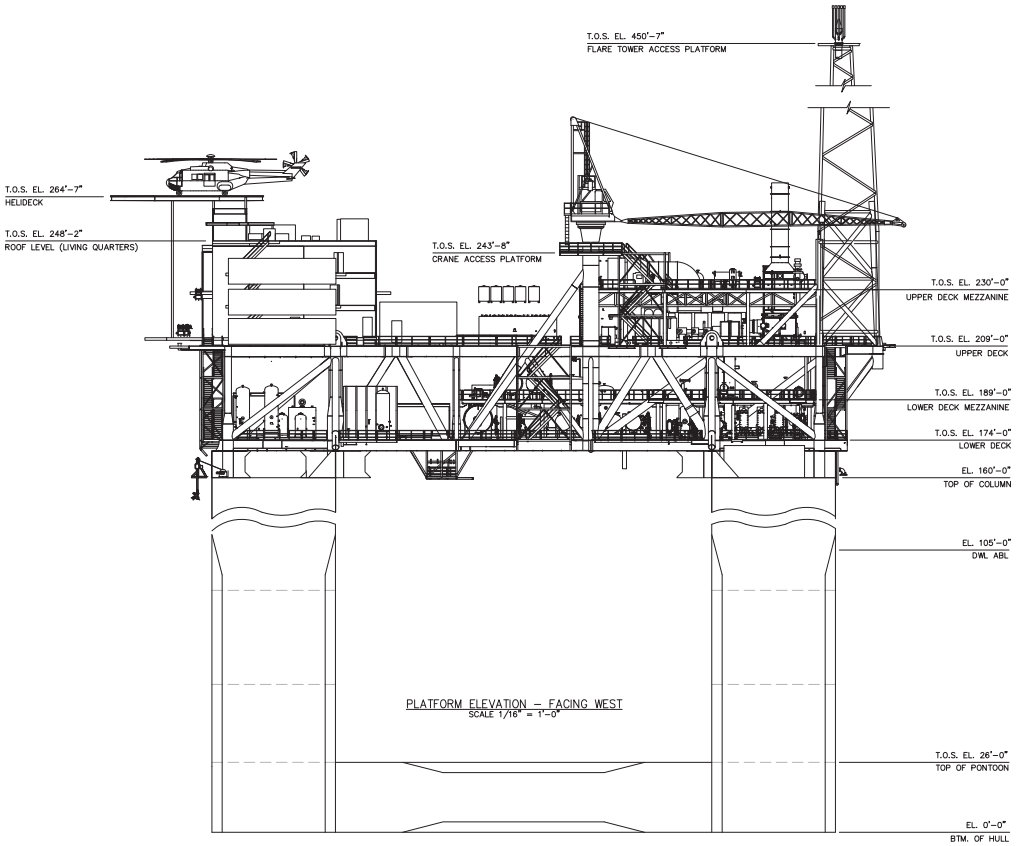
audubon Engineering
111 VETERANS BLVD.
SUITE 1200
METAIRIE, LA 70005
PHONE: (504) 833-5669
LA REG. NO. E7.0000005

LLOG exploration

TITLE: PLATFORM ELEVATION
FACING EAST
SALAMANCA PRODUCTION FACILITY
PLATFORM "A"
KEATHLEY CANYON BLOCK 689

DWG. NO. KC689A-G1007
REV. A

Drawing name: \\audubon-engineering.com\shares\AEC Projects\LLOG\Salamanca\021488-300\300_Mechanical\170_Drawings\01_GA's\Working\KC689-G1007.dwg Plotted on: Sep 15, 2021 - 2:38pm



PLATFORM ELEVATION – FACING WEST
SCALE 1/16" = 1'-0"

ISSUED FOR REVIEW

NOTES

REFERENCE DRAWINGS

DWG. NO.	DESCRIPTION

REVISIONS

REV.	DESCRIPTION	DRWN	CHKD	APPRV	DATE
A	ISSUED FOR REVIEW	BEL	MAM	RTH	15SEP21

PROJECT INFO.

DRAWN BY	DATE
BEL	15SEP21
AEC JOB NO.	021488
AFE/P.O. NO.	
CLIENT FILE NO.	
SCALE	NONE

audubon
Engineering
111 VETERANS BLVD.
SUITE 1200
METAIRIE, LA 70005
PHONE: (504) 833-5669
LA REG. NO. E7.0000005

LLOG exploration

TITLE: PLATFORM ELEVATION
FACING WEST
SALAMANCA PRODUCTION FACILITY
PLATFORM "A"
KEATHLEY CANYON BLOCK 689

DWG. NO. KC689A-G1008

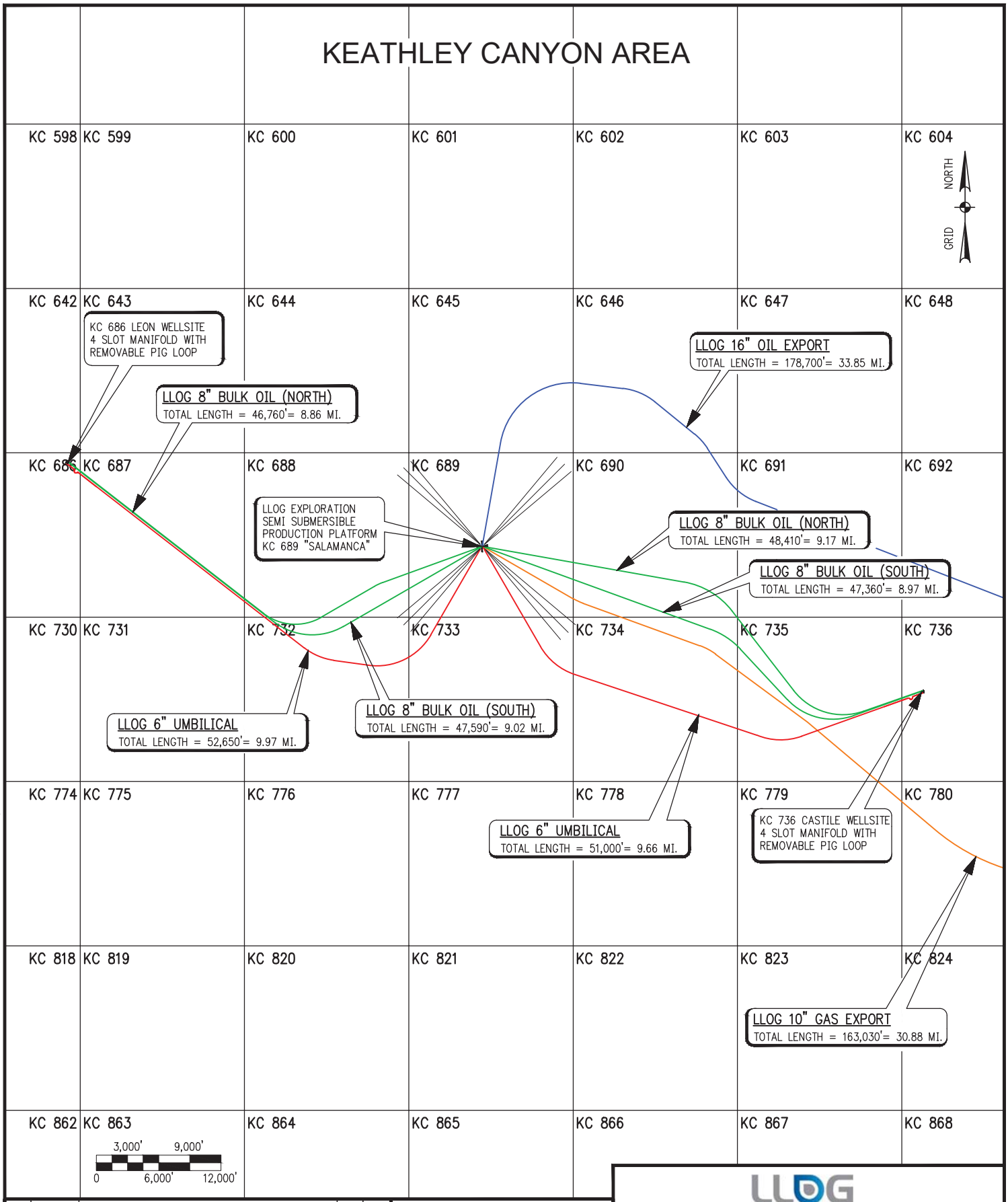
REV. A

Drawing name: \\audubon-engineering.com\shared\AE\Projects\LLOG\Salamanca\021488-300\300_Mechanical\170_Drawings\01_GA\Working\KC689A-G1008.dwg Plotted on: Sep 15, 2021 - 2:37pm

Conceptual Field Development

Attachment A-6
(Public Information)

KEATHLEY CANYON AREA



NO.	DATE	REVISION	BY	APPR
A		ISSUED FOR INFORMATION	JCG	MGL

PINNACLE ENGINEERING

TX REGISTERED ENGR FIRM F-567

LLOG exploration

SALAMANCA

KEATHLEY CANYON AREA

CONCEPTUAL FIELD DEVELOPMENT

DWG. NO. 205700-PIP-DG-9656-A

JGUEVARA 9/10/2021 8:30:07 AM P:\STRUCT\205700\PIPELINE\205700-PIP-DG-9656-A.dwg

APPENDIX B
GENERAL INFORMATION
(30 CFR PART 550.213 AND 550.243)

A. Application and Permits

The following Federal/State applications will be submitted for the activities provided for in this Plan exclusive of the BOEM permit applications and general permits issued by the EPA and COE.

Application/Permit	*Issuing Agency*	*Status*
CZM Consistency Certifications	Louisiana CMD	Pending
Navaids	USCG	Pending
ABS Classification	USCG	Pending

B. Drilling Fluids

Type of Drilling Fluid	Estimated Volume of Drilling Fluid to be used per Well
Water Based (seawater, freshwater, barite)	**See Appendix G, Table 1 of this Plan**
Oil–based (diesel, mineral oil)	**N/A**
Synthetic-based (internal olefin, ester)	**See Appendix G, Table 2 of this Plan**

C. Production

LLOG estimates the life of reserves for the proposed development activity to be as follows:

Type	Average Production Rate	Peak Production Rate	Life of the Reservoir
Oil			
Gas		17,486 MCFPD	

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

D. New Or Unusual Technology

LLOG **does not** propose using any new and/or unusual technology for the operations proposed in this Initial Plan.

E. Bonding Statement

The bond requirements for the activities and facilities proposed in this Initial Development Operations Coordination Document Plan are satisfied by an area wide bond, furnished and maintained according to 30 CFR Part 256; subpart I; NTL No. 2000-G16, "Guidelines for General Lease Surety Bonds," and additional security under 30 CFR 256.53(d) and NTL No. 2008-N07 "Supplemental Bond Procedures."

F. Oil Spill Responsibility (OSFR)

LLOG Exploration Offshore, L.L.C (MMS Co. No. 02058) will demonstrate oil spill financial responsibility for the facilities proposed in this Initial Development Operations Coordination Document according to 30 CFR Part 553, and NTL No. 2008-N05 "Guidelines for Oil Spill Financial Responsibility (OSFR) for Covered Facilities."

G. Deepwater Well Control Statement

LLOG Exploration Offshore, L.L.C. (MMS Co. No. 02058) has the financial capability to drill a relief well and conduct other emergency well control operations.

H. Suspensions of Production

LLOG Exploration Offshore, L.L.C. filed a Suspension of Operations for the Keathley Canyon Block 686 Unit which was approved for the period September 29, 2020, through November 30, 2021. The Suspension of Operations was approved by BSEE on November 13, 2020.

.

I. Blowout Scenario

Attachment B-1. The Blowout Scenario, including Site Specific Proposed Relief Well and Intervention Planning and Relief Well Response Time Estimate (Public Information)

Blowout Scenario

Attachment B-1
(Public Information)

BLOWOUT SCENARIO

Pursuant with 30 CFR 250.213(g), 250.219, 250,250 and NTL 2015-N01 the following attachment provides a blowout scenario description, information regarding any oil spill, WCD results and assumptions of potential spill and additional measures taken to firstly enhance the ability to prevent a blowout and secondly to manage a blowout scenario if it occurred.

INFORMATION REQUIREMENTS

A) Blowout scenario

The well(s) to be drilled to potential outlined in the Geological and Geophysical Information Section of this plan utilizing a typical subsea wellhead system, conductor, surface and intermediate casing strings and a MODU rig with marine riser and a subsea BOP system. A hydrocarbon influx and a well control event occurring from the objective sand is modeled with no drill pipe or obstructions in the wellbore followed by a failure of the subsea BOP's and loss of well control at the seabed. The simulated flow and worst case discharge (WCD) results for all wells are calculated and the highest WCD is used for this unrestricted blowout scenario.

B) Estimated flow rate of the potential blowout

Category	
Type of Activity	DOCD Drilling
Facility Location (area / block)	KC 736 (surface location)
Facility Designation	MODU
Distance to Nearest Shoreline (miles)	~214
Uncontrolled Blowout (Volume per day)	**135,476** bbls (max estimated)
Type of Fluid	Crude

C) Total volume and maximum duration of the potential blowout

Duration of Flow (days)	**119** days total (see Relief Well Response Estimate below)
Total Volume of Spill (bbls)	**~12.10** MMBO based on **119** days of uncontrolled flow based on simulator models (steady-state model)

D) Assumptions and calculations used in determining the worst case discharge

Submited In Initial EP N-10088 - Omitted from Public Information Copies

E) Potential for the well to bridge over

Mechanical failure/collapse of the borehole in a blowout scenario is influenced by several factors including in-situ stress, rock strength and fluid velocities at the sand face. Given the substantial fluid velocities inherent in the WCD, and the scenario as defined where the formation is not supported by a cased and cemented wellbore, it is possible that the borehole may fall/collapse/bridge over within a span of a few days, significantly reducing the outflow of the rates. For this blowout scenario, no bridging is considered.

F) Likelihood for intervention to stop blowout

The likelihood of surface intervention to stop a blowout is based on some of the following equipment specific to potential MODU's to be contracted for this well. It is reasonable to assume that the sooner you are able to respond to the initial blowout, the better likelihood there is to control and contain the event due to reduced pressures at the wellhead, less exposure of well fluids to erode and compromise the well control equipment, and less exposure of hydrocarbons to the surface to safeguard personnel and equipment in an emergency situation. This equipment includes:

- Secondary Acoustic BOP Control System – typically fitted on DP MODU's presently operating in the GOM. This system has the ability to communicate and function specific BOP controls from the surface in the event of a failure of the primary umbilical control system. This system typically can establish BOP controls from the surface acoustic system package on the rig or by deploying a second acoustic package from a separate vessel of opportunity. This system may not be included on all MODU's such as 4th generation moored rigs. This system is typically configured to function the following:

    - Blind/;shear ram close
    - Pipe ram close
    - LMRP disconnect

- ROV Intervention BOP Control System – includes one or more ROV intervention panels mounted on the subsea BOP's located on the seabed allows a ROV utilizing standard ROV stabs to access and function the specific BOP controls. These functions will be tested at the surface as part of the required BOP stump test and selectively at the seafloor to ensure proper functionality. These function include the following (at a minimum):

    - Blind/shear ram close
    - Pipe ram close
    - LMRP disconnect
    - WH disconnect

- Deadman / Autoshear function – typically fitted on DP MODU's and to be on all MODU's operating in the GOM according to new requirements, this equipment allows for an automated pre-programmed sequence of functions to close the casing shear rams and the blind/shear rams in the event of an inadvertent or emergency disconnect of the LMRP or loss of both hydraulic and electrical supply from the surface control system.

In the event that the intervention systems for the subsea BOP's fail, LLOG will initiate call out of a secondary containment / surface intervention system supported by the Helix Well Containment Group (HWCG) of which LLOG is a member. This system incorporates a capping stack capable of being deployed from the back of a vessel of opportunity equipped with an ROV or from the Helix Q4000 DP MODU. Based on the potential integrity concerns of the well, a "cap and flow" system can be deployed which may include the Helix Producer 1 capable of handling up to 55,000 BOPD flowback. The vertical intervention work is contingent upon the condition of the blowing out well and what equipment is intact to access the wellbore for kill or containment operations. The available intervention equipment may also require modifications based on actual wellbore conditions. Standard equipment is available through the Helix Deepwater Containment System to fit the wellhead and BOP stack profiles used for the drilling of the above mentioned well.

G) Availability of rig to drill relief well, rig constraints and timing of rigs

LLOG currently has one deepwater MODU under contract (Seadrill West Neptune DP drillship). In the event of a blowout scenario that does not involve loss or damage to the rig such as an inadvertent disconnect of the BOP's, then the existing contracted rig may be available for drilling the relief well and vertical intervention work. If the blowout scenario involves damage to the rig or loss of the BOP's and riser, a replacement rig or rigs will be required.

With the current activity level in the GOM, 20 to 25 deepwater MODU'S are potentially available to support the relief well drilling operations. Rig share and resource sharing agreements are in place between members of the Helix Well Containment Group. The ability to negotiate and contract an appropriate rig or rigs to drill relief wells is highly probable in a short period of time. If the rig or rigs are operating, the time to properly secure the well and mobe the rig to the relief well site location is estimated to be about 14 to 21 days. Dynamically positioned (DP) MODU's would be the preferred option due to the logistical advantage versus a moored MODU which may add complications due to the mooring spread.

VESSELS OF OPPORTUNITY

Based on the water depth restrictions for the proposed locations the following "Vessels of Opportunity" are presently available for utilization for intervention and containment and relief well operations. These may include service vessels and drilling rigs capable of working in the potential water depths and may include moored vessels and dynamically positioned vessels. The specific conditions of the intervention or relief well operations will dictate the "best fit" vessel to efficiently perform the desired results based on the blowout scenario. The list included below illustrates specific option that may vary according to the actual timing / availability at the time the vessels are needed.

OPERATION	SPECIFIC VESSEL OF OPPORTUNITY
Intervention and Containment	• Helix Q4000 (DP Semi) • Helix Producer 1 (DP FPU)
Relief Well Drilling Rigs	• Ensco 8500 Series Rigs (DP Semi) • Transocean Enterprise (DP Drillship) • Seadrill West Capricorn (DP Semi) • Seadrill West Neptune (DP Drillship)
ROV / Multi-Purpose Service Vessels	• Oceaneering (numerous DP ROV vessels) • HOS Achiever, Iron Horse 1 and 2 (DP MPSV) • Helix Pipe Lay Vessel (equipped w/ 6" PL – 75,000') • Other ROV Vessels – (Chouest, HOS, Fugro, Subsea 7)
Shuttle Tanker / Barge Support	• OSG Ship Management

H) Measures taken to enhance ability to prevent blowout

Pursuant to BOEM-2010-034 Final Interim Rules, measures to enhance the ability to prevent or reduce the likelihood of a blowout are largely based on proper planning and communication, identification of potential hazards, training and experience of personnel, use of good oil field practices and proper equipment that is properly maintained and inspected for executing drilling operations of the proposed well or wells to be drilled.

When planning and designing the well, ample time is spent analyzing offset data, performing any needed earth modeling and identifying any potential drilling hazards or well specific conditions to

safeguard the safety of the crews when well construction operations are underway. Once the design criteria and well design is established, the well design is modeled for the lifecycle of the wellbore to ensure potential failure modes are eliminated. Pursuant to BOEM-2010-0034 Interim Final Rules implemented additional considerations of a minimum of 2 independent barriers for both internal and external flow paths in addition to proper positive and negative testing of the barriers.

The proper training of crew members and awareness to identify and handle well control event is the best way prevent a blowout incident. Contractor's personnel and service personnel training requirements are verified per regulatory requirements per guidelines issued in BOEM-2010-034 Interim Final Rules. Drills are performed frequently to verify crew training and improve reaction times.

Good communication between rig personnel, office support personnel is critical to the success of the operations. Pre-spud meetings are conducted with rig crews and service providers to discuss, inform and as needed improve operations and well plans for safety and efficiency considerations. Daily meetings are conducted to discuss planning and potential hazards to ensure state of preparedness and behavior is enforced to create an informed and safe culture for the operations. Any changes in the planning and initial wellbore design is incorporated and communicated in a Management of Change (MOC) process to ensure continuity for all personnel.

Use of established good oil field practices that safeguard crews and equipment are integrated to incorporate LLOG's, the contractor and service provider policies.

Additional personnel and equipment will be used as needed to elevate awareness and provide real time monitoring of well conditions while drilling such as MWD/LWD/PWD tools used in the bottom hole assemblies. The tool configuration for each open hole section varies to optimize information gathered including the use of Formation-Pressure-While-Drilling (FPWD) tools to establish real time formation pressures and to be used to calibrates pore pressure models while drilling. Log information and pressure data is used by the drilling engineers, geologist and pore pressure engineers to maintain well control and reduced potential events such as well control events and loss circulation events.

Mud loggers continuously monitor return drilling fluids, drill gas levels and cuttings as well as surface mud volumes and flow rates, rate of penetration and lithology/paleo to aid in understanding trends and geology being drilled. Remote monitoring of real time drilling parameters and evaluation of geologic markers and pore pressure indicators is used to identify potential well condition changes.

Proper equipment maintenance and inspection program for same to before the equipment is required. Programmed equipment inspections and maintenance will be performed to ensure the equipment operability and condition. Operations will cease as needed in order to ensure equipment and well conditions are maintained and controlled for the safety of personnel, rig and subsurface equipment and the environment.

l) Measures to conduct effective and early intervention in the event of a blowout

In conjunction with the LLOG Exploration's "Well Control Emergency Response Plan" and as required by NTL 2010-N06, the following is provided to demonstrate the potential time needed for performing secondary intervention and drilling of a relief well to handle potential worst case discharge for the proposed prospect. Specific plans are integrated into the Helix Well Containment Groups procures to be approved and submitted with the Application for Permit to Drill. Equipment availability, backup equipment and adaptability to the potential scenarios will need to be addressed based on the initial site assessment of the seafloor conditions for intervention operations. Relief well equipment such as backup wellhead equipment and tubulars will be available in LLOG's inventory for immediate deployment as needed to address drilling the relief well(s).

SITE SPECIFIC PROPOSED RELIEF WELL AND INTERVENTION PLANNING

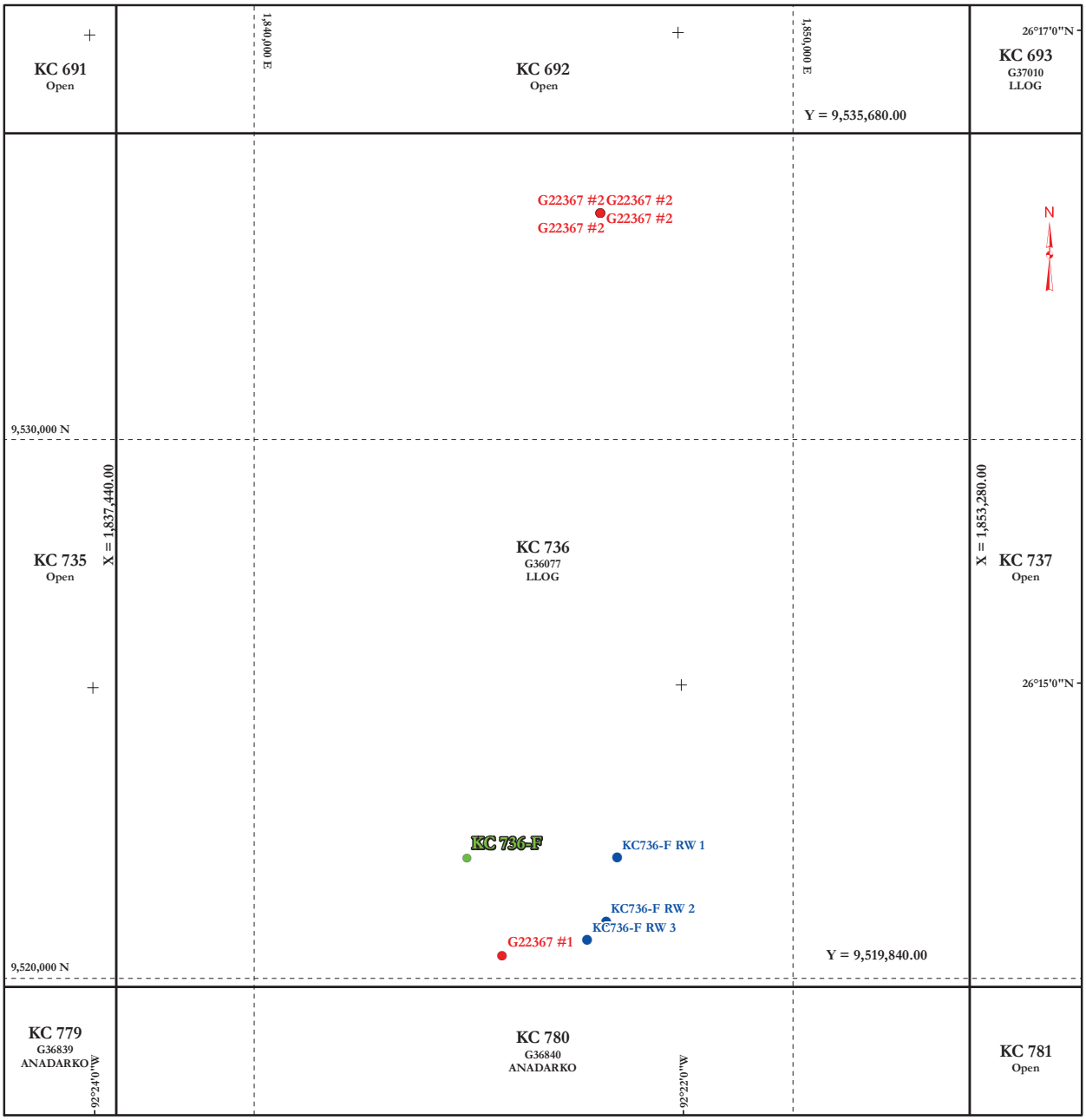
No platform was considered for drilling relief wells for this location due to location, water depth and lack of appropriate platform within the area. For this reason a DP MODU will be preferred / required.

Nearest production pipeline tie-in is located ~5 miles away at Anadarko's Lucius Spar in KC 875. An 18" SEKCO oil pipeline connects from Lucius Spar to a junction platform at South Marsh Island (SMI) Block 205 as part of the Enterprise Operated Poseidon Pipeline System. Discovery's KCC 18" gas pipeline connects from Lucius Spar to South Timbalier 283 platform where it connects with Discovery Gas Transmission (DGT) System to the Larose Processing Plant. Potential to utilize these lines in the event of a "cap and flow" scenario are limited but available.

Relief well sites have been initially identified to address blowout scenarios for the potential geologic targets for the proposed wells. Based on actual seafloor state unforeseen at this time, the final location(s) may need to be revised. The locations have been selected based on proximity to the targets sands and potential shallow hazards.

RELIEF WELL RESPONSE TIME ESTIMATE

OPERATION	TIME ESTIMATE (DAYS)
IMMEDIATE RESPONSE • safeguard personnel, render first-aid • make initial notifications • implement short term intervention (if possible) • implement spill control • develop Initial Action Plan	1
INTERIM REPSONSE • • establish Onsite Command Center and Emergency Management Team • assess well control issues • mobilize people and equipment (Helix DW Containment System) • implement short term intervention and containment (if possible) • develop Intervention Plan • initiate relief well planning • continue spill control measures	4
INTERVENTION AND CONTAIMENT OPERATIONS • mobilize equipment and initiate intervention and containment operations • perform TA operations and mobilize relief wells rig(s) • finalize relief well plans, mobilize spud equipment, receive approvals • continue spill control measures	14
RELIEF WELL(S) OPERATIONS • continue intervention and containment measures • continue spill control measures • drill relief well (s)	80
PERFORM HYDRAULIC KILL OPERATIONS / SECURE BLOWNOUT WELL • continue intervention and containment measures • continue spill control measures • perform hydraulic kill operations, monitor well, secure well	20
ESTIMATED TOTAL DAYS OF UNCONTROLLED FLOW	**119**
SECURE RELIELF WELL(S) / PERFORM P&A / TA OPERATIONS / DEMOBE	30
TOTAL DAYS	**149**



Proposed Well Location

Well Name	Surface X (ft)	Surface Y (ft)	Latitude	Longitude	Block	Block Call (ft W-E)	Block Call (ft N-S)	WD (ft)
KC 736-F	1,843,956.189	9,522,241.542	26° 14' 28.4637" N	92° 22' 43.8106" W	KC 736	6,516.19 FWL	2,401.54 FSL	6,688.00

Proposed Relief Well Locations

Well Name	Surface X (ft)	Surface Y (ft)	Latitude	Longitude	Block	Block Call (ft W-E)	Block Call (ft N-S)	WD (ft)
KC736-F RW 1	1,846,740.050	9,522,241.540	26° 14' 28.3306" N	92° 22' 13.2272" W	KC 736	6,539.95 FEL	2,401.54 FSL	6,745.00
KC736-F RW 2	1,846,531.260	9,521,058.400	26° 14' 16.6183" N	92° 22' 15.5840" W	KC 736	6,748.74 FEL	1,218.40 FSL	6,728.00
KC736-F RW 3	1,846,183.280	9,520,710.420	26° 14' 13.1873" N	92° 22' 19.4254" W	KC 736	7,096.72 FEL	870.42 FSL	6,748.00

LLOG exploration

Block 736
Keathley Canyon Area
Gulf of Mexico

Plat 4
Proposed Relief Wells for
Proposed Well KC 736-F
Lease No. G36179

Map Prepared by:
Berger Geosciences, LLC.

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

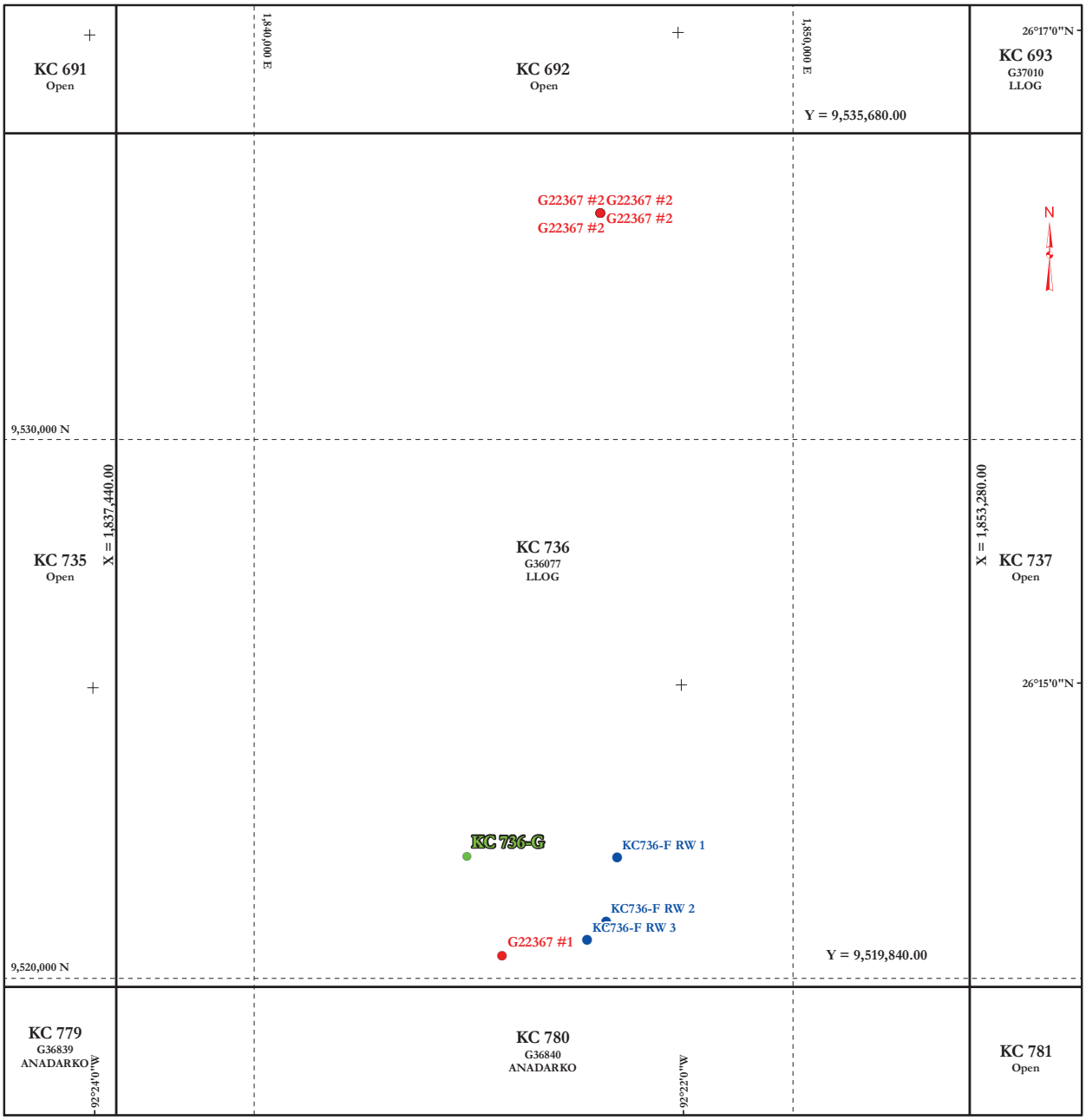
Geodetic Datum: NAD27
Projection: UTM
Zone: 15N
Grid Units: Feet

Interpretation By: B. Berger
Cartography: T. Nguyen
Project No.: 21-06-11
Date: August 2021

0 1,000 2,000 3,000 4,000
U.S. Survey Feet
Scale = 1:24,000

Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Line
- Existing Well
- Proposed Well
- Proposed Relief Well



Proposed Well Location

Well Name	Surface X (ft)	Surface Y (ft)	Latitude	Longitude	Block	Block Call (ft W-E)	Block Call (ft N-S)	WD (ft)
KC 736-G	1,843,956.189	9,522,266.542	26° 14' 28.7114" N	92° 22' 43.8106" W	KC 736	6,516.19 FWL	2,426.54 FSL	6,689.00
G_BHL	1,847,552.280	9,529,232.520	26° 15' 37.5564" N	92° 22' 03.9292" W	KC 736	6,516.19 FWL	2,426.54 FSL	-

Proposed Relief Well Locations

Well Name	Surface X (ft)	Surface Y (ft)	Latitude	Longitude	Block	Block Call (ft W-E)	Block Call (ft N-S)	WD (ft)
KC736-G RW 1	1,846,740.050	9,522,241.540	26° 14' 28.3306" N	92° 22' 13.2272" W	KC 736	6,539.95 FEL	2,401.54 FSL	6,745.00
KC736-G RW 2	1,846,531.260	9,521,058.400	26° 14' 16.6183" N	92° 22' 15.5840" W	KC 736	6,748.74 FEL	1,218.40 FSL	6,728.00
KC736-G RW 3	1,846,183.280	9,520,710.420	26° 14' 13.1873" N	92° 22' 19.4254" W	KC 736	7,096.72 FEL	870.42 FSL	6,748.00

LLOG exploration

Block 736
Keathley Canyon Area
Gulf of Mexico

Plat 7
Proposed Relief Wells for
Proposed Well KC 736-G
Lease No. G36179

Map Prepared by:
Berger Geosciences, LLC.

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

Geodetic Datum: NAD27
Projection: UTM
Zone: 15N
Grid Units: Feet

Interpretation By: B. Berger
Cartography: T. Nguyen
Project No.: 21-06-11
Date: August 2021

0 1,000 2,000 3,000 4,000
U.S. Survey Feet
Scale = 1:24,000

Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Line
- Existing Well
- Proposed Well
- Proposed Relief Well

APPENDIX C
GEOLOGICAL AND GEOPHYSICAL INFORMATION
(30 CFR PART 550.214 AND 550.244)

A. Geological Description

Included as ***Attachment C-1*** is the discussion of the geological objectives, including a brief description of the hydrocarbon trapping elements.

B. Structure Contour Maps

Included as ***Attachment C-2*** are current structure maps

C. Interpreted Seismic Lines

Included as ***Attachment C-3*** are seismic lines with depth scale within 500' of the surface locations for the subject wells.

D. Geological Structure Cross-Sections

Included as ***Attachment C-4*** are interpreted geological structure cross-sections.

E. Biostratigraphic / Lithostratigraphic Column

Included as ***Attachment C-5***

F. Shallow Hazards Reports

A Shallow Hazards and Archaeological Assessment for Block 736, Keathley Canyon Area was prepared by Geoscience Earth & Marine Services of Houston, Texas dated October 16, 2019, which was submitted to BOEM by separate letter dated October 17, 2019.

A shallow hazards survey was conducted over Keathley Canyon Blocks 642 and 686. The survey report was submitted by Repsol in relation to the Joint / Initial Exploration Plan (Control No. N-9559) approved on July 27, 2011.

F Shallow Hazards Assessments

Included as ***Attachment C-6*** is the shallow hazards assessment for the proposed "A" platform, Keathley Canyon Block 689 and associated anchor system. Also included is the Site Clearance Letters for the proposed Locations "F" (Well No. 3) and Location "G" (Well No. 4) at Keathley Canyon Block 736. Shallow Hazards Survey for Keathley Canyon 642/686 was submitted by Repsol with Initial Exploration Plan N-9559 on July 27,2011. Site Clearance letter for Keathley Canyon 686/642 Well No. 2 (Loc D) was submitted in Supplemental EP S-7941 approved May 3, 2019. The Keathley Canyon Block 686 Well No 4 surface location is within 500' of the previously approved Location D.

G. High Resolution Seismic Lines

Included as ***Attachment C-7***

GEOLOGIC DESCRIPTION

Attachment C-1
(Proprietary Information)

STRUCTURE MAP

Attachment C-2
(Proprietary Information)

INTERPRETED SEISMIC LINES

Attachment C-3
(Proprietary Information)

GEOLOGIC STRUCTURE CROSS-SECTIONS

Attachment C-4
(Proprietary Information)

Biostratigraphic / Lithostratigraphic Column

Attachment C-5
(Proprietary Information)

SHALLOW HAZARDS ASSESSMENTS

Attachment C-6
(Proprietary Information)

Public Shallow Hazards Statement – Proposed KC686-D (BHLKC642) well Location

March 16, 2020

US Department of the Interior
Bureau of Ocean Energy Management
1201 Elmwood Park Blvd.
New Orleans, LA 70213-2394

Reference: Shallow Hazards Analysis
Keathley Canyon Block 686
(OCS-G 33341)

Ladies/Gentlemen:

LLOG Exploration Company contracted Ocean Geo Solutions Inc. to prepare a Well Clearance Letter for the Proposed KC686-D (BHLKC642) well location in Block 686, Keathley Canyon Area (OCS-G-33341). This letter addresses seabed and shallow geologic conditions that may impact exploratory drilling operations within 2,000ft of the proposed well site. The depth limit of this site clearance assessment is 3.557 seconds two-way time (TWT), -9,303ft MD kb (-9,221ft TVDSS, 3,018ft TVDBML).

Seabed Hazards. The proposed location exhibits a smooth seabed.

There are no indications of seabed hydrocarbon fluid seeps within 2,000ft of the proposed well location.

The existing well KC686-3 occurs ~1ft to the NNE, KC686-2 is located ~3,000ft to the SSE of the proposed well, the existing KC686-1 well occurs 11,175ft to the southwest, and the existing KC642-1 is located 4,971ft to the northwest.

Sub-Seabed Hazards. Identified amplitude anomalies indicative of shallow gas occur within the 2,000ft radius in Units D but are not connected to the proposed well location. The vertical borehole will not penetrate any identified risk of gas anomalies. The well-path will penetrate a fault within Unit C and three faults in Unit D. The faults may cause minor drilling fluid circulation and wellbore stability problems and if connected to the shallow section may also experience drilling losses if pressures over hydrostatic are exerted by the drilling fluid column.

A **Slight Shallow Water Flow Risk** is assigned to a sand-rich interval in Unit B and within Unit D. Additionally, two <40ft thick sand interbeds may cause minor wellbore stability and drilling fluid circulation problems.

Proposed KC686-D Well Location (With BHL in KC642)							
Location Coordinates							
NAD 27 Datum - Clarke 1866 Ellipsoid					**UTM Zone 15 - CM 93° West**		
Latitude	**26°**	**19'**	**12.510"**	**North**	**Easting**	**1,757,048**	**US ft E**
Longitude	**92°**	**38'**	**37.751**	**West**	**Northing**	**9,550,582**	**US ft N**
FEL Keathley Canyon 686			**1,192ft**	**US ft**	**Inline**		**15200**
FNL Keathley Canyon 686			**938ft**	**US ft**	**Crossline**		**3589**
Water Depth: -6,285ft KB.			**Slope: <1.0° SW**				
Nearest Shoreline			188 Nautical Miles @ 30.18°				
Port of Operation			Fourchon 212 Nautical Miles @ 37.15°				
Nearest Manned Platform			A Lucius TLP in KC875		39.63 Miles @ 18.76°		

Conclusions and Recommendations. No problems are anticipated at the seabed.

No risk of gas is interpreted.

A **Slight Shallow Water Flow Risk** is assigned to a sand-rich interval in Unit B and D.

The faults may cause minor drilling fluid circulation and wellbore stability problems.

Sincerely,

LLOG Exploration Company

APPENDIX B – Sensitive Sessile Benthic Community Statement

Sensitive Sessile Benthic Communities Statement – Proposed KC686-D (BHL in KC642) Well Location

LLOG Exploration Company

March 16, 2020

US Department of the Interior
Bureau of Ocean Energy Management
1201 Elmwood Park Blvd.
New Orleans, LA 70213

Reference: Sensitive Sessile Benthic Community Summary
Proposed KC686-D (BHLKC642) Well Location in Keathley Canyon KC686 (OCS-G 33341)

Ladies/Gentlemen:
LLOG Exploration Company contracted Ocean Geo Solutions Inc. to prepare a Well Clearance Letter for the Proposed KC686-D (BHLKC642) well location in Block 686, Keathley Canyon Area (OCS-G-33341). This letter addresses location proximity to potential sensitive sessile benthic community sites. This well will be drilled from a dynamically positioned drilling module; therefore, an anchoring assessment is not required.

This sensitive sessile benthic community summary letter is issued as a supplement to the Well Clearance Letter for this proposed well. A Biological, Physical and Socio-economic Map is included illustrating the areas of potential seabed impact.

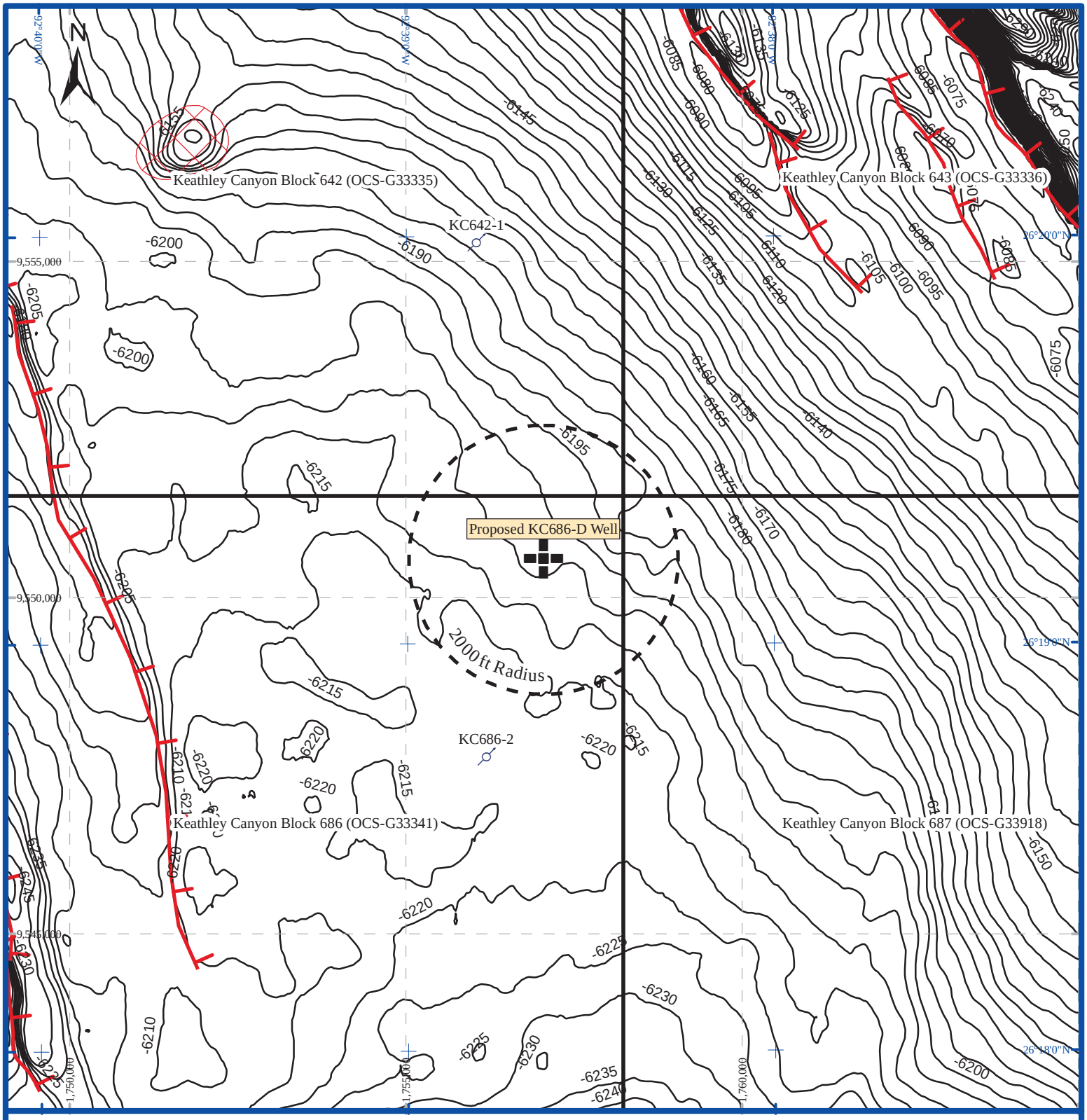
Potential Sensitive Sessile Benthic Communities
Features or areas that could support high-density sensitive sessile benthic communities are *not* located within 2,000 feet of any proposed mud and cuttings discharge location. The nearest potential sensitive sessile benthic community site is located 7,546ft to the northwest of the proposed well.

Proposed KC686-D Well Location (With BHL in KC642)							
Location Coordinates							
NAD 27 Datum - Clarke 1866 Ellipsoid					**UTM Zone 15 - CM 93° West**		
Latitude	**26°**	**19'**	**12.510"**	**North**	**Easting**	**1,757,048**	**US ft E**
Longitude	**92°**	**38'**	**37.751**	**West**	**Northing**	**9,550,582**	**US ft N**
FEL Keathley Canyon 686			**1,192ft**		**US ft**	**Inline**	**15200**
FNL Keathley Canyon 686			**938ft**		**US ft**	**Crossline**	**3589**
Water Depth: -6,285ft KB.			**Slope: <1.0° SW**				
Nearest Shoreline			188 Nautical Miles @ 30.18°				
Port of Operation			Fourchon 212 Nautical Miles @ 37.15°				
Nearest Manned Platform			A Lucius TLP in KC875			39.63 Miles @ 18.76°	

There are no areas with the potential to host a Sensitive Sessile Benthic Community within 2,000ft of the proposed location.

Conclusions and Recommendations: The proposed KC686-D (BHL in KC642) Well Location in KC686 will not impact any sites favorable for the development of sensitive sessile benthic communities.

Sincerely,
LLOG Exploration Company



Proposed KC686-D Well Location
(1,757,048ft E / 9,550,582ft N)

Existing Well

Block boundary

-6203 Depth in feet below sea surface to seabed, contoured at 5ft intervals

Seabed fault intersection, tick denotes downthrown block

Seabed mound of unknown origin - possibly favorable for sensitive sessile benthic community development

Chart scale 1" = 2,000'

0 500 1,000 2,000 Feet

0 125 250 500 Meters

Biological, Physical & Socio-Economic Plat

BERGER GEOSCIENCES, LLC.
13100 NORTHWEST FWY, STE 600
HOUSTON, TEXAS 77040
PHONE: 713-341-0397
FAX: 713-341-0398

3 September 2021

Mrs. Kim DeSopo
LLOG Exploration Company, LLC.
1001 Ochsner Blvd. #100
Covington, LA 70433

RE: Wellsite Clearance Letter for Proposed Wells KC 736-F and KC 736-G, Keathley Canyon Area, Block 736 (Lease No. G36077)

Dear Mrs. DeSopo,

Berger Geosciences, LLC. (Berger) is pleased to provide LLOG Exploration Company, LLC. (LLOG), with the following Wellsite Clearance Letter for Proposed Wells KC 736-F and KC 736-G with surface locations in Keathley Canyon (KC) Area, Block 736 (Lease No. G36077). The letter describes the seafloor, shallow geologic conditions, shallow hazards, and benthic community potential at the proposed locations. LLOG has submitted an Exploration Plan for KC 736 which includes a shallow hazards, benthic communities', and archaeological assessment of Block KC 736 completed by Geoscience Earth and Marine Services (GEMS) in 2019 entitled, "Shallow hazards and archaeological assessment, Block 736, Keathley Canyon Area, Gulf of Mexico". This letter is an amendment to the existing Exploration Plan for LLOG to include Proposed Wells KC 736-F and KC 736-G. This report includes wellsite clearance letters and updated maps and figures featuring the proposed well locations.

This letter is intended to satisfy requirements set forth by the Notice-to-Lessees (NTL) Nos. 2008-G05 (Shallow Hazards Program) and the shallow hazards portions of NTL No. 2008-G04 (Information Requirements for EPs and DOCDs). The Bureau of Ocean Energy Management NTL No. 2015-N02 provides indefinite extension to MMS NTLs 2008-G04 and 2008 G05. This letter is intended to comply with NTL No. 2009-G40 (Deepwater Benthic Communities).

The block of interest is located within an area of high archaeological potential as described in NTL Nos. JOINT 2011-G01, 2005-G07 (Archaeological Resource Surveys and Reports), and supplemental guidelines. High-resolution geophysical data was collected utilizing an AUV by Fugro Geoservices Inc. in 2013 and an archaeological assessment for block KC 736 was included in the GEMS 2019 report.

We appreciate the opportunity to be of service to LLOG on this project and look forward to working with you in the future. Please contact us if you have any questions or need further information.

Sincerely,

James F. Keenan
Manager, Geohazards Services

William J. Berger III, P.G.
President and CEO

Distribution: 2 copies

BERGER GEOSCIENCES, LLC.
13100 NORTHWEST FWY, STE 600
HOUSTON, TEXAS 77040
PHONE: 713-341-0397
FAX: 713-341-0398

Wellsite Clearance Letter

Proposed Wells KC 736-F And KC 736-G

Keathley Canyon Area Block 736 (Lease No. G36077) Gulf of Mexico

Berger Geosciences Project No. 21-06-11

Prepared for:

LLOG Exploration Company, LLC.
1001 Ochsner Blvd. #100
Covington, LA 70433

September 2021

Table of Contents

List of Figures

List of Maps (1:12,000)

List of Tables

List of Appendix Maps (1:24,000)

Introduction

LLOG Exploration Company, LLC. (LLOG) contracted Berger Geosciences, LLC. (Berger) to provide this letter to assess the shallow hazards and benthic communities potential for Proposed Wells KC 736-F and KC 736-G with surface locations in south-central Keathley Canyon (KC) Area, Block 736 (Lease No. G36077). All geologic interpretations presented in this report are based on the shallow hazards assessment entitled:

- *Shallow hazards and archaeological assessment, Block 736 (OCS G-36077), Keathley Canyon Area, Gulf of Mexico* prepared by GEMS (2019).

The shallow hazard assessment was prepared for LLOG and submitted to the Bureau of Ocean Energy Management (BOEM) under a different cover (GEMS, 2019).

This letter is intended to comply with Notice-to-Lessees (NTL) Nos. 2008-G04 and 2008-G05 (Shallow Hazards; MMS, 2008a and 2008b) and NTL No. 2009-G40 (Deepwater Benthic Communities; MMS, 2009). Bureau of Ocean Energy Management NTL 2015-N02 (BOEM, 2015a) eliminates the expiration of MMS NTLs 2008-G04 and 2008-G05. Keathley Canyon Block 736 is located within an area of high archaeological potential as described in NTL No. 2011 JOINT-G01 (BOEM/BSEE, 2011), NTL No. 2005-G07 (Archaeological Resource Surveys and Reports; MMS, 2005), and supplemental NTLs.

Available Data

LLOG provided two 3-D seismic volumes for this assessment, one depth (WGC Edge III 0-35K ft) and one velocity (Edge_Velmod_Pwave). The depth volume is identical to the data utilized for the GEMS 2019 report. The velocity volume was used, in combination with the depth volume, to produce a 3-D seismic time volume. The power spectra included in this letter was extracted from the 3-D seismic time volume (Figure W-2).

LLOG also provided high-resolution geophysical AUV data obtained from Chevron U.S.A., Inc. The AUV data was acquired by Fugro Geoservices, Inc. in 2013 and covers KC 736 (Figure W-1).

Eight maps (Maps W-1 through W-8) and seven figures (Figures W-1 through W-7) were generated for the proposed wellsite. The maps show the bathymetry, seafloor rendering, seafloor amplitude rendering, and geologic features near the proposed locations. The figures show the proposed well locations, power spectra, high-resolution subbottom profiler line, and seismic sections for the proposed wells. All the maps and figures provided are intended to be reviewed in conjunction with the Shallow Hazards Assessment and Benthic Communities Evaluation (GEMS, 2019) report.

Wellsite Discussion

This section contains an assessment of the shallow hazards and tophole prognosis for Proposed Wells KC 736-F and KC 736-G located within Keathley Canyon Area, Block 736.

The seafloor and benthic community assessments consider surface conditions within a 2,000-ft muds and cuttings discharge radius from the proposed well locations. The wellsite assessments for the proposed locations considers the subsurface conditions within a 500-ft radius of a presumed vertical wellbore from the seafloor to the top of salt (BML, approximately 1,512 ft BML). For avoidances and sonar contacts, please refer to the GEMS report (GEMS, 2019).

Maximum Anchor Radius Criteria

LLOG anticipates using a dynamically positioned Mobile Offshore Drilling Unit (MODU) in the seafloor assessment area; therefore, no anchor pattern has been analyzed.

Tophole Prognosis Criteria

The following sections specify the criteria used to develop the tophole prognosis for the proposed wells. The assessment is based on 3-D seismic data and comparison to regional stratigraphic units as available. Each tophole assessment is restricted to the specific proposed well locations.

Gas Hydrates. The base of the gas hydrate stability zone (BGHSZ) is calculated based on Maekawa et al. (1995) or an identifiable bottom-simulating reflector. The potential for solid gas hydrates was evaluated for the proposed wells. The criteria include:

- Is water depth conducive for gas hydrate formation?
- What is the depth to the base of the gas hydrate stability zone (BGHSZ) at the proposed well?
- Is a bottom-simulating reflector (BSR) present between the seafloor and BGHSZ?
- Is a BSR present within 500 ft of the proposed well?
- Does the proposed well intersect a BSR?
- Have gas hydrates been identified in the region of the proposed well?

HIGH	The wellsite conditions meet ALL of the above stated criteria, and correlates to an existing well that encountered gas hydrates.
MODERATE	The wellsite conditions meet SEVERAL of the above stated criteria. There is no direct evidence of gas hydrates at nearby wells.
LOW	The wellsite conditions meet SOME of the above stated criteria, and does not correlate to nearby wells.
NEGLIGIBLE	The wellsite conditions meet FEW to NONE of the above stated criteria, and there is no evidence of gas hydrates at nearby wells.

Shallow Gas. The potential for shallow gas was evaluated for the proposed wells. The criteria used to evaluate each proposed well include:

- Does an anomalous amplitude event exist in proximity of the proposed well, and is there evidence for connectivity to the proposed wellbore?
- Is there supporting geophysical evidence for shallow gas associated with the anomalous amplitude?
- Is the anomalous amplitude within a sequence that may be sand-prone?
- Is there evidence of migration of fluid (including hydrocarbons) from depth, such as along a fault plane?
- Does the sequence correlate to other wells within the area that encountered shallow gas?
- Is the proposed well located in a frontier area with little or no offset well control?

HIGH	The amplitude event meets ALL of the above stated criteria, or correlates to an existing well that encountered shallow gas.
MODERATE	The amplitude event meets SEVERAL of the above stated criteria. There is no direct evidence of shallow gas from nearby wells.
LOW	The amplitude event meets SOME of the above stated criteria, and does not correlate to nearby wells.
NEGLIGIBLE	The amplitude event meets FEW to NONE of the above stated criteria, and there is no evidence of shallow gas from nearby wells.

Shallow Water Flow. The potential for shallow water flow (SWF) was assessed for the proposed wells. The potential for SWF is based on the following criteria:

- Does the stratigraphic unit correlate to a regional sand-prone sequence?
- Is the area subject to high sedimentation rates and rapid overburden deposition?
- Is the sequence composed of high-amplitude, chaotic reflectors indicative of sand?
- Is there a potential seal (perhaps clay-prone) above the sand-prone sequence?
- Does the sequence correlate to other wells within the area that encountered SWF?
- Is the proposed well located in a frontier area with little or no offset well control?

HIGH	The stratigraphic unit meets ALL of the above stated criteria, and correlates to an existing well that encountered SWF.
MODERATE	The stratigraphic unit meets SEVERAL of the above stated criteria. There is no direct evidence of SWF from nearby wells.
LOW	The stratigraphic unit meets SOME of the above stated criteria, and does not correlate to nearby wells
NEGLIGIBLE	The stratigraphic unit meets FEW to NONE of the above stated criteria, and there is no evidence of SWF from nearby wells.

Proposed Well KC 736-F

The water depth at Proposed Well KC 736-F is 6,688 ft below sea level (BSL; Map W-1). The proposed well is within an area of relatively smooth seafloor that slopes to the southeast at 1.4°. The proposed location provided by LLOG is as follows:

Table W-1. Location, block calls, and seismic lines for Proposed Well KC 736-F

NAD27 UTM Zone 15 North, US Survey ft		Geographic Coordinates	
X	Y	Longitude	Latitude
1,843,956.19	9,522,241.54	92° 22’ 43.8106” W	26° 14’ 28.4637” N
Block Calls		3-D Seismic Line Reference	
		Line	Trace
6,516’ FWL	2,402’ FSL	4644	15461

Twinned Location

Proposed Well KC 736-Alt-F is 50 ft north from the Proposed KC 736-F location, and conditions are approximately equivalent, no separate illustrations of the subsurface conditions were prepared. The proposed alternate drilling location is as follows:

Table W-2. Location and block calls for Proposed Well KC 736-Alt-F

NAD27 UTM Zone 15 North, US Survey ft		Geographic Coordinates	
X	Y	Longitude	Latitude
1,843,956.19	9,522,291.54	92° 22’ 43.8080” W	26° 14’ 28.9591” N
Block Calls			
6,516’ FWL	2,452’ FSL		

Power Spectrum Analysis

The power spectrum for the proposed well was derived through the use of IHS Kingdom Suite's Trace Calculator tools. For Proposed Well KC 736-F, the power spectrum was extracted from a subset that ranges from Inline 4644 to 4744 and Crossline 15361 to 15561 and is limited to the data from the seafloor to the top of salt (2.717 sec to 3.230 sec). The frequency content is of sufficient quality for shallow hazards analysis.

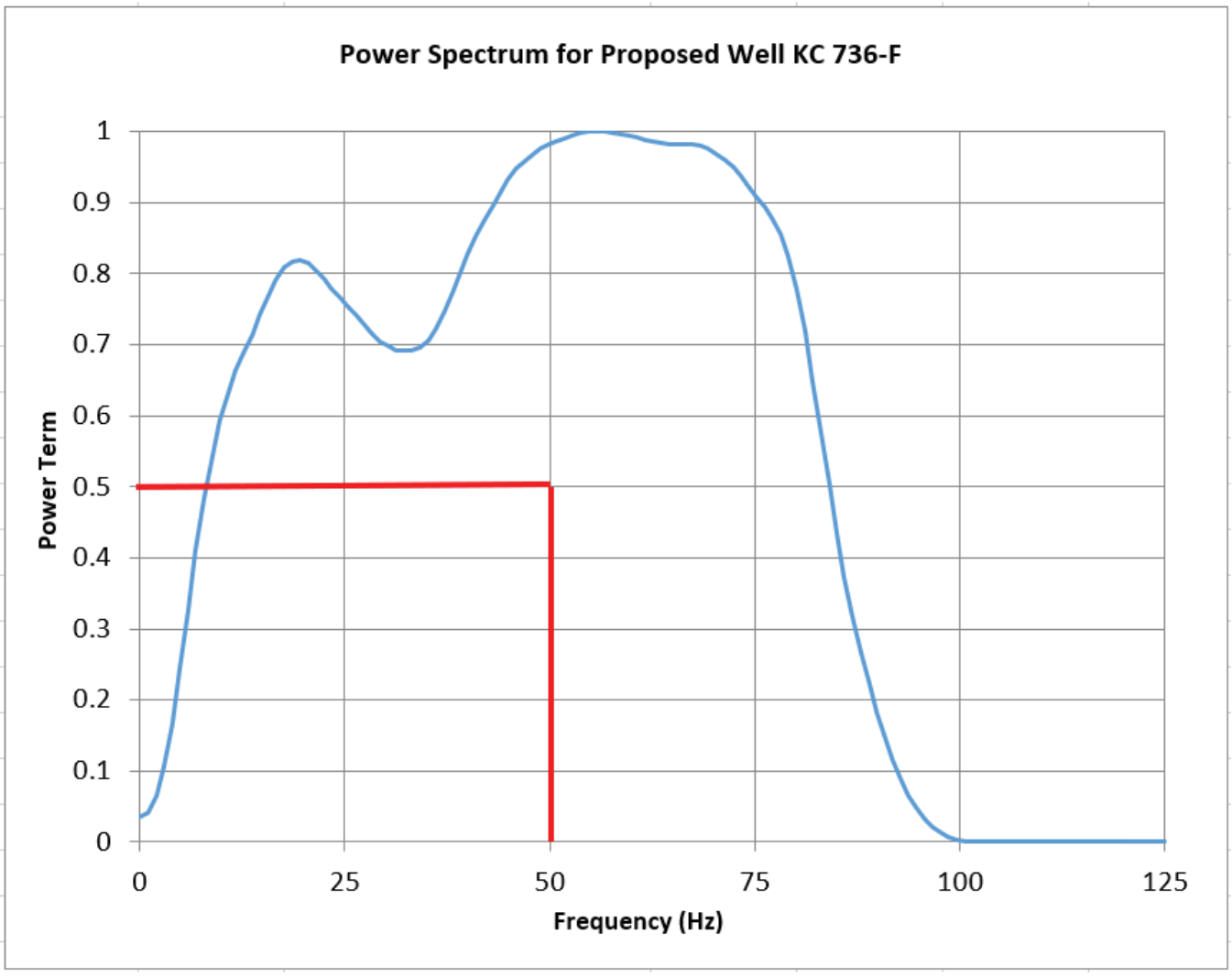


Figure W-2. Power spectrum at Proposed Well KC 736-F

Seafloor Conditions

The following paragraphs summarize the seafloor morphology, benthic communities potential, and archaeological potential at the proposed well location.

Seafloor Morphology. Proposed Well KC 736-F is located in the south-central portion of KC 736 (Figure W-1). Water depths near the proposed well range from 6,519 ft to 6,862 ft BSL (Map W-1). The seafloor near the proposed well is faulted and irregular with variable dip direction and slope angle. Numerous seafloor faults are within the 2,000-ft muds and cuttings radius for the proposed wellsite (Map W-2 and Map W-4). However, the planned wellbore will not intersect any of these faults.

There are numerous seafloor faults within 2,000 ft of Proposed Well KC 736-F; however, none will be intersected by the planned wellbore.

Benthic Communities Assessment. There are no water bottom anomalies identified by the BOEM (2021b) within 2,000 ft of the proposed well location. There are no high-amplitude seafloor anomalies identified in the 3-D seismic data within 2,000 ft of the proposed well location (Map W-3). Features or areas that could support high-density benthic communities are not anticipated within 2,000 ft of the proposed location.

Features or areas that could support high-density chemosynthetic or other benthic communities are not anticipated within 2,000 ft of Proposed Well KC 36-F.

Infrastructure. There is one existing well, G22367#1, located approximately 1,928 ft south-southeast of the proposed well location (BOEM, 2021a) (Figure W-1). A second well, G22367#2, is located in KC 736 approximately 2.3 miles northeast of the proposed location. No other infrastructure is within the study area.

One well, G22367#1, is located approximately 1,928 ft south-southeast of the proposed location.

Archaeologic Assessment. Keathley Canyon Block 736 is not regarded as being in a high probability zone for historic shipwrecks based on Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) NTL No. 2011-JOINT-G01 (BOEM/BSEE, 2011), including KC 736. Pursuant to the public information in the NOAA Automated Wreck and Obstruction Information System and Navigational Charts (NOAA, 2020); there are no reported shipwrecks within the seafloor assessment area. The required archaeological survey was conducted, and a report was completed by GEMS and was submitted under a separate cover (GEMS, 2019). There are no archaeologically significant contacts identified within 2,000 of Proposed Well KC 736-F. The nearest sonar contact to the proposed location is Contact #10 (GEMS, 2019) located 3,025 ft to the east-northeast (Map W-4). For avoidances and sonar contacts please refer to the archaeological assessment section of the GEMS report.

No archaeologically significant contacts identified within 2,000 of Proposed Well KC 736-F. For details about sonar contacts and avoidances please refer to the GEMS Archaeological Assessment (2019).

Wellsite Assessment

The wellsite assessment covers the subsurface conditions within a 500-ft radius of the proposed wellpath from the seafloor to the top of salt at approximately 1,512 ft BML.

Stratigraphy and Tophole Prognosis. Two 3-D seismic marker horizons (Horizon 20 and the top of salt) and one subbottom profiler horizon (Horizon 10) were interpreted at the Proposed Well KC 736-F location (Figure W-3 and Figure W-4). A generalized description of the stratigraphic sequences can be found in the previous GEMS (2019) Shallow Hazards Assessment. The following is an assessment of the conditions that will be encountered at or near the borehole.

Seafloor to the SBP Penetration Limit. Horizon 20 is the first stratigraphic marker horizon traced on the 3-D seismic data; however, the SBP data provided more detailed information about the sediments within this surficial sequence.

Horizon 10 was mapped on the subbottom profiler data as the base of the approximately 8 ft thick hemipelagic clay drape (Figure W-3). About 25 ft of well layered silts and clays underly the drape to 33 ft BML. A 12 ft thick clay-rich mass transport deposit is interpreted between 33 ft and 45 ft BML underlain by 18 ft of well layered clays and silts to about 63 ft BML. Alternating intervals of clay-rich mass transport and well layered sediments are imaged from 63 ft BML to the limit of subbottom profiler data at about 278 ft BML (Figure W-3). Numerous faults offset the stratigraphy below the mass transport interval at 33 ft BML; however, none will be intersected by the planned wellbore.

Unit 1, Seafloor to Horizon 20. The seismic data between the seafloor and Horizon 20 consists of low-amplitude, parallel and continuous to amorphous reflections. These reflections are interpreted to represent a fine-grained hemipelagic clay drape overlying silt and clay mass transport deposits (Figure W-4). Horizon 20 is expected to be encountered at 431 ft BML (Figure W-4).

There are no amplitude anomalies within 500 ft of the proposed wellbore in this interval (Map W-4).

There is a ***low*** potential for gas hydrates, a ***negligible*** potential for shallow gas, and a ***negligible*** potential for SWF within Unit 1.

Unit 2, Horizon 20 to Top of Salt. The sequence between Horizon 20 and top of salt consists of low- to moderate-amplitude, semi-parallel and continuous to chaotic reflections interpreted to represent sand, silt, and clay turbidites with intervals of mud-rich mass transport deposits (Figure W-4). The top of salt is mapped at 1,512 ft BML at the proposed location (Figure W-4).

There are no amplitude anomalies within 500 ft of the proposed wellbore in this interval (Map W-4).

The base of the gas hydrate stability zone (BGHSZ) at this water depth is estimated to be 1,861 ft BML based on Maekawa et al. (1995). This depth is below the top of salt at the proposed location.

There is a ***low*** potential for gas hydrates, a ***low*** potential for shallow gas, and a ***low*** potential for SWF within Unit 2

Faults. The proposed vertical wellbore will not intersect seafloor or buried faults at this location (Figure W-4).

Proposed Well KC 736-G

The water depth at Proposed Well KC 736-G is 6,689 ft below sea level (BSL; Map W-5). The proposed well is within an area of relatively smooth seafloor that slopes to the southeast at 1.4°. The proposed location provided by LLOG is as follows:

Table W-3. Location, block calls, and seismic lines for Proposed Well KC 736-G

NAD27 UTM Zone 15 North, US Survey ft		Geographic Coordinates	
X	Y	Longitude	Latitude
1,843,956.19	9,522,266.54	92° 22' 43.8106" W	26° 14' 28.7114" N
Block Calls		3-D Seismic Line Reference	
		Line	Trace
6,516' FWL	2,427' FSL	4644	15461

Twinned Location

Proposed Well KC 736-Alt-G is 50 ft north from the Proposed KC 736-G location, and conditions are approximately equivalent, no separate illustrations of the subsurface conditions were prepared. The proposed alternate drilling location is as follows:

Table W-4. Location and block calls for Proposed Well KC 736-Alt-G

NAD27 UTM Zone 15 North, US Survey ft		Geographic Coordinates	
X	Y	Longitude	Latitude
1,843,956.19	9,522,341.54	92° 22' 43.8093" W	26° 14' 29.4545" N
Block Calls			
6,516' FWL	2,502' FSL		

Power Spectrum Analysis

The power spectrum for the proposed well was derived through the use of IHS Kingdom Suite's Trace Calculator tools. For Proposed Well KC 736-G, the power spectrum was extracted from a subset that ranges from Inline 4644 to 4744 and Crossline 15361 to 15561 and is limited to the data from the seafloor to the top of salt (2.719 sec to 3.230 sec). The frequency content is of sufficient quality for shallow hazards analysis.

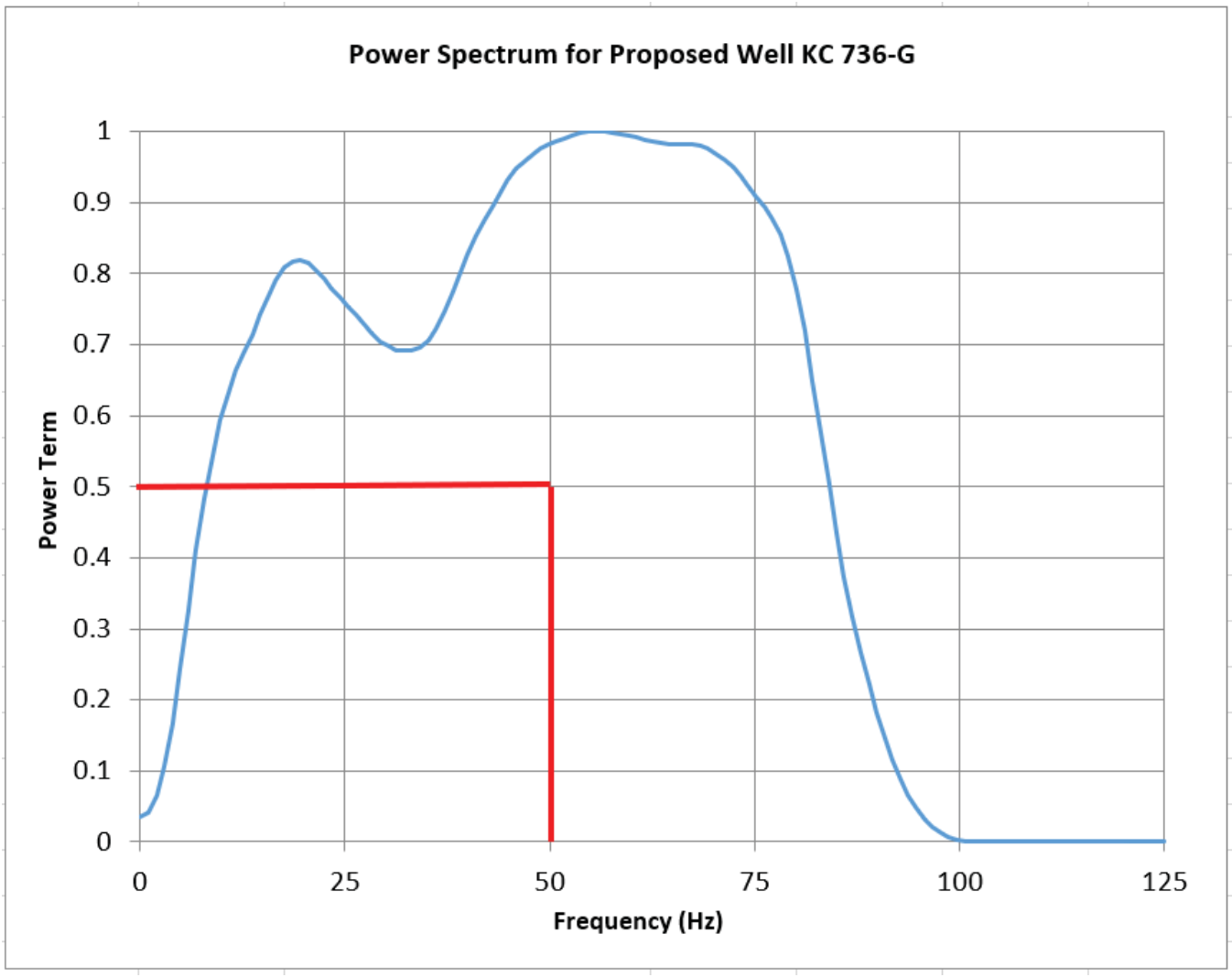


Figure W-5. Power spectrum at Proposed Well KC 736-G

Seafloor Conditions

The following paragraphs summarize the seafloor morphology, benthic communities potential, and archaeological potential at the proposed well location.

Seafloor Morphology. Proposed Well KC 736-G is located in the south-central portion of KC 736 (Figure W-1). Water depths near the proposed well range from 6,519 ft to 6,862 ft BSL (Map W-5). The seafloor near the proposed well is faulted and irregular with variable dip direction and slope angle. Numerous seafloor faults are within the 2,000-ft muds and cuttings radius for the proposed wellsite (Map W-6 and Map W-8). However, the planned wellbore will not intersect any of these faults.

There are numerous seafloor faults within 2,000 ft of Proposed Well KC 736-G; however, none will be intersected by the planned wellbore.

Benthic Communities Assessment. There are no water bottom anomalies identified by the BOEM (2021b) within 2,000 ft of the proposed well location. There are no high-amplitude seafloor anomalies identified in the 3-D seismic data within 2,000 ft of the proposed well location (Map W-7). Features or areas that could support high-density benthic communities are not anticipated within 2,000 ft of the proposed location.

Features or areas that could support high-density chemosynthetic or other benthic communities are not anticipated within 2,000 ft of Proposed Well KC 36-G.

Infrastructure. There is one existing well, G22367#1, located approximately 1,952 ft south-southeast of the proposed well location (BOEM, 2021a) (Figure W-1). A second well, G22367#2, is located in KC 736 approximately 2.3 miles northeast of the proposed location. No other infrastructure is within the study area.

One well, G22367#1, is located approximately 1,952 ft south-southeast of the proposed location.

Archaeologic Assessment. Keathley Canyon Block 736 is not regarded as being in a high probability zone for historic shipwrecks based on Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) NTL No. 2011-JOINT-G01 (BOEM/BSEE, 2011), including KC 736. Pursuant to the public information in the NOAA Automated Wreck and Obstruction Information System and Navigational Charts (NOAA, 2020); there are no reported shipwrecks within the seafloor assessment area. The required archaeological survey was conducted, and a report was completed by GEMS and was submitted under a separate cover (GEMS, 2019). There are no archaeologically significant contacts identified within 2,000 of Proposed Well KC 736-G. The nearest sonar contact to the proposed location is Contact #10 (GEMS, 2019) located 3,020 ft to the east-northeast (Map W-8). For avoidances and sonar contacts please refer to the archaeological assessment section of the GEMS report.

No archaeologically significant contacts identified within 2,000 of Proposed Well KC 736-G. For details about sonar contacts and avoidances please refer to the GEMS Archaeological Assessment (2019).

Wellsite Assessment

The wellsite assessment covers the subsurface conditions within a 500-ft radius of the proposed wellpath from the seafloor to the top of salt at approximately 1,512 ft BML.

Stratigraphy and Tophole Prognosis. Two 3-D seismic marker horizons (Horizon 20 and the top of salt) and one subbottom profiler horizon (Horizon 10) were interpreted at the Proposed Well KC 736-G location (Figure W-6 and Figure W-7). A generalized description of the stratigraphic sequences can be found in the previous GEMS (2019) Shallow Hazards Assessment. The following is an assessment of the conditions that will be encountered at or near the borehole.

Seafloor to the SBP Penetration Limit. Horizon 20 is the first stratigraphic marker horizon traced on the 3-D seismic data; however, the SBP data provided more detailed information about the sediments within this surficial sequence.

Horizon 10 was mapped on the subbottom profiler data as the base of the approximately 8 ft thick hemipelagic clay drape (Figure W-6). About 25 ft of well layered silts and clays underly the drape to 33 ft BML. A 12 ft thick clay-rich mass transport deposit is interpreted between 33 ft and 45 ft BML underlain by 18 ft of well layered clays and silts to about 63 ft BML. Alternating intervals of clay-rich mass transport and well layered sediments are imaged from 63 ft BML to the limit of subbottom profiler data at about 278 ft BML (Figure W-6). Numerous faults offset the stratigraphy below the mass transport interval at 33 ft BML; however, none will be intersected by the planned wellbore.

Unit 1, Seafloor to Horizon 20. The seismic data between the seafloor and Horizon 20 consists of low-amplitude, parallel and continuous to amorphous reflections. These reflections are interpreted to represent a fine-grained hemipelagic clay drape overlying silt and clay mass transport deposits (Figure W-7). Horizon 20 is expected to be encountered at 431 ft BML (Figure W-7).

There are no amplitude anomalies within 500 ft of the proposed wellbore in this interval (Map W-8).

There is a ***low*** potential for gas hydrates, a ***negligible*** potential for shallow gas, and a ***negligible*** potential for SWF within Unit 1.

Unit 2, Horizon 20 to Top of Salt. The sequence between Horizon 20 and the top of salt consists of low- to moderate-amplitude, semi-parallel and continuous to chaotic reflections interpreted to represent sand, silt, and clay turbidites with intervals of mud-rich mass transport deposits (Figure W-7). The top of salt is mapped at 1,512 ft BML at the proposed location (Figure W-7).

There are no amplitude anomalies within 500 ft of the proposed wellbore in this interval (Map W-8).

The base of the gas hydrate stability zone (BGHSZ) at this water depth is estimated to be 1,863 ft BML based on Maekawa et al. (1995). This depth is below the top of salt at the proposed location.

There is a ***low*** potential for gas hydrates, a ***low*** potential for shallow gas, and a ***low*** potential for SWF within Unit 2

Faults. The proposed vertical wellbore will not intersect seafloor or buried faults at this location (Figure W-7).

References

References

Bureau of Ocean Energy Management, 2021a. ASCII Data and Geographic Mapping Data. Published on the BOEM Gulf of Mexico Data Center. Accessed August 2021. Available online at: https://www.data.boem.gov/Main/Mapping.aspx

Bureau of Ocean Energy Management, 2021b. Seismic Water Bottom Anomalies Map Gallery. Published on the BOEM Gulf of Mexico Map Gallery. Accessed August 2021. Available online at: http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Map-Gallery/Seismic-Water-Bottom-Anomalies-Map-Gallery.aspx

Bureau of Ocean Energy Management, 2015a. Notice to Lessees and Operators (NTL) of Federal Oil, Gas, and Sulphur Leases in the Outer Continental Shelf, Gulf of Mexico Region, Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance, NTL 2015-N02. Accessed August 2021. Available online at: https://www.boem.gov/sites/default/files/regulations/Notices-To-Lessees/2015/BOEM-NTL-2015-N02.pdf

Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement, 2011. Notice to Lessees and Operators (NTL) of Federal Oil and Gas Leases and Pipeline Right-of-Way (ROW) Holders on the Outer Continental Shelf (OCS). Revisions to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports. United States Department of the Interior NTL 2011-JOINT_G01. Accessed August 2021 Available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2011/2011-JOINT-G01-pdf.aspx

Geoscience Earth and Marine Services, (GEMS), 2019, Shallow hazards and archaeological assessment, Block 736, Keathley Canyon Area, Gulf of Mexico. Report prepared for LLOG Exploration Offshore, LLC., Project No. 0219-2862.

Maekawa, T., Itoh, S., Sakata, A., Igari, S.I., and Imai, N. 1995. Pressure and temperature conditions for methane hydrate dissociation in sodium chloride solutions. Geochemical Journal. 29, 325-329.

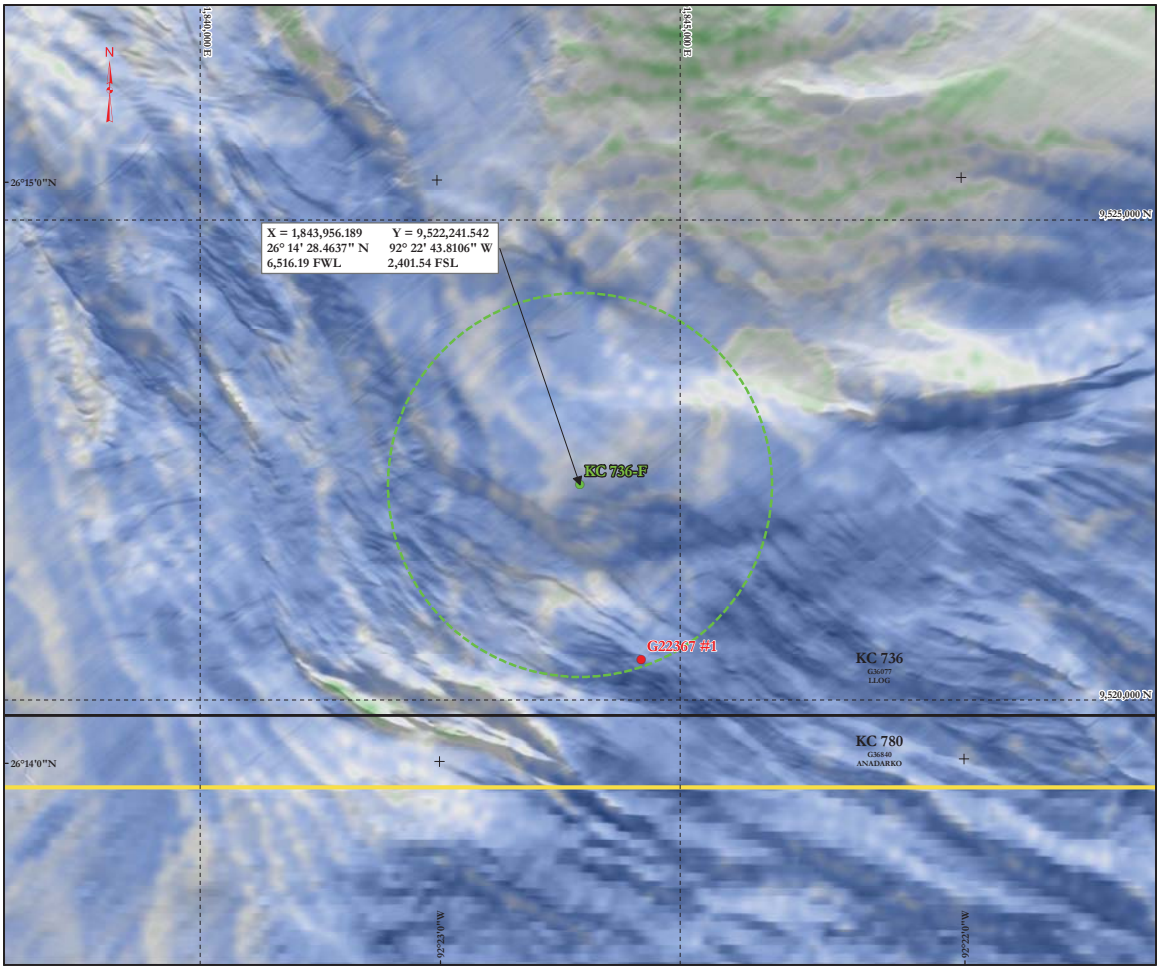
Minerals Management Service, 2009. Notice to Lessees and Operators of Federal Oil, Gas and Sulphur Leases and Pipeline Right-of-Way Holders, Outer Continental Shelf, Gulf of Mexico OCS Region, Deepwater Benthic Communities. United States Department of the Interior, Minerals Management Service, Gulf of Mexico, NTL 2009-G40. Accessed January 2020. Available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2009/09-G40.aspx

Minerals Management Service, 2008a. Notice to Lessees and Operators of Federal Oil, Gas and Sulphur Leases in the Outer Continental Shelf, Gulf of Mexico OCS Region: Information Requirements for Exploration Plans and Development Operations Coordination Documents. United States Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, NTL-2008-G04. Accessed August 2021. Available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2008/08-g04.aspx

Minerals Management Service, 2008b. Notice to Lessees and Operators of Federal Oil, Gas and Sulphur Leases and Pipeline Right-of-Way Holders in the Outer Continental Shelf, Gulf of Mexico OCS Region: Shallow Hazards Program. United States Department of the Interior, Minerals Management. Service, Gulf of Mexico OCS Region, NTL 2008-G05. Accessed August 2021. Available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2008/08-g05.aspx

Minerals Management Service, 2005. Notice to Lessees and Operators of Federal Oil, Gas and Sulphur Leases and Pipeline Right-of-Way Holders in the Outer Continental Shelf, Gulf of Mexico OCS Region, Archaeological Resource Surveys and Reports. United States Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, NTL 2005-G07. Accessed August 2021. Available online at: http://www.boem.gov/Regulations/Notices-To-Lessees/2005/05-G07.aspx

National Oceanic and Atmospheric Administration, 2021. Office of Coast Survey, Wrecks and Obstructions Database Accessed August 2021. Available online at: https://oceanexplorer.noaa.gov/data/access/access.html



Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Lines
- Study Area
- Existing Well
- Proposed Well
- 2,000-ft Radius Circle

Grid Information:
Data Source:
AUV Multibeam
Method: Kriging
Spacing: 10 ft
Search Radius: 30 ft

Data Source: 3-D Seismic
Method: Kriging
Spacing: 100 ft
Search Radius: 150 ft

Rendering Illumination:
Azimuth: 45°
Elevation : 70°
Vertical Exaggeration: 4X

Amplitude
(Peak)
Low
High

NOTE:
Seafloor Amplitude Rendering obtained from GEMS project number 0720-2977

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

Geodetic Datum: NAD27 Projection: UTM Zone: 15N Grid Units: Feet	Interpretation By: B. Berger Cartography: T. Nguyen Project No.: 21-06-11 Date: August 2021

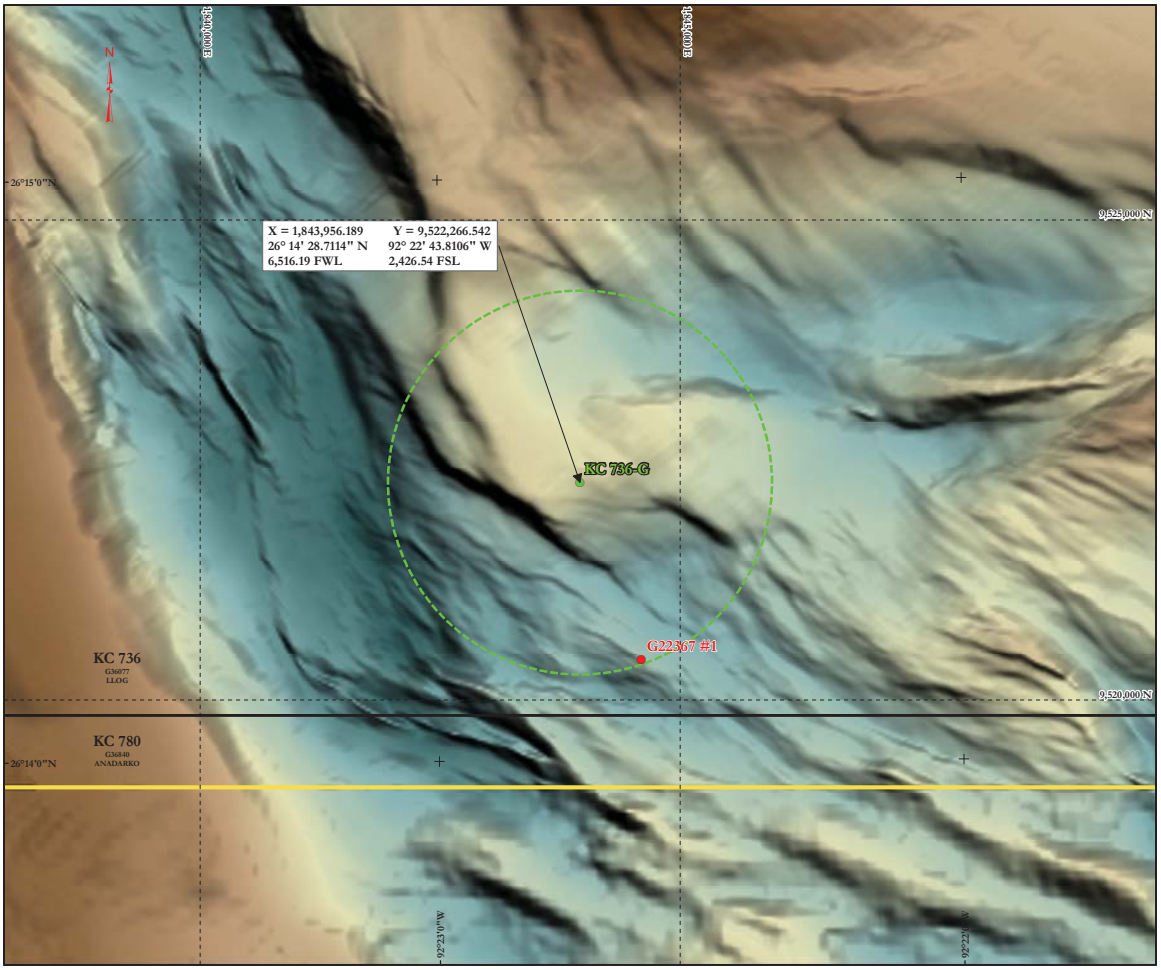
0 500 1,000 1,500 2,000 Feet

Scale = 1:12,000

Block 736
Keathley Canyon Area
Gulf of Mexico

Map W-3
Seafloor Amplitude Rendering
Proposed Well KC 736-F
Lease No. G36077

Map Prepared by:
Berger Geosciences, LLC.



Legend

- Lat/Long Grid Points
- UTM Northing and Easting Grid Lines
- Study Area
- Existing Well
- Proposed Well
- 2,000-ft Radius Circle

Grid Information:
Data Source:
AUV Multibeam
Method: Kriging
Spacing: 10 ft
Search Radius: 30 ft

Data Source: 3-D Seismic
Method: Kriging
Spacing: 100 ft
Search Radius: 150 ft

Rendering Illumination:
Azimuth: 45°
Elevation : 70°
Vertical Exaggeration: 4X

Depths
(Below Sea Level)
6,519 ft
6,862 ft

NOTE:
Bathymetry infromation were obtained from GEMS project number 0720-2977

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

Geodetic Datum: NAD27
Projection: UTM
Zone: 15N
Grid Units: Feet

Interpretation By: B. Berger
Cartography: T. Nguyen
Project No.: 21-06-11
Date: August 2021

0 500 1,000 1,500 2,000 Feet

Scale = 1:12,000

Block 736
Keathley Canyon Area
Gulf of Mexico

Map W-6
Seafloor Rendering
Proposed Well KC 736-G
Lease No. G36077

Map Prepared by:
Berger Geosciences, LLC.

LLOG Exploration Offshore, L.L.C.

Project:
Gulf of Mexico
Keathley Canyon
Blocks 642-647,686-691, 731-736, 779-780

Description:
3D Seismic - Seafloor Reconnaissance Study
Proposed Salamanca FPS Location

Project Number:
21-024-55_FPS/2021-399

Report Status:
Final

Mr. Julian Williams
LLOG Exploration Offshore, L.L.C.
1001 Ochsner Blvd #100
Covington, LA 70433

Echo Offshore, LLC appreciates the opportunity to submit this revised 3D reconnaissance study covering Keathley Canyon Blocks 642-647, 686-691, 731-736, 779-780, offshore Gulf of Mexico. This assessment was prepared utilizing 3D seismic data provided by LLOG Exploration Offshore, L.L.C. (LLOG) to address seafloor and near-seafloor conditions that may pose hazards or constraints to operations. Following completion of this analysis, the data set was subsequently utilized to help select a safe and practical location for a proposed Floating Production System (FPS) centered in Block 689, Keathley Canyon Area as addressed herein.

This report has been prepared with due care, diligence, and with the skill reasonably expected of a reputable contractor experienced in the types of work, carried out under the contract. As such, the findings in this report are based on an interpretation of data which is a matter of opinion on which professionals may differ and, unless clearly stated, is not a recommendation of any course of action.

Please be aware that further distribution of this report, in whole or part, or the use of the data for a purpose not expressly stated within the contractual work scope is at the client's sole risk, and it is recommended that this disclaimer be included in any such distribution.

If we can be of further assistance, or if you have any questions, please do not hesitate to call.

We sincerely appreciate this opportunity to be of service to you.

Very truly yours,

C. D. Schempf, Jr.
President

MK for CDS

REPORT AUTHORIZATION AND DISTRIBUTION

Report Status		Final
Issue Date		September 17, 2021
Compilation	Geophysicist	K Parsons
Authorization	Geophysics	..... A R Haigh
	Quality Assurance	..... M Keith

Revision	Date	Title
0	September 17, 2021	Final

Distribution

1 Digital Copy

LLOG Exploration Offshore, L.L.C.
1001 Ochsner Blvd #100
Covington, LA 70433

For attention of:
Mr. Julian Williams

SYNOPSIS

Client	LLOG Exploration Offshore, L.L.C.
Area	Offshore Gulf of Mexico
Site Title	Keathley Canyon Blocks 642-647, 686-691, 731-736, 779-780: Proposed Salamanca FPS Location
Evaluation Region	~144 square mile area

Seafloor Conditions (Section 2)

- Water depths vary from -5,675ft to -7,470ft throughout the study area
- Intense and complex seafloor faulting in north, east, and west
- Gradients are predominantly 2° or less, locally increasing to over 25° where seafloor is affected by faulting
- Localized faulting elsewhere
- Broad debris flow in west

Seafloor Obstructions and Sensitive Sessile Benthic Communities (Section 2)

- Existing wells occur in KC642, 686, and 736
- Six localized and discrete sites favorable for sensitive biological communities

Potential Seafloor Problems & Hazards (Section 2)

- Six localized and discrete fluid seeps favorable for biological communities
- Seafloor fault intersections and gradients over 10°
- Existing wells

Conclusions and Recommendations (Section 3)

- Avoid six localized fluid seeps by the required regulatory distance
- Avoid existing wells
- Consider high gradients associated with seafloor fault intersections
- Consideration of surficial instability in association with seafloor fault intersections, especially in KC687, 688, 731 & 732
- Conditions at the proposed FPS location are considered benign. Water depth is -6,405ft at the proposed FPS with depths ranging from -6,126ft to -6,738ft across the anchor spread.

Further expanded detail on the synopsis material can be found in **Sections 2 and 3** of this report.

Location Map

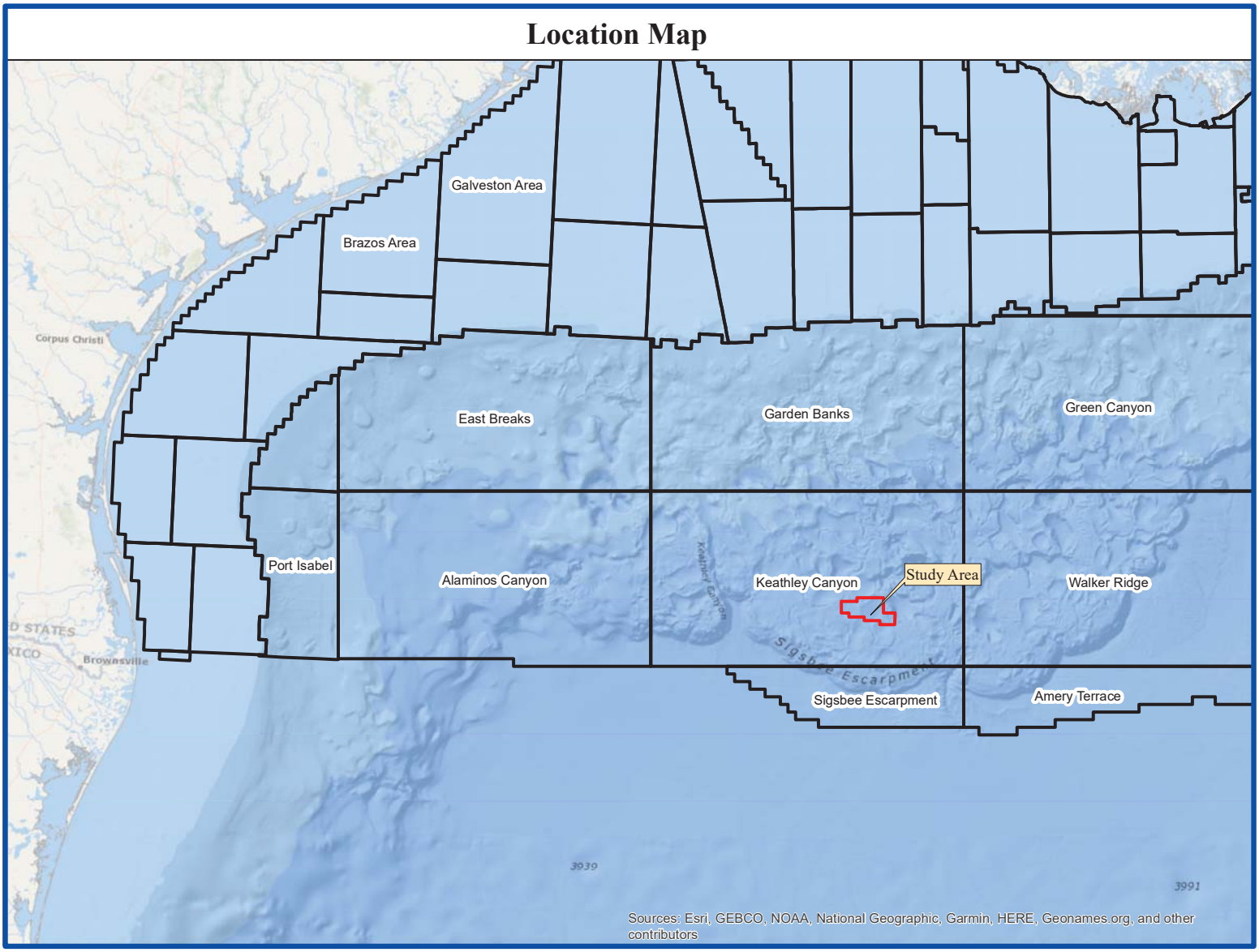


TABLE OF CONTENTS

LIST OF FIGURES

LIST OF CHARTS

Charts are presented at a scale of 1" = 2,500ft (1:30,000)
The following charts are enclosed:

Chart No	Title	Drawing No
1	Seafloor Depth	2021-399.01
2	Seafloor Morphology	2021-399.02
3	Seafloor Gradient	2021-399.03

All charts are additionally provided as tabloid-sized images in **Appendix A**.

1. PROJECT SUMMARY

1.1 Scope of Work

Echo Offshore, LLC was contracted by LLOG Exploration Offshore, L.L.C., to provide a seafloor reconnaissance study, offshore Gulf of Mexico. The study was prepared in partnership with Ocean Geo Solutions, Inc., and covers the south half of Block 642, south half of Block 643, Block 644, Block 645, Block 646, the west half of Block 647, Block 686, Block 687, Block 688, Block 689, Block 690, the west half of Block 691, the north half of Block 731, the north half of Block 732, Block 733, Block 734, Block 735, Block 736, the north half of Block 779, and the north half of Block 780, Keathley Canyon Area (144 square mile area). The provided 3D data set did not include coverage over the north half of Block 646 or the northwestern corner of Block 647. Publicly available data obtained from the BOEM Northern Gulf of Mexico Deepwater Bathymetry Grid from 3D Seismic was utilized to address the bathymetry across this missing area.

Following completion of this analysis, the results were utilized to determine the optimal position for placing a proposed Floating Production System (FPS) and associated anchors. The proposed facility is located in the central portion of KC 689 at: X=1,797,000.00, Y=9,542,500.00 (NAD 27 UTM 15 feet). Sections 2.1-2.9 of this assessment address conditions throughout the entirety of the study area while Section 2.10 specifically addresses conditions at the location of the proposed FPS site and associated anchor spread.

1.2 Data Provided, Processing History, and Data Quality

3D seismic data was provided in depth below sea surface.

The dataset is of good quality and suitable for shallow hazard assessment. Inlines are oriented northeast to southwest, have a numerical increment of one, and exhibit a line spacing of 98.443ft. Crosslines are oriented northwest to southeast, have a numerical increment of four, and exhibit a line spacing of 82.02ft. Sample rate of the data 32ft, and record length is 11,000ft.

The data presents a relatively low frequency response across the upper one second below seafloor, with an effective frequency range of 8-35Hz. The data exhibits a dominant frequency of approximately 25Hz.

The data is free of major artifacts and allows a clear analysis of seafloor to the limit of the frequency content.

2. DATA INTERPRETATION – SEAFLOOR CONDITIONS

Four seafloor maps have been produced. Chart 1 shows depth to seafloor in feet below sea surface, Chart 2 shows interpreted seafloor morphology overlain on a shaded relief attribute, and Chart 3 shows relative amplitudes at seafloor. Chart 3 is a seafloor gradient map derived from the seafloor depth.

2.1 Seafloor Depth Conversion

3D seismic data was provided in depth, so no depth conversion was necessary.

2.2 Seafloor Depth

Water depths derived from the seafloor pick on the 3D seismic data, are presented on (Chart 1), and vary from -5,700ft in the northeast part of Block KC688 to -7,400ft in the northeast of KC736.

Seafloor slope is generally 2° or less, except within the intensely faulted seafloor grabens and along individual seafloor fault induced scarps where gradients increase locally to over 30°. Seafloor slope in degrees from horizontal are presented on (Chart 3). Regions of seafloor exhibiting a gradient of over 10° have been isolated and are presented on Chart 2.

2.3 Seafloor Morphology

The seafloor morphology is predominantly controlled by underlying salt uplift and the affects that has on seafloor. Interpreted seafloor morphology is presented on Chart 2.

Across most of the area, seafloor is smooth and featureless. A broad mini basin covers most of blocks KC689, 690, 733, and 734 deepening to around -6,900ft.

Across the north, east, and to a lesser extent the west peripheries of the study area, underlying salt uplift deforms the seafloor, forming complex intensely faulted grabens (Figures 1 through 3). Within these grabens numerous linear fault intersections occur with throws of up to 50ft and there are frequent occurrences of gradients greater than 10° and locally over 35°.

In blocks KC688 and KC732 a narrow ridge of underlying salt uplift extends southward from the intensely faulted graben area to the north. This uplift induces a large seafloor fault intersection (Figure 5), that pushes up a large seafloor fault downthrown around 100ft to the west. To the west side of this fault the uplift has been the likely catalyst for a debris flow deposit that flows to the west, covering most of block KC687 and the northeast of KC731 (Figure 6). The debris flow is poorly imaged on the vertical seismic data but is quite well defined on the seafloor rendering and discussed further in Section 2.5.

Further additional faults trending NNE / WSW occur in KC642 and KC646 (Figure 4). These faults are also cause by the adjacent underlying salt uplift.

The remainder of the seafloor is generally smooth and featureless.

2.4 Man-made Seafloor Obstructions

Existing wells occur in Blocks KC642, KC646, and KC736. No other seafloor obstructions or objects were detected or are reported.

The minimum dimensions of a seafloor object that would be expected to be detected by 3D seismic data would be of the order of several bin dimensions in length and/or width, and several feet in height. As a guide, it is suggested that an object less than 200ft in length and less than 40ft high would not be detected on this dataset. No man-made seafloor obstructions were observed within the resolution capabilities of the 3D seismic dataset.

2.5 Seafloor Stability

There is clear indication of past surficial soil failures originating from a north to south trending salt ridge in KC688 and KC732. A broad surficial debris flow extends from the ridge almost 15,000ft to the west and covering most of KC687 and the northeast of KC731 (Figure 6). There is some indication that more recent and smaller debris flows are deposited on-top of the larger flow. These occur primarily in northeast of KC687. These debris flows are induced by the effects of the underlying salt uplift, which is interpreted as continuing.

The debris flows are not fully resolved on the 3D seismic data, and exact thickness cannot be determined. Based on the resolution of the available data the debris flows are estimated to be less than 20ft thick.

No other clear surficial soil instabilities are observed, however, within the intensely faulted graben areas additional localized smaller surficial instabilities are likely to have occurred and are not resolved on this data set.

2.6 Seafloor Faulting

Intensely faulted seafloor grabens occur along the peripheries of the study area to the north and east, and to a lesser extent the west. Within these regions seafloor faults are frequent and complex, exhibiting throws of up to 50ft.

In blocks KC688 and KC732 a narrow ridge of underlying salt uplift extends southward from the intensely faulted graben area. This uplift induces a large seafloor fault intersection (Figure 5) exhibiting a broad roll over structure to the east and sharp downthrown of around 100ft to the west. Other smaller antithetic faults or sub-parallel faults intersect seafloor around 1,000ft

to 1,500ft west of this larger fault.

In blocks KC642 and KC686 additional salt induced NNW / SSE trending faults occur downthrown to the east and west by up to 50ft (Figure 4).

None of the faults appear to be acting as preferential fluid conduits to seafloor.

2.7 Seafloor Amplitudes

Seafloor 3D seismic amplitudes within the study area are generally low to moderate (Figure 11). Soft clays and silts are interpreted at seafloor throughout the study area.

Occasional slightly elevated amplitudes occur within the seafloor grabens, and these appear to be due to exposure of slightly firmer sediments due to the faulting.

2.8 Hydrocarbon Seeps

Six localized and discrete hydrocarbon seepages are interpreted (Figures 7 through 10). One in KC642, two in the southeast of KC645, one in the northwest of KC690, and two in the northwest of KC734.

One of these seeps, in KC734, is identified in the BOEM hydrocarbon seep database.

The seeps appear to be originating from shallow buried debris flow units.

2.9 Sensitive Habitats and Sensitive Sessile Benthic Communities

A number of techniques are used to detect the presence of sensitive sessile benthic communities. Initially, anomalously high seafloor amplitudes are the primary criteria. Irregularly high amplitudes in association with structural seafloor features, such as mud volcanoes, seafloor mounds and extensional collapse, are benchmark indicators marking the possible presence of these biologically sensitive habitats.

The localized and discrete hydrocarbon seeps described in Section 2.8 are considered favorable sites for development of sensitive seabed biology. Additional higher resolution geophysical data or photographic imagery would be necessary to determine the presence or absence of biologic communities at these sites.

2.10 Proposed FPS Location

Water depth at the proposed FPS location is -6,405ft. Depths across the proposed anchor radius range from -6,126ft to -6,738ft sloping steadily to the southeast. Seafloor gradient across the anchor radius is 1.5°.

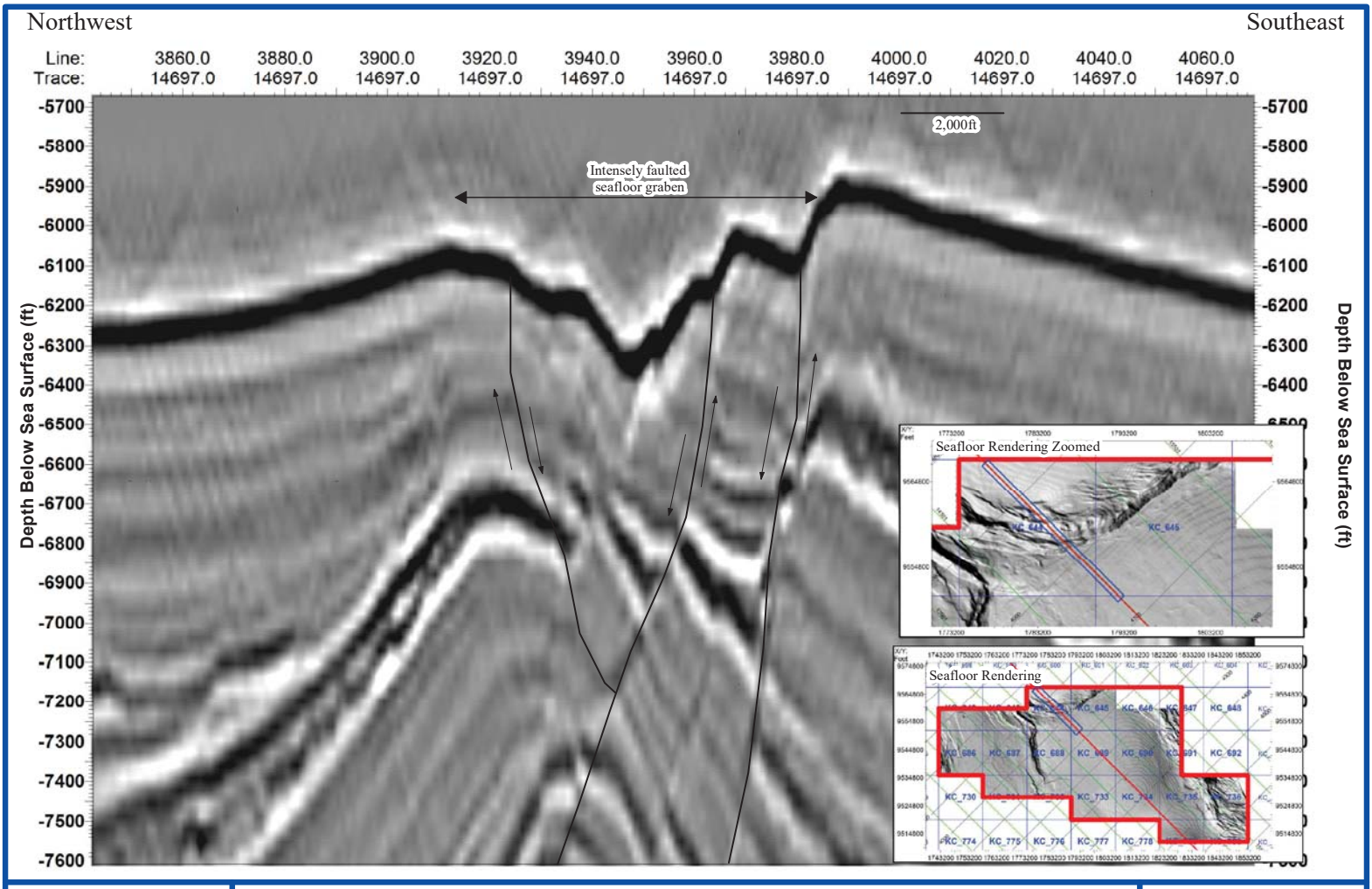
The seafloor at the FPS and throughout the proposed anchor radius is benign and does not exhibit evidence of any seafloor or near seafloor irregularities or potential hazards (Figures 12 and 13). A single fault was mapped just to the southwest of the anchor spread downthrown around 10ft to the southwest. Anchor 7 is 250ft north of this seafloor fault intersection.

The anchors were designed to avoid the aforementioned hydrocarbon seeps by at least 1,000ft. The closest anchor to an identified seep is anchor 4 at 1,820ft west.

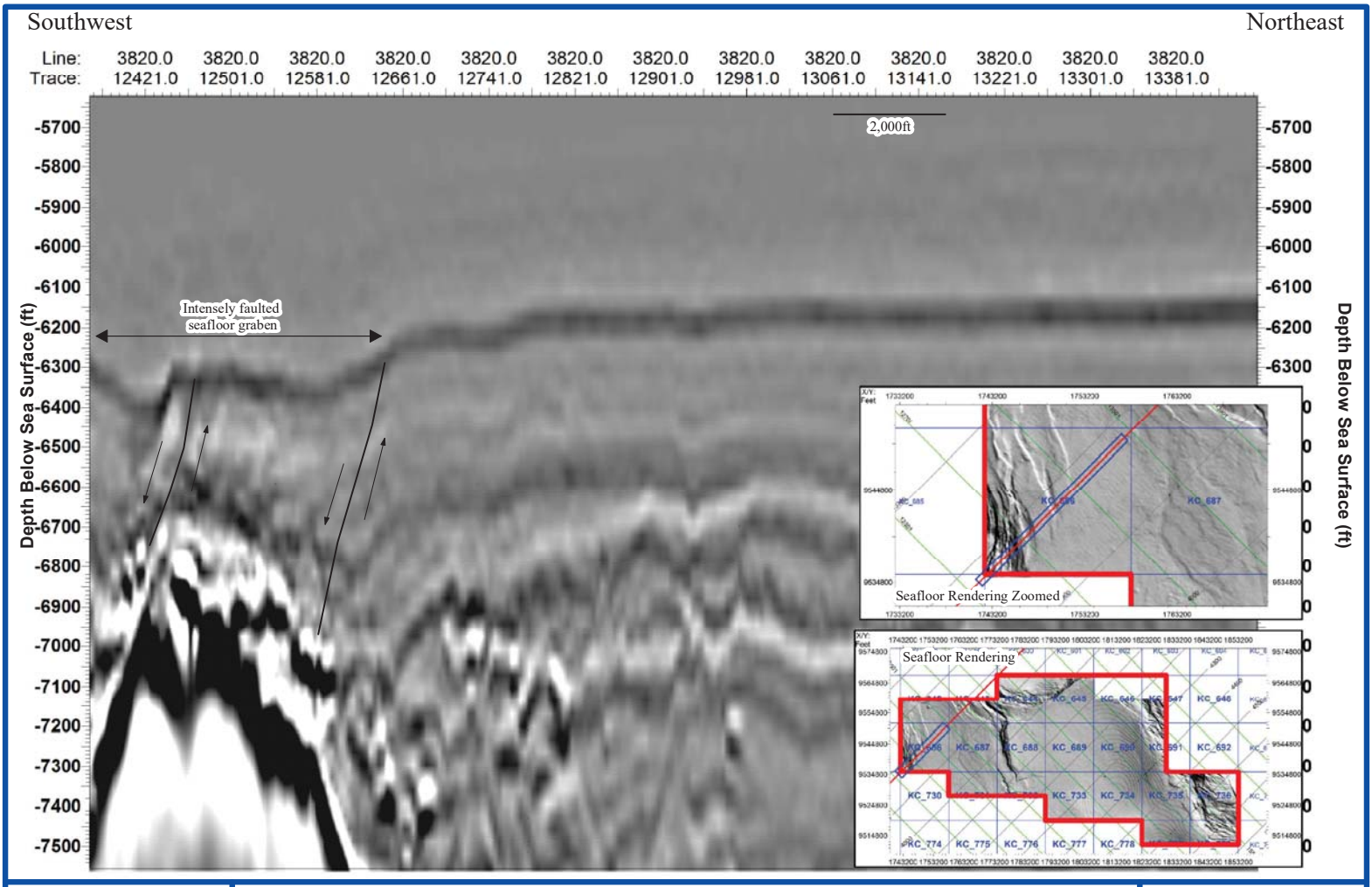
This assessment is based on existing 3D seismic data and is therefore limited by the resolution of the dataset. LLOG intends to commission a high-resolution geophysical investigation utilizing an autonomous underwater vehicle to fully address geohazard, archaeological, and biological concerns in compliance with NTLs 2008-G05, 2005-G07, and 2009-G40 issued by the Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement. In preparation for this scope of work, on behalf of LLOG, Echo Offshore has applied for and been issued G&G Permit L21-015. As currently planned, the proposed AUV investigation will cover a 14,000ft radius centered on the proposed FPS location and will utilize a sidescan sonar, multibeam echosounder, and subbottom profiler data. This work is tentatively planned for late September to early October 2021. Following completion of the geophysical scope of work, a complete report will be prepared fully addressing the data sets in compliance with the above referenced NTLs.

3. SUMMARY

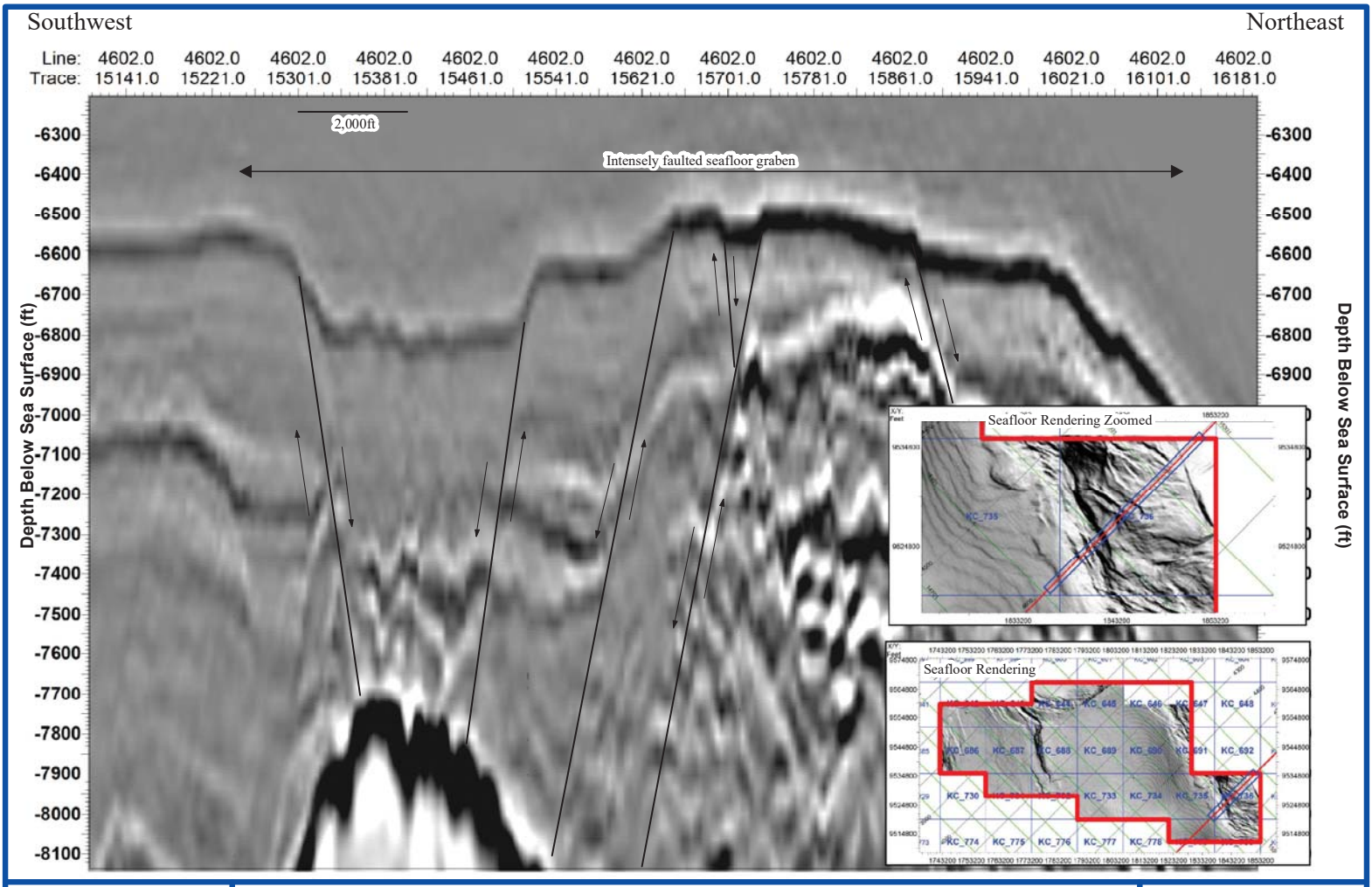
- Existing well locations should be noted with respect to future developments.
- Six potential hydrocarbon seeps favorable for the development of sensitive sessile benthic communities should be avoided by at least 2,000ft for future well locations and 300ft by any other bottom disturbing activities. Additional higher resolution data acquisition of seafloor is recommended to best quantify these features.
- Seafloor fault intersections that locally exhibit gradients over 10° should be considered when planning future developments.
- Further surficial instability from the faulted uplift in KC688, KC732, 687, and 731 should be considered when planning future developments. The underlying salt uplift which is interpreted as the catalyst for the surficial instability is likely continuing, and further failures are considered possible. Further higher resolution geophysical survey, possibly supplemented with additional geotechnical sampling, could be considered over this area to better quantify the potential risk for future surficial instability in this area.
- Conditions across the proposed FPS anchor radii are considered benign. Water depth at the FPS location are -6,405ft while depths range from -6,126ft to -6,738ft throughout the proposed anchor radius, sloping 1.5° to the southeast. The proposed anchors will avoid observed hydrocarbon seeps by a minimum of 1,000ft. Subsequent data will be obtained to fully address shallow hazards, archaeology, biology, and geotechnical conditions throughout the proposed radii.
- For a detailed discussion of all seafloor conditions, refer to Section 2 of this report.



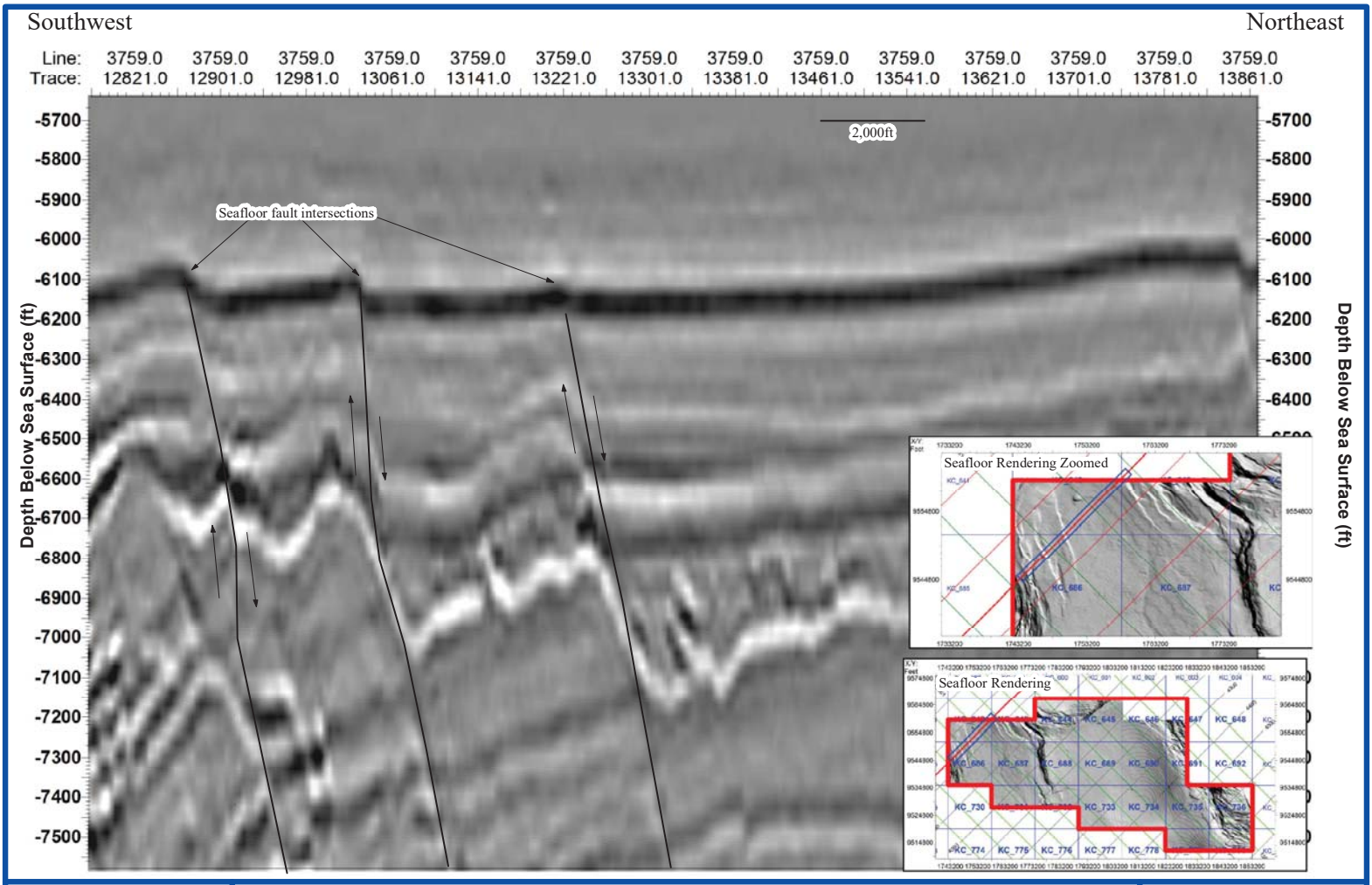
Crossline 14697	Illustrating Seafloor Graben	Figure 1



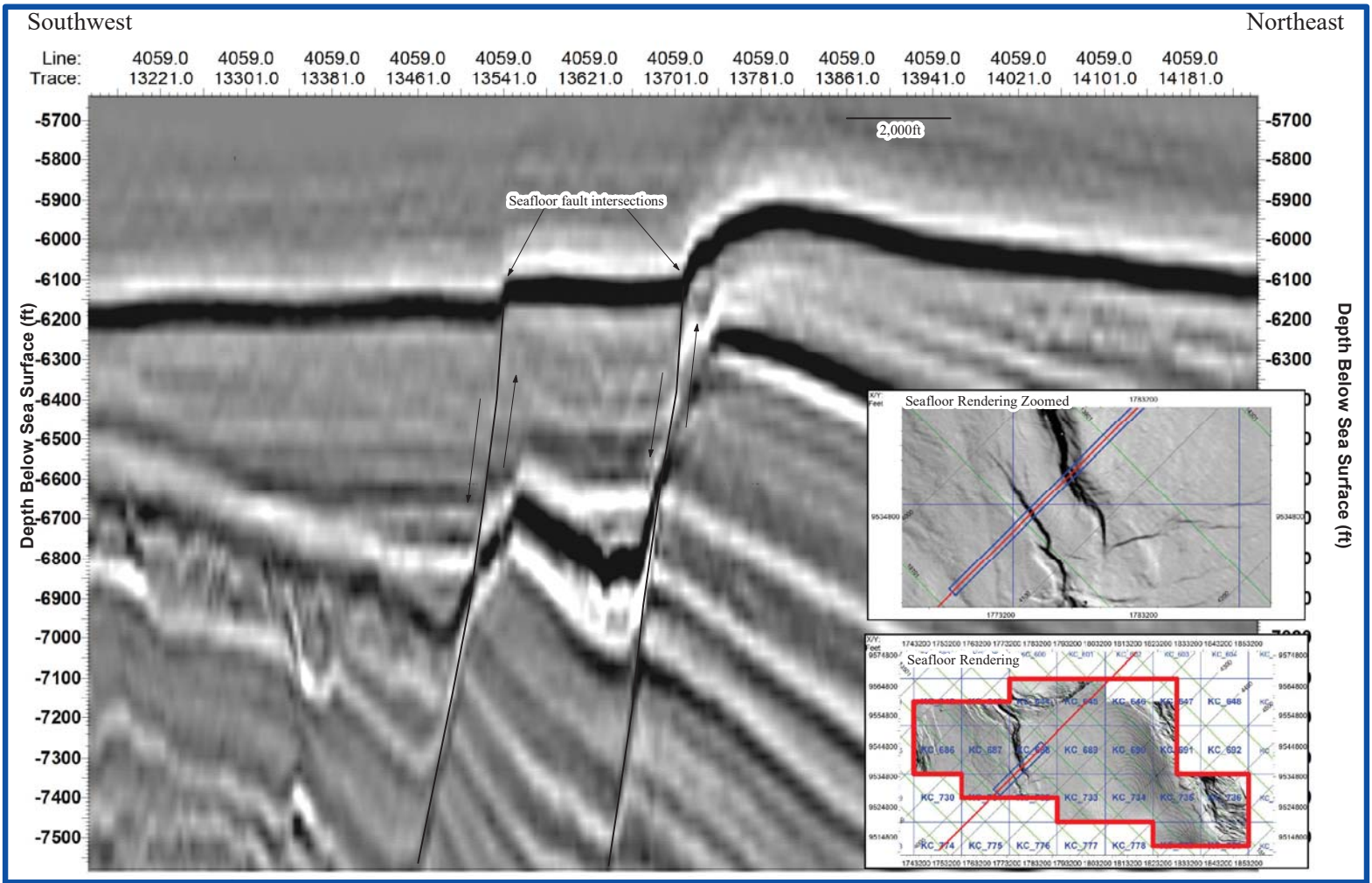
Inline 3820	Illustrating Seafloor Graben	Figure 2



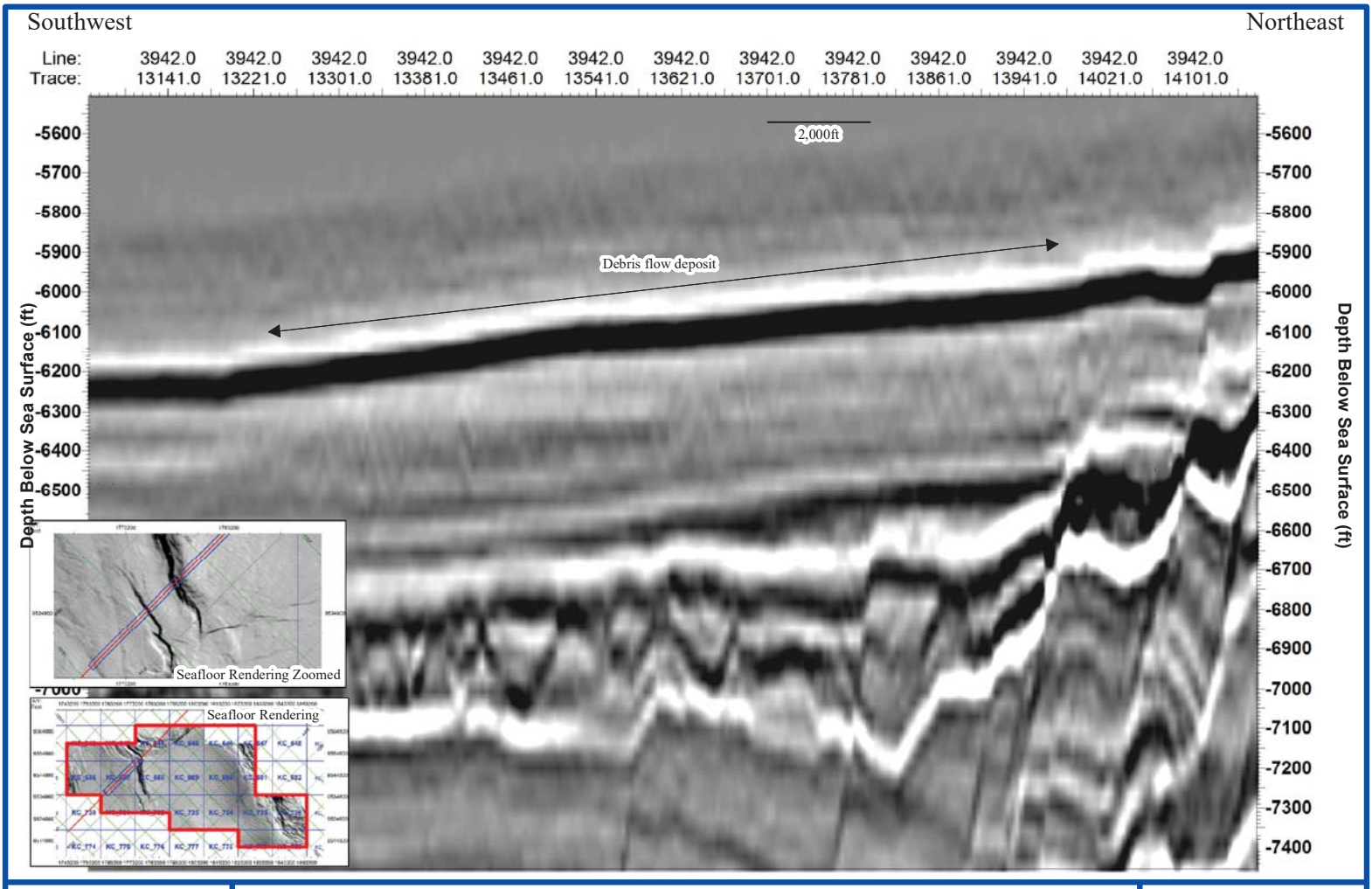
Inline 4602	Illustrating Seafloor Graben	Figure 3



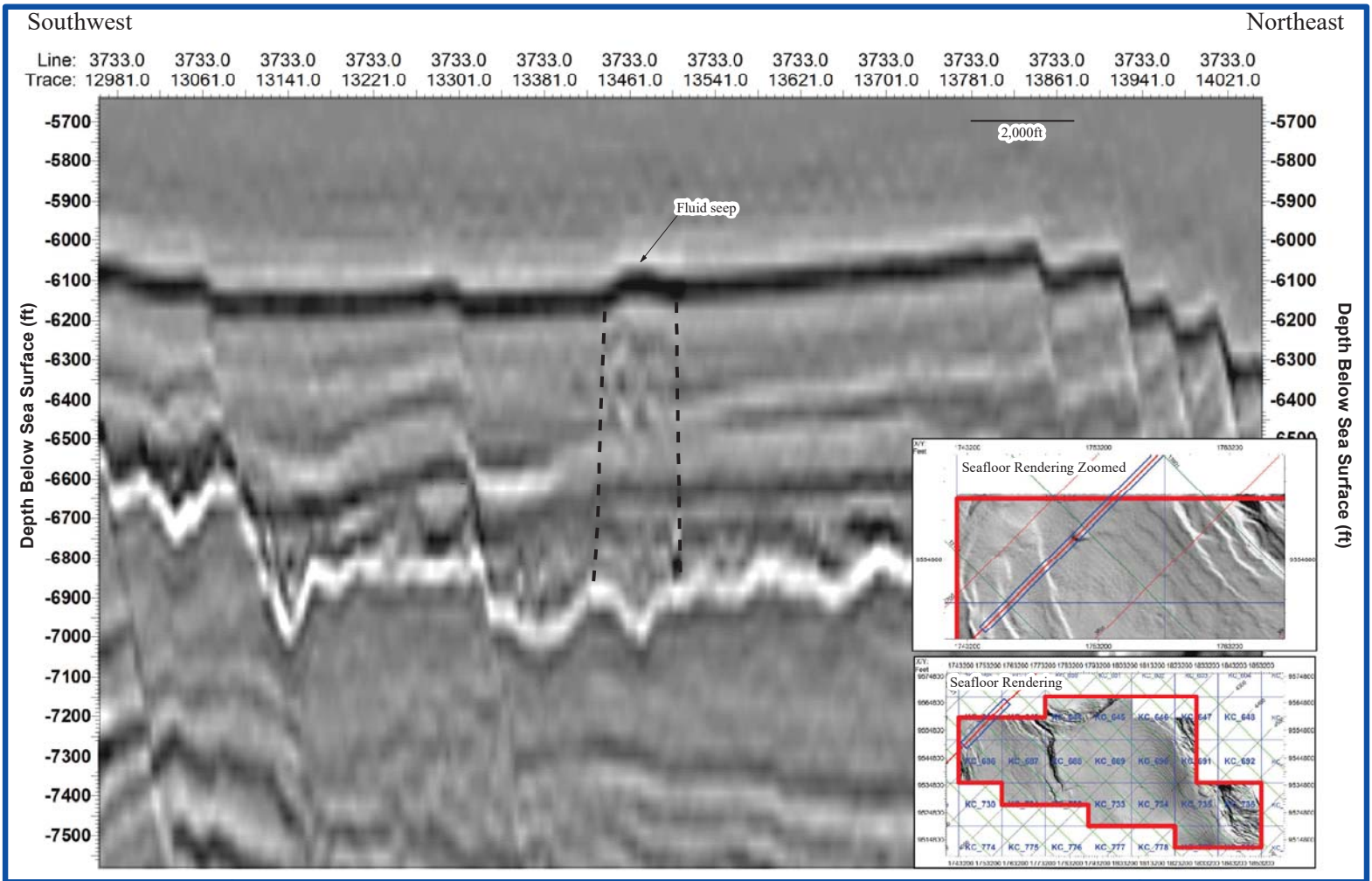
Inline 3759	Illustrating Seafloor Fault Intersections	Figure 4



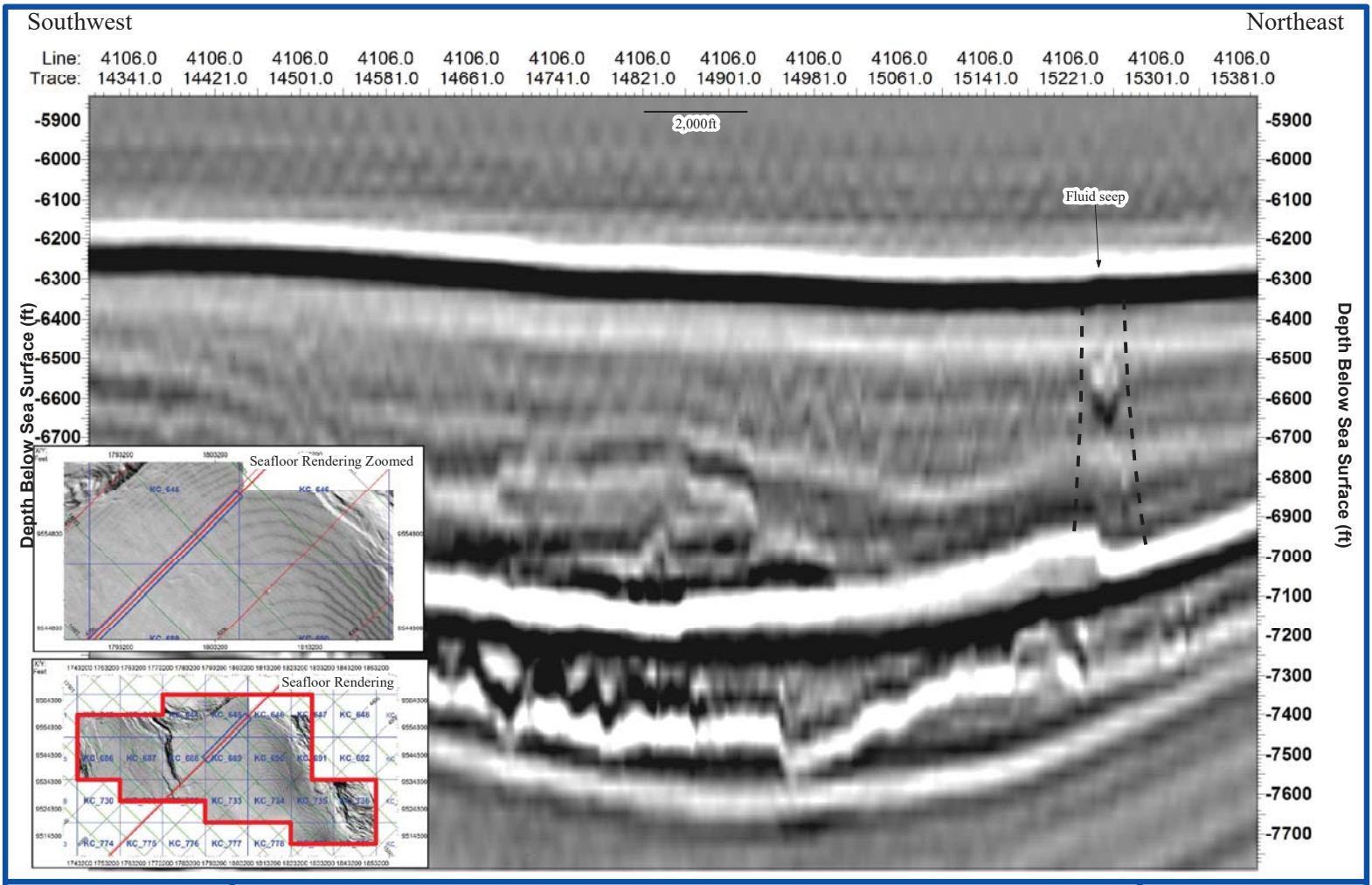
Inline 4059	Illustrating Seafloor Fault Intersections	Figure 5



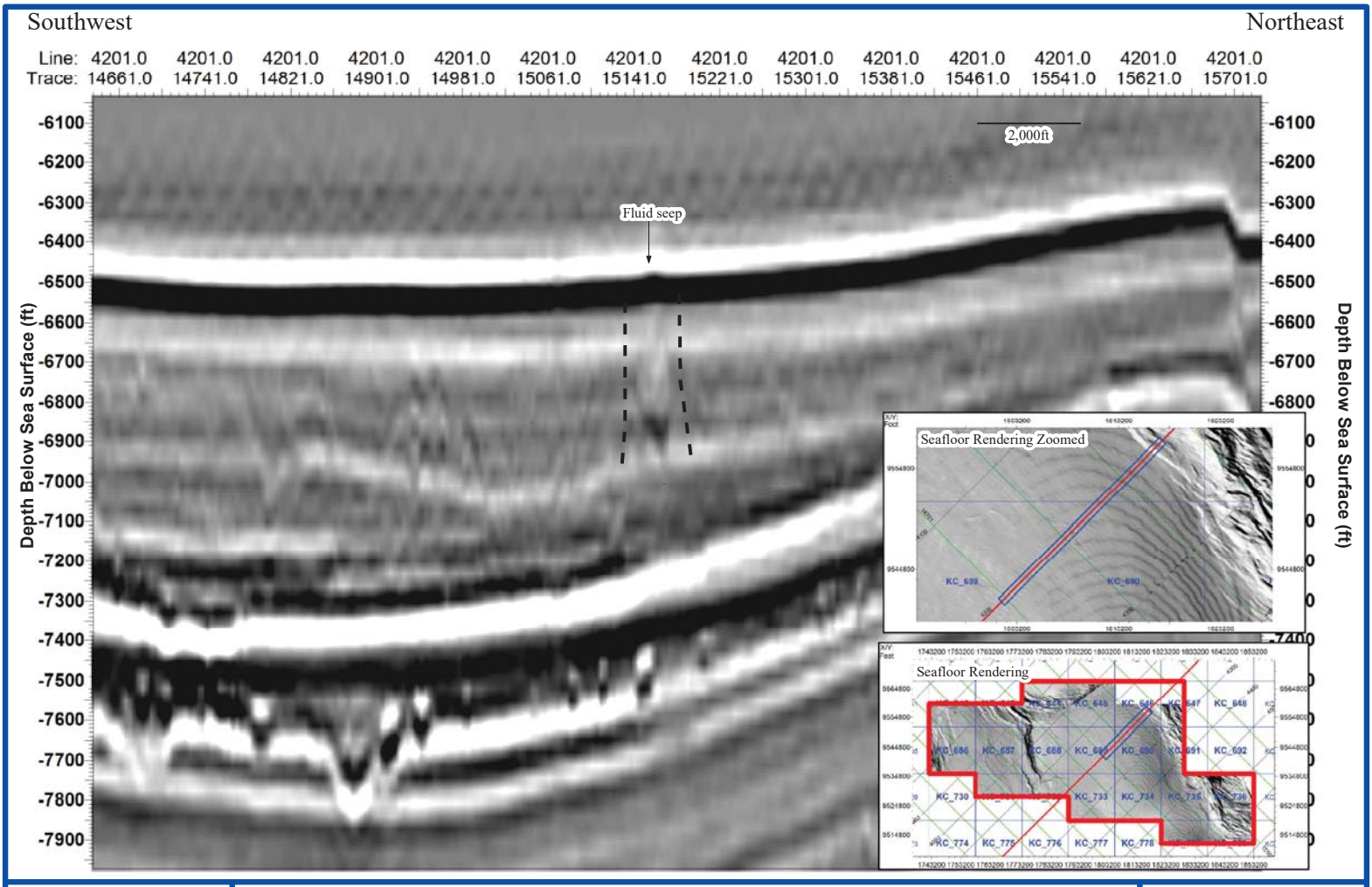
Inline 3942	Illustrating Debris Flow Deposit	Figure 6



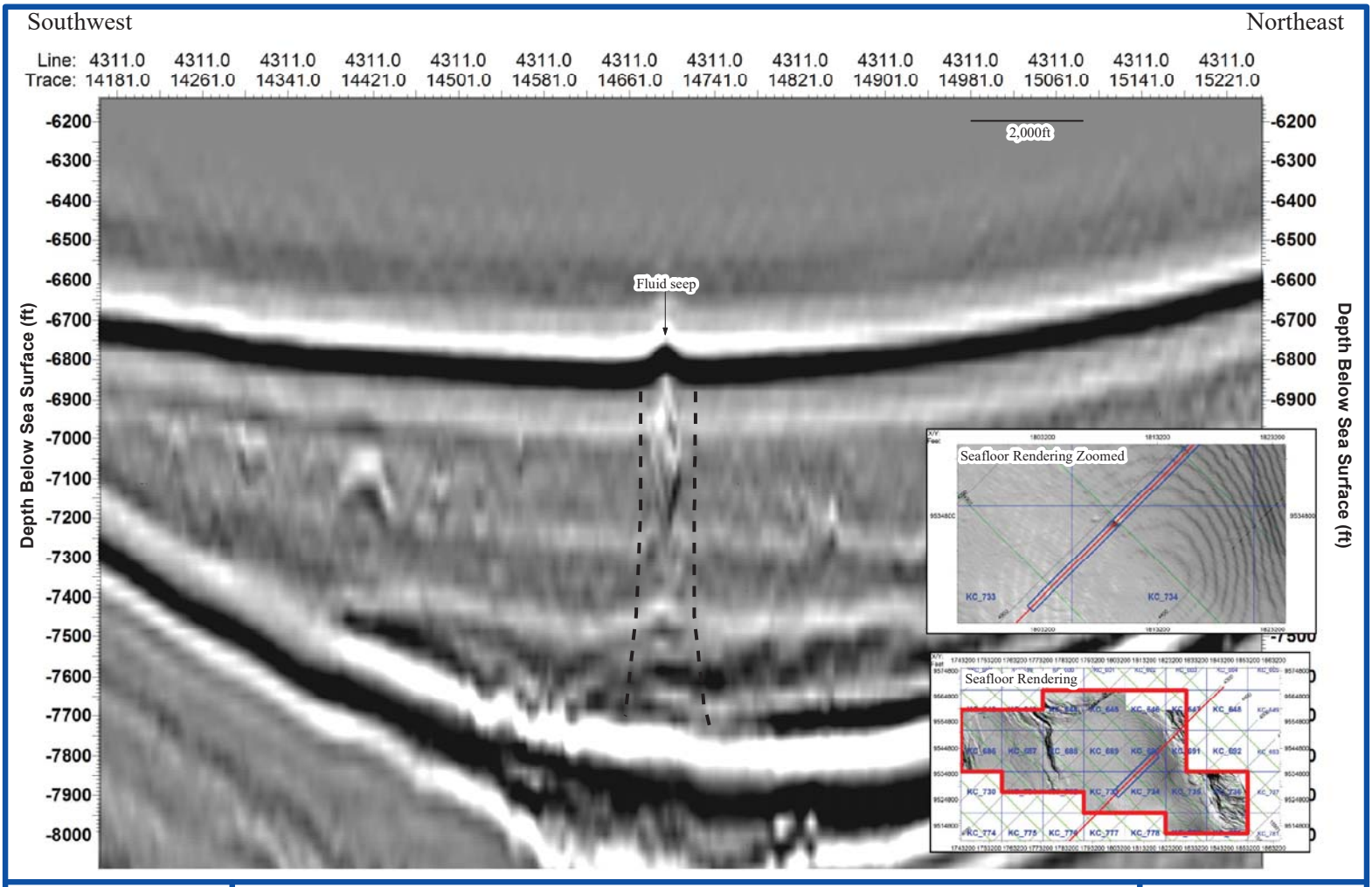
Inline 3733	Illustrating Seafloor Fluid Seep	Figure 7



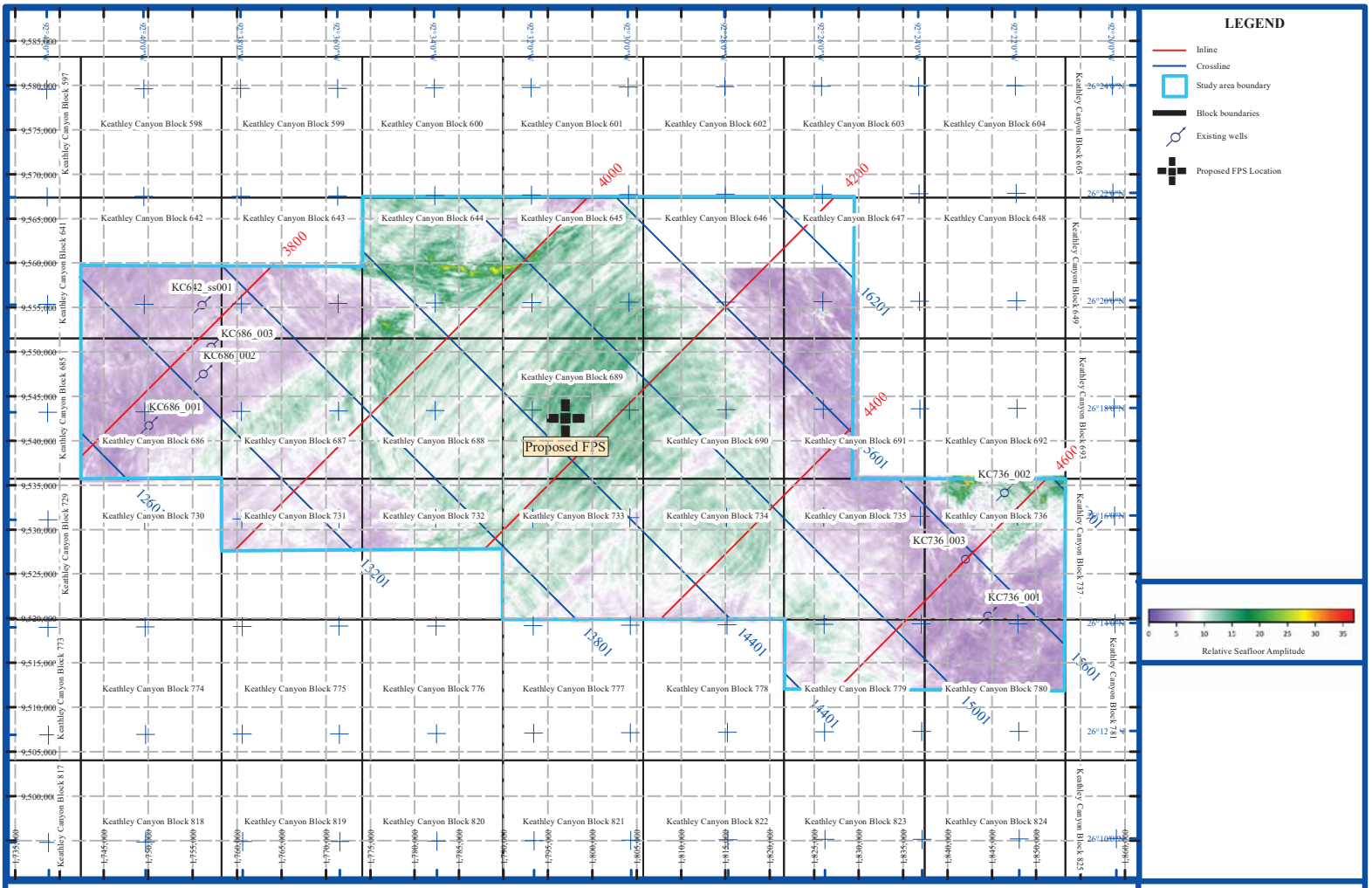
Inline 4106	Illustrating Seafloor Fluid Seep	Figure 8



Inline 4201	Illustrating Seafloor Fluid Seep	Figure 9



Inline 4311	Illustrating Seafloor Fluid Seep	Figure 10

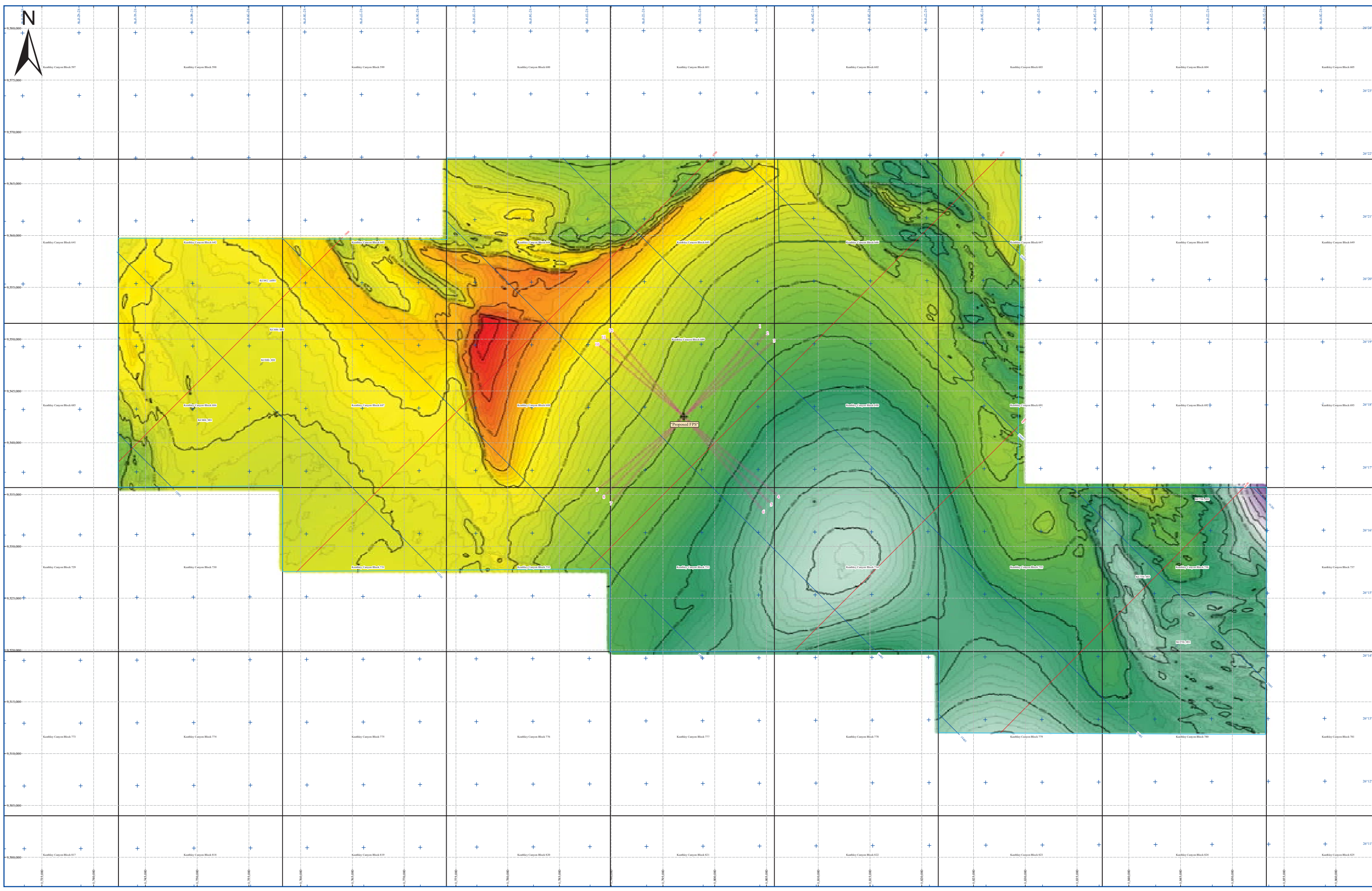


Seafloor Amplitude

Figure 11

APPENDIX A - TABLOID SIZED CHARTS

ENCLOSURES - DRAWINGS 2021-399.01 – 2021-399.03



LEGEND

- Inline
- Crossline
- Study area boundary
- Block boundaries
- Existing wells
- Region of seafloor rendered using publicly available depth information
- Proposed FPS Location
- Proposed Anchor Locations

-6300 Seabed depth below sea surface, contoured at 100ft intervals, minor contours at 20ft intervals.

PROPOSED FPS LOCATION
1,797,000
9,542,500

PROPOSED ANCHOR LOCATIONS		
1	1,804,218.80	9,551,080.79
2	1,804,929.53	9,550,429.53
3	1,805,580.79	9,549,718.80
4	1,805,971.47	9,534,953.38
5	1,805,290.15	9,534,209.85
6	1,804,546.62	9,533,528.53
7	1,790,109.02	9,534,309.89
8	1,789,431.09	9,534,931.09
9	1,788,809.89	9,535,609.02
10	1,788,809.89	9,549,390.98
11	1,789,431.09	9,550,068.91
12	1,790,109.02	9,550,690.11

Notes

3D data was provided in depth therefore no depth conversion was necessary.

Seafloor Depth (Feet)

GEODETIC INFORMATION

Coordinate System: NAD 1927 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1927
Units: Foot US

false easting: 1,640,416.6667
false northing: 0.0000
central meridian: -93.0000
scale factor: 0.9996
latitude of origin: 0.0000

Chart scale 1" = 2,500'

3D SEAFLOOR STUDY
GULF OF MEXICO
KEATHLEY CANYON
BLOCKS 642-647, 686-691, 731-736, 779-780
PROPOSED FPS

SEAFLOOR DEPTH
CHART 1

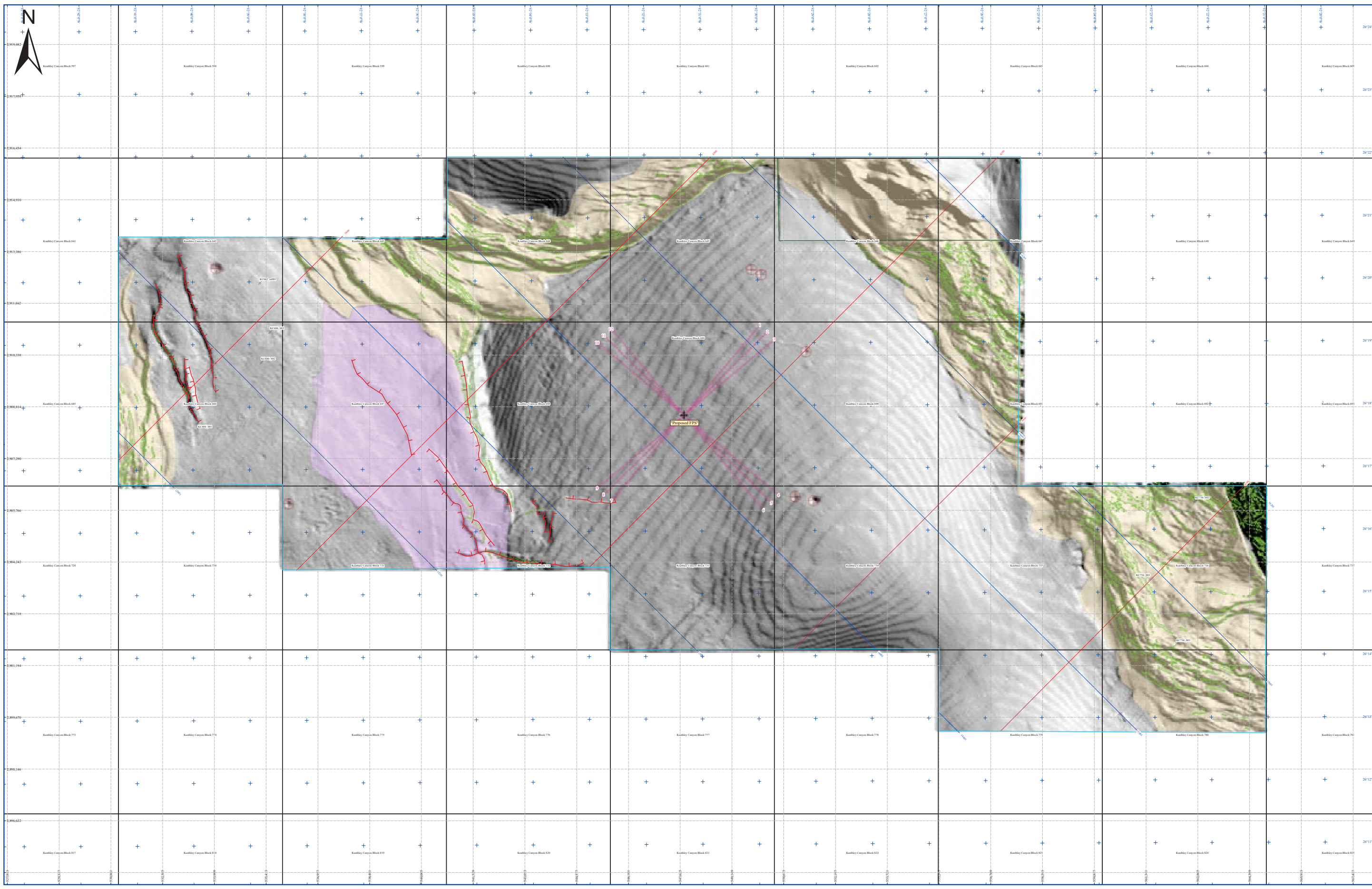
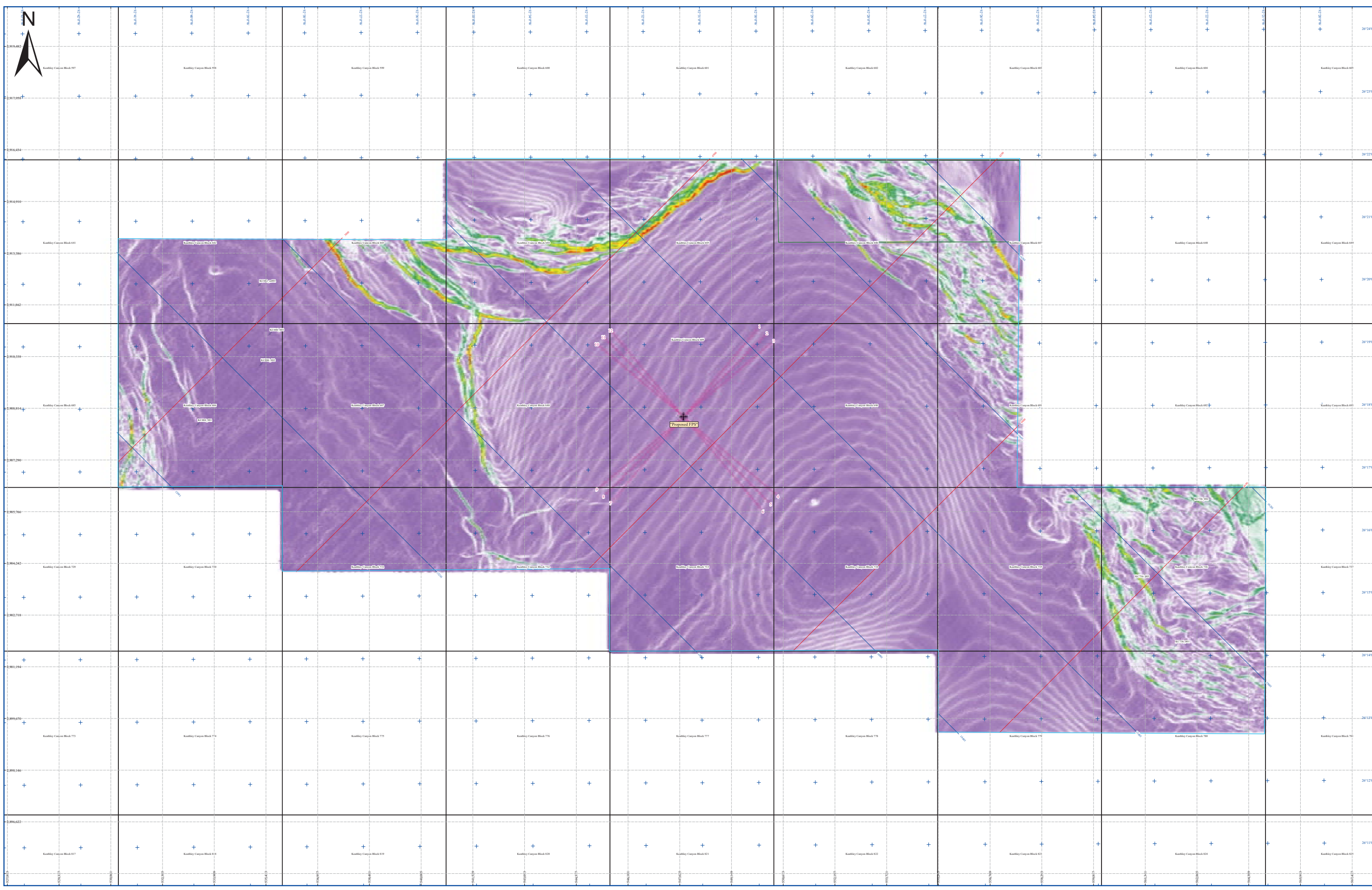


Chart scale 1" = 2,500'

3D SEAFLOOR STUDY
GULF OF MEXICO
KEATHLEY CANYON
BLOCKS 642-647, 686-691, 731-736, 779-780
PROPOSED FPS

SEAFLOOR MORPHOLOGY
CHART 2



LEGEND

- Inline
- Crossline
- Study area boundary
- Block boundaries
- Existing wells
- Region of seafloor rendered using publicly available depth information
- Proposed FPS Location
- Proposed Anchor Locations

GEODETIC INFORMATION

Coordinate System: NAD 1927 UTM Zone 15N
Projection: Transverse Mercator
Datum: North American 1927
Units: Meter

False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -93.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000

Chart scale 1" = 2,500'

3D SEAFLOOR STUDY
GULF OF MEXICO
KEATHLEY CANYON
BLOCKS 642-647, 686-691, 731-736, 779-780
PROPOSED FPS

SEAFLOOR SLOPE
CHART 3

High Resolution Seismic Lines

Attachment C-8
(Proprietary Information)

APPENDIX D
HYDROGEN SULFIDE (H2S) INFORMATION
(30 CFR PART 550.215 AND 550.245)

A. Concentration

LLOG does not anticipate encountering H2S while conducting the proposed development operations provided under this plan.

B. Classification

In accordance with Title 30 CFR 250.490 ©, the areas of operations have been classified by the Bureau of Ocean Energy Management as “H2S” absent.

C. H2S Contingency Plan

Not applicable to proposed operations.

D. Modeling Report

Not applicable to proposed operations.

APPENDIX E
MINERAL RESOURCE CONSERVATION INFORMATION
(30 CFR PART 550.246)

A. Technology and Reservoir Engineering Practices and Procedures:

Provide a brief description of the technology and reservoir engineering practices and procedures you will use to increase the ultimate recovery of oil and gas (e.g., secondary tertiary, or other enhanced recovery practices). If enhanced recovery practices are not going to be used initially, provide an explanation of the methods you considered and the reasons why you are not using them.

PROPRIETARY DATA

B. Technology and Recovery Practices and Procedures. Provide a brief description of the technology and recovery practices and procedures you may use to ensure optimum recovery of oil and gas.

PROPRIETARY DATA

C Reservoir Development – Provide a brief description of your exploratory well results, other relevant data, proposed well spacing, completion methods, and other relevant well plan information.

PROPRIETARY DATA

APPENDIX F
BIOLOGICAL, PHYSICAL AND SOCIOECONOMIC INFORMATION
(30 CFR PART 550.216 AND 550.247)

A. High-Density Deepwater Benthic Communities Information:

Keathley Canyon Blocks 686, 689, and 736 are located in water depths of 984 feet (300 meters) or greater. At such depth high-density, deepwater benthic communities may sometimes be found. However, Keathley Canyon Blocks 686, 689, and 736 are approximately 22.5 miles, 24.8, and 32.1 miles, respectfully, from a known deepwater benthic community site (Keathley Canyon Block 333), listed in NTL 2009-G40. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Due to the distance from the closest known deepwater benthic community and because physical disturbances to the seafloor will be minimized by the use of a dynamically positioned semisubmersible or drillship, LLOG Offshore Exploration, L. L. C.'s proposed operations in Keathley Canyon Blocks 686, 689, and 736 are not likely to impact deepwater benthic communities.

B. Topographic Features Map

Keathley Canyon Block 686 is 105.3 miles from the closest designated Topographic Features Stipulation Blocks (Geyer Bank). Keathley Canyon Blocks 689 and 736 are 106.9 miles and 112.1 miles, respectively, from the next closest designated Topographic Features Stipulation Blocks (Elvers Bank). Therefore, no adverse impacts are expected. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

If such proposed bottom disturbing activities are within 500 feet of a "No Activity Zone", the BOEM is required to consult with the NMFS.

The activities proposed in this Plan are not affected by a topographic feature.

C. Topographic Features Statement (Shunting)

The activities proposed in this Plan are not affected by a topographic feature.

D. Live Bottoms (Pinnacle Trend) Map

Certain leases are located in areas characterized by the existence of live bottoms. Live bottom (Pinnacle trend features) are small, isolated, low to moderate relief carbonate reefal features or outcrops of unknown origin or hard substrates exposed by erosion that provide surface area for the growth of sessile invertebrates and attract large numbers of fish. Known features occur in an area of topographic relief in the northeaster portion of the western Gulf of Mexico. These leases contain a Live Bottom Stipulation to ensure that impacts from nearby oil and gas activities on these live bottom areas are mitigated to the greatest extent possible.

Keathley Canyon Blocks 686, 689, and 736 are 325.8 miles, 318.9 miles, and 314 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed

E. Live Bottom (Low Relief) Map

Certain leases are located in areas characterized by the existence of live bottoms. Live bottom (Low Relief Features) are seagrass communities; those areas that contain biological assemblages consisting of sessile invertebrates living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; and areas where a hard substrate and vertical relief may favor the accumulation of turtles, fish or other fauna. These features occur in the Eastern Planning Area of the Gulf of Mexico.

Keathley Canyon Blocks 642/686/736/689 are not located within the vicinity of a proposed live bottom (low relief) area.

F. Potentially Sensitive Biological Features

Oil and gas operations and transportation activities in the vicinity of potentially sensitive biological features may cause deleterious impacts to the sessile and pelagic communities associated with those habits. Adverse impacts to the communities could be caused by mechanical damage from drilling rigs, platform, pipelines and anchor employment.

Keathley Canyon Blocks 642/686/736/689 are not located within the vicinity of a proposed sensitive biological feature area.

G. *Threatened or Endangered Species, Critical Habitat, and Marine Mammal Information.*

Proposed activities in Keathley Canyon Blocks 642, 686, 736 and 689 are not located in a critical habitat designated under ESA and marine mammals protected under the MMPA although federally protected marine mammals are always anticipated. LLOG will mitigate impact through compliance with BOEM NTL 2016-G01, G02 and NTL 2015 BSEE-G03. See ***Attachment E-1*** for a list of the NOAA Species known in the Gulf of Mexico. In the event federally listed species become present on Keathley Canyon Blocks 642, 686, 736 and 689 LLOG will mitigate impact through compliance with BOEM NTL 2016-G01, G02, NTL 2015 BSEE-G03 and the Biological Opinion of the Endangered Species Act Section 7. See Attachment E-1 for a list of the NOAA Species known in the Gulf of Mexico. Moon pool daily observation log shall be maintained on the bridge. The deck supervisor on tour shall go to the bridge and log time, date, and results of each moon pool inspection. STOP WORK AUTHORITY shall be used and implemented, in a safe and timely manner, for any work that could affect marine life listed on the Endangered Species Act.

I. Archaeological Report

Keathley Canyon Block 736/686/642/689 are not regarded as being in a high probability zone for historic shipwrecks based on Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) NTL No. 2011-JOINT-G01 (BOEM/BSEE, 2011). Pursuant to the public information in the NOAA Automated Wreck and Obstruction Information System and Navigational Charts (NOAA, 2019); no shipwrecks are reported within KC 686736/689.

J. Air and Water Quality Information

Not applicable. The State of Florida is not an affected State.

K. Socioeconomic Information

Not applicable. The State of Florida is not an affected State.

List of the NOAA Species Known in the Gulf of Mexico

Attachment F-1
(Public Information)

Endangered Species List Common to the Gulf of Mexico

Geophysical surveys, including the use of airguns and airgun arrays,may have an impact on marine wildlife. Many marine species are protected under the Endangered Species Act (ESA) and all marine mammals (including manatees) are protected under the Marine Mammal Protection Act (MMPA). The following Gulf of Mexico species are listed under the ESA:

Gulf of Mexico Bryde's Whale (Balaenoptera edeni)
Sperm Whale (Physeter macrocephalus)
Green Turtle (Chelonia mydas) – North Atlantic DPS and South Atlantic DPS
Hawksbill Turtle (Eretmochelys imbricata)
Kemp's Ridley Turtle (Lepidochelys kempii)
Leatherback Turtle (Dermochelys coriacea) - Northwest Atlantic
Loggerhead Turtle (Caretta caretta) – Northwest Atlantic Ocean DPS
Gulf Sturgeon (Acipenser oxyrinchus desotoi)
Oceanic Whitetip Shark (Carcharhinus longimanus)
Giant Manta Ray (Manta birostris)
West Indian Manatee (Trichechus manatus)*

Note that this list can change as other species are listed/delisted, and this protocol shall be applied to any ESA protected species (and all marine mammals) that occur in the Gulf of Mexico, including rare and extralimital species.

LLOG's proposed operations in this plan will not impact the critical habitats of the marine species listed in the Endangered Species Act.

*Managed by the US Fish and Wildlife Service

APPENDIX G
WASTE AND DISCHARGE INFORMATION
(30 CFR PART 550.217 AND 550.248)

A. Projected Generated Waste

- See Attached Waste Tables

B. Projected Ocean Discharges

- See Attached Discharge Tables

C Modeling Report

Not applicable. Discharges will be performed under EPA NPDES General Permit GMG 290000.

D. NPDES Permits

Not applicable. Discharges will be performed under EPA NPDES General Permit GMG290000.

E. Cooling Water Intakes

The information at 250.217(e) and 250.248(e) regarding cooling water intakes is not required to accompany DOCD's submitted in the BOEM.

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

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

Projected generated waste			Projected ocean discharges		Downhole Disposal
Type of Waste	**Composition**	**Projected Amount**	**Discharge rate**	**Discharge Method**	**Answer yes or no**
Will drilling occur ? If yes, fill in the muds and cuttings.					
EXAMPLE: Cuttings wetted with synthetic based fluid	*Cuttings generated while using synthetic based drilling fluid.*	*X bbl/well*	*X bbl/day/well*	*discharge overboard*	*No*
Water-based drilling fluid	Water based mud additives, barite and gel used for WBM	255,442 bbls/well	10,316 bbls/day/well	Discharge overboard	No
Cuttings wetted with water-based fluid	Cuttings generated while using water based drilling fluid.	12,147 bbls/well	491 bbls/day/well	Discharge overboard	No
Cuttings wetted with synthetic-based fluid	Cuttings generated while using synthetic based drilling fluid.	15,873 bbls/well	129 bbls/day/well	Discharge overboard	No
Will humans be there? If yes, expect conventional waste					
EXAMPLE: Sanitary waste water	Sanitary waste from living quarters	X bbl/well	X bbl/hr/well	chlorinate and discharge overboard	No
Domestic waste	Misc waste for living quarters	55,257 bbls/well	3.9 bbls/hr/well	Discharge overboard (no free oil)	No
Sanitary waste	Processed sanitary waste from living quarters	36,838 bbls/well	2.6 bbls/hr/well	Chlorinate and discharge overboard per USCG approved MSD	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Accumulated drainage due to rainfall	0 to 47,261 bbls/well	0 to 167 bbls/hr/well	Test for oil and grease and discharge overboard	No
Will you conduct well treatment, completion, or workover?					
Well treatment fluids - chemical product waste	Ethylene glycol, methonal	300 bbls/well	20 bbls/hr/well	Transported to shore on vessels in DOT approved containers to Fourchon base for pick-up	No
Well completion fluids	Brines: NaCL, KCl, CaBr2, CaCl2, spent acids (hydroflouric and hydrochloric), prop sand, debris from potential flowback operations	500 bbls/well	100 bbls/hr/well	Non-pollutant brines - tested for oil and grease for discharge overboard. This excludes clear brines containing Zinc, spent acids, prop sand and debris. These will be transported to shore on vessels in DOT approveed containers to Fourchon base and on to Newpark Base for disposal.	No
Workover fluids	Brines: NaCL, KCl, CaBr2, CaCl2, spent acids (hydroflouric and hydrochloric), prop sand, debris from potential flowback operations	500 bbls/well	100 bbls/hr/well	Non-pollutant brines - tested for oil and grease for discharge overboard. This excludes clear brines containing Zinc, spent acids, prop sand and debris. These will be transported to shore on vessels in DOT approveed containers to Fourchon base and on to Newpark Base for disposal.	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization unit discharge	Uncontaminated spent seawater used for potable water generation unit	0 to 100,000 bbls/well	60 bbls/hr/well	Discharge overboard	No
Blowout prevent fluid	Stack Magic 200/0/5% glycol based on 2% mixture with potable water	0 to 100 bbls/well	5 bbls/hr/well	Discharge at seafloor	No
Ballast water	Uncontaminated seawater used for ballast control	0 to 100,000 bbls/well	16,350 bbls/hr/well	Discharge overboard	No
Bilge water	Uncontaminated freshwater and seawater overflow / leakage accumuated from machinery operations	200 bbls/well	0 to 2 bbls/hr/well	Discharge overboard	No
Excess cement at seafloor	Excess cement slurry and mixwater used for cementing operation - NPDES allowed	1000 bbls/well	360 bbls/hr/well	Discharge at mudline	No
Fire water	Uncontaminated seawater used for fire control system - no additives	0 to 10,000 bbls/well	16,350 bbls/hr/well	Discharge overboard	No
Cooling water	Uncontaminated seawater used for heat exchanger operations used to cool machinery	0 to 400,000 bbls/well	0 to 1600 bbls/hr/well	Discharge overboard	No
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	NA	NA	NA	NA	No
Will you be covered by an individual or general NPDES permit ?		**General NPDES**			
			Comply with the requirements of the NPDES permit.		

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

TABLE 2. WASTES YOU WILL TRANSPORT AND /OR DISPOSE OF ONSHORE

Please specify whatever the amount reported is a total or per well

	Projected generated waste		Solid and Liquid Wastses Transportation	Waste Disposal		
Type of Waste	**Composition**		**Transport Method**	**Name/Location of Facility**	**Amount**	**Disposal Method**
				Newport Environmental Services Inc., Ingleside, TX	*X bbl/well*	*Recycled*
Oil-based drilling fluid or mud	Inverted diesel based mud		NA	Newpark Transfer Station, Fourchon, LA	NA	NA
Synthetic-based drilling fluid or mud	Internal olifin, ester nbased mud		Barged in 25 bbls cutting boxes and / or liquid mud tanks for supply vessels	Newpark Transfer Station, Fourchon, LA	6750 bbls / well	Recycled
Cuttings wetted with Water-based fluid	Drill cuttings wetted with WBM generated while drilling		NA	Newpark Transfer Station, Fourchon, LA	NA	NA
Cuttings wetted with Synthetic-based fluid	Drill cuttings wetted with SBM generated while drilling.		NA	Newpark Transfer Station, Fourchon, LA	NA	NA
Cuttings wetted with oil-based fluids	Drill cuttings wetted with inverted diesel based mud		NA	Newpark Transfer Station, Fourchon, LA	NA	NA
Will you produce hydrocarbons? If yes fill in for produced sand.						
Produced sand						
Will you have additional wastes that are not permitted for discharge? If						
EXAMPLE: trash and debris (recylables)	*Plastic, paper, aluminum*		*barged in a storage bin*	*ARC, New Iberia, LA*	*X lb/well*	*Recycled*
Trash and debris	Plastic, paper, aluminum		Barged in a storage bin	Blanchard Landfill, Golden Meadows, LA	4000 lbs / well	Recycled
Used oil	Spent oil from machinery		Barged in USCG approved transfer tote tanks.	L&L Services, Fourchon, LA	200 bbls / well	Recycled
Wash water	Wash water w/ SBM residue and surfactants		Barged in 25 bbls cutting boxes and / or liquid mud tanks for supply vessels	Newpark Transfer Station, Fourchon, LA	2000 bbls / well	Approved disposal well injection or land farm
Chemical product wastes	Spent treatment and / or damaged chemicals used in operations		Barged in 25 bbls cutting boxes and / or cutting boxes	L&L Services, Fourchon, LA	10 bbls / well	Recycled

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

APPENDIX H
AIR EMISSIONS INFORMATION
(30 CFR PART 550.218 AND 550.249)

The primary air pollutants associated with OCS development activities are:

- Carbon Monoxide
- Particulate Matter
- Sulphur Oxides
- Nitrogen Oxides
- Volatile Organic Compounds

These offshore air emissions result mainly from the drilling rig operations, helicopters, and support vessels. These emissions occur mainly from combustion or burning of fuels and natural gas and from venting or evaporation of hydrocarbons. The combustion of fuels occurs primarily on diesel powered generators, pumps or motors and from lighter fuel motors. Other air emissions can result from catastrophic events such as oil spills and blowouts.

A. Emission Worksheets and Screening Questions

The Projected Air Quality Emissions Report (Form MMS-139) addresses the related support vessels and construction barge information.

B. Emissions Reduction Measures

The projected air emissions are within the exemption level; therefore, no emission reduction measures are being proposed.

C. Verification of Non-default Emissions Factors

LLOG has elected to use the default emission factors as provided in ***Attachment H-1***

D. Non-Exempt Activities

The proposed activities are within the exemption amount.

E. Modeling Report

Not applicable. The State of Florida is not an affected State for the proposed activities in this plan.

Air Quality Emissions Report

Attachment H-1
(Public Information)

AIR EMISSIONS CALCULATIONS

COMPANY	LLOG Exploration Offshore, L. L. C.
AREA	Keathley Canyon
BLOCK	689
LEASE	G19619
FACILITY	A
WELL	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4
COMPANY CONTACT	Kim DeSopo/Nelda Runyon
TELEPHONE NO.	985-801-4300
REMARKS	Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATOR emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%.

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:

YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2023	0	0
2024	13	182
2025	0	0
2026	0	0
2027	0	0
2028-2034	0	0

Yes	No	Air Quality Screening Questions
	X	Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development and production 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 H2S 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 our proposed development and production activities located within 200 kilometers of the Breton Wilderness Area?

Air emission calculations prepared by Brian E. Boyer, BTGap, LLC. (337.356.9856; brianeboyer@gmail.com)

AIR EMISSIONS CALCULATIONS

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

Equipment/Emission Factors	units	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	REF.	DATE	Reference Links
Natural Gas Turbine	g/hp-hr		0.0086	0.0086	0.0026	1.4515	0.0095	N/A	0.3719	N/A	AP42 3.1-1& 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
RECIP. 2 Cycle Lean Natural Gas	g/hp-hr		0.1293	0.1293	0.0020	6.5998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf https://cfpub.epa.gov/webfire/
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://cfpub.epa.gov/webfire/
Vessels – Propulsion	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (light smoke)	lbs/MMscf	2.10	2.10	2.10	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (medium smoke)	lbs/MMscf	10.50	10.50	10.50	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/tank						4.300				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Fugitives	lbs/hr/component						0.0005				API Study	12/93	https://www.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-9b5c-9b623870125d
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Construction Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Other Survey Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Tractor	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
On-Ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day)	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels - Hovercraft Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	

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

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

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

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

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
LLOG Exploration Offshore, L. L. C	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSopo		985-801-4300		Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATO										
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel	Drillship	61800	3179.3628	76304.71	24	188	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	98.36	59.34	57.56	1.43	2356.59	67.76	0.01	369.63	0.69
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	Structure Towing Tug		16500	848.859	20372.62	0	0	11.64	7.02	6.81	0.17	278.89	8.02	0.00	43.74	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	15200	781.9792	18767.50	0	0	10.72	6.47	6.28	0.16	256.92	7.39	0.00	40.30	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Mooring /ROV Vessel	10300	529.8938	12717.45	24	30	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	2.62	1.58	1.53	0.04	62.68	1.80	0.00	9.83	0.02
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	0	0	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	0	0	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	0	0	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	0	0	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	0	0	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	0	0	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	0	0	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - no smoke	HP Flare		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2023	**Facility Total Emissions**							**146.22**	**89.95**	**87.34**	**2.47**	**3,678.12**	**102.79**	**0.01**	**599.17**	**1.00**	**100.97**	**60.92**	**59.09**	**1.47**	**2,419.26**	**69.56**	**0.01**	**379.46**	**0.71**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	**Non-Facility Total Emissions**							**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS													
LLOG Exploration Offshore, L. L. C	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSopo	985-801-4300	Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATO														
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**										**ESTIMATED TONS**									
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																					
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																					
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel	Drillship	61800	3179.3628	76304.71	24	215	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	112.48	67.86	65.83	1.64	2695.03	77.49	0.01	422.71	0.79
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	24	60	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	6.10	3.68	3.57	0.09	146.04	4.20	0.00	22.91	0.04
INSTALLATION	VESSELS - Support - Diesel	ROV Vessel	8000	411.568	9877.63	24	125	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	24	45	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	4.57	2.76	2.68	0.07	109.53	3.15	0.00	17.18	0.03
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	24	10	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.68	0.41	0.40	0.01	16.23	0.47	0.00	2.55	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	24	45	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	4.57	2.76	2.68	0.07	109.53	3.15	0.00	17.18	0.03
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	24	10	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.68	0.41	0.40	0.01	16.23	0.47	0.00	2.55	0.00
FACILITY INSTALLATION	Structure Towing Tug		16500	848.859	20372.62	24	15	11.64	7.02	6.81	0.17	278.89	8.02	0.00	43.74	0.08	2.10	1.26	1.23	0.03	50.20	1.44	0.00	7.87	0.01
	Structure Towing Tug		14500	745.967	17903.21	24	15	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	1.84	1.11	1.08	0.03	44.12	1.27	0.00	6.92	0.01
	Structure Towing Tug		14500	745.967	17903.21	24	15	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	1.84	1.11	1.08	0.03	44.12	1.27	0.00	6.92	0.01
	Structure Support Vessel	Support//ROV Vessel	15200	781.9792	18767.50	24	30	10.72	6.47	6.28	0.16	256.92	7.39	0.00	40.30	0.07	3.86	2.33	2.26	0.06	92.49	2.66	0.00	14.51	0.03
	Structure Support Vessel	Support//ROV Vessel	10300	529.8938	12717.45	24	30	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	2.62	1.58	1.53	0.04	62.68	1.80	0.00	9.83	0.02
	Structure Support Vessel	Mooring /ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	4	256	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.45	0.45	0.45	0.01	6.37	0.47	--	1.37	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	4	256	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.45	0.45	0.45	0.01	6.37	0.47	--	1.37	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	1	256	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.08	0.04	0.04	0.00	2.57	0.07	--	0.59	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	1	256	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.08	0.04	0.04	0.00	2.57	0.07	--	0.59	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	24	256	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.10	1.10	0.33	184.56	1.21	--	47.29	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	24	256	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.10	1.10	0.33	184.56	1.21	--	47.29	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	24	256	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.10	1.10	0.33	184.56	1.21	--	47.29	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																					
	STORAGE TANK				2	1.5	13.0	--	--	--	--	--	881.96	--	--	--	--	--	--	--	--	8.60	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		1875		24	256	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.41	0.21	--	1.87	--
	COMBUSTION FLARE - no smoke	HP Flare		1875		24	256	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.41	0.21	--	1.87	--
	FUGITIVES				11350	24	256	--	--	--	--	--	5.68	--	--	--	--	--	--	--	--	17.43	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			1	1.5	13.0	--	--	--	--	--	1973.33	--	--	--	--	--	--	--	--	19.24	--	--	--
DRILLING	Liquid Flaring							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke							0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2024 Facility Total Emissions								**146.22**	**89.95**	**87.34**	**2.48**	**3,678.39**	**2,963.89**	**0.01**	**600.39**	**1.00**	**150.85**	**94.65**	**91.94**	**3.19**	**4,161.37**	**153.59**	**0.01**	**712.47**	**1.05**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel	Fast Rescue Boat	90	4.63014	111.12	1	256	0.06	0.04	0.04	0.00	1.52	0.04	0.00	0.24	0.00	0.01	0.00	0.00	0.00	0.19	0.01	0.00	0.03	0.00
	VESSELS - Support Diesel	North Survival Craft	50	2.5723	61.74	1	256	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	South Survival Craft	50	2.5723	61.74	1	256	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	West Survival Craft	50	2.5723	61.74	1	256	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	Crew Boat	7644	393.25322	9438.08	8	37	5.39	3.25	3.16	0.08	129.20	3.71	0.00	20.27	0.04	0.80	0.48	0.47	0.01	19.12	0.55	0.00	3.00	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	37	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	0.77	0.47	0.45	0.01	18.51	0.53	0.00	2.90	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	37	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	0.77	0.47	0.45	0.01	18.51	0.53	0.00	2.90	0.01
2024 Non-Facility Total Emissions								**16.00**	**9.66**	**9.37**	**0.23**	**383.42**	**11.02**	**0.00**	**60.14**	**0.11**	**2.37**	**1.43**	**1.38**	**0.03**	**56.67**	**1.63**	**0.00**	**8.89**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
LLOG Exploration Offshore, L. L. C	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSopo		985-801-4300		Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATO									
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**									
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																					
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																					
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel	Drillship	61800	3179.3628	76304.71	24	61	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	31.91	19.25	18.68	0.46	764.64	21.98	0.00	119.93	0.22
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	Structure Towing Tug		16500	848.859	20372.62	0	0	11.64	7.02	6.81	0.17	278.89	8.02	0.00	43.74	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	15200	781.9792	18767.50	0	0	10.72	6.47	6.28	0.16	256.92	7.39	0.00	40.30	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Mooring /ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				2	1.5	298	--	--	--	--	--	38.47	--	--	--	--	--	--	--	--	8.60	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	COMBUSTION FLARE - no smoke	HP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	FUGITIVES				11350	24	365	--	--	--	--	--	5.68	--	--	--	--	--	--	--	--	24.86	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			1	1.5	298	--	--	--	--	--	86.09	--	--	--	--	--	--	--	--	19.24	--	--	--
DRILLING	Liquid Flaring							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0				0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2025	**Facility Total Emissions**							**146.22**	**89.95**	**87.34**	**2.48**	**3,678.39**	**233.16**	**0.01**	**600.39**	**1.00**	**33.42**	**25.35**	**24.77**	**1.91**	**1,580.69**	**81.98**	**0.00**	**333.14**	**0.22**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel	Fast Rescue Boat	90	4.63014	111.12	1	365	0.06	0.04	0.04	0.00	1.52	0.04	0.00	0.24	0.00	0.01	0.01	0.01	0.00	0.28	0.01	0.00	0.04	0.00
	VESSELS - Support Diesel	North Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	South Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	West Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	Crew Boat	7644	393.25322	9438.08	8	52	5.39	3.25	3.16	0.08	129.20	3.71	0.00	20.27	0.04	1.12	0.68	0.66	0.02	26.87	0.77	0.00	4.22	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
2025	**Non-Facility Total Emissions**							**16.00**	**9.66**	**9.37**	**0.23**	**383.42**	**11.02**	**0.00**	**60.14**	**0.11**	**3.32**	**2.01**	**1.95**	**0.05**	**79.65**	**2.29**	**0.00**	**12.49**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS									
LLOG Exploration Offshore, L. L. C	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSopo		985-801-4300		Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATO									
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel	Drillship	61800	3179.3628	76304.71	24	71	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	37.15	22.41	21.74	0.54	889.99	25.59	0.00	139.59	0.26
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	Structure Towing Tug		16500	848.859	20372.62	0	0	11.64	7.02	6.81	0.17	278.89	8.02	0.00	43.74	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	15200	781.9792	18767.50	0	0	10.72	6.47	6.28	0.16	256.92	7.39	0.00	40.30	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Mooring /ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				2	1.5	298	--	--	--	--	--	38.47	--	--	--	--	--	--	--	--	8.60	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	COMBUSTION FLARE - no smoke	HP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	FUGITIVES				11350	24	365	--	--	--	--	--	5.68	--	--	--	--	--	--	--	--	24.86	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			1	1.5	298	--	--	--	--	--	86.09	--	--	--	--	--	--	--	--	19.24	--	--	--
DRILLING	Liquid Flaring							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0				0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2026 Facility Total Emissions								**146.22**	**89.95**	**87.34**	**2.48**	**3,678.39**	**233.16**	**0.01**	**600.39**	**1.00**	**38.65**	**28.51**	**27.83**	**1.98**	**1,706.04**	**85.59**	**0.00**	**352.80**	**0.26**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel	Fast Rescue Boat	90	4.63014	111.12	1	365	0.06	0.04	0.04	0.00	1.52	0.04	0.00	0.24	0.00	0.01	0.01	0.01	0.00	0.28	0.01	0.00	0.04	0.00
	VESSELS - Support Diesel	North Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	South Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	West Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	Crew Boat	7644	393.25322	9438.08	8	52	5.39	3.25	3.16	0.08	129.20	3.71	0.00	20.27	0.04	1.12	0.68	0.66	0.02	26.87	0.77	0.00	4.22	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
2026 Non-Facility Total Emissions								**16.00**	**9.66**	**9.37**	**0.23**	**383.42**	**11.02**	**0.00**	**60.14**	**0.11**	**3.32**	**2.01**	**1.95**	**0.05**	**79.65**	**2.29**	**0.00**	**12.49**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS										
LLOG Exploration Offshore, L. L. C.	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSipio	985-801-4300	Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRATO										
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel	Drillship	61800	3179.3628	76304.71	24	60	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	31.39	18.94	18.37	0.46	752.10	21.62	0.00	117.97	0.22
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Support - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Laying Vessel - Diesel		12000	617.352	14816.45	0	0	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - ROV Vessel - Diesel	ROV Vessel	8000	411.568	9877.63	0	0	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	Structure Towing Tug		16500	848.859	20372.62	0	0	11.64	7.02	6.81	0.17	278.89	8.02	0.00	43.74	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Towing Tug		14500	745.967	17903.21	0	0	10.23	6.17	5.99	0.15	245.09	7.05	0.00	38.44	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	15200	781.9792	18767.50	0	0	10.72	6.47	6.28	0.16	256.92	7.39	0.00	40.30	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Support//ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Structure Support Vessel	Mooring /ROV Vessel	10300	529.8938	12717.45	0	0	7.27	4.38	4.25	0.11	174.10	5.01	0.00	27.31	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				2	1.5	298	--	--	--	--	--	38.47	--	--	--	--	--	--	--	--	8.60	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	COMBUSTION FLARE - no smoke	HP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	FUGITIVES				11350	24	365	--	--	--	--	--	5.68	--	--	--	--	--	--	--	--	24.86	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			1	1.5	298	--	--	--	--	--	86.09	--	--	--	--	--	--	--	--	19.24	--	--	--
DRILLING	Liquid Flaring							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0				0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2027	**Facility Total Emissions**							**146.22**	**89.95**	**87.34**	**2.48**	**3,678.39**	**233.16**	**0.01**	**600.39**	**1.00**	**32.89**	**25.04**	**24.46**	**1.90**	**1,568.15**	**81.62**	**0.00**	**331.18**	**0.22**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel	Fast Rescue Boat	90	4.63014	111.12	1	365	0.06	0.04	0.04	0.00	1.52	0.04	0.00	0.24	0.00	0.01	0.01	0.01	0.00	0.28	0.01	0.00	0.04	0.00
	VESSELS - Support Diesel	North Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	South Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	West Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	Crew Boat	7644	393.25322	9438.08	8	52	5.39	3.25	3.16	0.08	129.20	3.71	0.00	20.27	0.04	1.12	0.68	0.66	0.02	26.87	0.77	0.00	4.22	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
2027	**Non-Facility Total Emissions**							**16.00**	**9.66**	**9.37**	**0.23**	**383.42**	**11.02**	**0.00**	**60.14**	**0.11**	**3.32**	**2.01**	**1.95**	**0.05**	**79.65**	**2.29**	**0.00**	**12.49**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS											
LLOG Exploration Offshore, L. L. C	Keathley Canyon		689	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4					Kim DeSopo	985-801-4300	Calculated STORAGE TANK emissions based on VOC vent gas emissions routed to vapor recovery unit (VRU) with estimated maximum downtime of 5%. Calculated GLYCOL DEHYDRAT												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	Structure Support Vessel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel	Pedestal Crane 1	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.<600hp Diesel	Pedestal Crane 2	400	20.5784	493.88	4	365	0.88	0.88	0.88	0.02	12.43	0.92	--	2.67	--	0.64	0.64	0.64	0.02	9.08	0.67	--	1.95	--
	RECIP.>600hp Diesel	Firewater Pump 1	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	RECIP.>600hp Diesel	Firewater Pump 2	834	42.905964	1029.74	1	365	0.59	0.33	0.33	0.01	20.04	0.53	--	4.60	--	0.11	0.06	0.06	0.00	3.66	0.10	--	0.84	--
	Natural Gas Turbine	ZAN-9000	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9100	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	Natural Gas Turbine	ZAN-9200	18774	178800	4291200.00	24	365	--	0.36	0.36	0.11	60.08	0.39	--	15.39	--	--	1.56	1.56	0.47	263.14	1.73	--	67.43	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				2	1.5	298	--	--	--	--	--	38.47	--	--	--	--	--	--	--	--	8.60	--	--	--
	COMBUSTION FLARE - no smoke	LP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	COMBUSTION FLARE - no smoke	HP Flare		1875		24	365	0.00	0.00	0.00	0.00	0.13	0.07	--	0.61	--	0.00	0.00	0.00	0.00	0.59	0.30	--	2.67	--
	FUGITIVES				11350	24	365	--	--	--	--	--	5.68	--	--	--	--	--	--	--	--	24.86	--	--	--
	GLYCOL DEHYDRATOR	MAF-3110			1	1.5	298	--	--	--	--	--	86.09	--	--	--	--	--	--	--	--	19.24	--	--	--
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
2028-2034	**Facility Total Emissions**							**2.94**	**3.50**	**3.49**	**0.39**	**245.45**	**134.45**	**0.00**	**61.94**	**0.00**	**1.50**	**6.10**	**6.09**	**1.44**	**816.05**	**60.00**	**0.00**	**213.21**	**0.00**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**7,459.20**			**7,459.20**	**7,459.20**	**7,459.20**		**125,403.87**	
	224.0																								
DRILLING	VESSELS- Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Tugs Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Support Diesel, Laying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Support Diesel, Burying		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Material Tug Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSELS - Support Diesel	Fast Rescue Boat	90	4.63014	111.12	1	365	0.06	0.04	0.04	0.00	1.52	0.04	0.00	0.24	0.00	0.01	0.01	0.01	0.00	0.28	0.01	0.00	0.04	0.00
	VESSELS - Support Diesel	North Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	South Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	West Survival Craft	50	2.5723	61.74	1	365	0.04	0.02	0.02	0.00	0.85	0.02	0.00	0.13	0.00	0.01	0.00	0.00	0.00	0.15	0.00	0.00	0.02	0.00
	VESSELS - Support Diesel	Crew Boat	7644	393.25322	9438.08	8	52	5.39	3.25	3.16	0.08	129.20	3.71	0.00	20.27	0.04	1.12	0.68	0.66	0.02	26.87	0.77	0.00	4.22	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
	VESSELS - Support Diesel	Supply Boat	7400	380.7004	9136.81	8	52	5.22	3.15	3.06	0.08	125.08	3.60	0.00	19.62	0.04	1.09	0.66	0.64	0.02	26.02	0.75	0.00	4.08	0.01
2028-2034	**Non-Facility Total Emissions**							**16.00**	**9.66**	**9.37**	**0.23**	**383.42**	**11.02**	**0.00**	**60.14**	**0.11**	**3.32**	**2.01**	**1.95**	**0.05**	**79.65**	**2.29**	**0.00**	**12.49**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
LLOG Exploration Offshore, L. L. C.	689	G19619	G19619	A	KC 736 #3, KC 736 #4, KC 642 #2, KC 686 #3, KC 686 #4

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2023	100.97	60.92	59.09	1.47	2419.26	69.56	0.01	379.46	0.71
2024	150.85	94.65	91.94	3.19	4161.37	153.59	0.01	712.47	1.05
2025	33.42	25.35	24.77	1.91	1580.69	81.98	0.00	333.14	0.22
2026	38.65	28.51	27.83	1.98	1706.04	85.59	0.00	352.80	0.26
2027	32.89	25.04	24.46	1.90	1568.15	81.62	0.00	331.18	0.22
2028-2034	1.50	6.10	6.09	1.44	816.05	60.00	0.00	213.21	0.00
Allowable	7459.20			7459.20	7459.20	7459.20		125403.87	

APPENDIX I
OIL SPILL INFORMATION
(30 CFR PART 550.219 AND 550.250)

A. Oil Spill Response Planning

All the proposed activities in this Initial Development Operations Coordination Document will be covered by the Oil Spill Response Plan filed by LLOG (No. 02058) in accordance with 30 CFR 254, plan was last approved on September 18, 2018, and our biennial update was found to be "incompliance" on July 21, 2020. LLOG will file a revised updated OSRP on/or before September 30, 2021 to reflect the increase of the Development WCD which was approved on December 22, 2021.

B. Spill Response Sites

The following locations will be used in the event an oil spill occurs as a result of the proposed activities.

Primary Response Equipment Location	Pre-Planned Staging Location(s)
Houma, LA	Fort Jackson, LA

C. OSRO Information

The O'Brien Group (TOG) will provide trained personnel capable of providing supervisory management of the oil spill response in addition to contacting and deploying cleanup personnel and equipment.

LLOG utilizes Clean Gulf Associates (CGA) as it's primary provider for equipment, which is an industry cooperative owning an inventory of oil spill clean-up equipment. CGA is supported by the Marine Spill Response Corporation's (MSRC), which is responsible for storing, inspecting, maintaining, and dispatching CGA's equipment. The MSRC STARS network provides for the closest available personnel, as well as an MSRC supervisor to operate the equipment.

D. Worst-Case Scenario Information

Category	***Regional OSRP***	***DOCD***
Type of Activity	Drilling	Drilling
Facility Surface Location	Mississippi Canyon 386	Keathley Canyon 736
Facility Description	Well 001	Well No. 003 (Loc F)
Distance to Nearest Shore (Miles)	58 Miles	214 Miles
Volume: Storage Tanks (total) Facility Piping (total) Lease Term Pipeline Uncontrolled Blowout (day) **Potential 24 Hour Volume (bbls)**	 **396,602 bbls/day**	 **135,476 bbls/day**
Type of Liquid Hydrocarbon	Crude Oil	Crude Oil
API Gravity	25°	31.7°

Category	***Regional OSRP***	***DOCD***
Type of Activity	Development	Development
Facility Surface Location	Keathley Canyon 689	Keathley Canyon 689
Facility Description	Platform A	Platform A
Distance to Nearest Shore (Miles)	224 Miles	224 Miles
Volume: Storage Tanks (total) Facility Piping (total) Lease Term Pipeline Uncontrolled Blowout (day) **Potential 24 Hour Volume (bbls)**	 2097 bbls 327 bbls 15 bbls 45,260 bbls **47,699 bbls**	 2097 bbls 327 bbls 15 bbls 45,260 bbls **47,699 bbls**
Type of Liquid Hydrocarbon	Crude Oil	Crude Oil
API Gravity	32.1°	31.7°

LLOG Exploration Offshore, L.L.C. (LLOG) has the capability to respond to the appropriate worst-case spill scenario included in its regional OSRP Plan, filed by LLOG (No. 02058) in accordance with 30 CFR 254 our biannual update for this plan was submitted on June 17, 2020, and was approved July 21, 2020. LLOG Exploration Offshore, L.L.C. will file a revision to our Regional OSRP on or before September 30, 2021 to reflect the Development WCD increase which was approved on December 22, 2021.

Since LLOG Exploration Offshore, L.L.C. (LLOG) has the capability to respond to the appropriate worst-case spill scenario for drilling included in its regional OSRP Plan filed by LLOG (Operator No.02058) in accordance with 30 CFR 254 Biennial update submitted on June 17, 2020 and was approved July 21, 2020 and since the worst case discharge determined in our Initial Development Operations Coordination Document for Keathley Canyon 642/686/736 is the drilling worst case discharge outlined in our revised updated Regional OSRP to be filed by letter on/or before September 30, 2021, I hereby certify that LLOG Exploration Offshore, L.L.C. has the capability to respond, to the maximum extent practicable, to a worst-case discharge, or a substantial threat of such a discharge,

resulting from the activities proposed in this Development Operations Coordination Document.

LLOG Exploration Offshore, L.L.C., Company No. 02058, previously submitted the Regional OSRP Exploration WCD volume to be reviewed in Plan R-6763, Revised Exploration Plan, which was approved on November 2, 2018. LLOG agreed to accept BOEM's calculations for this plan.

The required proprietary data outlined in NTL 2015-N01 was submitted to BOEM within the Confidential Copy of the Revised Exploration Plan, R-6763

LLOG Exploration Offshore, L.L.C., Company No. 02058 will not use any new or unusual technology in responding to an oil spill.

F. Oil Spill Discussion – See Following Attachment

E. Modeling Report

Not applicable. Florida is not an affected state.

SPILL RESPONSE DISCUSSION

For the purpose of NEPA and Coastal Zone Management Act analysis, the largest spill volume originating from the proposed activity would be a well blowout during drilling operations, estimated to be 135,476 barrels of crude oil with an API gravity of 32.1°.

Land Segment and Resource Identification

Trajectories of a spill and the probability of it impacting a land segment have been projected utilizing information in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website. The results are shown in **Figure 1.** The BOEM OSRAM identifies a 2% probability of impact to the shorelines of Matagorda County, TX, Galveston County, TX, and/or Cameron Parish, LA within 30 days. Cameron Parish includes the east side of Sabine Lake, Sabine National Wildlife Refuge, Calcasieu Lake, Lacassine National Wildlife Refuge (inland) and Grand Lake. Cameron Parish also includes the area along the coastline from Sabine Pass to Big Constance Lake in Rockefeller Wildlife Refuge. This region is composed of open public beaches, marshlands and swamps. It serves as a habitat for numerous birds, finfish and other animals, including several rare, threatened and endangered species. Galveston County includes the Gulf Beach from the west end of Galveston Island at Texas Highway 3005 to the east coast of High Island at the Jefferson County line. Habitats include marshes at the west end of Seawall Boulevard and on the east end of the island and open beaches and avian feeding areas all along the coastline, including a National Audubon Society Sanctuary. The waters of Galveston Bay are classified as an EPA National Estuary. Matagorda County stretches from Matagorda Bay, across the Colorado River and up to the border of San Bernard Wildlife Refuge (immediately west of the San Bernard River). The county includes Matagorda Peninsula on the Gulf coast and Matagorda Bay. This area is primarily open beach. However, marshland exists along the east side of Matagorda Bay. Several bird rookeries are present around the peninsula. Seagrass is present off of Matagorda Peninsula on the bay side.

Response

LLOG will make every effort to respond to the Worst Case Discharge as effectively as practicable. A description of the response equipment under contract to contain and recover the Worst Case Discharge is shown in **Figure 2.**

Using the estimated chemical and physical characteristics of crude oil, an ADIOS weathering model was run on a similar product from the ADIOS oil database. The results indicate 13% or approximately 17,612 barrels of crude oil would be evaporated/dispersed within 24 hours, with approximately 117,864 barrels remaining.

Natural Weathering Data: KC 736, Well Location F (Well #3)	**Barrels of Oil**
WCD Volume	135,476
Less 13% natural evaporation/dispersion	17,612
Remaining volume	117,864

Figure 2 outlines equipment, personnel, materials and support vessels as well as temporary storage equipment available to respond to the worst case discharge. The volume accounts for the amount remaining after evaporation/dispersion at 24 hours. The list estimates individual times needed for

procurement, load out, travel time to the site and deployment. **Figure 2** also indicates how operations will be supported.

LLOG's Oil Spill Response Plan includes alternative response technologies such as dispersants and in-situ burn. Strategies will be decided by Unified Command based on an operations safety analysis, the size of the spill, weather and potential impacts. If aerial dispersants are utilized, 8 sorties (9,600 gallons) from two of the DC-3 aircrafts and 4 sorties (8,000 gallons) from the Basler aircraft would provide a daily dispersant capability of 7,540 barrels. If the conditions are favorable for in-situ burning, the proper approvals have been obtained and the proper planning is in place, in-situ burning of oil may be attempted. Slick containment boom would be immediately called out and on-scene as soon as possible. Offshore response strategies may include attempting to skim utilizing CGA spill response equipment, with a total derated skimming capacity of 206,084 barrels. Temporary storage associated with skimming equipment equals 4,498 barrels. If additional storage is needed, various storage barges with a total capacity 218,000+ bbls may be mobilized and centrally located to provide temporary storage and minimize off-loading time. **Safety is first priority. Air monitoring will be accomplished and operations deemed safe prior to any containment/skimming attempts.**

If the spill went unabated, shoreline impact in Galveston County, Texas, Matagorda County, Texas, and/or Cameron Parish, Louisiana would depend upon existing environmental conditions. Shoreline protection would include the use of CGA's near shore and shallow water skimmers with a totaled derated skimming capacity of 50,131 barrels. Temporary storage associated with skimming equipment equals 968 barrels. If additional storage is needed, various storage barges with a total capacity of 60,000 barrels may be mobilized and centrally located to provide temporary storage and minimize off-loading time. Onshore response may include the deployment of shoreline boom on beach areas, or protection and sorbent boom on vegetated areas. Master Service Agreements with AMPOL and OMI Environmental will ensure access to 155,350 feet of 18" shoreline protection boom. **Figure 2** outlines individual times needed for procurement, load out, travel time to the site and deployment. Strategies would be based upon surveillance and real time trajectories that depict areas of potential impact given actual sea and weather conditions. Strategies would be based upon surveillance and real time trajectories that depict areas of potential impact given actual sea and weather conditions. Applicable Area Contingency Plans (ACPs), Geographic Response Plans (GRPs), and Unified Command (UC) will be consulted to ensure that environmental and special economic resources are correctly identified and prioritized to ensure optimal protection. Shoreline protection strategies depict the protection response modes applicable for oil spill clean-up operations. As a secondary resource, the State of Louisiana Initial Oil Spill Response Plan will be consulted as appropriate to provide detailed shoreline protection strategies and describe necessary action to keep the oil spill from entering Louisiana's coastal wetlands. LLOG's contract Incident Management Team has access to the applicable ACP(s) and GRP(s).

Based on the anticipated worst case discharge scenario, LLOG can be onsite with contracted oil spill recovery equipment with adequate response capacity to contain and recover surface hydrocarbons, and prevent land impact, to the maximum extent practicable, within an estimated 60 hours (based on the equipment's Effective Daily Recovery Capacity (EDRC)).

Initial Response Considerations
Actual actions taken during an oil spill response will be based on many factors to include but not be limited to:

- Safety
- Weather
- Equipment and materials availability
- Ocean currents and tides
- Location of the spill
- Product spilled
- Amount spilled
- Environmental risk assessments
- Trajectory and product analysis
- Well status, i.e., shut in or continual release

LLOG will take action to provide a safe, aggressive response to contain and recover as much of the spilled oil as quickly as it is safe to do so. In an effort to protect the environment, response actions will be designed to provide an "in-depth" protection strategy meant to recover as much oil as possible as far from environmentally sensitive areas as possible. Safety will take precedence over all other considerations during these operations.

Coordination of response assets will be supervised by the designation of a SIMOPS group as necessary for close quarter vessel response activities. Most often, this group will be used during source control events that require a significant number of large vessels operating independently to complete a common objective, in close coordination and support of each other. This group must also monitor the subsurface activities of each vessel (ROV, dispersant application, well control support, etc.). The SIMOPS group leader reports to the Source Control Section Chief.

In addition, these activities will be monitored by the spill management team (SMT) and Unified Command via a structured Common Operating Picture (COP) established to track resource and slick movement in real time.

Upon notification of a spill, the following actions will be taken:

- Information will be confirmed
- An assessment will be made and initial objectives set
- OSROs and appropriate agencies will be notified
- ICS 201, Initial Report Form completed
- Initial Safety plan will be written and published
- Unified Command will be established
    - Overall safety plan developed to reflect the operational situation and coordinated objectives
    - Areas of responsibility established for Source Control and each surface operational site
    - On-site command and control established

Offshore Response Actions

Equipment Deployment

Surveillance

- Surveillance Aircraft: within two hours of QI notification, or at first light
- Provide trained observer to provide on site status reports
- Provide command and control platform at the site if needed
- Continual surveillance of oil movement by remote sensing systems, aerial photography and visual confirmation
- Continual monitoring of vessel assets using vessel monitoring systems

Dispersant application assets

- Put ASI on standby
- With the FOSC, conduct analysis to determine appropriateness of dispersant application (refer to Section 18)
- Gain FOSC approval for use of dispersants on the surface
- Deploy aircraft in accordance with a plan developed for the actual situation
- Coordinate movement of dispersants, aircraft, and support equipment and personnel
- Confirm dispersant availability for current and long range operations
- Start ordering dispersant stocks required for expected operations

Containment boom

- Call out early and expedite deployment to be on scene ASAP
- Ensure boom handling and mooring equipment is deployed with boom
- Provide continuing reports to vessels to expedite their arrival at sites that will provide for their most effective containment
- Use Vessels of Opportunity (VOO) to deploy and maintain boom

Oceangoing Boom Barge

- Containment at the source
- Increased/enhanced skimmer encounter rate
- Protection booming

In-situ Burn assets

- Determine appropriateness of in-situ burn operation in coordination with the FOSC and affected SOSC
- Determine availability of fire boom and selected ignition systems
- Start ordering fire boom stocks required for expected operations
- Contact boom manufacturer to provide training & tech support for operations, if required
- Determine assets to perform on water operation
- Build operations into safety plan
- Conduct operations in accordance with an approved plan
- Initial test burn to ensure effectiveness

Dedicated off-shore skimming systems
General

- Deployed to the highest concentration of oil
- Assets deployed at safe distance from aerial dispersant and in-situ burn operations

CGA HOSS Barge

- Use in areas with heaviest oil concentrations
- Consider for use in areas of known debris (seaweed, and other floating materials)

CGA 95' Fast Response Vessels (FRVs)

- Designed to be a first vessel on scene
- Capable of maintaining the initial Command and Control function for on water recovery operations
- 24 hour oil spill detection capability
- Highly mobile and efficient skimming capability
- Use as far off-shore as safely possible

CGA FRUs

- To the area of the thickest oil
- Use as far off-shore as allowed
- VOOs 140' – 180' in length
- VOOs with minimum of 18' x 38' or 23' x 50' of optimum deck space
- VOOs in shallow water should have a draft of <10 feet when fully loaded

T&T Koseq Skimming Systems

- To the area of the thickest oil
- Use as far off-shore as allowed
- VOOs with a minimum of 2,000 bbls storage capacity
- VOOs at least 200' in length
- VOOs with deck space of 100' x 40' to provide space for arms, tanks, and crane
- VOOs for shallow water should be deck barges with a draft of <10 feet when fully loaded

Storage Vessels

- Establish availability of CGA contracted assets (See Appendix E)
- Early call out (to allow for tug boat acquisition and deployment speeds)
- Phase mobilization to allow storage vessels to arrive at the same time as skimming systems
- Position as closely as possible to skimming assets to minimize offloading time

Vessels of Opportunity (VOO)

- Use LLOG's contracted resources as applicable
- Industry vessels are ideal for deployment of Vessel of Opportunity Skimming Systems (VOSS)
- Acquire additional resources as needed
- Consider use of local assets, i.e. fishing and pleasure craft for ISB operations or boom tending
- Expect mission specific and safety training to be required
- Plan with the US Coast Guard for vessel inspections
- Place VOOs in Division or Groups as needed
- Use organic on-board storage if appropriate
- Maximize non-organic storage appropriate to vessel limitations
- Decant as appropriate after approval to do so has been granted
- Assign bulk storage barges to each Division/Group
- Position bulk storage barges as close to skimming units as possible
- Utilize large skimming vessel (e.g. barges) storage for smaller vessel offloading
- Maximize skimming area (swath) to the optimum width given sea conditions and available equipment
- Maximize use of oleophilic skimmers in all operations, but especially offshore
- Nearshore, use shallow water barges and shuttle to skimming units to minimize offloading time
- Plan and equip to use all offloading capabilities of the storage vessel to minimize offloading time

Adverse Weather Operations:

In adverse weather, when seas are $\geq$ 3 feet, the use of larger recovery and storage vessels, oleophilic skimmers, and large offshore boom will be maximized. KOSEQ Arm systems are built for rough conditions, and they should be used until their operational limit (9.8' seas) is met. Safety will be the overriding factor in all operations and will cease at the order of the Unified Command, vessel captain, or in an emergency, "stop work" may be directed by any crew member.

Surface Oil Recovery Considerations and Tactics
(Offshore and Near-shore Operations)

Maximization of skimmer-oil encounter rate

- Place barges in skimming task forces, groups, etc., to reduce recovered oil offloading time
- Place barges alongside skimming systems for immediate offloading of recovered oil when practicable
- Use two vessels, each with heavy sea boom, in an open-ended "V" configuration to funnel surface oil into a trailing skimming unit's organic, V-shaped boom and skimmer (see page 7, *CGA Equipment Guide Book and Tactic Manual* (CGATM)

- Use secondary vessels and heavy sea boom to widen boom swath beyond normal skimming system limits (see page 15, CGATM)
- Consider night-time operations, first considering safety issues
- Utilize all available advanced technology systems (IR, X-Band Radar, etc.) to determine the location of, and move to, recoverable oil
- Confirm the presence of recoverable oil prior to moving to a new location

Maximize skimmer system efficiency

- Place weir skimming systems in areas of calm seas and thick oil
- Maximize the use of oleophilic skimming systems in heavier seas
- Place less mobile, high EDRC skimming systems (e.g. HOSS Barge) in the largest pockets of the heaviest oil
- Maximize onboard recovered oil storage for vessels.
- Obtain authorization for decanting of recovered water as soon as possible
- Use smaller, more agile skimming systems to recover streamers of oil normally found farther from the source. Place recovered oil barges nearby

Recovered Oil Storage

- Smaller barges in larger quantities will increase flexibility for multi-location skimming operations
- Place barges in skimming task forces, groups, etc., to reduce recovered oil offloading time
- Procure and deploy the maximum number of portable tanks to support Vessel of Opportunity Skimming Systems if onboard storage is not available
- Maximize use of the organic recovered oil storage capacity of the skimming vessel

Command, Control, and Communications (C^3)

- Publish, implement, and fully test an appropriate communications plan
- Design an operational scheme, maintaining a manageable span of control
- Designate and mark C^3 vessels for easy aerial identification
- Designate and employ C^3 aircraft for task forces, groups, etc.
- Use reconnaissance air craft and Rapid Response Teams (RAT) to confirm the presence of recoverable oil

On Water Recovery Group
When the first skimming vessel arrives on scene, a complete site assessment will be conducted before recovery operations begin. Once it is confirmed that the air monitoring readings for O2, LEL, H2S, CO, VOC, and Benzene are all within the permissible limits, oil recovery operations may begin.

As skimming vessels arrive, they will be organized to work in areas that allow for the most efficient vessel operation and free vessel movement in the recovery of oil. Vessel groups will vary in structure as determined by the Operations Section of the Unified Command, but will generally consist, at a minimum, of the following dedicated assets:

- 3 to 5 – Offshore skimming vessels (recovery)
- 1 – Tank barge (temporary storage)
- 1 – Air asset (tactical direction)
- 2 – Support vessels (crew/utility for supply)
- 6 to 10 – Boom vessels (enhanced booming)

***Example** (**Note:** Actual organization of TFs will be dependent on several factors including, asset availability, weather, spilled oil migration, currents, etc.)*

The 95' FRV Breton Island out of Venice arrives on scene and conducts an initial site assessment. Air monitoring levels are acceptable and no other visual threats have been observed. The area is cleared for safe skimming operations. The Breton Island assumes command and control (CoC) of on-water recovery operations until a dedicated non-skimming vessel arrives to relieve it of those duties.

A second 95' FRV arrives and begins recovery operations alongside the Breton Island. Several more vessels begin to arrive, including a third 95' FRV out of Galveston, the HOSS Barge (High Volume Open Sea Skimming System) out of Harvey, a boom barge (CGA 300) with 25,000' of 42" auto boom out of Leeville, and 9 Fast Response Units (FRUs) from the load-out location at C-Port in Port Fourchon.

As these vessels set up and begin skimming, they are grouped into task forces (TFs) as directed by the Operations Section of the Unified Command located at the command post.

Initial set-up and potential actions:

- A 1,000 meter safety zone has been established around the incident location for vessels involved in Source Control
- The HOSS Barge is positioned facing the incident location just outside of this safety zone or at the point where the freshest oil is reaching the surface
- The HOSS Barge engages its Oil Spill Detection (OSD) system to locate the heaviest oil and maintains that ability for 24-hour operations

- The HOSS Barge deploys 1,320’ of 67” Sea Sentry boom on each side, creating a swath width of 800’
- The Breton Island and H.I. Rich skim nearby, utilizing the same OSD systems as the HOSS Barge to locate and recover oil
- Two FRUs join this group and it becomes TF1
- The remaining 7 FRUs are split into a 2 and 3 vessel task force numbered TF2 and TF3
- A 95’ FRV is placed in each TF
- The boom barge (CGA 300) is positioned nearby and begins deploying auto boom in sections between two utility vessels (1,000’ to 3,000’ of boom, depending on conditions) with chain-link gates in the middle to funnel oil to the skimmers
- The initial boom support vessels position in front of TF2 and TF3
- A 100,000+ barrel offshore tank barge is placed with each task force as necessary to facilitate the immediate offload of skimming vessels

The initial task forces (36 hours in) may be structured as follows:

TF 1

- 1 – 95’ FRV
- 1 – HOSS Barge with 3 tugs
- 2 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 8 – 500’ sections of auto boom with gates
- 8 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

TF 2

- 1 – 95’ FRV
- 4 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 10 – 500’ sections of auto boom with gates
- 10 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

TF 3

- 1 – 95’ FRV
- 3 – FRUs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 8 – 500’ sections of auto boom with gates
- 8 – Boom-towing vessels
- 2 – Support vessels (crew/utility)

Offshore skimming equipment continues to arrive in accordance with the ETA data listed in figure H.3a; this equipment includes 2 AquaGuard skimmers and 11 sets of Koseq Rigid Skimming Arms. These high volume heavy weather capable systems will be divided into functional groups and assigned to specific areas by the Operations Section of the Unified Command.

At this point of the response, the additional TFs may assume the following configurations:

TF 4

- 2 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – AquaGuard Skimmer
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

TF 5

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – AquaGuard Skimmer
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 8 – 500' sections of auto boom with gates
- 8 – Boom-towing vessels

TF 6

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

TF 7

- 3 – Sets of Koseq Rigid Skimming Arms w/ associated 200'+ PIDVs
- 1 – 100,000+ barrel tank barge and associated tug(s)
- 1 – Dedicated air asset for tactical direction
- 2 – Support vessels (crew/utility)
- 6 – 500' sections of auto boom with gates
- 6 – Boom-towing vessels

CGA Minimum Acceptable Capabilities for Vessels of Opportunity (VOO)
Minimum acceptable capabilities of Petroleum Industry Designed Vessels (PIDV) for conducting Vessel of Opportunity (VOO) skimming operations are shown in the table below. PIDVs are "purpose-built" to provide normal support to offshore oil and gas operators. They include but are not limited to utility boats, offshore supply vessels, etc. They become VOOs when tasked with oil spill response duties.

Capability	FRU	KOSEQ	AquaGuard
Type of Vessel	Utility Boat	Offshore Supply Vessel	Utility Boat
Operating parameters			
Sea State	3-5 ft max	9.8 ft max	3-5 ft max
Skimming speed	≤1 kt	≤3 kts	≤1 kt
Vessel size			
Minimum Length	100 ft	200 ft	100 ft
Deck space for: • Tank(s) • Crane(s) • Boom Reels • Hydraulic Power Units • Equipment Boxes	18x32 ft	100x40 ft	18x32 ft
Communication Assets	Marine Band Radio	Marine Band Radio	Marine Band Radio

Tactical use of Vessels of Opportunity (VOO): LLOG will take all possible measures to maximize the oil-to-skimmer encounter rate of all skimming systems, to include VOOs, as discussed in this section. VOOs will normally be placed within an On-water recovery unit as shown in figures below.

Skimming Operations: PIDVs are the preferred VOO skimming platform. OSROs are more versed in operating on these platforms and the vessels are generally large enough with crews more likely versed in spill response operations. They also have a greater possibility of having on-board storage capacity and the most likely vessels to be under contract, and therefore more readily available to the operator. These vessels would normally be assigned to an on-water recovery group/division (see figure below) and outfitted with a VOSS suited for their size and capabilities. Specific tactics used for skimming operations would be dependent upon many parameters which include, but are not limited to, safety concerns, weather, type VOSS on board, product being recovered, and area of oil coverage. Planners would deploy these assets with the objective of safely maximizing oil- to-skimmer encounter rate by taking actions to minimize non-skimming time and maximizing boom swath. Specific tactical configurations are shown in figures below.

The Fast Response Unit (FRU): A self-contained, skid based, skimming system that is deployed from the right side of a vessel of opportunity (VOO). An outrigger holds a 75' long section of air inflatable boom in place that directs oil to an apex for recovery via a Foilex 250 weir skimmer. The outrigger creates roughly a 40' swath width dependent on the VOO beam. The lip of the collection bowl on the skimmer is placed as close to the oil and water interface as possible to maximize oil recovery and minimize water retention. The skimmer then pumps all fluids recovered to the storage tank where it is allowed to settle, and with the approval of the Coast Guard, the water is decanted from the bottom of the tank back into the water ahead of the containment boom to be recycled through the system. Once the tank is full of as much pure recovered oil as possible it is offloaded to a storage barge for disposal in accordance with an approved disposal plan. A second 100 barrel storage tank can be added if the appropriate amount of deck space is available to use as secondary storage.

Tactical Overview

Mechanical Recovery – The FRU is designed to provide fast response skimming capability in the offshore and nearshore environment in a stationary or advancing mode. It provides a rated daily recovery capacity of 4,100 barrels. An additional boom reel with 440' of offshore boom can be deployed along with the FRU, and a second support vessel for boom towing, to extend the swath width when attached to the end of the fixed boom. The range and sustainability offshore is dependent on the VOO that the unit is placed on, but generally these can stay offshore for extended periods. The FRU works well independently or assigned with other on-water recovery assets in a task force. In either case, it is most effective when a designated aircraft is assigned to provide tactical direction to ensure the best placement in recoverable oil.
Maximum Sea Conditions – Under most circumstances the FRU can maintain standard oil spill recovery operations in 2' to 4' seas. Ultimately, the Coast Guard licensed Captain in charge of the VOO (with input from the CGAS Supervisor assigned) will be responsible to determine when the sea conditions have surpassed the vessel's safe operating capabilities.

Possible Task Force Configuration (Multiple VOOs can be deployed in a task force)
1 – VOO (100' to 165' Utility or Supply Vessel)
1 – Boom reel w/support vessel for towing
1 – Tank barge (offshore) for temporary storage
1 – Utility/Crewboat (supply)
1 – Designated spotter aircraft

The VOSS (yellow) is being deployed and connected to an out-rigged arm. This is suitable for collection in both large pockets of oil and for recovery of streaming oil. The oil-to-skimmer encounter rate is limited by the length of the arm. Skimming pace is ≤ 1 knot.

Through the use of an additional VOO, and using extended sea boom, the swath of the VOSS is increased therefore maximizing the oil-to-skimmer encounter rate. Skimming pace is ≤ 1 knot.

The Koseq Rigid Sweeping Arm: A skimming system deployed on a vessel of opportunity. It requires a large Offshore or Platform Supply Vessel (OSV/PSV), greater than 200' with at least 100' x 50' of free deck space. On each side of the vessel, a 50' long rigid framed Arm is deployed that consists of pontoon chambers to provide buoyancy, a smooth nylon face, and a hydraulically adjustable mounted weir skimmer. The Arm floats independently of the vessel and is attached by a tow bridle and a lead line. The movement of the vessel forward draws the rubber end seal of the arm against the hull to create a collection point for free oil directed to the weir by the Arm face. The collection weir is adjusted to keep the lip as close to the oil water interface as possible to maximize oil recovery while attempting to minimize excess water collection. A transfer pump (combination of positive displacement, screw type and centrifuge suited for highly viscous oils) pump the recovered liquid to portable tanks and/or dedicated fixed storage tanks onboard the vessel. After being allowed to sit and separate, with approval from the Coast Guard, the water can be decanted (pumped off) in front of the collection arm to be reprocessed through the system. Once full with as much pure recovered oil as possible, the oil is transferred to a temporary storage barge where it can be disposed of in accordance with an approved disposal plan.

Tactical Overview

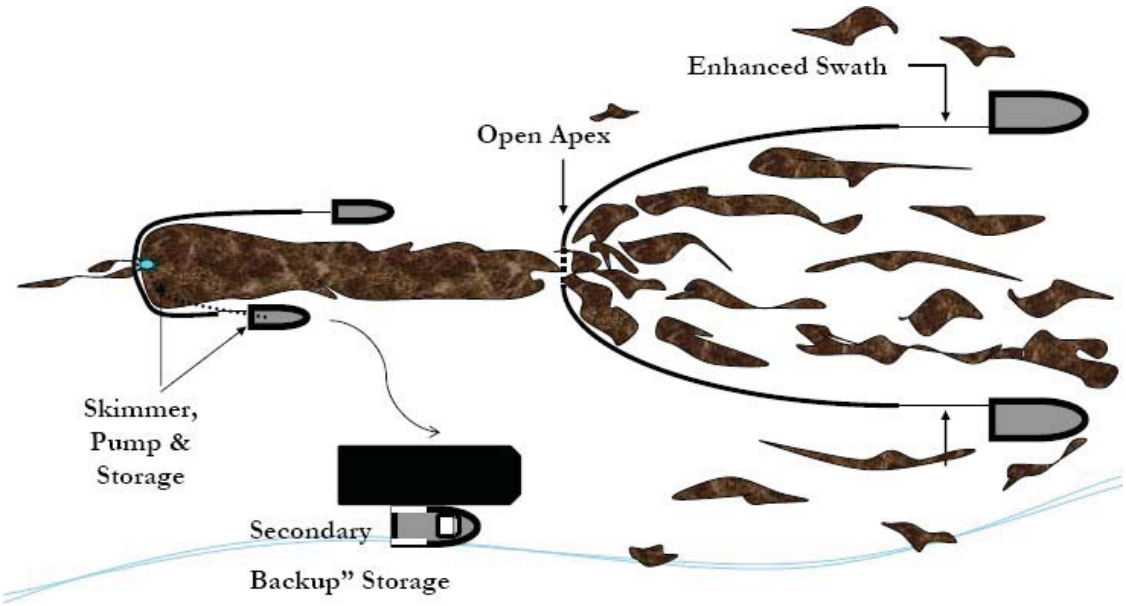
Mechanical Recovery – Deployed on large vessels of opportunity (VOO) the Koseq Rigid Sweeping Arms are high volume surge capacity deployed to increase recovery capacity at the source of a large oil spill in the offshore and outer nearshore environment of the Gulf of Mexico. They are highly mobile and sustainable in rougher sea conditions than normal skimming vessels (9.8' seas). The large Offshore Supply Vessels (OSV) required to deploy the Arms are able to remain on scene for extended periods, even when sea conditions pick up. Temporary storage on deck in portable tanks usually provides between 1,000 and 3,000 bbls. In most cases, the OSV will be able to pump 20% of its deadweight into the liquid mud tanks in accordance with the vessels Certificate of Inspection (COI). All storage can be offloaded utilizing the vessels liquid transfer system.

Maximum Sea Conditions - Under most circumstances the larger OSVs are capable of remaining on scene well past the Skimming Arms maximum sea state of 9.8'. Ultimately it will be the decision of the VOO Captain, with input from the T&T Supervisor onboard, to determine when the sea conditions have exceeded the safe operating conditions of the vessel.

Command and Control – The large OSVs in many cases have state of the art communication and electronic systems, as well as the accommodations to support the function of directing all skimming operations offshore and reporting back to the command post.

Possible Task Force Configuration (Multiple Koseq VOOs can be deployed in a task force)

1 – $\geq$ 200' Offshore Supply Vessels (OSV) with set of Koseq Arms
2 to 4 portable storage tanks (500 bbl)
1 – Modular Crane Pedestal System set (MCPS) or 30 cherry picker (crane) for deployment
1 – Tank barge (offshore) for temporary storage
1 – Utility/Crewboat (supply)
1 – Designated spotter aircraft
4 – Personnel (4 T&T OSRO)



Scattered oil is "caught" by two VOO and collected at the apex of the towed sea boom. The oil moves thought a "gate" at that apex, forming a larger stream of oil which moves into the boom of the skimming vessel. Operations are paced at >1. A recovered oil barge stationed nearby to minimize time taken to offload recovered oil.

This is a depiction of the same operation as above but using KOSEQ Arms. In this configuration, the collecting boom speed dictates the operational pace at $\geq$ 1 knot to minimize entrainment of the oil.

Clean Gulf Associates (CGA) Procedure for Accessing Member-Contracted and other Vessels of Opportunity (VOOs) for Spill Response

- CGA has procedures in place for CGA member companies to acquire vessels of opportunity (VOOs) from an existing CGA member's contracted fleet or other sources for the deployment of CGA portable skimming equipment including Koseq Arms, Fast Response Units (FRUs) and any other portable skimming system(s) deemed appropriate for the response for a potential or actual oil spill, WCD oil spill or a Spill of National Significance (SONS).

- CGA uses Port Vision, a web-based vessel and terminal interface that empowers CGA to track vessels through Automatic Identification System (AIS) and terminal activities using a Geographic Information System (GIS). It provides live AIS/GIS views of waterways showing current vessel positions, terminals, created vessel fleets, and points-of-interest. Through this system, CGA has the ability to get instant snapshots of the location and status of all vessels contracted to CGA members, day or night, from any web-enabled PC.

Near Shore Response Actions

Timing

- Put near shore assets on standby and deployment in accordance with planning based on the actual situation, actual trajectories and oil budgets
- VOO identification and training in advance of spill nearing shoreline if possible
- Outfitting of VOOs for specific missions
- Deployment of assets based on actual movement of oil

Considerations

- Water depth, vessel draft
- Shoreline gradient
- State of the oil
- Use of VOOs
- Distance of surf zone from shoreline

Surveillance

- Provide trained observer to direct skimming operations
- Continual surveillance of oil movement by remote sensing systems, aerial photography and visual confirmation
- Continual monitoring of vessel assets

Dispersant Use

- Generally will not be approved within 3 miles of shore or with less than 10 meters of water depth
- Approval would be at Regional Response Team level (Region 6)

Dedicated Near Shore skimming systems

- FRVs
- Egmopol and Marco SWS
- Operate with aerial spotter directing systems to observed oil slicks

VOO

- Use LLOG's contracted resources as applicable
- Industry vessel are usually best for deployment of Vessel of Opportunity Skimming Systems (VOSS)
- Acquire additional resources as needed
- Consider use of local assets, i.e. fishing and pleasure craft
- Expect mission specific and safety training to be required
- Plan with the US Coast Guard for vessel inspections
- Operate with aerial spotter directing systems to oil patches

Shoreline Protection Operations

Response Planning Considerations

- Review appropriate Area Contingency Plan(s)
- Locate and review appropriate Geographic Response and Site Specific Plans
- Refer to appropriate Environmentally Sensitive Area Maps
- Capability for continual analysis of trajectories run periodically during the response
- Environmental risk assessments (ERA) to determine priorities for area protection
- Time to acquire personnel and equipment and their availability
- Refer to the State of Louisiana Initial Oil Spill Response Plan, Deep Water Horizon, dated 2 May 2010, as a secondary reference
- Aerial surveillance of oil movement
- Pre-impact beach cleaning and debris removal
- Shoreline Cleanup Assessment Team (SCAT) operations and reporting procedures
- Boom type, size and length requirements and availability
- Possibility of need for In-situ burning in near shore areas
- Current wildlife situation, especially status of migratory birds and endangered species in the area
- Check for Archeological sites and arrange assistance for the appropriate state agency when planning operations the may impact these areas

Placement of boom

- Position boom in accordance with the information gained from references listed above and based on the actual situation
- Determine areas of natural collection and develop booming strategies to move oil into those areas
- Assess timing of boom placement based on the most current trajectory analysis and the availability of each type of boom needed. Determine an overall booming priority and conduct booming operations accordingly. Consider:
    - Trajectories
    - Weather forecast
    - Oil Impact forecast
    - Verified spill movement
    - Boom, manpower and vessel (shallow draft) availability
    - Near shore boom and support material, (stakes, anchors, line)

Beach Preparation - Considerations and Actions

- Use of a 10 mile go/no go line to determine timing of beach cleaning
- SCAT reports and recommendations
- Determination of archeological sites and gaining authority to enter
- Monitoring of tide tables and weather to determine extent of high tides
- Pre cleaning of beaches by moving waste above high tide lines to minimize waste
- Determination of logistical requirements and arranging of waste removal and disposal

- Staging of equipment and housing of response personnel as close to the job site as possible to maximize on-site work time
- Boom tending, repair, replacement and security (use of local assets may be advantageous)
- Constant awareness of weather and oil movement for resource re-deployment as necessary
- Earthen berms and shoreline protection boom may be considered to protect sensitive inland areas
- Requisitioning of earth moving equipment
- Plan for efficient and safe use of personnel, ensuring:
    - A continual supply of the proper Personal Protective Equipment
    - Heating or cooling areas when needed
    - Medical coverage
    - Command and control systems (i.e. communications)
    - Personnel accountability measures
- Remediation requirements, i.e., replacement of sands, rip rap, etc.
- Availability of surface washing agents and associated protocol requirements for their use (see National Contingency Plan Product Schedule for list of possible agents)
- Discussions with all stakeholders, i.e., land owners, refuge/park managers, and others as appropriate, covering the following:
    - Access to areas
    - Possible response measures and impact of property and ongoing operations
    - Determination of any specific safety concerns
    - Any special requirements or prohibitions
    - Area security requirements
    - Handling of waste
    - Remediation expectations
    - Vehicle traffic control
    - Domestic animal safety concerns
    - Wildlife or exotic game concerns/issues

Inland and Coastal Marsh Protection and Response Considerations and Actions

- All considered response methods will be weighed against the possible damage they may do to the marsh. Methods will be approved by the Unified Command only after discussions with local Stakeholder, as identified above.
    - In-situ burn may be considered when marshes have been impacted
- Passive clean up of marshes should considered and appropriate stocks of sorbent boom and/or sweep obtained.
- Response personnel must be briefed on methods to traverse the marsh, i.e.,
    - use of appropriate vessel
    - use of temporary walkways or road ways
- Discuss and gain approval prior cutting or moving vessels through vegetation
- Discuss use of vessels that may disturb wildlife, i.e, airboats
- Safe movement of vessels through narrow cuts and blind curves

- Consider the possibility that no response in a marsh may be best
- In the deployment of any response asset, actions will be taken to ensure the safest, most efficient operations possible. This includes, but is not limited to:
    - Placement of recovered oil or waste storage as near to vessels or beach cleanup crews as possible.
    - Planning for stockage of high use items for expeditious replacement
    - Housing of personnel as close to the work site as possible to minimize travel time
    - Use of shallow water craft
    - Use of communication systems appropriate ensure command and control of assets
    - Use of appropriate boom in areas that I can offer effective protection
    - Planning of waste collection and removal to maximize cleanup efficiency
- Consideration or on-site remediation of contaminated soils to minimize replacement operations and impact on the area

Decanting Strategy

Recovered oil and water mixtures will typically separate into distinct phases when left in a quiescent state. When separation occurs, the relatively clean water phase can be siphoned or decanted back to the recovery point with minimal, if any, impact. Decanting therefore increases the effective on-site oil storage capacity and equipment operating time. FOSC/SOSC approval will be requested prior to decanting operations. This practice is routinely used for oil spill recovery.

CGA Equipment Limitations

The capability for any spill response equipment, whether a dedicated or portable system, to operate in differing weather conditions will be directly in relation to the capabilities of the vessel the system in placed on. Most importantly, however, the decision to operate will be based on the judgment of the Unified Command and/or the Captain of the vessel, who will ultimately have the final say in terminating operations. Skimming equipment listed below may have operational limits which exceed those safety thresholds. As was seen in the Deepwater Horizon (DWH) oil spill response, vessel skimming operations ceased when seas reached 5-6 feet and vessels were often recalled to port when those conditions were exceeded. Systems below are some of the most up-to-date systems available and were employed during the DWH spill.

Boom	3 foot seas, 20 knot winds
Dispersants	Winds more than 25 knots Visibility less than 3 nautical miles Ceiling less than 1,000 feet.
FRU	8 foot seas
HOSS Barge/OSRB	8 foot seas
Koseq Arms	8 foot seas
OSRV	4 foot seas

Environmental Conditions in the GOM

Prevailing winds, waves and currents along the Texas coast are from the southeast and northeast quadrants. Ten to 20 foot waves may occur during hurricanes. The combined effect of the winds, surface currents, and waves refracting shoreward produce the prevailing westerly longshore currents.

Tides are semi-diurnal and diurnal, and range in height from less than 1 foot to 2.5 feet. The direction, force, and duration of the wind has a considerable effect on the tides and currents. Fifteen foot tides may be expected during severe hurricanes and very low tides may accompany strong northerlies of long duration.

Surface water temperature averages slightly less than 90° F and ranges between 80 and 100° F during the late summer. During the winter the average is slightly less than 60° F and the range is between 35 and 80° F.

Louisiana is situated between the easterly and westerly wind belts, and therefore, experiences westerly winds during the winter and easterly winds in the summer. Average wind speed is generally 14-15 mph along the coast. Wave heights average 4 and 5 feet. However, during hurricane season, Louisiana has recorded wave heights ranging from 40 to 50 feet high and winds reaching speeds of 100 mph. Because much of southern Louisiana lies below sea level, flooding is prominent.

Surface water temperature ranges between 70 and 80˚F during the summer months. During the winter, the average temperature will range from 50 and 60˚F.

The Atlantic and Gulf of Mexico hurricane season is officially from 1 June to 30 November. 97% of all tropical activity occurs within this window. The Atlantic basin shows a very peaked season from August through October, with 78% of the tropical storm days, 87% of the minor (Saffir-Simpson Scale categories 1 and 2) hurricane days, and 96% of the major (Saffir-Simpson categories 3, 4 and 5) hurricane days occurring then. Maximum activity is in early to mid September. Once in a few years there may be a hurricane occurring "out of season" - primarily in May or December. Globally, September is the most active month and May is the least active month.

FIGURE 1
TRAJECTORY BY LAND SEGMENT

Trajectory of a spill and the probability of it impacting a land segment have been projected utilizing LLOG's WCD and information in the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website using 30 day impact. The results are tabulated below.

Area/Block	OCS-G	LaunchArea	Land Segment and/or Resource	Conditional Probability (%)
KC 736,	G36077	W29	Kenedy, TX	1
Well Location F (Well #3)			Kleberg, TX	1
			Aransas, TX	1
215 miles from shore			Calhoun, TX	1
			Matagorda, TX	**2**
			Brazoria, TX	1
			Galveston, TX	**2**
			Jefferson, TX	1
			Cameron, LA	**2**
			Vermilion, LA	1

WCD Scenario– <u>BASED ON WELL BLOWOUT DURING DRILLING OPERATIONS</u> (215 miles from shore)
117,864 bbls of crude oil (Volume considering natural weathering)
API Gravity 32.1°

FIGURE 2 – Equipment Response Time to KC 736, Well Location F (Well#3)

Dispersants/Surveillance

Dispersant/Surveillance	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI							
Basler 67T	2000	2	Houma	2	2	1.3	5.3
DC 3	1200	2	Houma	2	2	1.7	5.7
DC 3	1200	2	Houma	2	2	1.7	5.7
Aero Commander	NA	2	Houma	2	2	1.3	5.3

Offshore Response

Offshore Equipment Pre-Determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
HOSS Barge	76285	4000	3 Tugs	12	Harvey	6	0	12	27	2	47
95' FRV	22885	249	NA	6	Galveston	2	0	2	13.5	1	18.5
95' FRV	22885	249	NA	6	Vermilion	2	0	3	11	1	17
95' FRV	22885	249	NA	6	Leeville	2	0	2	12	1	17
95' FRV	22885	249	NA	6	Venice	2	0	3	12.5	1	18.5
Boom Barge (CGA-300) 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville	8	0	4	34	2	48
Enterprise Marine Services LLC (Available through contract with CGA)											
RO Barge	NA	100000+	1 Tug	6	Venice	24	0	4	31	1	60
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia	14	0	6	27	1	48
CTCo 2608	NA	23000	1 Tug	6	Amelia	14	0	6	27	1	48
CTCo 2609	NA	23000	1 Tug	6	Amelia	14	0	6	27	1	48
CTCo 5001	NA	47000	1 Tug	6	Amelia	14	0	6	27	1	48

Staging Area: Fourchon

Offshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Vermilion	2	6	5.5	20	1	34.5
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Galveston	2	6	12	20	1	41
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Aransas Pass	2	6	16.5	20	1	45.5
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville	2	6	2	20	1	31
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice	2	6	5	20	1	34
Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey	0	24	3	20	6	53

Nearshore Response

Nearshore Equipment Pre-determined Staging	EDRC	Storage Capacity	VOO	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
46' FRV	15257	65	NA	4	Leeville	2	0	2	8	1	13
46' FRV	15257	65	NA	4	Vermilion	2	0	2	2.5	1	7.5
Enterprise Marine Services LLC (Available through contract with CGA)											
CTCo 2604	NA	20000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2605	NA	20000	1 Tug	6	Amelia	26	0	6	15	1	48
CTCo 2606	NA	20000	1 Tug	6	Amelia	26	0	6	15	1	48

Staging Area: Cameron

Nearshore Equipment With Staging	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
SWS Egmopol	1810	100	NA	3	Galveston	2	2	5	2	1	12
SWS Egmopol	1810	100	NA	3	Leeville	2	2	7	2	1	14
SWS Marco	3588	20	NA	3	Vermilion	2	2	2	2	1	9
SWS Marco	3588	34	NA	3	Leeville	2	2	7	2	1	14
SWS Marco	3588	34	NA	3	Venice	2	2	9.5	2	1	16.5
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Vermilion	4	12	2	2	2	22
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Galveston	4	12	5	2	2	25
Foilex Skim Package (TDS 150)	1131	50	1 Utility	3	Harvey	4	12	7	2	2	27
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Vermilion	2	2	2	2	1	9
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey	2	2	7	2	1	14
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermilion	2	2	2	2	1	9
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey	2	2	7	2	1	14

Shoreline Protection

Staging Area: Cameron

Shoreline Protection Boom	VOO	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
AMPOL (available through MSA)									
34,050’ 18” Boom	13 Crew	26	New Iberia, LA	2	2	3.5	2	12	21.5
12,850’ 18” Boom	7 Crew	14	Chalmette, LA	2	2	7.5	2	6	19.5
900’ 18” Boom	1 Crew	2	Morgan City, LA	2	2	5	2	2	13
3,200’ 18” Boom	2 Crew	4	Venice, LA	2	2	9	2	2	17
12,750’ 18” Boom	7 Crew	14	Port Arthur, TX	2	2	1.5	2	6	13.5
OMI Environmental (available through MSA)									
14,000’ 18” Boom	6 Crew	12	Belle Chasse, LA	1	1	8	2	3	15
2,000’ 18” Boom	1 Crew	2	Galliano, LA	1	1	7	2	3	14
1,800’ 18” Boom	1 Crew	2	Gonzalez, LA	1	1	8	2	3	15
11,800’ 18” Boom	5 Crew	10	Harvey, LA	1	1	7	2	3	14
2,000’ 18” Boom	2 Crew	4	Houma, LA	1	1	7	2	3	14
2,400’ 18” Boom	2 Crew	4	Morgan City, LA	1	1	5	2	3	12
3,800’ 18” Boom	2 Crew	4	New Iberia, LA	1	1	4	2	3	11
2,300’ 18” Boom	2 Crew	4	Port Allen, LA	1	1	5	2	3	12
1,500’ 18” Boom	1 Crew	2	Venice, LA	1	1	9	2	3	16
19,000’ 18” Boom	6 Crew	12	Deer Park, TX	1	1	4	2	3	11
11,000’ 18” Boom	5 Crew	10	La Marque, TX	1	1	4	2	3	11
20,000’ 18” Boom	6 Crew	12	Port Arthur, TX	1	1	2	2	3	9

Wildlife Response	EDRC	Storage Capacity	VOO	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
					CGA						
Wildlife Support Trailer	NA	NA	NA	2	Harvey	2	2	7	1	2	14
Bird Scare Guns (24)	NA	NA	NA	2	Harvey	2	2	7	1	2	14
Bird Scare Guns (12)	NA	NA	NA	2	Galveston	2	2	5	1	2	12
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass	2	2	9.5	1	2	16.5
Bird Scare Guns (48)	NA	NA	NA	2	Vermilion	2	2	2	1	2	9
Bird Scare Guns (24)	NA	NA	NA	2	Leeville	2	2	7	1	2	14

Response Asset	Total
Offshore EDRC	206,084
Offshore Recovered Oil Capacity	224,796+
Nearshore / Shallow Water EDRC	50,131
Nearshore / Shallow Water Recovered Oil Capacity	60,968

APPENDIX J
ENVIRONMENTAL MONITORING INFORMATION
(30 CFR PART 550.221 AND 550.252)

A. Monitoring Systems

LLOG subscribes to StormGeo Weather Service which provides access to real-time weather conditions and provides periodic updates on impending inclement weather conditions such as tropical depressions, storms and/or hurricanes entering the Gulf of Mexico.

LLOG also relies on the National Weather Service to support the aforementioned subscribed service. During impending inclement weather conditions, LLOG closely coordinates the activity with our contractors and field personnel to ensure the safety of people for evacuation; measures to prepare the facility for evacuation to ensure protection of the environment and the facility/equipment.

Keathley Canyon Blocks 642/686/736 is in water depths greater than 400 meters (1,312'); therefore, LLOG will follow the guidelines of the applicable NTL 2018-G01 by monitoring and gathering ocean current data using Acoustic Doppler Current Profile (ADCP) while the MODU is on location.

B. Incidental Takes

LLOG is sensitive to the marine life and the environment we work in, especially regarding activities in or around the moon pool. LLOG will implement and adhere to, the BSEE NTL No. 2015-G03 "Marine Trash and Debris Awareness Training and Elimination" and BOEM NTL No. 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting", and BOEM NTL No. 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program". Moon pool daily observation log shall be maintained on the bridge. The deck supervisor on tour shall go to the bridge and log time, date, and results of each moon pool inspection. STOP WORK AUTHORITY shall be used and implemented, in a safe and timely manner, for any work that could affect marine life listed on the Endangered Species Act.

LLOG will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG will collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (previously "All Washed Up: The Beach Litter Problem"). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE. Contract vessel operators can avoid marine mammals and reduce potential deaths by maintaining a vigilant watch for marine mammals and maintaining a safe distance of 91 meters or greater from whales and a distance of 45 meters or greater from small cetaceans. When assemblages of cetaceans are observed vessel speeds will be reduced to 10 knots or less. Vessel personnel should use a Gulf of Mexico reference guide to help identify the twenty-one species of whales and dolphins, and the single species of manatee that may be encountered in the Gulf of Mexico OCS. Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion, BOEM NTL 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting" and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Vessel personnel must report sightings of any injured or dead protected marine mammal species immediately, regardless of whether the injury or death is caused by their vessel, to the NMFS Southeast Marine Mammal Stranding Hotline at (877) WHALE-HELP (877-942-5343). Additional information may be found at the following website: (https://www.fisheries.noaa.gov/report). Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov.

If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

These proposed operations may utilize a moon pool(s) to conduct various subsea activities. LLOG's contractor or company representative will provide a dedicated crew member to monitor and continually survey the moon pool area during the operations for sea turtles. If any sea turtle is detected in the moon pool, LLOG will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incidental report information. The procedures found in Appendix J of the NMFS Biological Opinion will be employed to free entrapped or entangled marine life safely.

The specific rig that will be used in the proposed operations has not been identified. A deepwater drilling rig, most likely a dual activity dynamically positioned Drillship with a moonpool will be necessary for the operations. Moonpools on Drillships range in size from 35ft to 45ft in width and 70ft to 130ft in length. The moonpool, located underneath the drilling rig rotary floor, is open to the sea below to allow for passage of wellbore equipment necessary for the construction of the well on the seafloor.

The proposed operations covered by this plan include the drilling, completion and production of wells in Keathley Canyon Blocks 642, 686, 736 and the installation of a standalone, semi-submersible, floating production system (FPS) facility in the unleased Keathley Canyon Block 689.

The initial start of each drilling operation consists of 7 days of riserless drilling operations where the drilling tools are tripped in and out through the moonpool to the seabed to drill and install the conductor and surface casings and the subsea wellhead which will be installed 10 feet above the seafloor. After the wellhead is in place and included in this initial 7 day time frame, the Blowout Preventer (BOP) will be run on joints of riser through the moonpool and the BOP will be latched onto the wellhead with the joints of riser pipe extending through the moonpool and connected to the rig floor. The remainder of the drilling operations will be conducted through the inside of the riser pipe. The riser pipe will be the only equipment utilized through the moonpool during this time frame. At the end of the drilling operation, the riser and BOP will be retrieved by pulling the equipment through the moonpool and storing on the rig.

The completion operations will involve running the BOP and riser through the moonpool and latching the BOP to the wellhead with joints of riser pipe extending through the moonpool and connected to the rig floor. The entire completion operation will be conducted through the inside of the riser pipe. The riser pipe will be the only equipment utilized through the moonpool during this operation. At the end of the completion, the BOP and riser will be retrieved by pulling the equipment through the moonpool and storing on the rig

C. Flower Garden Banks National Marine Sanctuary

This section of the plan is not applicable to the proposed operations.

APPENDIX K
LEASE STIPULATION INFORMATION
(30 CFR PART 550.222 AND 550.253)

A. Lease Stipulations

Minerals Management Service (BOEM) invoked Stipulation No. 4 – Protected Species

Lease Stipulation No. 4 is to reference measures to minimize or avoid potential adverse impacts to protected species (sea turtles, marine mammals, gulf sturgeon, and other federally protected species). BOEM has issued Notice to Lessees BOEM NTL No. 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program", BSEE NTL No. 2015-G03 "Marine Trash and Debris Awareness Training and Elimination"; BOEM NTL No. 2012-G01-JOINT "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"; BOEM NTL No. 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program."

B. Special Conditions

- **Subsea Completions**

  LLOG will be completing the subject wells as subsea completions, therefore, LLOG will follow the regulations in Title 30 CFR Parts 550.286 through 550.299, which mandates the submittal and approval of separate regulatory filings entitled as a "Deepwater Operations Plan" and a Conservation Information Document" respectively.

- **Ocean Current Monitoring**

  The proposed operations under this Plan are in water depths greater than 400 meters (1,312'); therefore, LLOG will follow the guidelines of the applicable NTL 2009-G02 "Ocean Current Monitoring", by continuously monitoring and gathering ocean current data using Acoustic Doppler Current Profile (ADCP) while the MODU is on location.

APPENDIX L
ENVIRONMENTAL MITIGATION MEASURES INFORMATION (30 CFR PART 550.223 AND 550.254)

A. Measures Taken to Avoid, Minimize, and Mitigate Impacts

This section does not apply to the operations as proposed herein.

B. Incidental Takes

LLOG does not anticipate the incidental taking of any species as a result of the proposed activities based on the implementation of, and adherence to, the BSEE NTL No. 2012-G01 "Marine Trash and Debris Awareness Training and Elimination"; Joint NTL No. 2012-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"; and Joint NTL No. 2012-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program".

APPENDIX M
RELATED FACILITIES AND OPERATIONS INFORMATION (30FR PART 550.256)

A. Related OCS Facilities and Operations –

The subject subsea wells will be connected via proposed manifolds and ROW pipeline systems with associated appurtenances & ancillary components (umbilicals, well jumpers, flowline jumpers, etc.) to LLOG's proposed semi-submersible floating platform "A" Keathley Canyon Block 689. This will be a manned platform and will process produced hydrocarbons from the incoming subsea wells from two drill sites designated as Castille on the western half of Keathley Canyon Block 736 and Leon on the northern half of Keathley Canyon Block 686.

Castille – Keathley Canyon 736

An approximate 48,410' long x 8.625" dual ROW pipelines will be installed (via dynamically positioned pipe lay vessel) to transport production from Castille drill site (KC 736 Well SS003 and SS004) to LLOG's Platform "A" in Keathley Canyon Block 689.

An approximate 80' long x 6.625" Well Jumper at KC 736 Well SS003.

An approximate 80' long x 6.625" Well Jumper at KC 736 Well SS004.

An approximate 51,000' 6.0" Umbilical from the KC 689 "A" production platform to the KC 736 umbilical termination assembly

Leon – Keathley Canyon 642/686

An approximate 47,590' long x 8.625" dual ROW pipelines will be installed (via dynamically positioned pipe lay vessel) to transport production from drill Leon (KC 642 Well SS002, KC 686 Well SS003 and SS004) to LLOG's Platform "A" in Keathley Canyon Block 689.

An approximate 80' long x 6.625" Well Jumper at KC 642 Well SS002.

An approximate 80' long x 6.625" Well Jumper at KC 686 Well SS003.

An approximate 80' long x 6.625" Well Jumper at KC 686 Well SS004.

An approximate 52,650' long x 6.0" Umbilical from the KC 689 "A" production platform to the KC 686 umbilical termination assembly

An approximate 163,030' long x 10" ROW gas sales pipeline will be installed (via ROV/construction support vessel) to transport gas production from LLOG's Platform "A" in Keathley Canyon 689 to a SSTI on a Discovery 20" pipeline (segment 18711) located in Viosca Knoll 831.

An approximate 178,700' long x 16" ROW oil sales pipeline will be installed (via ROV/construction support vessel) to transport oil production from LLOG's Platform "A" in Keathley Canyon 689 to a SSTI on a SEKCO 18-in. pipeline (SN 18606) located Viosca Knoll 831.

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

Origination Point	*Flow Rates*	*Shut In Time*

Origination Point	*Flow Rates*	*Shut In Time*

B. Transportation System

LLOG does not anticipate installation of any new/or modified onshore facilities to accommodate the production of Keathley Canyon Block 689.

C. Produced Liquid Hydrocarbon Transportation Vessels

Not applicable. All production will flow through pipelines. No transportation vessels will be utilized.

APPENDIX N
SUPPORT VESSELS AND AIRCRAFT INFORMATION
(30 CFR PART 550.224 AND 550.257)

A. General

During Installation

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Tug Boats	5,100 bbls	3	15 days
Support Vessel	4,250 bbls	0	0 days
ROV Vessel	8,805 bbls	2	185 days
DP Pipelay Vessel	10,000 bbls	2	170 days
MSV	15,000 bbls	0	0 days

Routine

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Supply Boats	500 bbls	2	Weekly
Crew Boat	500 bbls	1	Weekly
Air Craft	1,900 bbls	1	As needed

B. Diesel Oil Supply Vessels.

The following table details the vessels to be used for purposes other than fuel (i.e., corrosion control):

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
180' feet	1,500 bbls	Twice Monthly	From the shorebase to KC 689 Platform A

C. Drilling Fluids Transportation – N/A

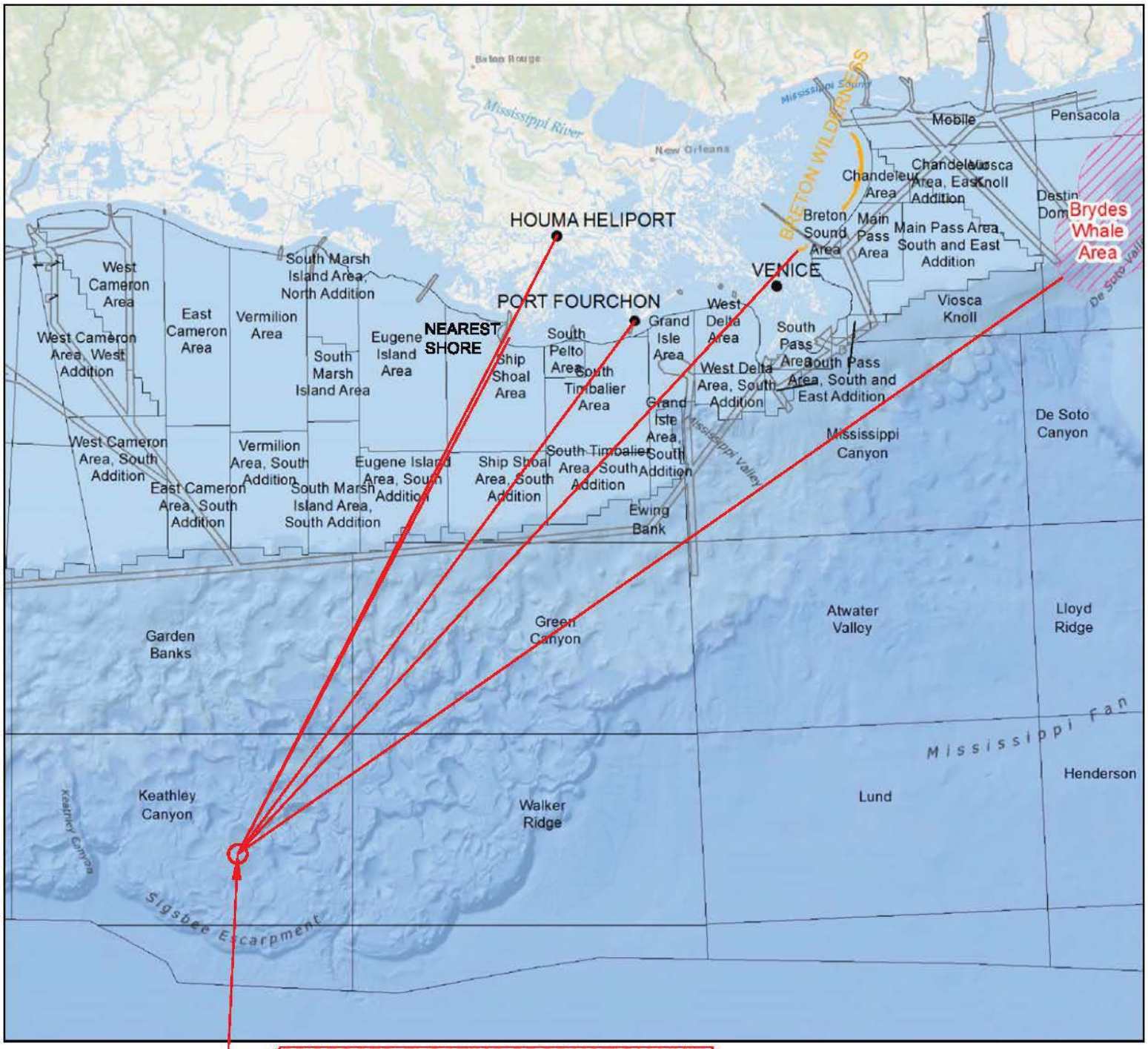
D. Solid and Liquid Wastes Transportation

See Attached Waste Tables 1 and 2 in Appendix G

E. Vicinity Map – A Vicinity Maps showing the location KC 642/686/736/689 relative to the shoreline and onshore base is attached. **See *Attachments N-1.***

VICINITY MAPS

Attachment N-1
(Public Information)



PROPOSED FLOATING PRODUCTION UNIT

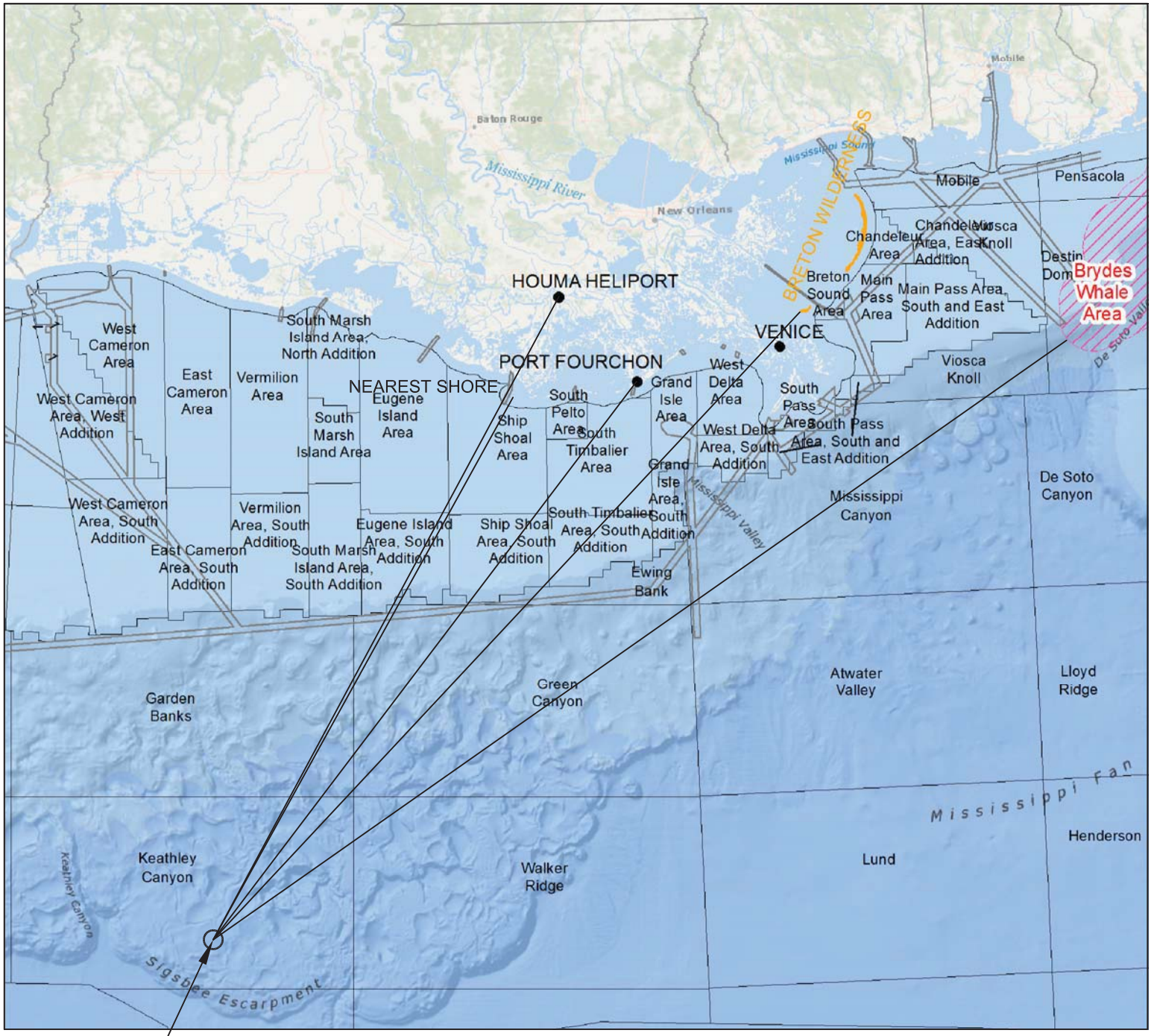
~213 STATUTE (185 NAUTICAL) MILES TO TERREBONNE PARISH (NEAREST SHORE)
COORDINATE TO NEAREST POINT ON SHORELINE X = 2,292,944 Y = 10,550,063
~240 STATUTE (209 NAUTICAL) MILES TO PORT FOURCHON, LA
~252 STATUTE (219 NAUTICAL) MILES TO HOUMA HELIPORT, HOUMA, LA
~417 STATUTE (362 NAUTICAL) MILES TO BRYDES WHALE AREA
~478 KILOMETERS TO BRETON WILDERNESS
WATER DEPTH = 6,405'

VICINITY MAP

THE DISTANCES SHOWN HEREON ARE FROM THE PROPOSED FPU TO THE NEAREST COASTLINE POINT AS OBTAINED FROM NOAA, ENTITLED NOAA MEDIUM RESOLUTION SHORELINE. <HTTP://SHORELINE.NOAA.GOV/DATA/DATASHEETS/MEDRES.HTML>.

LLOG EXPLORATION OFFSHORE, L.L.C.	LLOG exploration	**LOCATION PLAT** **PROPOSED FLOATING PRODUCTION UNIT** **BLOCK 689** **KEATHLEY CANYON AREA** **GULF OF MEXICO**
Echo OFFSHORE LLC 35499 Perkins Road Prairieville, Louisiana 70769 Tel: 225-673-2163	NOT TO SCALE	

DRAWN BY: RJN	CHK. BY.: MEK	REV. No.:	JOB No.: 21-024	DWG No.: 21-024-PLAT	
DATUM: NAD 27	SPHEROID: CLARKE 1866	PROJECTION: U.T.M.	ZONE: 15	DATE: 9/14/2021	REV. DATE:	SCALE: N.T.S.	SHEET 1 OF 1



WELLS KC642#2, KC686#4 & ALT #4

~215 STATUTE (187 NAUTICAL) MILES TO TERREBONNE PARISH (NEAREST SHORE)
COORDINATE TO NEAREST POINT ON SHORELINE X = 2,292,609 Y = 10,550,230
~244 STATUTE (212 NAUTICAL) MILES TO PORT FOURCHON, LA
~254 STATUTE (221 NAUTICAL) MILES TO HOUMA HELIPORT, HOUMA, LA
~423 STATUTE (367 NAUTICAL) MILES TO BRYDES WHALE AREA
~484 KILOMETERS TO BRETON WILDERNESS

VICINITY MAP

THE DISTANCES SHOWN HEREON ARE FROM THE PROPOSED WELL TO THE NEAREST COASTLINE POINT AS OBTAINED FROM NOAA, ENTITLED NOAA MEDIUM RESOLUTION SHORELINE. <HTTP://SHORELINE.NOAA.GOV/DATA/DATASHEETS/MEDRES.HTML>.

LLOG EXPLORATION OFFSHORE, L.L.C.

LLOG exploration

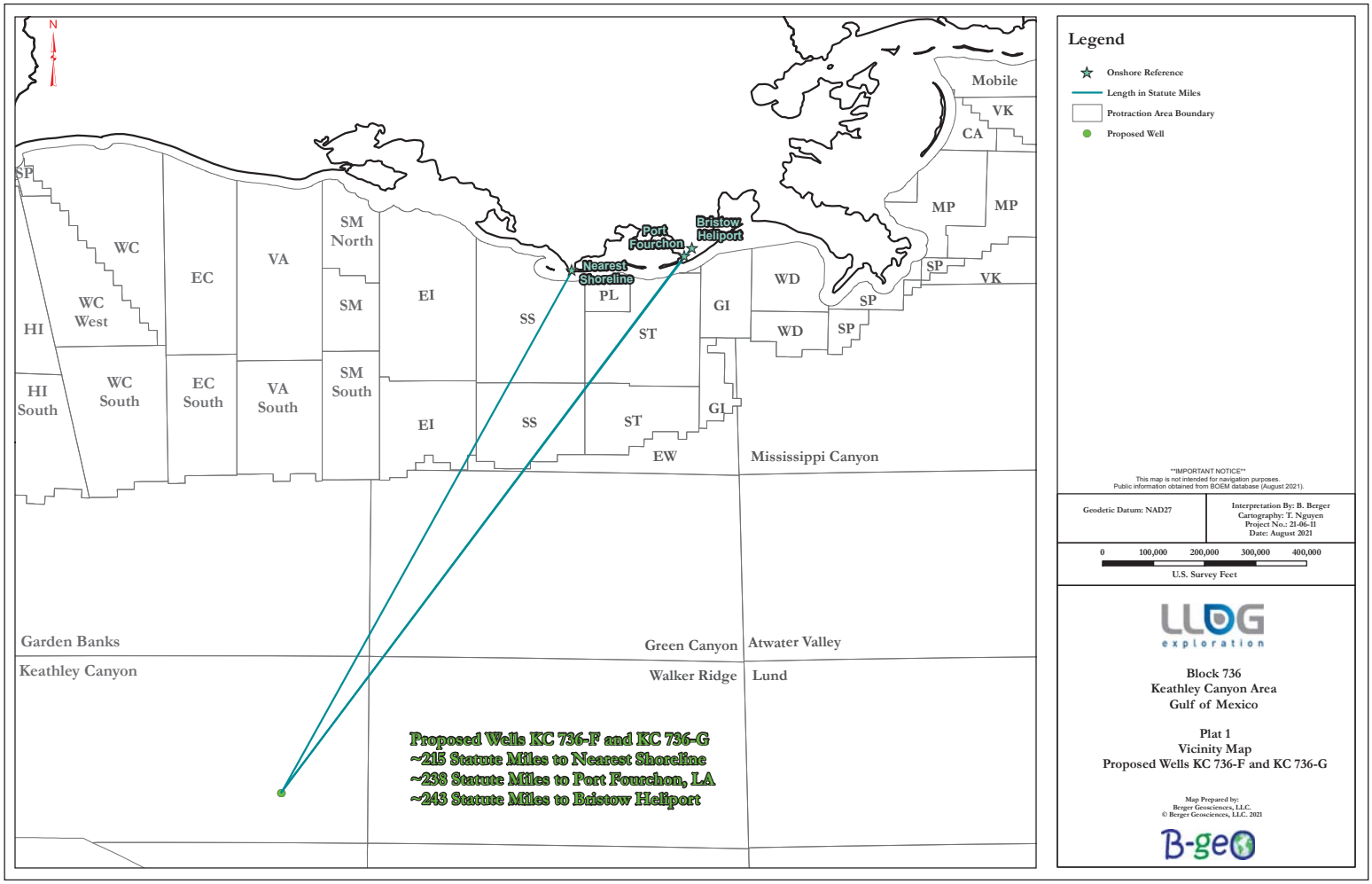
Echo OFFSHORE LLC
36499 Perkins Road
Prairieville, Louisiana 70769
Tel: 225-673-2163

NOT TO SCALE

DOCD PLAT

PROPOSED WELLS
KC642#2 (G33335), KC686#4 & ALT #4 (G33341)
BLOCKS 686 & 642
KEATHLEY CANYON AREA
GULF OF MEXICO

DRAWN BY: RJN	CHK. BY.: MEK	REV. No.: 2	JOB No.: 21-038	DWG No.: 21-038-EXP_REV2
DATUM: NAD 27	SPHEROID: CLARKE 1866	PROJECTION: U.T.M.	ZONE: 15	DATE: 9/8/2021	REV. DATE: 9/23/2021	SCALE: N.T.S.	SHEET 1 OF 1



Legend

- Onshore Reference
- Length in Statute Miles
- Protraction Area Boundary
- Proposed Well

IMPORTANT NOTICE
This map is not intended for navigation purposes.
Public information obtained from BOEM database (August 2021).

Geodetic Datum: NAD27

Interpretation By: B. Berger
Cartography: T. Nguyen
Project No.: 21-06-II
Date: August 2021

0 100,000 200,000 300,000 400,000
U.S. Survey Feet

LLOG exploration

Block 736
Keathley Canyon Area
Gulf of Mexico

Plat 1
Vicinity Map
Proposed Wells KC 736-F and KC 736-G

B-geo

APPENDIX O
ONSHORE SUPPORT FACILITIES INFORMATION
(30 CFR PART 550.225 AND 550.258)

A. General

The proposed operations in Keathley Canyon Blocks 642/686/736/689 will be located approximately 213 miles from the nearest shoreline and 240 miles from the onshore support base.

Name	Location	Existing/New/Modified
Martin North	Fourchon	Existing

B. Support Base Construction or Expansion

Not applicable. All bases are existing and will not be modified due to proposed operations.

C. Support Base Construction or Expansion Timetable.

Not applicable. LLOG will utilize and existing shore base and has no plans to modify due to proposed operations.

D. Waste disposal.

See Attached Waste Tables 1 & 2 in Appendix G

APPENDIX P
COASTAL ZONE MANAGEMENT ACT (CZMA) INFORMATION (30 CFR PART 550.226 AND 550.260)

Under direction of the Coastal Zone Management Act (CZMA), the States of Alabama, Florida, Louisiana, Mississippi and Texas developed Coastal Zone Management Programs (CZMP) to allow for the supervision of significant land and water use activities that take place within or that could significantly impact their respective coastal zones.

A. Consistency Certification

Certificates of Coastal Zone Management Consistency for the State of Louisiana are enclosed as Attachment P-1

B. Other Information

LLOG Exploration Offshore, L.L.C. has considered all of Louisiana's enforceable polices and certifies the consistency for the proposed operations.

Coastal Zone Conistency Certifications

Attachment P-1
(Public Information)

LOUISIANA
COASTAL ZONE MANAGEMENT CONSISTENCY CERTIFICATION

JOINT INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT

OCS-G 33335 LEASE
KEATHLEY CANYON BLOCK 642

OCS-G 33341 LEASE
KEATHLEY CANYON BLOCK 686

OCS-G-36077 LEASE
KEATHLEY CANYON BLOCK 736

(UNLEASED)
KEATHLEY CANYON BLOCK 689

The proposed activities described in detail in the enclosed Joint Initial Development Operations Coordination Document will comply with Louisiana's approved Coastal Zone Management Program and will be conducted in a manner consistent with such Program.

By: **LLOG Exploration Offshore, L.L.C., Operator**

Signed by: Kim Desopo
Kim Desopo, Certifying Official

Date: 9-16-21

APPENDIX Q
ENVIRONMENTAL IMPACT ANALYSIS
(30 CFR PART 550.227 AND 550.261)

LLOG Offshore Exploration, L. L. C.

Initial Development Operations Coordination Document
Keathley Canyon Blocks 686 and 736
OCS-G 33341 and 36077

(A) IMPACT PRODUCING FACTORS

ENVIRONMENTAL IMPACT ANALYSIS WORKSHEET

Environment Resources	Impact Producing Factors (IPFs) Categories and Examples Refer to recent GOM OCS Lease Sale EIS for a more complete list of IPFs					
	Emissions (air, noise, light, etc.)	**Effluents (muds, cutting, other discharges to the water column or seafloor)**	**Physical disturbances to the seafloor (rig or anchor emplacements, etc.)**	**Wastes sent to shore for treatment or disposal**	**Accidents (e.g., oil spills, chemical spills, H_2S releases)**	**Discarded Trash & Debris**
Site-specific at Offshore Location						
Designated topographic features		(1)	(1)		(1)	
Pinnacle Trend area live bottoms		(2)	(2)		(2)	
Eastern Gulf live bottoms		(3)	(3)		(3)	
Benthic communities			(4)			
Water quality		X			X	
Fisheries		X			X	
Marine Mammals	X(8)	X			X(8)	X
Sea Turtles	X(8)	X			X(8)	X
Air quality	X(9)					
Shipwreck sites (known or potential)			X(7)			
Prehistoric archaeological sites			(7)			
Vicinity of Offshore Location						
Essential fish habitat		X			X(6)	
Marine and pelagic birds					X	X
Public health and safety					(5)	
Coastal and Onshore						
Beaches					X(6)	X
Wetlands					X(6)	
Shore birds and coastal nesting birds					X6)	
Coastal wildlife refuges						
Wilderness areas						

Footnotes for Environmental Impact Analysis Matrix

1) Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well or platform site or any anchors will be on the seafloor within the:
   - 4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;
   - 1000-meter, 1-mile or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an OCS lease;
   - Essential Fish Habitat (EFH) criteria of 500 feet from any no-activity zone; or
   - Proximity of any submarine bank (500 foot buffer zone) with relief greater than two meters that is not protected by the Topographic Features Stipulation attached to an OCS lease.
2) Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.
3) Activities within any Eastern Gulf OCS block where seafloor habitats are protected by the Live Bottom (Low-Relief) Stipulation attached to an OCS lease.
4) Activities on blocks designated by the BOEM as being in water depths 300 meters or greater.
5) Exploration or production activities where H_2S concentrations greater than 500 ppm might be encountered.
6) All activities that could result in an accidental spill of produced liquid hydrocarbons or diesel fuel that you determine would impact these environmental resources. If the proposed action is located a sufficient distance from a resource that no impact would occur, the EIA can note that in a sentence or two.
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 a prehistoric site that no impact would occur, the EIA can note that in a sentence or two.
8) All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.
9) Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.

TABLE 1: THREATENED AND ENDANGERED SPECIES, CRITICAL HABITAT, AND MARINE MAMMAL INFORMATION

The federally listed endangered and threatened species potentially occurring in the lease area and along the Gulf Coast are provided in the table below

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Marine Mammals						
Manatee, West Indian	*Trichechus manatus latirostris*	T	--	X	Florida (peninsular)	Coastal Louisiana, Mississippi, Alabama, and Florida
Whale, Blue	*Balaenoptera masculus*	E	X[1]	--	None	GOM
Whale, Bryde's[4]	*Balaenoptera brydei/edeni*	E	X	--	None	Eastern GOM
Whale, Fin	*Balaenoptera physalus*	E	X[1]	--	None	GOM
Whale, Humpback	*Megaptera novaeangliae*	E	X[1]	--	None	GOM
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X[1]	--	None	GOM
Whale, Rice's[4]	*Balaenoptera ricei*	E	X	--	None	GOM
Whale, Sei	*Balaenopiera borealis*	E	X[1]	--	None	GOM
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None	GOM
Terrestrial Mammals						
Mouse, Beach (Alabama, Choctawatchee, Perdido Key, St. Andrew)	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches	Alabama, Florida (panhandle) beaches
Birds						
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal GOM
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas	Coastal Texas and Louisiana
Crane, Mississippi sandhill	*Grus canadensis pulla*	E	-	X	Coastal Mississippi	Coastal Mississippi
Curlew, Eskimo	*Numenius borealis*	E	-	X	none	Coastal Texas
Falcon, Northern Aplomado	*Falco femoralis septentrionalis*	E	-	X	none	Coastal Texas

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico	Gulf of Mexico Range
			Lease Area	Coastal		
Knot, Red	*Calidris canutus rufa*	T	-	X	None	Coastal GOM
Stork, Wood	*Mycteria americana*	T	-	X	None	Coastal Alabama and Florida
Reptiles						
Sea Turtle, Green	*Chelonia mydas*	T/E[3]	X	X	None	GOM
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None	GOM
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None	GOM
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None	GOM
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida	GOM
Fish						
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)	Coastal Louisiana, Mississippi, Alabama and Florida (panhandle)
Shark, Oceanic Whitetip	Carcharhinus longimanus	E	X	_	None	GOM
Sawfish, Smalltooth	Pristis pectinate	E	-	X	None	Florida
Grouper, Nassau	Epinephelus striatus	T	-	X	None	Florida
Ray, Giant Manta	Manta birostris	E	X	--	None	GOM
Corals						
Coral, Elkhorn	*Acopora palmate*	T	X[2]	X	Florida Keys and Dry Tortugas	Flower Garden Banks, Florida, and the Caribbean
Coral, Staghorn	*Acopora cervicornis*	T	X	X	Florida	Flower Garden Banks, Florida, and the Caribbean
Coral, Boulder Star	*Orbicella franksi*	T	X	X	none	Flower Garden Banks and Florida
Coral, Lobed Star	*Orbicella annularis*	T	X	X	None	Flower Garden Banks and Caribbean
Coral, Mountainous Star	*Orbicella faveolate*	T	X	X	None	Flower Garden Banks and Gulf of Mexico
Coral, Rough Cactus	*Mycetophyllia ferox*	T	-	X	None	Florida and Southern Gulf of Mexico

Abbreviations: E = Endangered; T = Threatened

1 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.

2 According to the 2017 EIS, Elkhorn Coral, while uncommon, has been found in the Flower Garden Banks. (BOEM 2017-009)

3 Green Sea Turtles are considered threatened throughout the Gulf of Mexico; however, the breeding population off the coast of Florida is considered endangered.

4 The Bryde's whale, also known as the Bryde's whale complex, is a collection of baleen whales that are still being researched to determine if they are the same species or if they are individual species of whales. In 2021, the Rice's whale, formerly known as the Gulf of Mexico Bryde's whale, was determined to be a separate species. There are less than 100 Rice's whales living in the Gulf of Mexico year-round. These whales retain all the protections of the Gulf of Mexico Bryde's whale under the Endangered Species Act while the regulations are being updated to reflect the name change. Other Bryde's whales are migratory and may enter the Gulf of Mexico; however, the migratory Bryde's whales are rare or extralimital in the Gulf of Mexico and are unlikely to be present in the lease area.

(B) Analysis

Site-Specific at Keathley Canyon Blocks 686, 689, and 736

Proposed operations consist of the drilling and completion of two wells and the completion of one well in Keathley Canyon Block 686 (locations 2, 3, and 4), and the drilling and completion of two wells with two alternate wells in the event of failure in Keathley Canyon Block 736 (locations F, G, Alt F, and Alt G). Additionally, proposed operations involve the installation of a semi-submersible floating platform in Keathley Canyon Block 689 (unleased).

The operations will be conducted with a dynamically positioned semisubmersible or drillship.

There are no seismic surveys, pile driving, or pipelines making landfall associated with the operations covered by this Plan.

1. Designated Topographic Features

Potential IPFs to topographic features as a result of the proposed operations include physical disturbances to the seafloor, effluents, and accidents.

Physical disturbances to the seafloor: Keathley Canyon Block 686 is 105.3 miles from the closest designated Topographic Features Stipulation Blocks (Geyer Bank). Keathley Canyon Blocks 689 and 736 are 106.9 miles and 112.1 miles, respectively, from the next closest designated Topographic Features Stipulation Blocks (Elvers Bank). Therefore, no adverse impacts are expected. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Effluents: Keathley Canyon Blocks 686 is 105.3 miles from the closest designated Topographic Features Stipulation Blocks (Geyer Bank). Keathley Canyon Blocks 689 and 736 are 106.9 miles and 112.1 miles, respectively, from the next closest designated Topographic Features Stipulation Blocks (Elvers Bank). Therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed activities (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to benthic organisms only if the oil contacts the organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on corals. Because the crests of topographic features in the Northern Gulf of Mexico are found below 10 meters, oil from a surface spill is not expected to reach their sessile biota. Oil from a subsurface spill is not applicable due to the distance of these blocks from a topographic area. The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. Dispersants have been utilized in previous spill response efforts and were used

extensively in the response to the Deepwater Horizon oil spill, with both surface and sub-surface applications. Reports on dispersant usage on surface oil indicate that a majority of the dispersed oil remains in the top 10 meters of the water column, with 60 percent of the oil in the top two meters of water (McAuliffe et al, 1981; Lewis and Aurand, 1997; OCS Report BOEM 2017-007). Lubchenco et al. (2010) report that most chemically dispersed surface oil from the Deepwater Horizon explosion and oil spill remained in the top six meters of the water column where it mixed with surrounding waters and biodegraded (BOEM 2017-007). None of the topographic features or potentially sensitive biological features in the GOM are shallower than 10 meters (33 feet), and only the Flower Garden Banks are shallower than 20 meters (66 feet).

In one extraordinary circumstance with an unusual combination of meteorological and oceanographic conditions, a tropical storm forced a large volume of Deepwater Horizon oil spill-linked surface oil/dispersant mixture to as deep as 75 meters (246 feet), causing temporary exposure to mesophotic corals in the Pinnacle Trend area and leading to some coral mortality and sublethal impacts (Silva et al., 2015; BOEM 2017-007).

Additionally, concentrations of dispersed and dissolved oil in the Deepwater Horizon oil-spill subsea plume were reported to be in the parts per million range or less and were generally lower away from the water's surface and away from the well head (Adcroft et al., 2010; Haddad and Murawski, 2010; Joint Analysis Group, 2010; Lubchenco et al, 2010; BOEM 2017-007).

In the case of subsurface spills like a blowout or pipeline leak, dispersants may be injected at the seafloor. This will increase oil concentrations near the source but tend to decrease them further afield, especially at the surface. Marine organisms in the lower water column will be exposed to an initial increase of water-soluble oil compounds that will dilute in the water column over time (Lee et al., 2013a; NAS 2020).

Dispersant application involves a trade-off between decreasing the risk to the surface and shoreline habitat and increasing the risk beneath the surface. The optimal trade-off must account for various factors, including the type of oil spilled, the spill volume, the weather and sea state, the water depth, the degree of turbulence, and the relative abundance and life stages of organisms (NRC, 2005; NAS 2020).

Chemical dispersants may increase the risk of toxicity to subsurface organisms by increasing bioavailability of the oil. However, it is important to note that at the 1:20 dispersant-to-oil ratio recommended for use during response operations, the dispersants currently approved for use are far less acutely toxic than oil is. Toxicity of chemically dispersed oil is primarily due to the oil itself and its enhanced bioavailability (Lee et al., 2015; NAS 2020).

With the exception of special Federal management areas or designated exclusion areas, dispersants have been preapproved for surface use, which provides the USCG On-Scene Coordinator with the authority to approve the use of dispersants. However, that approval would only be granted upon completion of the protocols defined in the appropriate Area Contingency Plan (ACP) and the

Regional Response Team (RRT) Dispersant Plan. The protocols include conducting an environmental benefit analysis to determine if the dispersant use will prevent a substantial threat to the public health or welfare or minimize serious environmental damage. The Regional Response Team would be notified immediately to provide technical support and guidance in determining if the dispersant use meets the established criteria and provide an environmental benefit. Additionally, there is currently no preapproval for subsea dispersant injection and the USCG On-Scene Coordinator must approve use of this technology before any subsea application. Due to the unprecedented volume of dispersants applied for an extended period of time, the U.S. National Response Team has developed guidance for atypical dispersant operations to ensure that planning and response activities will be consistent with national policy (BOEM 2017-007).

Dispersants were used extensively in the response to the Deepwater Horizon oil spill, both surface and sub-surface applications. However, during a May 2016 significant oil spill (approximately 1,926 barrels) in the Gulf of Mexico dispersants were not utilized as part of the response. The Regional Response Team was consulted and recommended that dispersants not be used, despite acknowledging the appropriate protocols were correctly followed and that there was a net environmental benefit in utilizing dispersants. This demonstrates that the federal authorities (USCG and RRT) will be extremely prudent in their decision-making regarding dispersant use authorizations.

Due to the distance of these blocks from a topographic area and the coverage of the activities proposed in this plan by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**), impacts to topographic features from surface or sub-surface oil spills are not expected.

There are no other IPFs (including emissions and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact topographic features.

2. Pinnacle Trend Area Live Bottoms

Potential IPFs to pinnacle trend area live bottoms from the proposed operations include physical disturbances to the seafloor, emissions (noise / sound), effluents, and accidents.

Physical disturbances to the seafloor: Keathley Canyon Blocks 686, 689, and 736 are 325.8 miles, 318.9 miles, and 314 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound

introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Keathley Canyon Blocks 686, 689, and 736 are 325.8 miles, 318.9 miles, and 314 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

Effluents: Keathley Canyon Blocks 686, 689, and 736 are 325.8 miles, 318.9 miles, and 314 miles, respectively, from the closest live bottom (pinnacle trend) area; therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed activities (refer to statistics in **Item 5**, Water Quality). Oil spills have the potential to foul benthic communities and cause lethal and sublethal effects on live bottom organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on marine organisms. Oil from a subsurface spill is not expected to impact pinnacle trend area live bottoms due to the distance of these blocks from a live bottom (pinnacle trend) area and the coverage of the activities proposed in this plan by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

There are no other IPFs (including wastes sent to shore for treatment or disposal) from the proposed activities that are likely to impact a live bottom (pinnacle trend) area.

3. Eastern Gulf Live Bottoms

Potential IPFs on Eastern Gulf live bottoms from the proposed operations include physical disturbances to the seafloor, emissions (noise / sound), effluents, and accidents.

Physical disturbances to the seafloor: Keathley Canyon Blocks 686, 689, and 736 are not located in an area characterized by the existence of live bottoms, and this lease does not contain a Live-Bottom Stipulation requiring a photo documentation survey and survey report. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and

reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms. Although there is little information available on sound detection and sound-mediated behaviors for marine invertebrates, the overall impacts on pinnacle and low-relief feature communities from anthropogenic noise are expected to be negligible (BOEM 2017-009). Additionally, Keathley Canyon Blocks 686, 689, and 736 are not located in an area characterized by the existence of live bottoms; therefore, no adverse impacts are expected.

Effluents: Keathley Canyon Blocks 686, 689, and 736 are not located in an area characterized by the existence of live bottoms; therefore, no adverse impacts are expected.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed activities (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to live bottom organisms only if the oil contacts the organisms. Oil from a surface spill can be driven into the water column; measurable amounts have been documented down to a 10 meter depth. At this depth, the oil is found only at concentrations several orders of magnitude lower than the amount shown to have an effect on marine invertebrates. Oil from a subsurface spill is not expected to impact Eastern Gulf live bottoms due to the distance of these blocks from a live bottom area and coverage of the activities proposed in this plan by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

There are no other IPFs (including wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact an Eastern Gulf live bottom area.

4. Deepwater Benthic Communities

There are no IPFs (including emissions (noise / sound), physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, and accidents) from the proposed operations that are likely to cause impacts to deepwater benthic communities.

Keathley Canyon Blocks 686, 689, and 736 are located in water depths of 984 feet (300 meters) or greater. At such depth high-density, deepwater benthic communities may sometimes be found. However, Keathley Canyon Blocks 686, 689, and 736 are approximately 22.5 miles, 24.8, and 32.1 miles, respectfully, from a known deepwater benthic community site (Keathley Canyon Block 333), listed in NTL 2009-G40. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Due to the distance from the closest known deepwater benthic community and because physical disturbances to the seafloor will be minimized by the use of a

dynamically positioned semisubmersible or drillship, LLOG Offshore Exploration, L. L. C.'s proposed operations in Keathley Canyon Blocks 686, 689, and 736 are not likely to impact deepwater benthic communities.

Deepwater benthic communities would potentially be subject to detrimental effects from a catastrophic seafloor blowout due to sediment and oiled sediment from the initial event (BOEM 2017-007). However, this is unlikely due to the distancing requirements described in NTL 2009-G40. Additionally, the potential impacts would be localized due to the directional movement of oil plumes by water currents and the scattered, patchy distribution of sensitive habitats. Although widely dispersed, biodegraded particles of a passing oil plume might impact patchy habitats, no significant impacts would be expected to the Gulfwide population. Most deepwater benthic communities are expected to experience no impacts from a catastrophic seafloor blowout due to the directional movement of oil plumes by the water currents and their scattered, patchy distribution. Impacts may be expected if a spill were to occur close to a deepwater benthic habitat, however, beyond the localized area of impact particles would become increasingly biodegraded and dispersed. Localized impacts to deepwater benthic organisms would be expected to be mostly sublethal (BOEM 2017-007).

If dispersants were utilized as a response method, the fate and effects of spilled oil would be impacted. A detailed discussion on dispersants, their usage during the Deepwater Horizon oil spill, and their impacts on different levels of benthic communities can be found in **Item 1**.

5. Water Quality

Potential IPFs that could result in water quality degradation from the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include disturbances to the seafloor, effluents, and accidents.

Physical disturbances to the seafloor: Bottom area disturbances resulting from the emplacement of drill rigs, the drilling of wells and the installation of platforms and pipelines would increase water-column turbidity and re-suspension of any accumulated pollutants, such as trace metals and excess nutrients. This would cause short-lived impacts on water quality conditions in the immediate vicinity of the emplacement operations. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Effluents: Levels of contaminants in drilling muds and cuttings and produced water discharges, discharge-rate restrictions and monitoring and toxicity testing are regulated by the EPA NPDES permit, thereby eliminating many significant biological or ecological effects. Operational discharges are not expected to cause significant adverse impacts to water quality. Additionally, an analysis of the best available information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020) concludes that exposures to toxicants in discharges from oil and gas activities are not likely to adversely affect ESA-listed species.

Accidents: IPFs related to OCS oil- and gas-related accidental events primarily involve drilling fluid spills, chemical spills, and oil spills.

Drilling Fluid Spills

Water-based fluid (WBF) and Synthetic-based fluid (SBF) spills may result in elevated turbidity, which would be short term, localized, and reversible. The WBF is normally discharged to the seafloor during riserless drilling, which is allowable due to its low toxicity. For the same reasons, a spill of WBF would have negligible impacts. The SBF has low toxicity, and the discharge of SBF is allowed to the extent that it adheres onto drill cuttings. Both USEPA Regions 4 and 6 permit the discharge of cuttings wetted with SBF as long as the retained SBF amount is below a prescribed percent, meets biodegradation and toxicity requirements, and is not contaminated with the formation oil or PAH. A spill of SBF may cause a temporary increase in biological oxygen demand and locally result in lowered dissolved oxygen in the water column. Also, a spill of SBF may release an oil sheen if formation oil is present in the fluid. Therefore, impacts from a release of SBF are considered to be minor. Spills of SBF typically do not require mitigation because SBF sinks in water and naturally biodegrades, seafloor cleanup is technically difficult, and SBF has low toxicity. (BOEM 2017-009)

Chemical Spills

Accidental chemical spills could result in temporary localized impacts on water quality, primarily due to changing pH. Chemicals spills are generally small volume compared with spills of oil and drilling fluids. During the period of 2007 to 2014, small chemical spills occurred at an average annual volume of 28 barrels, while large chemical spills occurred at an average annual volume of 758 barrels. These chemical spills normally dissolve in water and dissipate quickly through dilution with no observable effects. Also, many of these chemicals are approved to be commingled in produced water for discharge to the ocean, which is a permitted activity. Therefore, impacts from chemical spills are considered to be minor and do not typically require mitigation because of technical feasibility and low toxicity after dilution (BOEM 2017-009).

Oil Spills

Oil spills have the greatest potential of all OCS oil-and gas-related activities to affect water quality. Small spills (<1,000 barrels) are not expected to substantially impact water quality in coastal or offshore waters because the oil dissipates quickly through dispersion and weathering while still at sea. Reasonably foreseeable larger spills (≥1,000 barrels), however, could impact water quality in coastal and offshore waters (BOEM 2017-007). However, based on data provided in the BOEM 2016 Update of Occurrence Rates for Offshore Oil Spills, it is unlikely that an accidental surface or subsurface spill of a significant volume would occur from the proposed activities. Between 2001 and 2015 OCS operations produced eight billion barrels of oil and spilled 0.062 percent of this oil, or one barrel for every 1,624 barrels produced. (The overall spill volume was almost entirely accounted for by the 2010 Deepwater Horizon blowout and subsequent discharge of 4.9 million barrels of oil. Additional information on unlikely scenarios and impacts from very large oil spills are discussed in the Catastrophic Spill Event Analysis white paper (BOEM 2017-007).

If a spill were to occur, the water quality of marine waters would be temporarily affected by the dissolved components and small oil droplets. Dispersion by currents and microbial degradation would remove the oil from the water column and dilute the constituents to background levels. Historically, changes in offshore water quality from oil spills have only been detected during the life of the spill and up to several months afterwards. Most of the components of oil are insoluble in water and therefore float. Dispersants will only be used if approved by the Regional Response Team in coordination with the RRT Dispersant Plan and RRT Biological Assessment for Dispersants.

Oil spills, regardless of size, may allow hydrocarbons to partition into the water column in a dissolved, emulsion, and/or particulate phase. Therefore, impacts from reasonably foreseeable oil spills are considered moderate. Mitigation efforts for oil spills may include booming, burning, and the use of dispersants (BOEM 2017-009).

These methods may cause short-term secondary impacts to water quality, such as the introduction of additional hydrocarbon into the dissolved phase through the use of dispersants and the sinking of hydrocarbon residuals from burning. Since burning and the use of dispersants put additional hydrocarbons into the dissolved phase, impacts to water quality after mitigation efforts are still considered to be moderate, because dissolved hydrocarbons extend down into the water column. This results in additional exposure pathways via ingestion and gill respiration and may result in acute or chronic effects to marine life (BOEM 2017-009).

Most oil-spill response strategies and equipment are based upon the simple principle that oil floats. However, as evident during the Deepwater Horizon explosion, oil spill, and response, this is not always true. Sometimes it floats and sometimes it suspends within the water column or sinks to the seafloor (BOEM 2017-009).

Oil that is chemically dispersed at the surface moves into the top six meters of the water column where it mixes with surrounding waters and begins to biodegrade (U.S. Congress, Office of Technology Assessment, 1990). Dispersant use, in combination with natural processes, breaks up oil into smaller components that allows them to dissipate into the water and degrade more rapidly (Nalco, 2010). Dispersant use must be in accordance with an RRT Preapproved Dispersant Use Manual and with any conditions outlined within an RRT's site-specific, dispersant approval given after a spill event. Consequently, dispersant use must be in accordance with the restrictions for specific water depths, distances from shore, and monitoring requirements. At this time, neither the Region IV nor the Region VI RRT dispersant use manuals, which cover the GOM region, give preapproval for the application of dispersant use subsea (BOEM 2017-009).

The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional Oil Spill Response Plan, which discusses potential response actions in more detail (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact water quality.

6. Fisheries

There are multiple species of fish in the Gulf of Mexico, including the endangered and threatened species listed in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered gulf sturgeon (**Item 20.2**), oceanic whitetip shark (**Item 20.3**), and giant manta ray (**Item 20.4**) can be found below. Potential IPFs to fisheries as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include physical disturbances to the seafloor, emissions (noise / sound), effluents, and accidents.

Physical disturbances to the seafloor: The emplacement of a structure or drilling rig results in minimal loss of bottom trawling area to commercial fishermen. Pipelines cause gear conflicts which result in losses of trawls and shrimp catch, business downtime and vessel damage. Most financial losses from gear conflicts are covered by the Fishermen's Contingency Fund (FCF). The emplacement and removal of facilities are not expected to cause significant adverse impacts to fisheries. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms by stimulating behavioral response, masking biologically important signals, causing temporary or permanent hearing loss (Popper et al., 2005; Popper et al., 2014), or causing physiological injury (e.g., barotrauma) resulting in mortality (Popper and Hastings, 2009). The potential for anthropogenic sound to affect any individual organism is dependent on the proximity to the source, signal characteristics, received peak pressures relative to the static pressure, cumulative sound exposure, species, motivation, and the receiver's prior experience. In addition, environmental conditions (e.g., temperature, water depth, and substrate) affect sound speed, propagation paths, and attenuation, resulting in temporal and spatial variations in the received signal for organisms throughout the ensonified area (Hildebrand, 2009).

Sound detection capabilities among fishes vary. For most fish species, it is reasonable to assume hearing sensitivity to frequencies below 500 Hertz (Hz) (Popper et al., 2003 and 2014; Popper and Hastings, 2009; Slabbekoorn et al., 2010; Radford et al., 2014). The band of greatest interest to this analysis, low-frequency sound (30-500 Hz), has come to be dominated by anthropogenic sources and includes the frequencies most likely to be detected by most fish species. For example, the noise generated by large vessel traffic typically results from propeller cavitation and falls within 40-150 Hz (Hildebrand, 2009; McKenna et al., 2012). This range is similar to that of fish vocalizations and hearing, and could result in a masking effect.

Masking occurs when background noise increases the threshold for a sound to be detected; masking can be partial or complete. If detection thresholds are raised for biologically relevant signals, there is a potential for increased predation, reduced foraging success, reduced reproductive success, or other effects. However, fish hearing and sound production may be adapted to a noisy environment (Wysocki and Ladich, 2005). There is evidence that fishes are able to efficiently discriminate between signals, extracting important sounds from background noise (Popper et al., 2003; Wysocki and Ladich, 2005). Sophisticated sound processing capabilities and filtering by the sound sensing organs essentially narrows the band of masking frequencies, potentially decreasing masking effects. In addition, the low-frequency sounds of interest propagate over very long distances in deep water, but these frequencies are quickly lost in water depths between ½ and ¼ the wavelength (Ladich, 2013). This would suggest that the potential for a masking effect from low-frequency noise on behaviors occurring in shallow coastal waters may be reduced by the receiver's distance from sound sources, such as busy ports or construction activities.

Pulsed sounds generated by OCS oil-and gas-related activities (e.g., impact-driven piles and airguns) can potentially cause behavioral response, reduce hearing sensitivity, or result in physiological injury to fishes and invertebrate resources. However, there are no pulsed sound generation activities proposed for these operations.

Support vessel traffic, drilling, production facilities, and other sources of continuous sounds contribute to a chronic increase in background noise, with varying areas of effect that may be influenced by the sound level, frequencies, and environmental factors (Hildebrand, 2009; Slabbekoorn et al., 2010; McKenna et al., 2012). These sources have a low potential for causing physiological injury or injuring hearing in fishes and invertebrates (Popper et al., 2014). However, continuous sounds have an increased potential for masking biologically relevant sounds than do pulsed signals. The potential effects of masking on fishes and invertebrates is difficult to assess in the natural setting for communities and populations of species, but evidence indicates that the increase to background noise as a result of OCS oil and gas operations would be relatively minor. Therefore, it is expected that the cumulative impact to fishes and invertebrate resources would be minor and would not extend beyond localized disturbances or behavioral modification.

Despite the importance of many sound-mediated behaviors and the potential biological costs associated with behavioral response to anthropogenic sounds, many environmental and biological factors limit potential exposure and the effects that OCS oil-and gas-related sounds have on fishes and invertebrate resources. The overall impact to fishes and invertebrate resources due to anthropogenic sound introduced into the marine environment by OCS oil-and gas-related routine activities is expected to be minor.

Effluents: Effluents such as drilling fluids and cuttings discharges contain components and properties which are detrimental to fishery resources. Moderate petroleum and metal contamination of sediments and the water column can occur out to several hundred meters down-current from the discharge point. Offshore discharges are expected to disperse and dilute to very near background levels in the water column or on the seafloor within 3,000 meters of the discharge

point, and are expected to have negligible effect on fisheries. Additionally, an analysis of the best available information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020) concludes that exposures to toxicants in discharges from oil and gas activities are not likely to adversely affect ESA-listed species.

Accidents: Collisions between support vessels and ESA-listed fish, would be unusual events, however, should one occur, death or injury to ESA-listed fish is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, LLOG Offshore Exploration, L. L. C. may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

An accidental oil spill has the potential to cause some detrimental effects on fisheries; however, it is unlikely that such an event would occur from the proposed activities (refer to **Item 5**, Water Quality). The effects of oil on mobile adult finfish or shellfish would likely be sublethal and the extent of damage would be reduced to the capacity of adult fish and shellfish to avoid the spill, to metabolize hydrocarbons, and to excrete both metabolites and parent compounds. The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including wastes sent to shore for treatment or disposal) from the proposed operations that are likely to cause impacts to fisheries.

7. Marine Mammals

The latest population estimates for the Gulf of Mexico revealed that cetaceans of the continental shelf and shelf-edge were almost exclusively bottlenose dolphin and Atlantic spotted dolphin. Squid eaters, including dwarf and pygmy killer whale, Risso's dolphin, rough-toothed dolphin, and Cuvier's beaked whale, occurred most frequently along the upper slope in areas outside of anticyclones. The Rice's whale (née Gulf of Mexico Bryde's whale) is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. Florida manatees have been sighted along the entire northern GOM but are mainly found in the shallow coastal waters of Florida, which are unassociated with the proposed actions. A complete list of all endangered and threatened marine mammals in the GOM may be found in **Table 1** at the beginning of this Environmental Impact Assessment. More information regarding the endangered Rice's whale can be found in **Item 20.1** below. Potential IPFs to marine mammals as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include emissions (noise / sound), effluents, discarded trash and debris, and accidents.

Emissions (noise / sound): Noises from drilling activities, support vessels and helicopters (i.e. non-impulsive anthropogenic sound) may elicit a startle reaction from marine mammals. This reaction may lead to disruption of marine mammals' normal activities. Stress may make them more vulnerable to parasites, disease, environmental contaminants, and/or predation (Majors and Myrick, 1990). Responses to sound exposure may include lethal or nonlethal injury, temporary hearing impairment, behavioral harassment and stress, or no apparent response. Noise-induced stress is possible, but it is little studied in marine mammals. Tyack (2008) suggests that a more significant risk to marine mammals from sound are these less visible impacts of chronic exposure. There is little conclusive evidence for long-term displacements and population trends for marine mammals relative to noise.

Vessels are the greatest contributors to increases in low-frequency ambient sound in the sea (Andrew et al. 2011). Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Cetacean responses to aircraft depend on the animals' behavioral state at the time of exposure (e.g., resting, socializing, foraging or traveling) as well as the altitude and lateral distance of the aircraft to the animals (Luksenburg and Parsons 2009). The underwater sound intensity from aircraft is less than produced by vessels, and visually, aircraft are more difficult for whales to locate since they are not in the water and move rapidly (Richter et al. 2006). Perhaps not surprisingly then, when aircraft are at higher altitudes, whales often exhibit no response, but lower flying aircraft (e.g., approximately 500 meters or less) have been observed to elicit short-term behavioral responses (Luksenburg and Parsons 2009; NMFS 2017b; NMFS 2017f; Patenaude et al. 2002; Smultea et al. 2008a; Wursig et al. 1998). Thus, aircraft flying at low altitude, at close lateral distances and above shallow water elicit stronger responses than aircraft flying higher, at greater lateral distances and over deep water (Patenaude et al. 2002; Smultea et al. 2008a). Routine OCS helicopter traffic

would not be expected to disturb animals for extended periods, provided pilots do not alter their flight patterns to more closely observe or photograph marine mammals. Helicopters, while flying offshore, generally maintain altitudes above 700 feet during transit to and from a working area, and at an altitude of about 500 feet between platforms. The duration of the effects resulting from a startle response is expected to be short-term during routine flights, and the potential effects will be insignificant to sperm whales and Rice's whales. Therefore, we find that any disturbance that may result from aircraft associated with the proposed action is not likely to adversely affect ESA-listed whales.

Drilling and production noise would contribute to increases in the ambient noise environment of the GOM, but they are not expected in amplitudes sufficient to cause either hearing or behavioral impacts (BOEM 2017-009). There is the possibility of short-term disruption of movement patterns and/or behavior caused by vessel noise and disturbance; however, these are not expected to impact survival and growth of any marine mammal populations in the GOM. Additionally, the National Marine Fisheries Service published a final recovery plan for the sperm whale, which identified anthropogenic noise as either a low or unknown threat to sperm whales in the GOM (USDOC, NMFS, 2010b). Sirenians (i.e. manatees) are not located within the area of operations. Additionally, there were no specific noise impact factors identified in the latest BOEM environmental impact statement for sirenians related to GOM OCS operations (BOEM 2017-009). See **Item 20.1** for details on the Rice's whale.

Impulsive sound impacts (i.e., pile driving, seismic surveys) are not included among the activities proposed under this plan.

Effluents: Drilling fluids and cuttings discharges contain components which may be detrimental to marine mammals. Most operational discharges are diluted and dispersed upon release. Any potential impact from drilling fluids would be indirect, either as a result of impacts on prey items or possibly through ingestion in the food chain (API, 1989).

Discarded trash and debris: Both entanglement in and ingestion of debris have caused the death or serious injury of marine mammals (Laist, 1997; MMC, 1999). The limited amount of marine debris, if any, resulting from the proposed activities is not expected to substantially harm marine mammals. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials,

particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

Accidents: Collisions between support vessels and marine mammals, including cetaceans, would be unusual events; however, should one occur, death or injury to marine mammals is possible. Contract vessel operators can avoid marine mammals and reduce potential deaths by maintaining a vigilant watch for marine mammals and maintaining a safe distance of 500 meters or greater from baleen whales, 100 meters or greater from sperm whales, and a distance of 50 meters or greater from all other aquatic protected species, with the exception of animals that approach the vessel. If unable to identify the marine mammal, the vessel will act as if it were a baleen whale and maintain a distance of 500 meters or greater. If a manatee is sighted, all vessels in the area will operate at "no wake/idle" speeds in the area, while maintaining proper distance. When assemblages of cetaceans are observed, including mother/calf pairs, vessel speeds will be reduced to 10 knots or less. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Vessel personnel must report sightings of any injured or dead protected marine mammal species immediately, regardless of whether the injury or death is caused by their vessel, to the NMFS Southeast Marine Mammal Stranding Hotline at (877) WHALE-HELP (877-942-5343). Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible

party, it is required to remain available to assist the respective salvage and stranding network as needed.

These proposed operations may utilize a moon pool(s) to conduct various subsea activities. LLOG Offshore Exploration, L. L. C.'s contractor or company representative will provide a dedicated crew member to monitor and continually survey the moon pool area during the operations for marine mammals. If any marine mammal is detected in the moon pool, LLOG Offshore Exploration, L. L. C. will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incident report information.

Oil spills have the potential to cause sublethal oil-related injuries and spill-related deaths to marine mammals. However, it is unlikely that an accidental oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Oil spill response activities may increase vessel traffic in the area, which could impact cetacean behavior and/or distribution, thereby causing additional stress to the animals. The effect of oil dispersants on cetaceans is not known. Removing oil from the surface would reduce the likelihood of oil adhering to marine mammals. Laboratory experiments have shown that the dispersants used during the Deepwater Horizon response are cytotoxic to sperm whale cells; however it is difficult to determine actual exposure levels in the GOM. Therefore, dispersants will only be used if approved by the Regional Response Team in coordination with the RRT Dispersant Plan and RRT Biological Assessment for Dispersants. The acute toxicity of oil dispersant chemicals included in LLOG Offshore Exploration, L. L. C.'s OSRP is considered to be low when compared with the constituents and fractions of crude oils and diesel products. The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s OSRP (refer to information submitted in accordance with **Section 9**).

The NMFS Office of Protected Resources coordinates agency assessment of the need for response and leads response efforts for spills that may impact cetaceans. If a spill may impact cetaceans, NMFS Protected Resources Contacts should be notified (see contact details below), and they will initiate notification of other relevant parties.

NMFS Protected Resources Contacts for the Gulf of Mexico:

- Marine mammals – Southeast emergency stranding hotline 1-877-433-8299
- Other endangered or threatened species – ESA section 7 consulting biologist: nmfs.ser.emergency.consult@noaa.gov

There are no other IPFs (including physical disturbances to the seafloor) from the proposed operations that are likely to impact marine mammals.

8. Sea Turtles

GulfCet II studies sighted most loggerhead, Kemp's ridley and leatherback sea turtles over shelf waters. Historically these species have been sighted up to the shelf's edge. They appear to be more abundant east of the Mississippi River than they are west of the river (Fritts et al., 1983b; Lohoefener et al., 1990). Deep waters may be used by all species as a transitory habitat. A complete list of endangered and threatened sea turtles in the GOM may be found in **Table 1** at the beginning of this Environmental Impact Assessment. Additional details regarding the loggerhead sea turtle's critical habitat in the GOM are located in **Item 20.5**. Potential IPFs to sea turtles as a result of the proposed operations include emissions (noise / sound), effluents, discarded trash and debris, and accidents.

Emissions (noise / sound): Noise from drilling activities, support vessels, and helicopters (i.e. non-impulsive anthropogenic sound) may elicit a startle reaction from sea turtles, but this is a temporary disturbance. Responses to sound exposure may include lethal or nonlethal injury, temporary hearing impairment, behavioral harassment and stress, or no apparent response. Vessels are the greatest contributors to increases in low-frequency ambient sound in the sea (Andrew et al. 2011). Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Routine OCS helicopter traffic would not be expected to disturb animals for extended periods, provided pilots do not alter their flight patterns to more closely observe or photograph marine mammals. Helicopters, while flying offshore, generally maintain altitudes above 700 feet during transit to and from a working area, and at an altitude of about 500 feet between platforms. The duration of the effects resulting from a startle response is expected to be short-term during routine flights and the potential effects will be insignificant to sea turtles. Therefore, we find that any disturbance that may result from aircraft associated with the proposed action is not likely to adversely affect sea turtles. Construction and operational sounds other than pile driving should have insignificant effects on sea turtles; effects would be limited to short-term avoidance of construction activity itself rather than the sound produced. As a result, sound sources associated with support vessel movement as part of the proposed operations are insignificant and therefore are not likely to adversely affect sea turtles.

Overall noise impacts on sea turtles from the proposed activities are expected to be negligible to minor depending on the location of the animal(s) relative to the sound source and the frequency, intensity, and duration of the source. The National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion Appendix C explains how operators must implement measures to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species. This guidance should also minimize the chance of sea turtles being subject to the increased noise level of a service vessel in very close proximity.

Effluents: Drilling fluids and cuttings discharges are not known to be lethal to sea turtles. Most operational discharges are diluted and dispersed upon release. Any potential impact from drilling fluids would be indirect, either as a result of impacts on prey items or possibly through ingestion in the food chain (API, 1989).

Discarded trash and debris: Both entanglement in, and ingestion of, debris have caused the death or serious injury of sea turtles (Balazs, 1985). The limited amount of marine debris, if any, resulting from the proposed activities is not expected to substantially harm sea turtles. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

Accidents: Collisions between support vessels and sea turtles would be unusual events; however, should one occur, death or injury to sea turtles is possible. Contract vessel operators can avoid sea turtles and reduce potential deaths by maintaining a vigilant watch for sea turtles and maintaining a safe distance of 50 meters or greater when they are sighted, with the exception of sea turtles that approach the vessel. Vessel crews should use a reference guide to help identify the five species of sea turtles that may be encountered in the Gulf of Mexico OCS as well as other marine protected species (i.e. Endangered Species Act listed species). Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Vessel crews must report sightings of any injured or dead protected sea turtle species immediately, regardless of whether the injury or death is caused by their vessel, to the State Coordinators for the Sea Turtle Stranding and Salvage Network (STSSN) at http://www.sefsc.noaa.gov/species/turtles/stranding_coordinators.htm (phone numbers vary by state). Additional information may be found at the following website:

https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

These proposed operations may utilize a moon pool(s) to conduct various subsea activities. LLOG Offshore Exploration, L. L. C.'s contractor or company representative will provide a dedicated crew member to monitor and continually survey the moon pool area during the operations for sea turtles. If any sea turtle is detected in the moon pool, LLOG Offshore Exploration, L. L. C. will cease operations and contact NMFS at nmfs.psoreview@noaa.gov and BSEE at protectedspecies@bsee.gov and 985-722-7902 for additional guidance and incidental report information. The procedures found in Appendix J of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion will be employed to free entrapped or entangled marine life safely.

All sea turtle species and their life stages are vulnerable to the harmful effects of oil through direct contact or by fouling of their food. Exposure to oil can be fatal, particularly to juveniles and hatchlings. However, it is unlikely that an accidental oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Oil spill response activities may increase vessel traffic in the area, which could add to the possibility of collisions with sea turtles. The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional Oil Spill Response Plan (refer to information submitted in accordance with **Section 9**).

The NMFS Office of Protected Resources coordinates agency assessment of the need for response and leads response efforts for spills that may impact sea turtles. If a spill may impact sea turtles, the following NMFS Protected Resources Contacts should be notified, and they will initiate notification of other relevant parties.

- Dr. Brian Stacy at brian.stacy@noaa.gov and 352-283-3370 (cell); or
- Stacy Hargrove at stacy.hargrove@noaa.gov and 305-781-7453 (cell)

There are no other IPFs (including physical disturbances to the seafloor) from the proposed operations that are likely to impact sea turtles.

9. Air Quality

Potential IPFs to air quality as a result of the proposed operations include accidents.

The projected air emissions identified in **Section 8** are not expected to affect the OCS air quality primarily due to distance to the shore or to any Prevention of Significant Deterioration Class I air quality area such as the Breton Wilderness Area. Keathley Canyon Blocks 686, and 736 are beyond the 200-kilometer (124 mile) buffer for the Breton Wilderness Area and are 215 miles and 214 miles, respectively, from the coastline. Therefore, no special mitigation, monitoring, or reporting requirements apply with respect to air emissions.

Accidents and blowouts can release hydrocarbons or chemicals, which could cause the emission of air pollutants. However, these releases should not impact onshore air quality because of the prevailing atmospheric conditions, emission height, emission rates, and the distance of Keathley Canyon Blocks 686, 689, and 736 from the coastline.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact air quality.

10. Shipwreck Sites (known or potential)

In accordance with BOEM NTL 2005-G07, LLOG Offshore Exploration, L. L. C. will submit an archaeological resource report per 30 CFR 550.194 if directed to do so by the Regional Director.

Potential IPFs to known or unknown shipwreck sites as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include physical disturbances to the seafloor. Should LLOG Offshore Exploration, L. L. C. discover any evidence of a shipwreck, they will immediately halt operations within a 1000-foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

Physical disturbances to the seafloor: Although the operations proposed will be conducted by utilizing a dynamically positioned semisubmersible or drillship, which would cause only an insignificant amount of seafloor to be disturbed, Keathley Canyon Blocks 686, 689, and 736 are located within the area designated by BOEM as high probability for occurrence of shipwrecks. Due to this designation, LLOG Offshore Exploration, L. L. C. will report to BOEM the discovery of any evidence of a shipwreck and make every reasonable effort to preserve and protect that cultural resource.

There are no other IPFs (including emissions, effluents, wastes sent to shore for treatment or disposal, and accidents) from the proposed operations that are likely to impact shipwreck sites.

11. Prehistoric Archaeological Sites

In accordance with BOEM NTL 2005-G07, LLOG Offshore Exploration, L. L. C. will submit an archaeological resource report per 30 CFR 550.194 if directed to do so by the Regional Director.

Potential IPFs to prehistoric archaeological sites as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include disturbances to the seafloor and accidents. Keathley

Canyon Blocks 686, 689, and 736 are located outside the Archaeological Prehistoric high probability line, therefore, no adverse impacts are expected. Should LLOG Offshore Exploration, L. L. C. discover any object of prehistoric archaeological significance, they will immediately halt operations within a 1000-foot radius, report to BOEM within 48 hours, and make every reasonable effort to preserve and protect that cultural resource.

Physical disturbances to the seafloor: A dynamically positioned semisubmersible, or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Because physical disturbances to the seafloor will be minimized by the use of a dynamically positioned semisubmersible or drillship, LLOG Offshore Exploration, L. L. C.'s proposed operations in Keathley Canyon Blocks 686, 689, and 736 are not likely to cause impacts to prehistoric archaeological sites.

Accidents: An accidental oil spill has the potential to cause some detrimental effects to prehistoric archaeological sites if the release were to occur subsea. However, it is unlikely that an accidental oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional Oil Spill Response Plan (refer to information submitted in accordance with **Section 9**).

There are no other IPFs (including emissions, effluents, wastes sent to shore for treatment or disposal, and accidents) from the proposed operations that are likely to impact prehistoric archeological sites.

Vicinity of Offshore Location

12. Essential Fish Habitat (EFH)

Potential IPFs to EFH as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include physical disturbances to the seafloor, effluents, and accidents. EFH includes all estuarine and marine waters and substrates in the Gulf of Mexico.

Physical disturbances to the seafloor: Turbidity and sedimentation resulting from the bottom disturbing activities included in the proposed operations would be short term and localized. Fish are mobile and would avoid these temporarily suspended sediments. Additionally, the Live Bottom Low Relief Stipulation, the Live Bottom (Pinnacle Trend) Stipulation, and the Eastern Gulf Pinnacle Trend Stipulation have been put in place to minimize the impacts of bottom disturbing activities. Additionally, a dynamically positioned semisubmersible or drillship is being used for the proposed activities; therefore, only an insignificant amount of seafloor will be disturbed. Therefore, the bottom disturbing activities from the proposed operations would have a negligible impact on EFH.

Effluents: The Live Bottom Low Relief Stipulation, the Live Bottom (Pinnacle Trend) Stipulation, and the Eastern Gulf Pinnacle Trend Stipulation would prevent most of the potential impacts on live-bottom communities and EFH from operational waste discharges. Levels of

contaminants in drilling muds and cuttings and produced-water discharges, discharge-rate restrictions, and monitoring and toxicity testing are regulated by the EPA NPDES permit, thereby eliminating many significant biological or ecological effects. Operational discharges are not expected to cause significant adverse impacts to EFH.

Accidents: An accidental oil spill has the potential to cause some detrimental effects on EFH. Oil spills that contact coastal bays and estuaries, as well as OCS waters when pelagic eggs and larvae are present, have the greatest potential to affect fisheries. However, it is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact essential fish habitat.

13. Marine and Pelagic Birds

Potential IPFs to marine birds as a result of the proposed activities include emissions (air, noise / sound), accidental oil spills, and discarded trash and debris from vessels and the facilities.

Emissions:

Air Emissions

Emissions of pollutants into the atmosphere from these activities are far below concentrations which could harm coastal and marine birds.

Noise / Sound Emissions

The OCS oil-and gas-related helicopters and vessels have the potential to cause noise and disturbance. However, flight altitude restrictions over sensitive habitat, including that of birds, may make serious disturbance unlikely. Birds are also known to habituate to noises, including airport noise. It is an assumption that the OCS oil-and gas-related vessel traffic would follow regular routes; if so, seabirds would find the noise to be familiar. Therefore, the impact of OCS oil-and gas-related noise from helicopters and vessels to birds would be expected to be negligible.

The use of explosives for decommissioning activities may potentially kill one or more birds from barotrauma if a bird (or several birds because birds may occur in a flock) is present at the location of the severance. For the impact of underwater sound, a threshold of 202 dB sound exposure level (SEL) for injury and 208 dB SEL for barotrauma was recommended for the Brahyramphus marmoratus, a diving seabird (USDOI, FWS, 2011). However, the use of explosive severance of facilities for decommissioning are not included in these proposed operations, therefore these impacts are not expected.

Accidents: An oil spill would cause localized, low-level petroleum hydrocarbon contamination. However, it is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Marine and pelagic birds feeding at the spill location may experience chronic, nonfatal, physiological stress. It is expected that few, if any, coastal and marine birds would actually be affected to that extent. The activities proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Marine and pelagic birds could become entangled and snared in discarded trash and debris, or ingest small plastic debris, which can cause permanent injuries and death. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE. Debris, if any, from these proposed activities will seldom interact with marine and pelagic birds; therefore, the effects will be negligible.

ESA bird species: Seven species found in the GOM are listed under the ESA. BOEM consults on these species and requires mitigations that would decrease the potential for greater impacts due to small population size.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact marine and pelagic birds.

14. Public Health and Safety Due to Accidents.

There are no IPFs (including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, and accidents, including an accidental H_2S release) from the proposed activities that are likely to impact public health and safety. In accordance with NTL No.'s 2008-G04, 2009-G27, and 2009-G31, sufficient information is included in **Section 4** to justify our request that our proposed operations be classified by BSEE as H_2S absent.

Coastal and Onshore

15. Beaches

Potential IPFs to beaches from the proposed operations include accidents and discarded trash and debris.

Accidents: Oil spills contacting beaches would have impacts on the use of recreational beaches and associated resources. Due to the distance from shore (214 miles) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Trash on the beach is recognized as a major threat to the enjoyment and use of beaches. There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease

operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact beaches.

16. Wetlands

Potential IPFs to wetlands from the proposed operations include accidents and discarded trash and debris.

Accidents: It is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Due to the distance from shore (214 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact wetlands.

17. Shore Birds and Coastal Nesting Birds

Potential IPFs to shore birds and coastal nesting birds as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: Oil spills could cause impacts to shore birds and coastal nesting birds. However, it is unlikely that an oil spill would occur from the proposed activities (refer to **Item 5**, Water Quality). Given the distance from shore (214 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Coastal and marine birds are highly susceptible to entanglement in floating, submerged, and beached marine debris: specifically, plastics. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact shore birds and coastal nesting birds.

18. Coastal Wildlife Refuges

Potential IPFs to coastal wildlife refuges as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: An accidental oil spill from the proposed activities could cause impacts to coastal wildlife refuges. However, it is unlikely that an oil spill would occur from the proposed activities (refer to Item 5, Water Quality). Due to the distance from shore (214 miles) and the response capabilities that would be implemented, no impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact coastal wildlife refuges.

19. Wilderness Areas

Potential IPFs to wilderness areas as a result of the proposed operations include accidents and discarded trash and debris.

Accidents: An accidental oil spill from the proposed activities could cause impacts to wilderness areas. However, it is unlikely that an oil spill would occur from the proposed operations (refer to **Item 5**, Water Quality). Due to the distance from the nearest designated Wilderness Area (292.8 miles) and the response capabilities that would be implemented, no significant adverse impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9).**

Discarded trash and debris: Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act and regulations imposed by various agencies including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on vessels and every facility that has sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact wilderness areas.

20. Other Environmental Resources Identified

20.1 – Rice's Whale (née Gulf of Mexico Bryde's whale)

The Bryde's whale, also known as the Bryde's whale complex, is a collection of baleen whales that are still being researched to determine if they are the same species or if they are individual species of whales. In 2021, the Rice's whale, formerly known as the Gulf of Mexico Bryde's whale, was determined to be a separate species from other Bryde's whales. There are less than 100 Rice's whales living in the Gulf of Mexico year-round. These whales retain all the protections of the Gulf of Mexico Bryde's whale under the Endangered Species Act while the regulations are being updated to reflect the name change.

The Rice's whale (née Gulf of Mexico Bryde's whale) is the only commonly occurring baleen whale in the northern Gulf of Mexico and has been sighted off western Florida and in the De Soto Canyon region. The Rice's whale area is over 321.9 miles from the proposed operations. Additionally, vessel traffic associated with the proposed operations will not flow through the Rice's whale area. Therefore, there are no IPFs from the proposed operations that are likely to impact the Rice's whale. Additional information on marine mammals may be found in **Item 7**.

20.2 – Gulf Sturgeon

The Gulf sturgeon resides primarily in inland estuaries and rivers from Louisiana to Florida and a small population of the species enters the Gulf of Mexico seasonally in western Florida. Potential IPFs to the Gulf sturgeon from the proposed operations include accidents, emissions (noise / sound), and discarded trash and debris. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the Gulf sturgeon would be unusual events; however, should one occur, death or injury to the Gulf sturgeon is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, LLOG Offshore Exploration, L. L. C. may call BSEE

at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

Due to the distance from the nearest identified Gulf sturgeon critical habitat (292.4 miles) and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to the Gulf sturgeon. Considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the location of this critical habitat in relation to proposed operations, the likely dilution of oil reaching nearshore areas, and the on-going weathering and dispersal of oil over time, we do not anticipate the effects from oil spills will appreciably diminish the value of Gulf sturgeon designated critical habitat for the conservation of the species. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9)**.

Emissions (noise / sound): All routine OCS oil-and gas-related activities have some element of sound generation. Common sound sources include propeller cavitation, rotating machinery, and reciprocating machinery, which are associated with routine OCS oil-and gas-related activities such as vessel traffic, drilling, construction, and oil and gas production, processing, and transport. Sound introduced into the marine environment as a result of human activities has the potential to affect marine organisms**.** The National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion found that construction and operational sounds other than pile driving will have insignificant effects on Gulf sturgeon (NMFS, 2020). There are no pile driving activities associated with the proposed operations, therefore noise impacts are not expected to significantly affect Gulf sturgeon.

Discarded trash and debris: Trash and debris are not expected to impact the Gulf sturgeon. There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special

precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact the Gulf sturgeon.

20.3 – Oceanic Whitetip Shark

Oceanic whitetip sharks may be found in tropical and subtropical waters around the world, including the Gulf of Mexico (Young 2016). According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, Essential Fish Habitat (EFH) for the oceanic whitetip shark includes localized areas in the central Gulf of Mexico and Florida Keys. Oceanic whitetip sharks were listed as threatened under the Endangered Species Act in 2018 due to worldwide overfishing. Oceanic whitetip sharks had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas operations on oceanic whitetip sharks (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to oceanic whitetip sharks include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs to oceanic whitetip sharks as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the oceanic whitetip shark would be unusual events, however, should one occur, death or injury to the oceanic whitetip shark is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, LLOG Offshore Exploration, L. L. C. may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

There is little information available on the impacts of oil spills or dispersants on oceanic whitetip sharks. It is expected that exposure of oil or dispersants to oceanic whitetip sharks would likely result in effects similar to other marine species, including fitness reduction and the possibility of mortality (NMFS, 2020). Due to the sparse population in the Gulf of Mexico, it is possible that a small number of oceanic whitetip sharks could be impacted by an oil spill. However, it is unlikely that such an event would occur from the proposed activities (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There is little available information on the effects of marine debris on oceanic whitetip sharks. Since these sharks are normally associated with surface waters, they may be susceptible to entanglement. However, due to the small, widely dispersed, and highly mobile population in the Gulf of Mexico, and the localized and patchy distribution of marine debris, it is extremely unlikely that oceanic whitetip sharks would be impacted by marine debris.

There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for treatment or disposal) from the proposed operations that are likely to impact oceanic whitetip sharks.

20.4 – Giant Manta Ray

According to the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion, the giant manta ray lives in tropical, subtropical, and temperate oceanic waters and productive coastlines throughout the Gulf of Mexico. While uncommon in the Gulf of Mexico, there is a population of approximately 70 giant manta rays in the Flower Garden Banks National Marine Sanctuary (Miller and Klimovich 2017). Giant manta rays were listed as threatened under the Endangered Species Act in 2018 due to worldwide overfishing. Giant manta rays had an abundant worldwide population, which has been threatened in recent years by inadequate regulatory measures governing fisheries; therefore, there is little research regarding the impact of oil and gas operations on giant manta rays (NMFS, 2020). IPFs that have been determined by NMFS to be discountable to giant manta rays include vessel strike, emissions (noise / sound), discharges, entanglement and entrapment, and marine debris. Potential IPFs to giant manta rays as a result of the proposed operations in Keathley Canyon Blocks 686, 689, and 736 include accidents. Additional information on ESA-listed fish may be found in **Item 6**.

Accidents: Collisions between support vessels and the giant manta ray would be unusual events, however, should one occur, death or injury to the giant manta ray is possible. Contract vessel operators can avoid protected aquatic species and reduce potential deaths by maintaining a vigilant watch and a distance of 50 meters or greater, with the exception of animals that approach the vessel. Vessel personnel should use a Gulf of Mexico reference guide that includes identifying

information on marine mammals, sea turtles, and other marine protected species (i.e., Endangered Species Act listed species such as Gulf sturgeon, giant manta ray, or oceanic whitetip shark) that may be encountered in the Gulf of Mexico Outer Continental Shelf (OCS).

Contract vessel operators will comply with the measures included in Appendix C of the NMFS Biological Opinion and requirements of the Protected Species Lease Stipulation, except under extraordinary circumstances when the safety of the vessel or crew is in doubt or the safety of life at sea is in question.

Should an ESA-listed fish (e.g. giant manta ray, oceanic whitetip shark, or Gulf sturgeon) be entrapped, entangled, or injured, personnel should contact the ESA Section 7 biologist at (301) 427-8413 (nmfs.psoreview@noaa.gov) and report all incidents to takereport.nmfsser@noaa.gov. After making the appropriate notifications, LLOG Offshore Exploration, L. L. C. may call BSEE at (985) 722-7902 for questions or additional guidance on recovery assistance needs, continued monitoring requirements, and incidental report information which at minimum is detailed below. Additional information may be found at the following website: https://www.fisheries.noaa.gov/report. Any injured or dead protected species should also be reported to takereport.nmfsser@noaa.gov. In addition, if the injury or death was caused by a collision with the operator's vessel, an entrapment within the operator's equipment or vessel (e.g. moon pool), or an entanglement within the operator's equipment, the operator must further notify BOEM and BSEE within 24 hours of the strike or entrapment/entanglement by email to protectedspecies@boem.gov and protectedspecies@bsee.gov. If the vessel is the responsible party, it is required to remain available to assist the respective salvage and stranding network as needed.

There is little information available on the impacts of oil spills or dispersants on giant manta rays. It is expected that exposure of oil or dispersants to giant manta rays would likely result in effects similar to other marine species, including fitness reduction and the possibility of mortality (NMFS, 2020). It is possible that a small number of giant manta rays could be impacted by an oil spill in the Gulf of Mexico. However, due to the distance to the Flower Garden Banks (105.3 miles), the low population dispersed throughout the Gulf of Mexico, and the response capabilities that would be implemented during a spill, no significant adverse impacts are expected to impact giant manta rays. Additionally, it is unlikely that such an event would occur from the proposed activities (refer to **Item 5**, Water Quality). The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

Discarded trash and debris: There is little available information on the effects of marine debris on giant manta rays. Since these sharks are normally associated with surface waters, they may be susceptible to entanglement. However, due to the small, widely dispersed, and highly mobile population in the Gulf of Mexico, and the localized and patchy distribution of marine debris, it is extremely unlikely that oceanic whitetip sharks would be impacted by marine debris.

There will only be a limited amount of marine debris, if any, resulting from the proposed activities. Operators are prohibited from deliberately discharging debris as mandated by MARPOL-Annex V, the Marine Plastic Pollution Research and Control Act, and regulations imposed by various agencies, including the United States Coast Guard (USCG) and the Environmental Protection Agency (EPA).

LLOG Offshore Exploration, L. L. C. will operate in accordance with the regulations, agency guidance, and Appendix B of the National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion and also avoid accidental loss of solid waste items by maintaining waste management plans, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. Special caution will be exercised when handling and disposing of small items and packaging materials, particularly those made of non-biodegradable, environmentally persistent materials such as plastic or glass. LLOG Offshore Exploration, L. L. C. will also collect and remove flotsam resulting from activities related to proposed operations.

Informational placards will be posted on all vessels and facilities having sleeping or food preparation capabilities. All offshore personnel, including contractors and other support services-related personnel (e.g. helicopter pilots, vessel captains and boat crews) will be indoctrinated on waste procedures, and will view the video (or Microsoft PowerPoint presentation), "Think About It" (*previously "All Washed Up: The Beach Litter Problem"*). Thereafter, all personnel will view the marine trash and debris training video annually. Offshore personnel will also receive an explanation from LLOG Offshore Exploration, L. L. C. management or the designated lease operator management that emphasizes their commitment to waste management in accordance with NTL No. 2015-G03-BSEE.

There are no other IPFs (including effluents, physical disturbances to the seafloor, and wastes sent to shore for disposal) from the proposed operations that are likely to impact giant manta rays.

20.5 – Loggerhead Sea Turtle

The loggerhead sea turtles are large sea turtles that inhabit continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic Ocean, with nesting beaches along the northern and western Gulf of Mexico. NMFS issued a Final Rule in 2014 (79 FR 39855) designating a critical habitat including 38 marine areas within the Northwest Atlantic Ocean, with seven of those areas residing within the Gulf of Mexico. These areas contain one or a combination of habitat types: nearshore reproductive habitats, winter areas, breeding areas, constricted migratory corridors, and/or *Sargassum* habitats.

There are multiple IPFs that may impact loggerhead sea turtles (see **Item 8**). However, the closest loggerhead critical habitat is located 351.7 miles from Keathley Canyon Blocks 686, 689, and 736; therefore, no adverse impacts are expected to the critical habitat. Additionally, considering the information from the National Marine Fisheries Service Endangered Species Act (ESA) Section 7

Biological Opinion, we do not expect proposed operations to affect the ability of *Sargassum* to support adequate prey abundance and cover for loggerhead turtles.

20.6 - Protected Corals

Protected coral habitats in the Gulf of Mexico range from Florida, the Flower Garden Banks National Marine Sanctuary, and into the Caribbean, including Puerto Rico, the U.S. Virgin Islands, and Navassa Island. Four counties in Florida (Palm Beach, Broward, Miami-Dade, and Monroe Counties) were designated as critical habitats for elkhorn (Acropora palmata) and staghorn (Acropora cervicornis) corals. These coral habitats are located outside of the planning area and are not expected to be impacted by the proposed actions. Elkhorn coral can also be found in the Flower Garden Banks along with three additional coral species, boulder star coral (Orbicella franksi), lobed star coral (Orbicella annularis), and mountainous star coral (Orbicella faveolatta). Potential IPFs to protected corals from the proposed operations include accidents.

Accidents: It is unlikely that an accidental surface or subsurface spill would occur from the proposed operations (refer to statistics in **Item 5**, Water Quality). Oil spills cause damage to corals only if the oil contacts the organisms. Due to the distance from the Flower Garden Banks (105.3 miles) and other critical coral habitats, no adverse impacts are expected. The operations proposed in this plan will be covered by LLOG Offshore Exploration, L. L. C.'s Regional OSRP (refer to information submitted in **Section 9**).

There are no other IPFs (including emissions, effluents, physical disturbances to the seafloor, and wastes sent to shore for disposal) from the proposed operations that are likely to impact protected corals.

20.7 - Endangered Beach Mice

There are four subspecies of endangered beach mouse that are found in the dune systems along parts of Alabama and northwest Florida. Due to the location of Keathley Canyon Blocks 686, 689, and 736 and the beach mouse critical habitat (above the intertidal zone), there are no IPFs that are likely to impact endangered beach mice.

20.8 - Navigation

The current system of navigation channels around the northern GOM is believed to be generally adequate to accommodate traffic generated by the future Gulfwide OCS Program. As exploration and development activities increase on deepwater leases in the GOM, port channels may need to be expanded to accommodate vessels with deeper drafts and longer ranges. However, current navigation channels will not be changed, and new channels will not be required as a result of the operations proposed in this plan.

(C) IMPACTS ON PROPOSED ACTIVITIES

The site–specific environmental conditions have been taken into account for the proposed activities. No impacts are expected on the proposed operations from site-specific environmental conditions.

(D) ENVIRONMENTAL HAZARDS

During the hurricane season, June through November, the Gulf of Mexico is impacted by an average of ten tropical storms (39-73 mph winds), of which six become hurricanes (> 74 mph winds). Due to their location in the Gulf, Keathley Canyon Blocks 686, 689, and 736 may experience hurricane and tropical storm force winds and related sea currents. These factors can adversely impact the integrity of the operations covered by this plan. A significant storm may present physical hazards to operators and vessels, damage exploration or production equipment, or result in the release of hazardous materials (including hydrocarbons). Additionally, the displacement of equipment may disrupt the local benthic habitat and pose a threat to local species.

The following preventative measures included in this plan may be implemented to mitigate these impacts:

1. Drilling & completion
    a. Secure well
    b. Secure rig / platform
    c. Evacuate personnel

Drilling activities will be conducted in accordance with NTL No.'s 2008-G09, 2009-G10, and 2010-N10.

2. Platform / Structure Installation
   Operator will not conduct platform / structure installation operations during Tropical Storm or Hurricane threat.

3. Pipeline Installation
   Operator will not conduct pipeline installation operations during Tropical Storm or Hurricane threat.

(E) ALTERNATIVES

No alternatives to the proposed operations were considered to reduce environmental impacts.

(F) MITIGATION MEASURES

No mitigation measures other than those required by regulation will be employed to avoid, diminish, or eliminate potential impacts on environmental resources.

(G) CONSULTATION

No agencies or persons were consulted regarding potential impacts associated with the proposed operations. Therefore, a list of such entities has not been provided.

(H) PREPARER(S)

Jami Christley
J. Connor Consulting, Inc.
19219 Katy Freeway, Suite 200
Houston, Texas 77094
281-578-3388
jami.christley@jccteam.com

(I) REFERENCES

Authors:

ABS Consulting Inc. 2016. 2016 Update of Occurrence Rates for Offshore Oil Spills. July 13, 2016. Contract #E15PX00045, Deliverable 7 (ABS, 2016)

Adcroft, A., R. Hallberg, J.P. Dunne, B.L. Samuels, J. A. Galt, C.H. Barker, and B. Payton. 2010. Simulations of underwater plumes of dissolved oil in the Gulf of Mexico. Geophysical Research Letters, Vol. 37, L18605, 5 pp. doi: 10.1029/2010GL044689. (Adcroft et al., 2010)

American Petroleum Institute (API). 1989. Effects of offshore petroleum operations on cold water marine mammals: a literature review. Washington, DC: American Petroleum Institute. 385 pp.

Andrew, R. K., B. M. Howe, and J. A. Mercer. 2011. Long-time trends in ship traffic noise for four sites off the North American West Coast. Journal of the Acoustical Society of America 129(2):642-651.

Balazs, G.H. 1985. Impact of ocean debris on marine turtles: entanglement and ingestion. In: Shomura, R.S. and H.O. Yoshida, eds. Proceedings, Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, HI. U.S. Dept. of Commerce. NOAA Tech. Memo. NOAA-TM-NMFS-SWFC-54. Pp 387-429.

Burke, C.J. and J.A. Veil. 1995. Potential benefits from regulatory consideration of synthetic drilling muds. Environmental Assessment Division, Argonne National Laboratory, ANL/EAD/TM-43.

Catastrophic Spill Event Analysis: High-Volume, Extended-Duration Oil Spill Resulting from Loss of Well Control on the Gulf of Mexico Outer Continental Shelf, 1st Revision (BOEM 2017-007)

Daly, J.M. 1997. Controlling the discharge of synthetic-based drilling fluid contaminated cuttings in waters of the United States. U.S. Environmental Protection Agency, Office of Water. Work Plan, June 24, 1997.

Engås, A., S. Løkkeborg, E. Ona, and A.V. Soldal. 1996. Effects of seismic shooting on local abundance and catch rates of cod (Gadus morhua) and haddock (Melanogrammusaeglefinus). Canadian Journal of Fisheries and Aquatic Science 53:2238-2249 (Engås et al., 1996)

GOM Deepwater Operations and Activities. Environmental Assessment. BOEM 2000-001.

GOM Central and Western Planning Areas Sales 166 and 168 Final Environmental Impact Statement. BOEM 96-0058.

Gulf of Mexico OCS Oil & Gas Lease Sales: 2017-2022, Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261, Final Multisale Environmental Impact Statement. (BOEM 2017-009)

Haddad, R. and S. Murawski. 2010. Analysis of hydrocarbons in samples provided from the cruise of the R/V Weatherbird II, May 23-26, 2010. U.S. Dept. of Commerce, National Oceanographic and Atmospheric Administration, Silver Spring, MD. 14 pp. (Haddad and Murawski, 2010)

Hansen, D.J. 198l. The relative sensitivity of seabird populations in Alaska to oil pollution. U.S. Dept. of the Interior, Bureau of Land Management, Alaska OCS Region, Anchorage. BLM-YK-ES-81-006-1792.

Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395:5-20. Internet website: http://www.int-res.com/articles/theme/m395p005.pdf. (Hildebrand, 2009)

Joint Analysis Group. 2010. Review of R/V Brooks McCall data to examine subsurface oil. 58 pp. (Joint Analysis Group, 2010)

Ladich, F. 2013. Effects of noise on sound detection and acoustic communication in fishes. In: Brumm, H., ed. Animal communication and noise. Berlin Heidelberg: Springer-Ver lag. Pp. 65- (Ladich, 2013)

Laist, D.W. 1997. Impacts of marine debris: entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J.M. and D.B. Rogers, eds. Marine debris: sources, impacts, and solutions. New York, NY: Springer-Verlag. Pp. 99-139.

Lee, K., T. Nedwed, R. C. Prince, and D. Palandro. 2013a. Lab tests on the biodegradation of chemically dispersed oil should consider the rapid dilution that occurs at sea. Marine Pollution Bulletin 73(1):314-318. DOI: 10.1016/j.marpolbul.2013.06.005. (Lee et al., 2013a)

Lee, K., M. Boufadel, B. Chen, J. Foght, P. Hodson, S. Swanson, and A. Venosa. 2015. The Behaviour and Environmental Impacts of Crude Oil Released into Aqueous Environments. https://www.cepa.com/wp-content/uploads/2014/01/OIWReport.compressed.pdf. (Lee et al., 2015)

Lewis, A. and D. Aurand. 1997. Putting dispersants to work: Overcoming obstacles. 1997 International Oil Spill Conference. API 4652A. Technical Report IOSC-004. (Lewis and Aurand, 1997)

Løkkeborg, S., E. Ona, A. Vold, and A. Salthaug. 2012. Sounds from seismic air guns: gear-and species specific effects on catch rates and fish distribution. Canadian Journal of Fisheries and Aquatic Sciences 69:1,278-1,291. (Løkkeborg et al., 2012)

Lubchenco, J., M. McNutt, B. Lehr, M. Sogge, M. Miller, S. Hammond, and W. Conner. 2010. BP Deepwater Horizon oil budget: What happened to the oil? 5 pp. (Lubchenco et al. 2010)

Luksenburg, J. and E. Parsons, 2009. The effects of aircraft on cetaceans: implications for aerial whale watching. Proceedings of the 61st Meeting of the International Whaling Commission.

Majors, A.P. and A.C. Myrick, Jr. 1990. Effects of noise on animals: implications for dolphins exposed to seal bombs in the eastern tropical Pacific purse-seine fishery–an annotated bibliography. NOAA Administrative Report LJ-90-06.

Marine Mammal Commission. 1999. Annual report to Congress – 1998.

McAuliffe, C.D., B.L. Steelman, W.R. Leek, D.F. Fitzgerald, J. P. Ray, and C.D. Barker. 1981. The 1979 southern California dispersant treated research oil spills. In: Proceedings 1981 Oil Spill Conference. March 2-5, 1981, Atlanta, GA. Washington, DC: American Petroleum Institute. Pp. 269-282. (McAuliffe et al, 1981)

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131(1):92-103. (McKenna et al., 2012)

Miller, M. H., and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi). NMFS.

National Academies of Sciences, Engineering, and Medicine 2020. The Use of Dispersants in Marine Oil Spill Response. Washington, DC: The National Academies Press. https://doi.org/10.17226/25161. (NAS 2020)

National Marine Fisheries Service Endangered Species Act (ESA) Section 7 Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico (NMFS, 2020)

NMFS. 2017b. Biological and Conference Opinion on the Issuance of Permit No. 20465 to NMFS Alaska Fisheries Science Center Marine Mammal Laboratory for Research on Cetaceans. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9186, Silver Spring, Maryland.

NMFS. 2017f. Letter of concurrence on the issuance of Permit No. 20527 to Ann Pabst for vessel and aerial surveys of blue, fin, North Atlantic right, sei, and sperm whales. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, FPR-2017-9199, Silver Spring, Maryland.

NRC. 2005. Oil Spill Dispersants: Efficacy and Effects. Washington, DC: The National Academies Press. (NRC, 2005)

Patenaude, N. J., W. J. Richardson, M. A. Smultea, W. R. Koski, G. W. Miller, B. Wursig, and C. R. Greene. 2002. Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea. Marine Mammal Science 18(2):309-335.

Piatt, J.F., C.J. Lensink, W. Butler, M. Kendziorek, and D.R. Nysewander. 1990. Immediate impact of the Exxon Valdez oil spill on marine birds. The Auk. 107 (2): 387-397.

Popper, A.N., R.R. Fay, C. Platt, and O. Sand. 2003. Sound detection mechanisms and capabilities of teleost fishes. In: Collin, S.P. and N.J. Marshall, eds. Sensory processing in aquatic environments. New York, NY: Springer-Verlag. Pp. 3-3 (Popper et al., 2003)

Popper, A.N., M.E. Smith, P.A. Cott, B.W. Hanna, A.O. MacGillivray, M.E. Austin, and D.A. Mann. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. Journal of the Acoustical Society of America 117(6):3958-3971. (Popper et al., 2005)

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D.G. Zeddies, and W.N. Tavolga. 2014. ASA S3/SC1. 4 TR -2014 sound exposure guidelines for fishes and sea turtles. A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI. New York, NY: Springer. 78 pp. (Popper et al., 2014)

Popper, A.N. and M.C. Hastings. 2009. Effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75:455-498 (Popper and Hastings, 2009)

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? Behavioral Ecology 00(00):1-9. doi:10.1093/beheco/aru029 (Radford et al., 2014)

Richter, C., S. Dawson, and E. Slooten. 2006. Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand. Marine Mammal Science 22(1):46-63. (Richter et al. 2006)

Silva, M., P.J. Etnoyer, and I.R. MacDonald. 2015. Coral injuries observed at mesophotic reefs after the Deepwater Horizon oil discharge. Deep Sea Research Part II: Topical studies in oceanography. doi: 10.1016/j.dsr2.2015.05.013. (Silva et al., 2015)

Slabbekoorn, H., N. Bouton, I. van Opzeeland, A. Coers, C. ten Cate, and A.N. Popper. 2010. A noisy spring: The impact of globally rising underwater sound levels on fish. Trends in Ecology & Evolution 25:419-427. (Slabbekoorn et al., 2010)

Smultea, M. A., J. J. R. Mobley, D. Fertl, and G. L. Fulling. 2008a. An unusual reaction and other observations of sperm whales near fixed-wing aircraft. Gulf and Caribbean Research 20:75-80.

Tyack, P.L. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. Journal of Mammology 89(3):549-558 (Tyack, 2008)

U.S. Dept. of Commerce. National Marine Fisheries Service. 2010b. Final recovery plan for the sperm whale (Physeter macrocephalus). U.S. Dept. of Commerce, National Marine Fisheries Service, Silver Spring, MD. 165 pp. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/recovery/final_sperm_whale_recovery_plan_21dec.pdf (USDOC, NMFS, 2010b)

U.S. Dept. of the Interior. Fish and Wildlife Service. 2011. Endangered Species Act – Section 7 consultation on the construction of a second explosive handling wharf at Bangor Navy Base, Kitsap County. Conducted by the U.S. Dept. of the Interior, Fish and Wildlife Service, Lacey, WA . 137 pp. (USDOI, FWS, 2011)

Vauk , G., E. Hartwig, B. Reineking, and E. Vauk-Hentzelt. 1989. Losses of seabirds by oil pollution at the German North Sea coast. Topics in Marine Biology. Ros, J.D, ed. Scient. Mar. 53 (2-3): 749-754.

Vermeer, K. and R. Vermeer, 1975 Oil threat to birds on the Canadian west coast. The Canadian Field-Naturalist. 89:278-298.

Wardle, C.S., T.J. Carter, G.G. Urquhart, A.D.F. Johnstone, A.M. Ziolkowski, G. Hampson, and D. Mackie. 2001. Effects of seismic air guns on marine fish. Continental Shelf Research21(8):1005-1027 (Wardle et al., 2001)

Wursig, B., S. K. Lynn, T. A. Jefferson, and K. D. Mullin. 1998. Behaviour of cetaceans in the northen Gulf of Mexico relative to survey ships and aircraft. Aquatic Mammals 24(1):41-50.

Wysocki, L.E. and F. Ladich. 2005. Hearing in fishes under noise conditions. Journal of the Association for Research in Otolaryngology 6:28-36. (Wysocki and Ladich, 2005)

Young, C. N., Carlson, J., Hutchinson, M., Hutt, C., Kobayashi, D., McCandless, C.T., Wraith, J. 2016. Status Review Report: oceanic whitetip shark (Carcharhinius longimanus). Final report to the National Marine Fisheries Service, Office of Protected Resourses.:162.

Although not cited, the following were utilized in preparing this EIA:

- Hazard Surveys

Appendix R
Administrative Information
(30FR Part 550.228 and 550.262)

Exempted Information Description (Public Information Copies Only)

Excluded from the Public Information copies are the following:

- Proposed bottomhole location information
- Proposed total well depths (measured and true vertical depth)
- New and Unusual Technology
- Production Rates and Life of Reserves
- Geological and Geophysical Attachments

Bibliography

The following documents were utilized in preparing this Plan:

Document	Author	Dated
MC 736 - Shallow Hazards & Archaeological Assessment	Geoscience Earth & Marine	2019
KC642/686 – Shallow Hazards Assessment	Ocean Geo Solutions	2019
Keathley Canyon Blocks 642-647,686-691, 731-736, 779-780	Echo Offshore	2021
KC 686 – Shallow Hazards	Ocean Geo Solutions	2020
Environmental Impact Analysis	JConnor	2021
NTL 2010-N06	BOEM	June 18, 2010
NTL 2008- G04	MMS	May 1, 2008
Regional Oil Spill Plan	JCC//LLOG	2021
Supplemental Exploration Plan (S-08023)	LLOG	Approved 12/18/2020
Initial Exploration Plan (N-10088)	LLOG	Approved 12/6/2019
Supplemental Exploration Plan (S-7941)	LLOG	Approved 05/03/2019
Supplemental Exploration Plan (S-8025)	LLOG	Approved 11/13/2020