UNITED STATES GOVERNMENT MEMORANDUM

March 11, 2021

To: Public Information

From: Plan Coordinator, OLP, Plans Section

Subject: Public Information copy of plan

Control #	-	N-10123
Type	-	Initial Development Operations Coordinations Document
Lease(s)	-	OCS-G25199 Block - 763 Green Canyon Area OCS-G31751 Block - 806 Green Canyon Area OCS-G31752 Block - 807 Green Canyon Area OCS-G31757 Block - 850 Green Canyon Area OCS-G31758 Block - 851 Green Canyon Area
Operator	-	Chevron U.S.A. Inc.
Description	-	Anchor Floating Production Unit

Attached is a copy of the subject plan.

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

Laura Christensen
Plan Coordinator

Site Type/Name	**Botm Lse/Area/Blk**	**Surface Location**	**Surf Lse/Area/Blk**
FPSO/ANCHOR		167 FNL, 4970 FEL	G25199/GC/763
WELL/AP001	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP002	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP004	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP005	G31758/GC/851	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP007	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP008	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/AP012	G31752/GC/807	4136 FSL, 4277 FWL	G31752/GC/807
WELL/BP006E	G31757/GC/850	5250 FSL, 2451 FEL	G31751/GC/806
WELL/BP006G	G31751/GC/806	5250 FSL, 2451 FEL	G31751/GC/806
WELL/BP009	G31751/GC/806	5250 FSL, 2451 FEL	G31751/GC/806
WELL/BP010	G31751/GC/806	5250 FSL, 2451 FEL	G31751/GC/806

Chevron U.S.A. Inc.

Plan Control No. N-10123 - Record of Changes
Initial Development Operations Coordination Document, GC 807 Unit (Anchor Project)
Proprietary & Public Copies

Date	Section / Appendix	Remarks
10/13/2020	All	Plan received by BOEM ***(Proprietary and Public Copies)***
11/02/2020	Appendix A Section 16 Appendix G	Update Appendix A - Pay Gov Receipt Update Section 16 to provide for Texas CZM Enforceable Policies Update Appendix G to provide for Texas CZM Certification
11/30/2020	Appendix D	Update AQR
12/04/2020	Section 14.2	Update Section 14.2 Transportation System
01/14/2021	Appendix B	Update Appendix B to provide for a sonar contact table, as well as a .dwg file of the archaeological survey area(s).
01/26/2021	Appendix D	Provide AQR in Excel format
02/19/2021	Appendix D	Update AQR to include pipeline construction emissions
02/26/2021	All	Submit complete final amended copy of Initial DOCD

PUBLIC COPY
October, 2020

INITIAL DEVELOPMENT OPERATIONS

COORDINATION DOCUMENT

CHEVRON U.S.A. INC.

GREEN CANYON BLOCK 807 UNIT

GC 762 (OCS-G25198), West ½ GC 763 (OCS-G25199), GC 806 (OCS-G31751), GC 807 (OCS-G31752), Northeast ¼ GC 850 (OCS-G31757), North ½ GC 851 (OCS-G31758)

OFFSHORE LOUISIANA

"ANCHOR" PROJECT

SUBMITTED BY:
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Appendix B: Interim Geophysical Survey Interpretive Report

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Appendix H: Environmental Impact Analysis (EIA)

1 Plan Contents (30 CFR 550.241)

1.1 Plan Information Form:

The Anchor semi-submersible floating production unit (FPU) will be located in the northeastern quadrant of Green Canyon Block 763 (OCS G-25199) which is operated by Chevron as part of the Anchor Unit. In the event that all or part of the mooring pattern is on a block which is either open or held by another operator, a right of use and easement (RUE) will be applied for in accordance with the regulations found in 30 CFR 250.160 - 162.

The Anchor project (Green Canyon Block 807 Unit); Chevron U.S.A. Inc. is the designated operator) is planned to be initially developed with subsea wells drilled from two drill centers and connected back to the FPU with one flowline plus an additional flowline that may be used for testing, production well clean up, etc. (referred to as a multi-purpose flowline). Provisions are being made to add a third drill center in the future, if warranted.

A truss type topsides and semi-submersible hull has been selected for the production facility. The hull is being fabricated in Okpo, South Korea at the DSME fabrication yard. The topsides are being fabricated in Ingleside, Texas at the Kiewit fabrication yard. The hull will be dry transported from Okpo, South Korea to Ingleside, Texas for integration with the topsides. A permanent chain-polyester-chain mooring system with suction piles will be utilized similar to that used elsewhere in the Gulf of Mexico. A conventional GOM production facility will be provided on the facility. General Arrangement drawings of the platform are enclosed in **Appendix A**. The facility will be wet towed to GC 763 and connected to the mooring system. Following installation, the export pipeline risers and the subsea well pipeline risers will be installed using dynamically positioned vessels.

For the Stage 1 development, the production facility will have capacity to process 75,000 barrels of oil per day (BOPD), 10,000 barrels of water per day (BWPD) and a gas-oil ratio (GOR) of 370 standard cubic feet per barrel (scf/bbl). Additional development stages will be evaluated after Stage 1 is brought online.

No drilling or completions activities are proposed in this DOCD. Drilling and completions activities are contained in EP S-07777 and S-08022.

BOEM-0137 Forms are included in **Appendix A**. Additional information to support BOEM-0137 Forms is contained below.

Schedule of Proposed Activities:

Proposed Activity	Start Date	End Date	No. of Days
Install pipeline foundation suction piles	6/1/2021	7/1/2021	30
Install facility mooring piles and pre-lay moorings	4/1/2022	5/1/2022	30
Install manifolds	5/1/2022	5/16/2022	15
Install production pipelines	2/1/2022	4/1/2022	60

Proposed Activity	Start Date	End Date	No. of Days
Install export oil and gas pipelines	7/1/2022	9/14/2022	75
Facility installation	4/15/2023	6/30/2023	75
Install umbilicals, jumpers and flying leads	7/1/2023	9/15/2023	75
Offshore hook-up and commissioning	7/1/2023	12/1/2023	150
First Oil	3/15/2024	NA	NA
Commence production at well location AP001 (B)	3/31/2024	12/15/2053	10951
Commence production at well location AP002 (D)	3/15/2024	12/15/2053	10867
Commence production at well location BP003 (G)	12/2/2024	12/15/2053	10605
Commence production at well location AP004 (H)	8/3/2025	12/15/2053	10361
Commence production at well location AP005 (A)	4/12/2026	12/15/2053	10109
Commence production at well location BP006 (E)	12/15/2026	12/15/2053	9862
Commence production at well location AP007 (O)	8/18/2027	12/15/2053	9616
Commence production at well location AP008 (J)	4/18/2028	12/15/2053	9373
Commence production at well location BP009 (C)	12/18/2028	12/15/2053	9130
Commence production at well location BP010 (F)	8/18/2029	12/15/2053	8887
Commence production at well location AP011 (P)	4/18/2030	12/15/2053	8644

**Assumptions: Add 2 weeks to probabilistic P50 first oil date of 29 Feb 2024, and 2 weeks to Operations Planned date of each well (updated schedule assessment Aug 2020)

Lease Term Pipeline Information:

Description of Lease Term Pipelines			
From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
GC 807	GC 763	10.75 OD	34,554
GC 807	GC 763	10.75 OD	33,526
GC 807	GC 807	10.75 OD	120
GC 807	GC 807	10.75 OD	120
GC 806	GC 807	10.75 OD	6,893
GC 806	GC 807	10.75 OD	7,012

Description of Lease Term Pipelines			
From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
GC 807	GC 807	6.81 OD	94
GC 807	GC 807	6.81 OD	117
GC 807	GC 807	6.81 OD	102
GC 807	GC 807	6.81 OD	111
GC 807	GC 807	6.81 OD	117
GC 807	GC 807	6.81 OD	115
GC 807	GC 807	6.81 OD	100
GC 806	GC 806	6.81 OD	117
GC 806	GC 806	6.81 OD	116
GC 806	GC 806	6.81 OD	94
GC 806	GC 806	6.81 OD	120

Mooring Pile Locations:

Anchor Locations					
Anchor Name or No.	Area	Block	X Coordinate	Y Coordinate	Length of Anchor Chain on Seafloor
Anchor - 1	Green Canyon	720	X= 2233938	Y= 9888577	82 ft
Anchor - 2	Green Canyon	720	X= 2233516	Y= 9889039	82 ft
Anchor - 3	Green Canyon	719	X= 2233054	Y= 9889461	82 ft
Anchor - 4	Green Canyon	719	X= 2223885	Y= 9889461	82 ft
Anchor - 5	Green Canyon	719	X= 2223424	Y= 9889039	82 ft
Anchor - 6	Green Canyon	719	X= 2223001	Y= 9888577	82 ft
Anchor - 7	Green Canyon	763	X= 2223001	Y= 9879409	82 ft
Anchor - 8	Green Canyon	763	X= 2223424	Y= 9878947	82 ft
Anchor - 9	Green Canyon	763	X= 2223886	Y= 9878524	82 ft
Anchor -10	Green Canyon	763	X= 2233054	Y= 9878524	82 ft
Anchor -11	Green Canyon	764	X= 2233516	Y= 9878947	82 ft
Anchor -12	Green Canyon	764	X= 2233938	Y= 9879407	82 ft

1.2 Location:

Please see the attached maps in **Appendix A** which depict the Anchor facility location, surface location and water depth of the wells, as well as the mooring anchor plans.

1.3 Safety and Pollution Prevention Features:

Equipment, such as separators, tanks, and treaters, utilized for the handling of hydrocarbons, will be designed, installed, and operated to prevent pollution. Necessary maintenance or repair work needed to prevent pollution of offshore waters will be performed as soon as practicable. Curbs, gutters, drip pans, and drains will be installed in deck areas in a manner necessary to collect all contaminants not authorized for discharge. Oil drainage will be piped to a properly designed, operated, and maintained sump system which will automatically maintain the oil at a level sufficient to prevent discharge of oil into offshore waters. All gravity drains will be equipped with a water trap or other means to prevent gas in the sump system from escaping through the drains. Sump piles will not be used as processing devices to treat or skim liquids, but may be used to collect treated produced water, treated produced sand, or liquids from drip pans and deck drains and as a final trap for hydrocarbon liquid in the event of equipment upsets.

There will be no disposal of equipment, cables, chains, containers, or other materials into offshore waters.

1.4 Storage Tanks and Production Vessels:

The following storage tanks and/or production vessels will be located on the facility and will store oil, as defined in 30 CFR 254.6. Only those tanks with a capacity of 25 barrels or more are included.

Type of Storage Tank	Type of Facility	Tank Capacity (Barrels)	Number of Tanks	Total Capacity (Barrels)	Fluid Gravity (API)
Test Separator	Oil Production	84	1	84	25-32
HP Production Separator[1]	Oil Production	346	1	346	25-32
LP Production Separator[1]	Oil Production	1027	1	1027	25-32

Type of Storage Tank	Type of Facility	Tank Capacity (Barrels)	Number of Tanks	Total Capacity (Barrels)	Fluid Gravity (API)
Oil Treater Degasser[1]	Oil Production	310	1	310	25-32
Oil Treater[1]	Oil Production	746	1	746	25-32
Dry Oil Separator[1]	Oil Production	540	1	540	25-32
Main Gas Compressor 1st Stage Suction	Oil Production	25	2	50	77-80
Main Gas Compressor 2nd Stage Suction	Oil Production	33	2	66	86-90
HP Flare Scrubber [2]	Oil Production	563	1	563	25-32
LP Flare Scrubber [2]	Oil Production	104	1	104	25-32
Flotation Cells	Oil Production	16	2	32	25-32
Recovered Oil Separator[1]	Oil Production	70	1	70	25-32

Type of Storage Tank	Type of Facility	Tank Capacity (Barrels)	Number of Tanks	Total Capacity (Barrels)	Fluid Gravity (API)
Essential Generator Diesel Storage	Oil Production	88	1	88	25-40
Emergency Generator Diesel Storage	Oil Production	46	1	46	25-40
Firewater Pump Diesel Storage	Oil Production	33	2	66	25-40
Crane Pedestal Diesel Storage	Oil Production	119	1	119	25-40
Hull Diesel Storage	Oil Production	3384; 4554	2	7938	25-40
Helicopter Fuel Storage	Oil Production	167	1	167	37-51

[1] Hydrocarbon Capacity at High Level Shutdown for Tanks > 50 BBLs
[2] These vessels are normally empty and contain volume stated only in an emergency condition
[3] Based on 2 ft. of oil pad in the float cell

1.5 Pollution Prevention Measures:

Florida is not an affected State under this plan, therefore this information is not required based on the guidelines provided in NTL No. 2008-G04.

1.6 Additional Measures:

Chevron has a robust Health Safety and Environment (HSE) system with a focus on Injury and Incident Free operations. The facility and its operations have been, and will continue to be, the focus of numerous hazard assessments and mitigations to reduce the risk of accidents and incidents, including pollution.

1.7 Cost Recovery Fee:

Documentation of the cost recovery fee payment is included in **Appendix A.**

2 General information (30 CFR 550.243)

2.1 Applications and Permits:

Application/Permit	Issuing Agency	Status
Supplemental EP	BOEM	Submitted (09/03/2020)
CID	BOEM	To be submitted
SOP	BSEE	Approved (3/20/2020)
RUE for mooring piles	BOEM	Submitted (10/22/2020)
APD	BSEE	To be submitted
APM	BSEE	To be submitted
Production Safety System	BSEE	To be submitted
DWOP	BSEE	To be submitted
Pipeline Permits	BSEE	To be submitted
EOR Application	BSEE	To be submitted
Downhole Commingling	BSEE	To be submitted

2.2 Drilling Fluids:

No wells are proposed to be drilled as part of this plan. Please see EP S-07777 AND S-08022.

2.3 Production:

Proprietary Information.

2.4 Oil Characteristics:

Proprietary Information.

2.5 New or Unusual Technology:

The following new or unusual technology will be utilized for the project:

Anchor will be the first deepwater HPHT development for Chevron in the Gulf of Mexico. A number of completion, intervention and subsea production equipment items will be rated for pressures greater than 15,000 psi. This equipment is currently being qualified to the higher pressure requirement per BSEE HPHT Guidelines Provided in NTL: NTL 2019-G03 - Guidance for Information Submissions Regarding Site Specific and Non-Site Specific HPHT Equipment Design Verification Analysis and Design Validation Testing

Chevron's Conceptual plan, defining high pressure technology was submitted by Chevron on January 22, 2019 and BSEE review was dated February 21, 2019 (GE 1065A).

The Anchor Project does not include any "new" or "unusual" technology (NUT) in the context of the 2020 Biological Opinion (function and interface with the environment). Anchor will utilize subsea production, riser, and floating production unit systems that are conventionally used in deepwater Gulf of Mexico. As with all equipment, it is designed to the project-specific operating framework and has been reviewed and approved for use in Gulf of Mexico by BOEM and BSEE. These systems will function and interface with the environment in a way that is consistent with technology reviewed and analyzed in the 2020 Biological Opinion, and therefore is not considered "new" or "unusual" in this context.

2.6 Bonding Statement:

The bond requirements for the activities and facilities proposed in this DOCD are satisfied by an area-wide bond, furnished and maintained according to 30 CFR part 256, subpart I; NTL No. 2000-G16, "Guidelines for General Lease Surety Bonds;" and a current BSEE-approved deferment from providing additional security under 30 CFR 256.53(d) and National NTL No. 2008-N07, "Supplemental Bond Procedures. If, at any point, Chevron no longer qualifies for a supplemental bonding deferment, Chevron will either provide the required additional security or a third party guarantee within 60 days after such disqualification.

2.7 Oil Spill Financial Responsibility:

Chevron U.S.A. Inc., Company Number 00078, has demonstrated oil spill financial responsibility for the facilities proposed in this DOCD according to 30 CFR Part 254, and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility (OSFR) for Covered Facilities."

2.8 Deepwater Well Control Statement:

No wells are proposed to be drilled as part of this plan. Please see EP S-07777 AND S-08022.

2.9 Suspension of Production (SOP):

The Anchor field is currently under an existing Unit SOP which holds all leases in the Unit. The SOP was submitted on February 6, 2020 and has been approved until March 31, 2021.

2.10 Blowout Scenario:

A drilling blowout scenario was included in NTL 2010-N06 submittal. The production blowout scenario is as follows:

The Worst Case Discharge (WCD) scenario for the Anchor production facility is based on Green Canyon 807 #4 (Anchor 4) – a representative crestal well. The Anchor wells will commingle Wilcox1, Wilcox2 and Wilcox3 across the field. Wilcox4 will be added to the commingle flow in crestal wells.

The WCD scenario makes the following assumptions:

- Flow will be thru 4-1/2" production tubing, with a short (~7500') section of 5-1/2" in the upper part of the well
- No production depletion due to reservoir depletion – WCD is estimated for initial reservoir conditions
- No water intrusion or coning effects
- No sanding, bridging, or completion failure – WCD assumes wells flow without restriction in the well pipe
- Wellhead pressure will be the mudline pressure

For the Wilcox reservoirs, the Worst-Case Discharge Scenario initial flow rate is calculated to be 33,679 bopd by IPM (GAP-Prosper-MBAL) modeling. This rate is expected to decline over time due to reservoir transient effects and depletion. Multiple tanks, one tank representing one Wilcox reservoir, have been set up and used in this GAP-Prosper-MBAL modeling. The use of tank models implies perfect and instantaneous communication from well penetration to the entire reservoir. Assuming a 500-acre drainage, the oil rate would decrease to 32,732 bopd in 3 months and 31,815 bopd in 6 months. Chevron estimates that it would take 177 days to mobilize a rig, drill a relief well to intersect the blowout well, and conduct a kill operation. During this time, the estimated Total Potential Spill Volume is 5,926,923 bbls.

2.11 Chemical Products:

Not required in the BOEM GOMR.

3 Geological and Geophysical information (30 CFR 550.244)

3.1 Geological Description:

Proprietary Information.

3.2 Structure Contour Maps:

Proprietary Information.

3.3 Interpreted Two-Dimensional (2-D) and/or Three-Dimensional (3-D) Seismic Lines:

Proprietary Information.

3.4 Geological Structure Cross Sections:

No wells are planned to be drilled as part of this plan. Please see EP S-07777 AND S-08022.

3.5 Shallow Hazards Report:

No wells are planned to be drilled as part of this plan. Please see EP S-07777 AND S-08022.

The location of the anchor piles for the Anchor platform was based on conventional 3-D seismic information by GEMS previously submitted to BOEM in the EPs referenced above. In addition, Fugro Geoservices, Inc. conducted a high resolution survey utilizing the M/V Fugro Enterprise and interpreted the data and issued a report. The geohazard report is included in **Appendix B** to cover the twelve anchor locations for the platform.

The routing and shallow hazards assessment for the pipelines, flowlines, manifolds, and associated suction anchor piles will be submitted with the pipeline application.

3.6 Shallow Hazards Assessment:

No wells are planned to be drilled as part of this plan. A shallow hazards report covering all drilling locations was previously submitted with EP S-07777 AND S-08022.

The four (4) mooring pile locations for the Anchor facility each consist of three (3) closely space individual suction piles. These locations are approximately 7,135 ft from the facility and located in water depths of approximately 4,750 ft. A site clearance letter prepared by Fugro for the facility anchor locations is included in **Appendix B.** As concluded in their assessment, the anchor locations appear to be suitable for placement with little to no geologic constraints.

Although lease term pipelines are proposed to be laid as a part of this plan, the routing and shallow hazards assessment will be submitted with the pipeline permits.

3.7 High-Resolution Seismic Lines:

Proprietary Information.

3.8 Stratigraphic Column:

Proprietary Information.

3.9 Time vs. Depth Tables:

Proprietary Information.

3.10 Geochemical Information:

Not required in the BOEM GOMR.

3.11 Future G&G activities:

Not required in the BOEM GOMR.

4 Hydrogen Sulfide (H2S) Information (30 CFR 550.245)

4.1 Concentration:

It is not expected that H2S will be encountered or handled while conducting the activities proposed in this plan.

4.2 Classification:

Pursuant to 30 CFR 250.490(c), Chevron requests the Regional Supervisor make a determination of the area's classification as H2S absent.

4.3 H2S Contingency Plan:

Not applicable.

4.4 Modeling Report:

Not applicable.

5 Mineral Resource Conservation Information (30 CFR 550.246)

5.1 Technology and Reservoir Engineering Practices and Procedures:

Proprietary Information.

5.2 Technology and Recovery Practices and Procedures:

Proprietary Information.

5.3 Reservoir Development:

Proprietary Information.

6 Biological, Physical, and Socioeconomic Information (30 CFR 550.247)

6.1 High-Density Deepwater Benthic Communities Information:

A Site Clearance Letter covering the Anchor drill centers and wells were included in **Section D** of EP S-07777 and S-08022. A site clearance letter for the facility mooring locations is included in **Appendix B**. Information for the Lease Term and Right-of-Way pipelines proposed as a part of this plan will be included in the pipeline applications. All installation vessels used for the activities proposed in this plan will be dynamically positioned and no anchors will be utilized.

In summary, the site clearance letter states for each mooring cluster (four total): There is no evidence of gas/fluid venting or hardgrounds within 500 feet of the mooring cluster. We do not anticipate benthic or chemosynthetic communities within 500 feet of the mooring cluster.

6.2 Topographic Features Map:

The proposed bottom disturbing activity is greater than 305 meters (1,000 feet) from the "No Activity Zone" of an identified topographic feature; therefore the map described in Attachment 2, Section A, Item No. 1 of NTL No. 2004-G05 is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

6.3 Topographic Features Statement (Shunting):

Not required for this plan based on the guidelines provided in NTL No. 2008-G04.

6.4 Live Bottoms (Pinnacle Trend) Map:

The lease in this proposed plan does not have the Live Bottoms (Pinnacle Trend) stipulation.

6.5 Live bottoms (Low Relief) Map:

The lease in this proposed plan does not have the Live Bottoms (Low Relief) stipulation.

6.6 Potentially Sensitive Biological Features Map:

No bottom disturbing activities will be within 30 meters (100 feet) of potentially sensitive biological features. Therefore the map described in Attachment 8, Section A of NTL No. 2004-G05 is not required for this plan based on the guidelines provided in NTL No. 2008-G04.

6.7 Remotely Operated Vehicle (ROV) Monitoring Survey Plan:

The BOEM GOMR has determined that sufficient ROV information has been achieved for the grid area that contains the proposed activities in this plan. As per NTL 2008-G04 an ROV survey plan is not required.

6.8 Threatened or endangered species, critical habitat, and marine mammal information:

Under Section 7 of the Endangered Species Act (ESA) all federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat.

In accordance with 30 CFR 550, Subpart B, effective May 14, 2007, and further outlined in Notice to Lessees (NTL) 2008-G04, lessees/operators are required to address site-specific information on the presence of federally listed threatened or endangered species and critical habitat designated under the ESA and marine mammals protected under the Marine Mammal Protection Act (MMPA) in the area of proposes activities under this plan.

NOAA Fisheries currently lists the Sperm Whale, Leatherback Turtle, Green Turtle, Hawksbill Turtle, and the Kemp's Ridley Turtle as endangered and the Loggerhead Turtle and Gulf Sturgeon as threatened. Currently there are no designated critical habitats for the listed species in the Gulf of Mexico Outer Continental Shelf; however, it is possible that one or more of these species could be seen in the area of Chevron's operations.

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

Species	**Scientific Name**	**Status**	**Potential Presence**		**Critical Habitat Designated in the Gulf of Mexico**
			Lease Area	**Coastal**	
Marine Mammals					
Manatee, West Indian	*Trichechus manatus latirostris*	E	--	X	Florida (peninsular)
Whale, Blue	*Balaenoptera masculus*	E	X*	--	None
Whale, Bryde's	*Balaenoptera Edeni*	E	X*	--	None
Whale, Finback	*Balaenoptera physalus*	E	X*	--	None
Whale, Humpback	*Megaptera novaeangliae*	E	X*	--	None
Whale, North Atlantic Right	*Eubalaena glacialis*	E	X*	--	None
Whale, Sei	*Balaenopiera borealis*	E	X*	--	None
Whale, Sperm	*Physeter catodon (=macrocephalus)*	E	X	--	None
Terrestrial Mammals					
Mouse, Beach (Alabama, Choctawatchee,	*Peromyscus polionotus*	E	-	X	Alabama, Florida (panhandle) beaches

Species	Scientific Name	Status	Potential Presence		Critical Habitat Designated in the Gulf of Mexico
			Lease Area	Coastal	
Perdido Key, St. Andrew)					
Birds					
Plover, Piping	*Charadrius melodus*	T	-	X	Coastal Texas, Louisiana, Mississippi, Alabama and Florida (panhandle)
Crane, Whooping	*Grus Americana*	E	-	X	Coastal Texas
Mississippi sandhill crane	*Grus canadensis pulla*	E	-	X	Coastal Mississippi
Eskimo curlew	*Numenius borealis*	E	-	X	None
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	E	-	X	None
Red knot	*Calidris canutus rufa*	T	-	X	None
Wood stork	*Mycteria Americana*	T	-	X	None
Reptiles					
Sea Turtle, Green	*Chelonia mydas*	T	X	X	None
Sea Turtle, Hawksbill	*Eretmochelys imbricata*	E	X	X	None
Sea Turtle, Kemp's Ridley	*Lepidochelys kempli*	E	X	X	None
Sea Turtle, Leatherback	*Dermochelys coriacea*	E	X	X	None
Sea Turtle, Loggerhead	*Caretta caretta*	T	X	X	Texas, Louisiana, Mississippi, Alabama, Florida
Sharks and Fishes					
Giant Manta Ray	*Manta birostris*	E	X	--	None
Oceanic Whitetip Shark	*Carcharhinus longimanus*	E	X	_	None
Nassau Grouper	*Epinephelus striatus*	T	-	X	None
Smalltooth Sawfish	*Pristis pectinata*	E	-	X	None
Sturgeon, Gulf	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	T	X	X	None
Corals					
Coral, Elkhorn	*Acopora palmate*	T	X**	X	Florida Keys and Dry Tortugas
Coral, Staghorn	*Acopora cervicornis*	T	-	X	Florida
Boulder Star Coral	*Orbicella franksi*	T	X	X	None
Lobed Star Coral	*Orbicella annularis*	T	X	X	None
Mountainous Star Coral	*Orbicella faveolata*	T	X	X	None
Rough Cactus Coral	*Mycetophyllia ferox*	T	-	X	None

Abbreviations: E = Endangered; T = Threatened

** The Blue Fin, Brydes, 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.

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

6.9 Archaeological Report:

The proposed bottom-disturbing activity area has not been identified as a High Probability Shipwreck block or prehistoric area.

All stipulations set forth in the approval of EP S-07777 AND S-08022 will be followed before, during, and after drilling activities. An archaeological survey is included in **Appendix B** and covers all potentially impacted lease blocks.

In the event man-made debris is discovered that appears to indicate the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of man-made objects such as bottles or ceramics, piles of ballast rock) within or adjacent to the lease area during the course of operations, the Regional Supervisor, Leasing and Environment, will be contacted within 48 hours of its discovery. All operations within 305 meters (1000 feet) of the site will cease until instructed by the Regional Supervisor on the steps to take to assess the site's potential historic significance and the steps to take to protect it.

6.10 Air and Water Quality Information:

The State of Florida is not an impacted State, therefore not required for this plan based on the guidelines provided in NTL No. 2008-G04.

6.11 Socioeconomic Information:

The State of Florida is not an impacted State, therefore not required for this plan based on the guidelines provided in NTL No. 2008-G04.

7 Waste and Discharge Information (30 CFR 550.248)

7.1 Projected Generated Wastes:

Water quality spreadsheets are included in **Appendix C.** This sheet replaces the Projected Generated Wastes and the Projected Ocean Discharges tables.

7.2 Projected Ocean Discharge:

Water quality spreadsheets are included in **Appendix C**. This sheet replaces the Projected Generated Wastes and the Projected Ocean Discharges tables.

7.3 Modeling Report:

The U.S. Environmental Protection Agency does not require an individual NPDES permit for the activities proposed in this plan, therefore a modeling report is not required to be provided.

7.4 NPDES Permit:

The information in 30 C.F.R. 250.248(c) regarding NPDES permits is not required to accompany DOCD's submitted in the BOEM GOMR based on NTL No. 2008-G04.

7.5 Cooling Water Intakes:

The information in 30 C.F.R. 250.248(e) regarding cooling water intakes is not required to accompany DOCD's submitted in the BOEM GOMR based on NTL No. 2008-G04.

8 Air Emissions Information (30 CFR 550.249)

8.1 Emissions Worksheets and Screening Questions:

Screening Questions for DOCD's	Yes	No
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 = 3400D2/3 for CO, and CT = 33.3D for the other air pollutants (where D = distance to shore in miles)?		✓
Do your emission calculations include any emission reduction measures or modified emission factors?		✓
Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?	✓	
Do you expect to encounter H2S at concentrations greater than 20 parts per million (ppmv)?		✓
Do you propose to flare or vent natural gas in excess of the criteria set forth under 30 CFR 250.1105(a)(2) and (3)?		✓
Do you propose to burn produced hydrocarbon liquids?		✓
Are your proposed development and production activities located within 25 miles (40 kilometers) from shore?		✓
Are your proposed development and production activities located within 124 miles (200 kilometers) of the Breton Wilderness Area?		✓

The activities proposed in this plan will occur in three different surface block locations (GC 763, GC 806, and GC 807). Therefore, an AQR sheet was prepared for facility operations as well as construction activities and future recompletions, workovers, interventions, abandonment activities, and inspections/maintenance of subsea wells, equipment and pipelines in each surface block during each calendar year and is included in **Appendix D**. Please note, the surface blocks are not within 300 km of Breton National Wildlife Refuge. The Complex Total Emissions are the same as the Plan Emissions, and therefore only one set of emissions calculations is included for each surface block.

CONTACT INFORMATION

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MODELING REPORT

A Modeling Report is not required for activities proposed in this plan.

9 Oil Spills Information (30 CFR 550.250)

9.1 Oil Spill Response Planning:

REGIONAL OSRP INFORMATION

All the proposed activities in this plan will be covered by Chevron's Gulf of Mexico Regional Oil Spill Response Plan (OSRP), approved by BSEE on March 22, 2016; Chevron submitted Biennial Review update on March 1, 2019 and was deemed in compliance by BSEE on July 22, 2019. The plan with revisions was submitted to BSEE on October 4, 2019 which BSEE acknowledged on October 9, 2019. Companies covered under this OSRP are: Chevron Corporation (02335), Chevron U.S.A. Inc. (00078), Chevron Pipe Line Company (00400), Sabine Pipe Line Company Inc. (00835), Union Oil Company of California (00003), Unocal Pipeline Company (01113), and PRS Offshore, L.P. (01767).

SPILL RESPONSE SITES

In the table below, information is provided concerning the location of the primary spill response equipment and the location of the planned staging area(s) that would be used should an oil spill occur resulting from activities proposed in this plan.

Primary Response Equipment Locations	Preplanned Staging Location(s)
Ingleside, Galveston, and Port Arthur, TX; Lake Charles, Morgan City, Houma, Port Fourchon, Leeville, Venice, Fort Jackson, Harvey, Belle Chasse, and Baton Rouge, LA; Pascagoula, MS; Theodore, AL; Tampa, Miami, and Jacksonville, FL.	Ingleside, TX; Port Fourchon and Galliano, LA; Theodore, AL.

OIL SPILL REMOVAL ORGANIZATION (OSRO) INFORMATION

Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) cooperatives are the primary surface response equipment providers for Chevron in the Gulf of Mexico Region. CGA & MSRC each maintain a dedicated fleet of vessels and other equipment strategically positioned along the Gulf Coast. CGA & MSRC each maintain a network of trained Oil Spill Removal Organizations (OSROs) to deploy and operate their equipment. CGA & MSRC have the capability to plan the mobilization and rapid deployment of spill response resources on a 24-hour, 7 days a week basis, year-round.

Marine Well Containment Company (MWCC) is the primary subsea containment service provider for Chevron. MWCC equipment is available on a 24-hour, 7 days a week basis, year-round.

Chevron's primary staging areas, marine transportation facilities and helicopter bases, are located in Port Fourchon and Galliano, Louisiana. Chevron has the capability to contract for additional staging areas throughout Gulf of Mexico coastal ports.

As per Chevron's Regional Oil Spill Response Plan, our primary Incident Command Post is located in Covington, LA. Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron has the capability to contract additional command posts facilities as necessary throughout Gulf Coast region.

(iv) Worst-case scenario determination:

Category	Regional OSRP "Deepwater Production" Worst-Case Discharge Scenario	Initial DOCD
Type of Activity *(Types of activities include pipeline, platform, caisson, subsea completion or manifold, and mobile drilling rig)*	Production—Subsea completion	Production—Subsea completion
Spill Location (area/block)	Green Canyon Block 641 (PS006)	Green Canyon 763
Facility Designation *(e.g., Well No. 2, Platform JA, Pipeline Segment No. 6373)*	Tahiti Platform	Anchor Platform
Distance to Nearest Shoreline	118 miles	126 miles
Volume		
Storage Tanks (total)	4,174 barrels	12,362 barrels
Flowlines (on facility)	740 barrels	80 barrels
Lease term pipelines	4,044 barrels	4,772 barrels
Uncontrolled blowout (volume per day)	186,452 barrels	33,679 barrels
Total Volume	195,410 barrels	50,893 barrels
Type of Oil(s) - *(crude oil, condensate, diesel)*	Crude Oil	Crude Oil, Diesel
Gravity(s) API - *(Provide API gravity of all oils given under "Type of Oil(s)" above. Estimate for EP's)*	30	26, 36

Since Chevron has the capability to respond to the worst-case spill scenario included in its Regional OSRP, and since the worst-case scenario determined for Chevron's Plan does not replace the worst-case scenario in Chevron's Regional OSRP; I hereby certify that Chevron 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 Plan.[1]

9.2 Oil Spill Response Discussion:

Given below is a discussion of the response to an oil spill resulting from the activities proposed in this plan. All the applicable information described in 30 CFR 254.26(b), (c), (d), and (e) is included.

Oil spill response-related activities for facilities included in this document are governed by the Chevron Gulf of Mexico Regional Oil Spill Response Plan (OSRP), approved by BSEE on March 22, 2016; Chevron submitted Biennial Review update on March 1, 2019 and was deemed in compliance by BSEE on July 22, 2019. The plan with revisions was submitted to BSEE on October 4, 2019 which BSEE acknowledged on October 9, 2019. The Chevron Regional Gulf of Mexico OSRP encompasses all facilities operated by Chevron U.S.A. Inc. and, herein, the jurisdiction of the BOEM and BSEE.

Upon notification of a major oil release from a Chevron facility or operation in the Gulf of Mexico, Chevron response personnel will make the initial notifications to all involved government agencies, Oil Spill Response Organizations (OSROs), and associated support services.

Chevron has a contract in effect with MWCC, MSRC and CGA, as well as other OSROs, to ensure availability of personnel, services, and equipment on a 24-hour-per-day basis. The OSROs can provide personnel, equipment, and materials in sufficient quantities and recovery capacity to respond effectively to oil spills from the facilities and leases covered by this plan, including the Worst-Case Discharge scenarios. OSROs under contract with Chevron have oil spill response equipment located throughout the Gulf Coast area. Much of the equipment is in road-ready condition and is available to be transported on short notice to the nearest predetermined staging areas(s). The "road-ready condition" provides the shortest reasonable response times for transporting equipment to the staging areas.

These assets are listed in the Chevron Oil Spill Response Plan.

Trajectory Analysis (§ 254.26 (b))

Land areas that could be potentially impacted by an oil spill were determined using the BOEM Oil Spill Risk Analysis Model (OSRAM) trajectory results. The OSRAM estimates the probability that oil spills from designated locations would contact shoreline and offshore natural resources. These probabilities indicate, in terms of percentage, the chance that an oil spill occurring in a particular launch area will contact a certain county or parish within 3, 10, and 30 days. OCS Launch Area C045 was used as the point of origin for Green Canyon Block 763. Land segments identified by the model are listed below:

[1] This language is included as required per NTL No. 2008-G04.

Land Segment	Chance of contacting within 3 days	Chance of contacting within 10 days	Chance of contacting within 30 days
C07 Calhoun TX	0	0	1
C08 Matagorda TX	0	0	1
C09 Brazoria TX	0	0	1
C10 Galveston TX	0	0	2
C12 Jefferson TX	0	0	1
C13 Cameron LA	0	0	4
C14 Vermilion LA	0	0	2
C15 Iberia LA	0	0	1
C16 St. Mary LA	0	0	0
C17 Terrebonne LA	0	0	2
C18 Lafourche LA	0	0	1
C19 Jefferson LA	0	0	0
C20 Plaquemines LA	0	0	2

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

RESOURCE IDENTIFICATION

Resources of special economic or environmental importance found in land segments identified in the above paragraph can be found in the NOAA ESI Coastal Sensitivity Atlas (Maps). These maps can be accessed through NOAA and will be used during any spill occurring from the locations listed in this document.

Additionally, information on environmental sensitivities is contained in the U.S. Coast Guard's Area Contingency Plans listed below. These plans will be accessed and followed during an oil spill that threatens the Gulf of Mexico shoreline.

- South Texas Coastal Zone Area Contingency Plan
- Central Texas Coastal Area Contingency Plan
- Southeast Texas and Southwest Louisiana Area Contingency Plan
- Southcentral Louisiana Area Contingency Plan
- Southeast Louisiana Area Contingency Plan
- Alabama, Mississippi and NW Florida Area Contingency Plan

- Southeast Florida Area Contingency Plan
- Florida Keys Coastal Zone Area Contingency Plan

RESPONSE DISCUSSION

Chevron maintains numerous resources, equipment and expertise to respond to an oil spill in the Gulf of Mexico. Chevron has oil spill response service contracts with both local and international companies and cooperatives and has a large corps of dedicated Chevron emergency responders that can work in the Gulf of Mexico. Chevron has contracts with the following oil spill response service providers.

Oil Spill Removal Organizations (OSRO). These companies have on-hand shoreline protection and cleanup equipment to respond to a spill in the Gulf of Mexico.

- American Pollution Control (AmPol)
- Clean Gulf Associates Services
- ES&H Environmental Services
- OMI Environmental Services
- T&T Marine Salvage Inc.
- U.S. Environmental Services
- Oil Spill Response (OSRL)

Oil Spill Cooperatives (OSC) – OSCs have equipment pre-staged in the Gulf of Mexico, including Lake Charles, Intracoastal City, Houma, Fort Jackson and Venice, Louisiana; Galveston, Texas; and Pascagoula, Mississippi. OSCs provide resources to respond to offshore incidents including areas identified in this plan.

- Clean Gulf Associates (CGA) – This major cooperative is strictly dedicated to Gulf of Mexico oil and gas developers and producers.
- Marine Spill Response Corporation (MSRC) – This national cooperative has extensive dedicated offshore resources located in the Gulf of Mexico

Well Control Emergency Response Companies

- Marine Well Containment Company (MWCC)
- Wild Well Control Inc. (WWC)
- Boots & Coots

Oil Spill Management and Response Consultants

- The Response Group (TRG)

Chemical Dispersant Companies (capable of delivering air and vessel dispersants)

- Airborne Support, Inc via Clean Gulf Associates (CGA)
- Marine Well Containment Company (MWCC)
- Oil Spill Response (OSRL)

Chevron will use a layered approach to respond to a worst-case discharge from the area by conducting simultaneous response operations at the well site, in the offshore environment and in nearshore and shoreline areas. Plans will be implemented, resources deployed and response operations established within these environmental areas to accomplish the following objectives:

- Provide for the safety of responders and the general public
- Intervene at the well site to stop the flow of oil
- Minimize the spread of oil at the surface
- Minimize encroachment to the coastline environment
- Protect coastal and natural resources

Upon notification of a worst-case discharge oil spill at the locations listed in this plan, Chevron will mobilize resources listed in the attached enclosures. This information comes directly from the Chevron regional Gulf of Mexico Oil Spill Response Plan and applies to a worst-case discharge volume of 465,709 barrels per day that could occur at a Chevron facility located in Mississippi Canyon Block 122. These same assets would be mobilized to all sites contained in this plan.

- Aerial Surveillance Equipment
- Offshore Recovery Equipment
- Nearshore Recovery Equipment
- In-Situ Burn Equipment
- Aerial Dispersant Equipment
- Shoreline Protection Equipment
- Offshore Storage Equipment

Chevron will also take the following general actions to mobilize and coordinate response operations:

- Set up and staff its command center in Covington, LA
- Set up a source control group in Houston, TX or Covington, LA
- Mobilize well site resources to cap, contain and disperse oil at the well head
- Mobilize assets to drill relief wells

- Mobilize assets to contain and collect surface oil at the well site and in the offshore environment

- Mobilize assets to disperse and burn surface oil at the well site and in the offshore environment

- Establish a deepwater staging area from a LA port or location

- Deploy assets to track the movement of oil on the surface

Follow up actions will include the following:

- Locate, monitor, track and project the movement of the oil spill

- Mobilize nearshore skimming and booming vessels, barges and systems to shorebase locations for rapid deployment in the nearshore environment

- Mobilize oil spill removal organization (OSRO) resources and assets to staging areas for rapid deployment of shoreline protection resources

- Mobilize wildlife protection and rehabilitation resources to staging areas for rapid deployment of resources

- Determine Incident Command Post (ICP) locations based on intervention operations and results and surface oil spill trajectories

- Determine ICP Operations Branch locations based on intervention operations and results and surface oil spill trajectories

- Determine additional staging areas based on the spill trajectory

Spill Response Resources and Deployment Time

Offshore Response: Offshore response operations may include some or all of the following simultaneous activities: containment booming, mechanical recovery, aerial dispersants and in-situ burning. Response objectives within the offshore layer are to:

- Provide for the safety of responders and the general public

- Minimize wide scale spread of oil

- Minimize encroachment to coastline environment

The strategy for offshore response will be to:

- Station mechanical recovery vessels and barges that are outfitted with ocean boom systems closest to the source to contain and collect as much oil as possible.

- Station mechanical recovery vessels and barges that deploy skimming systems on vessels of opportunity close to the source to rapidly contain and collect oil that strays from the main oil slick.

- Station in-situ burn assets close to the source to burn as much oil as possible.

- Aerially disperse oil that cannot be mechanically recovered.

Simultaneous implementation of these strategies is designed to effectively contain and recover an oil spill significantly offshore in order to minimize the potential impacts to public health, wildlife and the environment. Separate and distinct resources will be assigned for each operation. Based on the anticipated worst case discharge scenario, Chevron 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 24 hours.

The following sections provide more information on each operation needed to contain a worst case discharge to the maximum extent possible.

(1) Mechanical Recovery and Slick Containment. Offshore skimming and booming vessels, barges and systems will be deployed to the source of the spill and stationed in the thickest parts of the spill to enhance the encounter rate, collect and contain the oil. VHF radio communications will be established between skimming vessels and barges and spotter aircraft and surveillance systems to direct vessels to coordinates of thickest oil to maximize the effectiveness and efficiency of on-water recovery resources. Vessels operating in oil will relay spill characteristics (thickness, trajectory) to the Forward Operating Branch and Incident Command Post in order to station additional vessels and barges that are equipped with night-sensing systems in areas of recoverable oil prior to nightfall. This will again maximize the oil recovery encounter rate. MSRC Responder Class vessels, the CGA Hoss barge, Production Support Vessels, Dual Purpose Vessels and vessels of opportunity outfitted with KOSEQ skimming systems will deploy J-boom or U-boom configurations that will maximize containment of oil to collect using skimmers. These vessels will work in tandem to cover as large of a geographic area as possible at the location of the surface spill where oil is thickest.

Vessels deployed with MSRC and CGA Fast Response Units and CGA Fast Response Vessels will be stationed to collect oil that moves past the front-line mechanical assets. These units will deploy a J-boom configuration because it only requires one support vessel. Oil that escapes the above assets and moves shoreward will be collected by vessels of opportunity that deploy sorbent boom, collection nets or other types of equipment that absorbs surface oil. These assets will be deployed as task forces that can rapidly respond to light oil.

(2) In-Situ Burning. Offshore in-situ burn assets will be deployed as primary response resources for all locations within federal waters. Vessels of opportunity that can operate near the spill site will be used to deploy fire boom and trained in-situ burn responders. Fire boom will be configured in a “U” shape or similar to the NOFI Ocean Buster design.

(3) Aerial Dispersants. Aerial dispersants will be deployed as primary response resources for all locations that fall within the FOSC pre-approval process. Dispersant aircraft that arrive on-scene before mechanical recovery or in-situ burn resources will apply dispersants to areas until relieved by a different asset.

Vessel radar systems and infrared cameras will be used to detect and mechanically collect oil at night. This will allow surveillance operations to continue both day and night and through inclement weather. These systems also will be used to track the movement of oil which will assist with shoreline response planning.

Louisiana and Texas resources potentially at risk may include but are not limited to the following: marine sensitivities, beaches, waterfowl, shoreline resources, marshes, marinas/piers, populated areas, and environmental sensitivities

The BOEM oil spill trajectory model indicates that Louisiana parishes and Mississippi, Alabama, and Florida counties could be impacted by an oil spill from areas listed in this plan. These areas are dominated by fine sand beaches, coarse sand beaches, swamps and saltwater marshes. The four subsections below summarize potential concerns with each environment. This information is taken from various Coast Guard Area Contingency Plans.

Fine Sand Beach Environment

- Sensitivity: Fine sand beaches have a low sensitivity to oil spill impacts and cleanup methods.
- Oil Behavior: Oil typically stains and covers the beach sands with low permeability.
- Cleanup: The penetration is low to moderate depending on the water table and the position of the oiling on the shoreline. A potential environmental issue during beach cleanup is the protection of the dune habitat from the cleanup operations. Fine sand beaches typically have poor access, but good transportation ability. Fine sand beaches are relatively easier to clean in contrast to marshes. Large volumes of stained sand and debris can be generated by beach cleanup.

Coarse Sand Beach Environment

- Sensitivity: The environmental sensitivity of coarse sand beaches is low due to the limited animal and vegetation population.
- Oil Behavior: Spilled oil typically stains and coats coarse grain beach sands with moderate to high permeability.
- Cleanup: Sediment penetration on coarse grain beaches is moderate/high depending on the water table and the location of oil deposition. A potential environmental issue is the protection of the dune habitat from cleanup operations. The transit ability of this shoreline type is less than fine sand beaches because the bearing strength is lower, and this type of sand builds steep beach faces. Access is typically poor.

Swamp Environment

- Sensitivity: The environmental sensitivity is high for swamps because of the presence of wetland habitat.
- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.
- Cleanup: The sediment penetration potential is low due to the high water table and the water content of the sediments. A potential environmental issue is that the cleanup may be more damaging than the oil itself. The access to swamps is poor due to the soft sediment and the presence of dense tree growth.

Salt Marsh Environment

- Sensitivity: The environmental sensitivity is high for salt marsh because of the presence of wetland habitat.

- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.

- Cleanup: The sediment penetration potential is low/moderate due to the high water table and water content of the sediment. A potential environmental issue is that the cleanup may be more damaging than the oil itself. Access is typically poor in Louisiana.

The protection of waterfowl and wildlife during the course of an oil release is an essential element in every spill response operation. Federal and state natural resource trustees will be notified in the event that a wildlife habitat may be affected by a spill event. Information concerning methods to protect waterfowl and wildlife are contained in the Chevron OSRP. For fish and wildlife resources, the emphasis is on habitats where:

- Large numbers of animals are concentrated in small areas, such as bays where waterfowl concentrate during migration or for overwintering

- Early life stages are present in somewhat restricted areas or in shallow water, such as anadromous fish streams and turtle nesting beaches

- Habitats are extremely important to specific life stages or migration patterns such as foraging or overwintering

- Specific areas are vital sources for seed or propagation

- The species are on Federal or state threatened or endangered lists

- A significant percentage of the population is likely to be exposed to oil

Human-use resources of concern are listed in the Chevron OSRP. Areas of economic importance, like waterfront hotels, should also be considered when establishing resource protection priorities. Human-use resources are most sensitive when:

- Archaeological and cultural sites are located in the intertidal zones

- Oiling can result in potential significant commercial losses through fouling, tainting, or avoidance because of public perception of a problem

- The resource is unique, such as a historical site

- Oiling can result in potential human health concerns, such as tainting of water intakes and/or subsistence fisheries

Response Capability

Chevron is a member of both Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) cooperatives. CGA & MSRC are the primary surface response equipment providers for Chevron in the Gulf of Mexico Region. CGA & MSRC each maintain a dedicated fleet of vessels and other equipment strategically positioned along the Gulf Coast. CGA & MSRC each maintain a network of trained Oil Spill Removal Organizations (OSROs) deploy and operate their equipment. CGA & MSRC have the capability to plan the mobilization and rapid deployment of spill response resources on a 24-hour, 7 days a week basis, year-round.

Chevron maintains service contracts with several private OSROs including American Pollution Control Corporation (AmPol), U.S. Environmental Services (USES), OMI Environmental Services, ES&H Environmental Services and Airborne Support Inc.

Chevron's Aviation Group operates and maintains a private fleet of helicopters servicing our operation in the Gulf of Mexico. Chevron pilots and helicopters provide aerial surveillance. The Chevron Chief Pilot fills the Air Operations Branch Director role during an emergency.

Marine Well Containment Company (MWCC) is the designated subsea containment service provider for Chevron. MWCC equipment is available on a 24-hour, 7 days a week basis, year-round. MWCC equipment locations are Ingleside, TX and Theodore, AL.

Chevron's primary staging areas are located in Fourchon and Galliano, Louisiana. Chevron has the capability to contract for additional staging areas throughout Gulf of Mexico coastal ports.

Chevron's primary command post for an oil spill is located in Covington, LA; however, Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron has the capability to contract for additional command posts facilities as necessary throughout Gulf Coast region.

Estimated Initial Equipment Response Times

Capability	Equipment	ETA	Source
Aerial Surveillance	Manned Aircraft (Helicopters and Fixed-wing)	~1 to 2 hours	Chevron Aviation (Galliano, LA & Picayune, MS)
On-water Containment, Skimming, & Storage	Response Vessels (w/ boom, skimmer and storage and surveillance technology)	~10 to 14 hours	CGA & MSRC: Venice, Fort Jackson, Harvey, Belle Chasse, Fourchon
Aerial Dispersant	Spotter and Spray aircraft	~4 to 6 hours	MSRC (Stennis) and/or CGA Airborne Support (Houma)
In-Situ Burn	Vessels, Boom and support equipment	~12 to 24 hours	CGA (Harvey) & MSRC (Fort Jackson)
Sub-sea Surveillance	Remote Operated Vehicles (ROVs)	~18 to 24 hours	Chouest Offshore (Fourchon)
Additional resources will continue to be deployed over subsequent days, weeks, and/or months as necessary			

([1]This includes supervisors and response technicians trained to operate all equipment listed.)

Response Technology

Chevron, through our cooperative response organizations (Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) with other oil and gas operators), has developed high-tech surveillance capabilities with the primary objective of positioning on-water assets in the thickest parts of the spill by detection and classification of potential oil targets as recoverable, tracking moving oil, and expanding the operating window of skimming operations to low-light conditions.

This technology includes high-definition (HD) cameras, optical and thermal infrared imaging systems, and X-band radar oil detection. These systems are integrated into an electronic chart system that provides an exact geographic position and can project the image onto the electronic map for oil spill recovery.

This capability can be leveraged across the response zones and enables the on-water recovery task force strategy where multiple skimming vessels may be directed by a command and control vessel.

The above information is taken from the Chevron GOM Regional Oil Spill Response Plan (OSRP), submitted to BSEE in accordance with 30 CFR 254.

Suitability of Resources

All response equipment, materials, support vessels and strategies listed in this document and in the Chevron regional Gulf of Mexico Oil Spill Response Plan have proven suitable for the many environmental conditions existing at the locations listed in this plan. Chevron additionally conducts annual oil spill response training, drills and exercises and validates the content of the Oil Spill Response Plan. The Chevron regional Gulf of Mexico Oil Spill Response Plan is maintained by the Chevron Gulf of Mexico Emergency Management Advisor.

9.3 Modeling Report:

The information in 30 C.F.R. 250.250(c) regarding oil spill modeling report is not required to accompany DOCD's submitted in the BOEM GOMR based on NTL No. 2008-G04.

10 Environmental Monitoring Information (30 CFR 550.552)

10.1 Monitoring Systems:

Chevron will monitor currents as per NTL 2005-G05. The Anchor FPU has been equipped with an Environment and Facilities Monitoring System that includes current, wind speed and direction, air temperature, barometric pressure and other facility monitoring parameters. In addition, Chevron subscribes to third party monitoring system which provides real-time current and weather conditions such as tropical depressions, storms and/or hurricanes entering the Gulf.

10.2 Incidental Takes:

Chevron does not expect any "takes" of protected species as a result of the operations proposed under this Plan. Chevron will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any of the species listed in the Endangered Species Act (ESA) as a result of the operations conducted herein:

- NTL No. 2016-BOEM-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-BOEM-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" (<u>Note: there are no seismic surveys proposed in this Plan</u>)
- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program", Appendices A, B, C, and J

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Chevron does not expect any "takes" of protected species as a result of the operations proposed under this Plan. Chevron will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any of the species listed in the Endangered Species Act (ESA) as a result of the operations conducted herein:

- NTL No. 2016-BOEM-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-BOEM-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" (<u>Note: there are no seismic surveys proposed in this Plan</u>)
- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program", Appendices A, B, C, and J

2020 BIOLOGICAL OPINION

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or destroy or adversely modify their designated critical habitat. Per Section 7(b)(3) of the ESA, NMFS issued the "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico" on March 13, 2020, referred to herein as the "2020 Biological Opinion", to document NMFS' opinion on how oil and gas activities in Gulf of Mexico affect ESA-listed species and critical habitat. As "action" agencies under the 2020 Biological Opinion, BOEM and BSEE are responsible for implementation of the Reasonable and Prudent Alternative and Measures as stipulated in the 2020 Biological Opinion to ensure that oil and gas activities in the Gulf of Mexico are protective of ESA species and their critical habitat.

Chevron has evaluated the potential impacts of the Anchor project on ESA protected species based on Request for Information (RFI) and Conditions of Approval (COA) implemented since the publication of the 2020 Biological Opinion. The detailed analysis is included in **Appendix E**. The equipment and activities proposed as part of the Anchor FPU are consistent with those analyzed under the 2020 Biological Opinion, and do not include any of the items listed in Section 3.4.B which require Step Down Review (moonpools, new and unusual technology, slacklines, etc.).

10.4 Flower Garden Banks National Marine Sanctuary:

No activities proposed in this plan will be conducted within the Protective Zones of the Flower Garden Banks and Stetson Bank.

11 Lease Stipulations Information (30 CFR 550.253)

11.1 Marine Protected Species (Stipulation No. 8):

In accordance with the Federal Endangered Species Act and the Marine Mammal Protection Act, Chevron will:

(a) Collect and remove flotsam resulting from activities related to exploration, development, and production of this lease;

(b) Post signs in prominent places on all vessels and platforms used as a result of activities related to exploration, development, and production of this lease detailing the reasons (legal and ecological) why release of debris must be eliminated;

(c) Observe for marine mammals and sea turtles while on vessels, reduce vessel speed to 10 knots or less when assemblages of cetaceans are observed, and maintain a distance of 90 meters or greater from whales, and a distance of 45 meters or greater from small cetaceans and sea turtles;

(d) Employ mitigation measures prescribed by BOEM/BSEE or the National Marine Fisheries Service (NMFS) for all seismic surveys, including the use of an “exclusion zone” based upon the appropriate water depth, ramp-up and shutdown procedures, visual monitoring, and reporting;

(e) Identify important habitats, including designated critical habitat, used by listed species (e.g., sea turtle nesting beaches, piping plover critical habitat), in oil spill contingency planning and require the strategic placement of spill cleanup equipment to be used only by personnel trained in less-intrusive cleanup techniques on beaches and bay shores; and

(f) Immediately report all sightings and locations of injured or dead protected species (e.g., marine mammals and sea turtles) to the appropriate stranding network. If oil and gas industry activity is responsible for the injured or dead animal (e.g., because of a vessel strike), the responsible parties should remain available to assist the stranding network. If the injury or death was caused by a collision with the lessee’s vessel, the lessee must notify BOEM within 24 hours of the strike.

BOEM and BSEE issue Notices to Lessees (NTLs), which more fully describe measures implemented in support of the above-mentioned implementing statutes and regulations, as well as measures identified by the U.S. Fish and Wildlife Service and NMFS arising from, among others, conservation recommendations, rulemakings pursuant to the MMPA, or consultation. The lessee and its operators, personnel, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in NTL No. 2016-BOEM-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species

Reporting;" NTL No. 2016-BOEM-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program;" and NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination." At the lessee's option, the lessee, its operators, personnel, and contractors may comply with the most current measures to protect species in place at the time an activity is undertaken under this lease, including but not limited to new or updated versions of the NTLs identified in this paragraph. The lessee and its operators, personnel, and subcontractors will be required to comply with the mitigation measures, identified in the above referenced NTLs, and additional measures in the conditions of approvals for their plans or permits.

12 Environmental Mitigation Measures Information (30 CFR 550.554)

12.1 Incidental Takes

Chevron does not expect any "takes" of protected species as a result of the operations proposed under this Plan. Chevron will adhere to the requirements as set forth in the following documents, as applicable, to avoid or minimize impacts to any of the species listed in the Endangered Species Act (ESA) as a result of the operations conducted herein:

- NTL No. 2016-BOEM-G01, "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-BOEM-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program" (Note: there are no seismic surveys proposed in this Plan)
- NTL No. 2015-BSEE-G03, "Marine Trash and Debris Awareness and Elimination"
- "Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, Appendices to the Programmatic Biological Opinion on the Gulf of Mexico Oil and Gas Program", Appendices A, B, C, and J

See **SECTION 6** BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION for a list of Threatened and Endangered Species, Critical Habitat and Marine Mammal Information.

13 Decommissioning Information (30 CFR 550.255)

Not required in the BOEM GOMR.

14 Related facilities and operations information (30 CFR 550.256)

14.1 Related OCS Facilities and Operations:

The Anchor subsea development will be supported the Anchor FPU to be installed in GC 763. The Anchor subsea wells will be tied back to the FPU via two 10.75-inch OD pipelines (includes SCR, pipeline and jumpers) from the two subsea manifolds and Integrated Manifold Pump Station (IMPS) located in GC 806 and 807 to the Anchor FPU. The approximate length of each pipeline is 41,500 ft. Each of the pipelines are designed for 60,000 BOPD. The wells will be tied back to the manifolds and IMPS via eleven (11) 6.81 inch OD jumpers approximately 100 ft in length that are designed for 20,000 BOPD each. The pipeline system will shut-in according to the guidance contained in NTL 2009-G36. The boarding shut down valve will close in 45 seconds.

14.2 Transportation System:

No new pipelines going to shore or new onshore facilities are planned for this project.

The oil and gas will depart the Anchor FPU via export pipelines operated by Chevron and third parties. The oil will be transported via an 18-inch OD pipeline that is approximately 8.87 miles long between the Anchor FPU in GC 763 and will cross GC 764, GC 808, GC 809, to the tie in point in GC 853. The oil export SCR, pipeline and single jumper will be operated by Chevron. The second jumper downstream of the manifold to the existing Amberjack Oil Pipeline tie-in (GC 853, ILS-2) will be operated by Chevron Pipeline Company and will tie-in to the existing Chevron Pipeline 20-24 inch OD pipeline (S-16329), to Platform A, GC 19. At GC 19, Platform A, it will tie into existing infrastructure for ultimate delivery to shore.

The gas will be transported via a proposed 16-inch OD pipeline that is approximately 8.46 miles long between the Anchor FPU in GC 763 and will cross GC 764, GC 808, to the tie in point in GC 809. The gas export SCR, and pipeline and will be operated by Chevron. The second jumper downstream of the manifold to the existing Keathley Canyon Connector Pipeline tie-in (GC 809 ILS-4) will be operated by Discovery Producers Services, LLC and will tie-in to an existing 20-inch pipeline (S-18711), to an existing junction platform in ST 283. From the junction platform, the gas will travel via an existing 12-inch pipeline (S-18710) to a subsea tie-in located in ST 280 to an existing pipeline operated by Discovery Gas Transmission for ultimate delivery to shore.

14.3 Produced Liquid Hydrocarbons and Transportation Vessels:

No produced liquid hydrocarbons are anticipated to be transported by means other than a pipeline for the activities proposed as a part of this plan. port Vessels and Aircraft Information (30 CFR 550.257)

15 Support Vessels and Aircraft Information (30 CFR 550.257)

15.1 General:

The drilling unit, vessels, crew boats and supply boats associated with the operations proposed in this plan will not transit the Bryde's whale area.

In the table below, information is provided regarding the vessels (e.g., tug boats, anchor-handling vessels, construction barges, lay barges, supply boats, crew boats) and aircraft being used to support proposed activities. Specific vessels have not yet been determined; therefore the maximum capacities, numbers, and trip frequencies for the types of vessels have been used.

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
Escort/Offshore Tow Tug	Vessel TBC Wet Tow	4	878,000 US Gallons	43 days tow + Field	60	Estimate provided by Heerema for typical vessel

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
Offshore Tow Tug #1	Vessel TBC Wet Tow	4	878,000 US Gallons	42 days tow + Field	60	Estimate provided by Heerema for typical vessel
Offshore Tow Tug #2	Vessel TBC Wet Tow	4	878,000 US Gallons	42 days tow + Field	60	Estimate provided by Heerema for typical vessel
Offshore Tow Tug #3	Vessel TBC Wet Tow	4	878,000 US Gallons	42 days tow + Field	60	Estimate provided by Heerema for typical vessel
Foundation Piles Barge Tug	Vessel TBC Foundation Pile Transportation	1	878,000 US Gallons	20 days in field	24	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Mooring Piles Barge Tug	Vessel TBC Mooring Pile Transportation	1	878,000 US Gallons	20 days in field	24	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Manifold and IMPS Equipment Barge Tug	Vessel TBC Equipment Transportation	1	878,000 US Gallons	10 days tow + Field	12	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Mooring Line Components Tug (Pre-Lay)	Vessel TBC Mooring components transportation	1	878,000 US Gallons	30 days tow + field	36	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Mooring Line Components Barge Tug (post-installation clean up)	Vessel TBC Mooring components transportation	1	878,000 US Gallons	15 days tow + field	18	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Supply Boat	Vessel TBC Supply Runs	1	88,070 Gal (333 m3)	25 (based on 1 day, every week + transit)	25	Estimate provided by Heerema

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
T&I Main Installation Vessel	Heerema Balder Pile Installation, Mooring Installation, SCR Installation	1	1,452,000 US Gallons	47 days in field	65	Actual Value provided by Heerema
T&I Support Vessel	Vessel TBC T&I Support	1	878,000 US Gallons	46 days in field	65	Based on Olympic Zeus large tug (731,000 USG) or similar +20%
Light Construction vessel	Vessel TBC Mooring drag test and LBL transponder install) Mooring Drag Test and LBL Transponder Installation	1	856,800 US Gallons	25	30	Based on assumption of using vessel similar to Deep Pioneer which has 714,000 US Gallon capacity + 20%. Could be as low as 300,000 US Gallons depending on vessel utilized*
Diving Support Vessel	Vessel TBC, Spool and BSC Installation	1	360,000 US Gallons	17.5	21	Based on large DSV Acergy Osprey (290,000USG) large ROVSV Olympic Pegasus (315,000USG)
Pipelay vessel	Seven Vega, Flowline and riser installation Trip 1	1	766,099 US Gallons	8	9.6	Actual value provided by Subsea 7
Pipelay vessel	Seven Vega, Flowline and riser installation Trip 2	1	766,099 US Gallons	14	16.8	Actual value provided by Subsea 7
Installation Support Vessel	Vessel TBC; Pre-lay survey, mattress installation, markers, etc.	1	242,246 US Gallons	4	4.8	Estimate provided by Subsea 7 for Harvey Intervention LCV

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
Installation Support Vessel	Vessel TBC; Post-lay survey and site clean-up	1	242,246 US Gallons	2	2.4	Estimate provided by Subsea 7 for Harvey Intervention LCV
Supply Vessel	Vessel TBC; Pipelay support	1	350,000 US Gallons	3	3.6	Estimate based on other supply vessels planned for project
Pipelay Vessel	PLV Audacia or PLV Solitaire Install Export Oil and Gas Pipelines, PLETs Installation and Manifolds	1	Audacia Total bunker capacity is 4750 m3 Solitaire HFO 6,438 m^3 MDO 1,179 m^3 (excl. settling & service tanks) MGO 62 m^3 LO 50 m^3	55	66	Based on Allseas provided information and schedule
Light Construction Vessel	CSV Fortitude or CSV Oceanic Pre-lay survey, Installation of mattresses, Installation of LBL arrays, Pipeline installation support. Post-lay survey	1	Fortitude: Storage capacity in bunker tanks: 2600 m^3 Oceanic: Storage capacity in bunker tanks: 1946 m^3	55	66	Based on Allseas provided information and schedule
Pipe Transport Tugs	Vessel names TBC Transport pipe barges to PLV.	3	60,000 US Gallons	20	24	Based on Allseas provided information and schedule
Crew Boat	Vessel TBC	1	350,000 US gallons	8	10	Based on Allseas provided schedule

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
						Volume for crew boat ranges from 200,000 to 400,000 US gallons
Supply Boat	Vessel TBC	1	350,000 US gallons	24	29	Based on Allseas provided schedule Volume for crew boat ranges from 200,000 to 400,000 US gallons
Flotel	Vessel TBD Offshore accommodations	1	800,000 US gallons (*)	150	180	(*) Based on Flotel RFEs
HUC marine spread: FSV	Vessel TBD Support HUC campaign	1	350,000 gallons	22 (based on 1 day, every week + transit	27	Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
HUC marine spread: 300' vessel	Vessel TBD Support HUC campaign	1	350,000 gallons	22 (based on 1 day, every week + transit	27	Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
LCV1 Vessel	Vessel TBD, Subsea Array installation, Jumper metrology, SUT mudmat installation	1	630,000 US Gallons	11.25	13.5	Based on ITB schedule Volume for LCV ranges from 240,000 to 630,000 US Gallons
Umbilical/pipe lay vessel	Seven Pacific, Umbilical installation	1	396,000 US Gallons	12	14.4	Based on Subsea 7 vessel and schedule
LCV2 Vessel	Vessel TBD, Flying Lead installation, Jumper	1	630,000 US Gallons	24	28.8	Based on ITB schedule Volume for LCV ranges from

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
	installation, Pump Installation					240,000 to 630,000 US Gallons
OSV1 Trip #1	Vessel TBD, FPU Pull-in Kit Transportation	1	350,000 gallons	1	1.2	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV1 Trip #2	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV1 Trip #3	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV1 Trip #4	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV1 Trip #5	Vessel TBD, Pump Transportation	1	350,000 gallons	1	1.2	Based on ITB schedule Volume for supply vessel ranges from 200,000 to

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
						400,000 US Gallons
OSV2 Trip #1	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV2 Trip #2	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV3 Trip #1	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
OSV3 Trip #2	Vessel TBD, Jumper Transportation	3	350,000 gallons	2	2.4	Based on ITB schedule Volume for supply vessel ranges from 200,000 to 400,000 US Gallons
ROV Support Vessel	Vessel TBC, Flowline and Export Pipeline pre-commissioning	1	630,000 US Gallons	90	120	Based on project team estimate Volume expected to be similar to LCV 240,000-630,000 gallon range

Type of Vessel	Vessel Name & Description of Service	Maximum Number in Field	Maximum Fuel Storage Capacity	Estimated Time in Field (P50)	Estimated time + 20% contingency	Assumptions if not actual values
Supply Vessel	Vessel TBC, Flowline pre-commissioning	1	350,000 gallons	30	36	Based on project team estimate
Helicopter (Construction Vessels)	Approx 16 passenger capacity helicopter e.g. Sikorsky S92 or similar	1	760 US Gallons	203 flights	244 flights	For vessels remaining at sea able to take helicopter crew changes (all except tug and supply vessels) assume 16 passengers per helicopter every 4 weeks at sea. Based on 4 week on/off rota and between 100-250 POB depending on vessel. Vessel durations / 14 days
Helicopter (FPU)	Approx 16 passenger capacity helicopter e.g. Sikorsky S92 or similar	1	760 US Gallons	244 flights	293 flights	Based on FPU capacity/16 passengers every 4 weeks for the duration from platform safe to completion of HUC, plus expected Flotel POB /16 passengers for the duration noted above

15.2 Diesel Oil Supply Vessels:

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
280 foot	860,000 gals	quarterly	From shore base to block

280 foot	275,000 gals	4-6 weeks	From shore base to block

15.3 Drilling Fluids Transportation:

Information on drilling fluid transportation is not required in this plan based on the guidelines provided in NTL No. 2008-G04.

15.4 Solid and Liquid Waste Transportation:

Water quality spreadsheets are included following the Projected Generated Wastes and Projected Ocean Discharges sections. Those sheets replace the Projected Generated Wastes, Projected Ocean Discharges, Solid and liquid waste transportation, and Waste Disposal tables.

15.5 Vicinity Map:

The drilling unit, vessels, crew boats and supply boats associated with the operations proposed in this plan will not transit the Bryde's whale area.

A map showing the location of the proposed activities relative to the shoreline, the distance of the proposed activities from the shoreline, and the primary route(s) of the support vessels and aircraft you will use when traveling between the onshore support facilities and the drilling unit is included in **Appendix F**.

16 Onshore Support Facilities Information (30 CFR 550.258)

16.1 General:

The table below provides a listing of the onshore facilities that will be used to provide supply and service support for the proposed activities.

Name	Location	Existing/New/Modified
C-Port Shorebase - Port Fourchon	Fourchon, Louisiana	Existing

16.2 Support Base Construction or Expansion:

Chevron will use its existing onshore base facility located in Fourchon, Louisiana. The base has adequate facilities for marine and air transportation to accommodate the activities proposed in this plan. The proposed operations do not require expansion or modifications to the base.

16.3 Support Base Construction or Expansion Timetable:

Chevron has no plans to acquire land to construct or expand our onshore support base.

16.4 Waste Disposal:

Water quality spreadsheets are included following the Projected Generated Wastes and Projected Ocean Discharges sections. Those sheets replace the Projected Generated Wastes, Projected Ocean Discharges, Solid and liquid waste transportation, and Waste Disposal tables.

16.5 Air Emissions:

Not required in the BOEM GOMR.

16.6 Unusual Solid and Liquid Wastes:

Not required in the BOEM GOMR.

17 Sulphur Operations Information (30 CFR 550.259)

17.1 Bleedwater:

No sulphur operations are proposed as a part of this plan.

17.2 Subsidence:

No sulphur operations are proposed as a part of this plan.

18 Coastal Zone Management Act (CZMA) Information (30 CFR 550.260)

18.1 Consistency Certification (States of Louisiana and Texas):

Under direction of the Coastal Zone Management Act (CZMA), the states of Louisiana, 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 affect the Louisiana, and Texas coastal zones.

Proposed activities are 126 miles from the Louisiana shore and, 128 miles from the Texas shore. Measures will be taken to avoid or mitigate the probable impacts. Chevron will operate in compliance with existing federal and state laws, regulations, and resultant enforceable program policies in Louisiana's, and Texas' Coastal Zone Management Programs.

The OCS related oil and gas exploratory and development activities having potential impact on the Louisiana, and Texas Coastal Zones are based on the location of the proposed facilities, access to those sites, best practical techniques for drilling locations, drilling equipment guidelines for the prevention of adverse environmental effects, effective environmental protection, emergency plans and contingency plans.

Certificate of Coastal Zone Management Consistency for the states of Louisiana and Texas are included in **Appendix G.**

18.2 Other Information (States of Louisiana and Texas):

LOUISIANA

The following information is being provided to assist the LA CZMA review:

Included as **Appendix G** are two letters from BSEE acknowledging the two most recent submittals (Jul 2019 And Oct 2019) of the Chevron OSRP approved on March 22, 2016.

What is the location of spill response equipment and staging areas?

In the table below, information is provided concerning the location of the primary spill response equipment and the location of the planned staging area(s) that would be used should an oil spill occur resulting from activities proposed in this plan.

Primary Response Equipment Locations	Preplanned Staging Location(s)
Ingleside, Galveston, and Port Arthur, TX; Lake Charles, Morgan City, Houma, Port Fourchon, Leeville, Venice, Fort Jackson, Harvey, Belle Chasse, and Baton Rouge, LA; Pascagoula, MS; Theodore, AL; Tampa, Miami, and Jacksonville, FL.	Ingleside, TX; Port Fourchon and Galliano, LA; Theodore, AL.

Chevron's primary staging areas, marine transportation facilities and helicopter bases, are located in Port Fourchon and Galliano, Louisiana. Chevron has the capability to contract for additional staging areas throughout Gulf of Mexico coastal ports.

As per Chevron's Regional Oil Spill Response Plan, our primary Incident Command Post is located in Covington, LA. Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron has the capability to contract additional command posts facilities as necessary throughout Gulf Coast region.

What is the estimated time of spill response, from detection to equipment deployment on site?

The Anchor development is located approximately 140 miles from the Louisiana coast. Chevron will use a layered approach to respond to a worst-case discharge from the area by conducting simultaneous response operations at the **well site**, in the **offshore environment** and in **nearshore and shoreline areas**. Plans will be implemented, resources deployed and response operations established within these environmental areas to accomplish the following objectives:

- Provide for the safety of responders and the general public
- Intervene at the well site to stop the flow of oil
- Minimize the spread of oil at the surface
- Minimize encroachment to the coastline environment
- Protect coastal and natural resources

Upon notification of a worst-case discharge oil spill at the locations listed in this plan, Chevron will mobilize resources listed in the attached enclosures. This information comes directly from the Chevron regional Gulf of Mexico Oil Spill Response Plan and applies to a worst-case discharge volume of 465,709 barrels per day that could occur at a Chevron facility located in Mississippi Canyon Block 122. These same assets would be mobilized to all sites contained within this plan.

- Aerial Surveillance Equipment
- Offshore Recovery Equipment
- Nearshore Recovery Equipment
- In-Situ Burn Equipment
- Aerial Dispersant Equipment
- Shoreline Protection Equipment
- Offshore Storage Equipment

Chevron will also take the following general actions to mobilize and coordinate response operations:

- Set up and staff its command center in Covington, LA
- Set up a source control group in Houston, TX or Covington, LA
- Mobilize well site resources to cap, contain and disperse oil at the well head
- Mobilize assets to drill relief wells
- Mobilize assets to contain and collect surface oil at the well site and in the offshore environment
- Mobilize assets to disperse and burn surface oil at the well site and in the offshore environment
- Establish a deepwater staging area from a LA port or location
- Deploy assets to track the movement of oil on the surface

Follow up actions will include the following:

- Locate, monitor, track and project the movement of the oil spill
- Mobilize nearshore skimming and booming vessels, barges and systems to shorebase locations for rapid deployment in the nearshore environment
- Mobilize oil spill removal organization (OSRO) resources and assets to staging areas for rapid deployment of shoreline protection resources
- Mobilize wildlife protection and rehabilitation resources to staging areas for rapid deployment of resources
- Determine Incident Command Post (ICP) locations based on intervention operations and results and surface oil spill trajectories
- Determine ICP Operations Branch locations based on intervention operations and results and surface oil spill trajectories

- Determine additional staging areas based on the spill trajectory

Please provide an estimate of the time to contain spill, to the maximum extent practicable

Offshore Response: Offshore response operations may include some or all of the following simultaneous activities: containment booming, mechanical recovery, aerial dispersants and in-situ burning. Response objectives within the offshore layer are to:

- Provide for the safety of responders and the general public
- Minimize wide scale spread of oil
- Minimize encroachment to coastline environment

The strategy for offshore response will be to:

- Station mechanical recovery vessels and barges that are outfitted with ocean boom systems closest to the source to contain and collect as much oil as possible.
- Station mechanical recovery vessels and barges that deploy skimming systems on vessels of opportunity close to the source to rapidly contain and collect oil that strays from the main oil slick.
- Station in-situ burn assets close to the source to burn as much oil as possible.
- Aerially disperse oil that cannot be mechanically recovered.

Simultaneous implementation of these strategies is designed to effectively contain and recover an oil spill significantly offshore in order to minimize the potential impacts to public health, wildlife and the environment. Separate and distinct resources will be assigned for each operation. Based on the anticipated worst case discharge scenario, Chevron 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 24 hours.

The following sections provide more information on each operation needed to contain a worst case discharge to the maximum extent possible.

(1) Mechanical Recovery and Slick Containment. Offshore skimming and booming vessels, barges and systems will be deployed to the source of the spill and stationed in the thickest parts of the spill to enhance the encounter rate, collect and contain the oil. VHF radio communications will be established between skimming vessels and barges and spotter aircraft and surveillance systems to direct vessels to coordinates of thickest oil to maximize the effectiveness and efficiency of on-water recovery resources. Vessels operating in oil will relay spill characteristics (thickness, trajectory) to the Forward Operating Branch and Incident Command Post in order to station additional vessels and barges that are equipped with night-sensing systems in areas of recoverable oil prior to nightfall. This will again maximize the oil recovery encounter rate. MSRC Responder Class vessels, the CGA Hoss barge, Production Support Vessels, Dual Purpose Vessels and vessels of opportunity outfitted with KOSEQ skimming systems will deploy J-boom or U-boom configurations that will maximize containment of oil to collect using skimmers. These vessels will work in tandem to cover as large of a geographic area as possible at the location of the surface spill where oil is thickest.

Vessels deployed with MSRC and CGA Fast Response Units and CGA Fast Response Vessels will be stationed to collect oil that moves past the front-line mechanical assets. These units will deploy a J-boom configuration because it only requires one support vessel. Oil that escapes the above assets and moves shoreward will be collected by vessels of opportunity that deploy sorbent boom, collection nets or other types of equipment that absorbs surface oil. These assets will be deployed as task forces that can rapidly respond to light oil.

(2) In-Situ Burning. Offshore in-situ burn assets will be deployed as primary response resources for all locations within federal waters. Vessels of opportunity that can operate near the spill site will be used to deploy fire boom and trained in-situ burn responders. Fire boom will be configured in a “U” shape or similar to the NOFI Ocean Buster design.

(3) Aerial Dispersants. Aerial dispersants will be deployed as primary response resources for all locations that fall within the FOSC pre-approval process. Dispersant aircraft that arrive on-scene before mechanical recovery or in-situ burn resources will apply dispersants to areas until relieved by a different asset.

Vessel radar systems and infrared cameras will be used to detect and mechanically collect oil at night. This will allow surveillance operations to continue both day and night and through inclement weather. These systems also will be used to track the movement of oil which will assist with shoreline response planning.

<u>Will any new or unusual technology be employed in regards to spill prevention, control, cleanup, etc. (Yes/No)?</u>

Yes. Chevron, through our cooperative response organizations (Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) with other oil and gas operators), has developed high-tech surveillance capabilities with the primary objective of positioning on-water assets in the thickest parts of the spill by detection and classification of potential oil targets as recoverable, tracking moving oil, and expanding the operating window of skimming operations to low-light conditions.

This technology includes high-definition (HD) cameras, optical and thermal infrared imaging systems, and X-band radar oil detection. These systems are integrated into an electronic chart system that provides an exact geographic position and can project the image onto the electronic map for oil spill recovery.

This capability can be leveraged across the response zones and enables the on-water recovery task force strategy where multiple skimming vessels may be directed by a command and control vessel.

The above information is taken from the Chevron GOM Regional Oil Spill Response Plan (OSRP), submitted to BSEE in accordance with 30 CFR 254.

<u>Please discuss potential shoreline impacts:</u>

Louisiana and Texas resources potentially at risk may include but are not limited to the following:

marine sensitivities, beaches, waterfowl, shoreline resources, marshes, marinas/piers, populated areas, and environmental sensitivities

The BOEM oil spill trajectory model indicates that Louisiana parishes and Mississippi, Alabama, and Florida counties could be impacted by an oil spill from areas listed in this plan. These areas are dominated by fine sand beaches, coarse sand beaches, swamps and saltwater marshes. The four subsections below summarize potential concerns with each environment. This information is taken from various Coast Guard Area Contingency Plans.

Fine Sand Beach Environment

- Sensitivity: Fine sand beaches have a low sensitivity to oil spill impacts and cleanup methods.
- Oil Behavior: Oil typically stains and covers the beach sands with low permeability.
- Cleanup: The penetration is low to moderate depending on the water table and the position of the oiling on the shoreline. A potential environmental issue during beach cleanup is the protection of the dune habitat from the cleanup operations. Fine sand beaches typically have poor access, but good transportation ability. Fine sand beaches are relatively easier to clean in contrast to marshes. Large volumes of stained sand and debris can be generated by beach cleanup.

Coarse Sand Beach Environment

- Sensitivity: The environmental sensitivity of coarse sand beaches is low due to the limited animal and vegetation population.
- Oil Behavior: Spilled oil typically stains and coats coarse grain beach sands with moderate to high permeability.
- Cleanup: Sediment penetration on coarse grain beaches is moderate/high depending on the water table and the location of oil deposition. A potential environmental issue is the protection of the dune habitat from cleanup operations. The transit ability of this shoreline type is less than fine sand beaches because the bearing strength is lower, and this type of sand builds steep beach faces. Access is typically poor.

Swamp Environment

- Sensitivity: The environmental sensitivity is high for swamps because of the presence of wetland habitat.
- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.
- Cleanup: The sediment penetration potential is low due to the high water table and the water content of the sediments. A potential environmental issue is that the cleanup may be more damaging than the oil itself. The access to swamps is poor due to the soft sediment and the presence of dense tree growth.

Salt Marsh Environment

- Sensitivity: The environmental sensitivity is high for salt marsh because of the presence of wetland habitat.
- Oil Behavior: Oil usually coats and covers the sediment and vegetation with low sediment penetration.

- Cleanup: The sediment penetration potential is low/moderate due to the high water table and water content of the sediment. A potential environmental issue is that the cleanup may be more damaging than the oil itself. Access is typically poor in Louisiana.

The protection of waterfowl and wildlife during the course of an oil release is an essential element in every spill response operation. Federal and state natural resource trustees will be notified in the event that a wildlife habitat may be affected by a spill event. Information concerning methods to protect waterfowl and wildlife are contained in the Chevron OSRP. For fish and wildlife resources, the emphasis is on habitats where:

- Large numbers of animals are concentrated in small areas, such as bays where waterfowl concentrate during migration or for overwintering
- Early life stages are present in somewhat restricted areas or in shallow water, such as anadromous fish streams and turtle nesting beaches
- Habitats are extremely important to specific life stages or migration patterns such as foraging or overwintering
- Specific areas are vital sources for seed or propagation
- The species are on Federal or state threatened or endangered lists
- A significant percentage of the population is likely to be exposed to oil

Human-use resources of concern are listed in the Chevron OSRP. Areas of economic importance, like waterfront hotels, should also be considered when establishing resource protection priorities. Human-use resources are most sensitive when:

- Archaeological and cultural sites are located in the intertidal zones
- Oiling can result in potential significant commercial losses through fouling, tainting, or avoidance because of public perception of a problem
- The resource is unique, such as a historical site
- Oiling can result in potential human health concerns, such as tainting of water intakes and/or

  subsistence fisheries

<u>What is the name of Chevron’s hydrocarbon spill removal organization(s)?</u>

Chevron is a member of both Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) cooperatives. CGA & MSRC are the primary surface response equipment providers for Chevron in the Gulf of Mexico Region. CGA & MSRC each maintain a dedicated fleet of vessels and other equipment strategically positioned along the Gulf Coast. CGA & MSRC each maintain a network of trained Oil Spill Removal Organizations (OSROs) deploy and operate their equipment. CGA & MSRC have the capability to plan the mobilization and rapid deployment of spill response resources on a 24-hour, 7 days a week basis, year-round.

Chevron maintains service contracts with several private OSROs including American Pollution Control Corporation (AmPol), U.S. Environmental Services (USES), OMI Environmental Services, ES&H Environmental Services and Airborne Support Inc.

Chevron's Aviation Group operates and maintains a private fleet of helicopters servicing our operation in the Gulf of Mexico. Chevron pilots and helicopters provide aerial surveillance. The Chevron Chief Pilot fills the Air Operations Branch Director role during an emergency.

Marine Well Containment Company (MWCC) is the designated subsea containment service provider for Chevron. MWCC equipment is available on a 24-hour, 7 days a week basis, year-round. MWCC equipment locations are Ingleside, TX and Theodore, AL.

Chevron's primary staging areas are located in Fourchon and Galliano, Louisiana. Chevron has the capability to contract for additional staging areas throughout Gulf of Mexico coastal ports.

Chevron's primary command post for an oil spill is located in Covington, LA; however, Chevron has the ability to set up and effectively manage spills at Chevron facilities located in Houma and Lafayette, LA and Houston, TX. Chevron has the capability to contract for additional command posts facilities as necessary throughout Gulf Coast region.

<u>Discuss the disposal methods of waste and discharge. Provide specific municipal, governmental or other facilities used for onshore disposal of wastes and discharges.</u>

The table below provides information on the onshore facilities used to store and dispose of any solid and liquid wastes generated by the proposed activities.

Name/Location of Facility	Type of Waste	Amount	Disposal Method
Waste Management Inc., Lake Charles, LA	Chemical product wastes i.e. contaminated glycol, paint waste and various production chemical	100 bbls (during installation up to 200 metric tons)	Incinerated depending on the product
>30 MR sent to Newpark, Fourchon, LA < 30 MR sent to Newpark in Big Hill, TX	NORM contaminated waste	1 ton	Slurred and Injected into a disposal well

Name/Location of Facility	Type of Waste	Amount	Disposal Method
Newpark, Fourchon, LA	Oil contaminated produced sand	100 bbls	Liquids are injected into a disposal well and the solids are landfilled
Aaron Oil, Berwick, LA	Waste Oil, i.e. refined oil, cooking oil and oily rags	400 bbls	Recycled
IESSI, Houma, LA	Trash and Debris	1500 cubic ft	Local Landfill

<u>Is the proposed facility/PL covered under Chevron's approved oil spill response plan? Or will the proposed facility/PL be added at next scheduled update? What is the date of plan approval?</u>

All the proposed activities in this plan will be covered by Chevron's Gulf of Mexico Regional Oil Spill Response Plan (OSRP), approved by BSEE on March 22, 2016; Chevron submitted Biennial Review update on March 1, 2019 and was deemed in compliance by BSEE on July 22, 2019. The plan with revisions was submitted to BSEE on October 4, 2019 which BSEE acknowledged on October 9, 2019. Companies covered under this OSRP are: Chevron Corporation (02335), Chevron U.S.A. Inc. (00078), Chevron Pipe Line Company (00400), Sabine Pipe Line Company Inc. (00835), Union Oil Company of California (00003), Unocal Pipeline Company (01113), and PRS Offshore, L.P. (01767).

TEXAS

The following information is being provided to assist the TX CZMA review:

Included as **Appendix G** are two letters from BSEE acknowledging the two most recent submittals (Jul 2019 And Oct 2019) of the Chevron OSRP approved on March 22, 2016.

The policies and corresponding sections within this Development Operations Coordination Document identified by the state of Texas Coastal Management Plan (TCMP) as being related to OCS Plans are provided in the table below.

Enforceable Program Policies of the Texas Coastal Management Plan (TCMP)

Policy	Plan Section	Evaluation
Category 2: Construction, Operation and Maintenance of Oil and Gas Exploration and Production Facilities	1 2	Proposed activities shall avoid to the maximum extent practicable significant impact to Texas submerged lands, critical areas, wetlands, beaches, or other coastal resources.
Category 3: Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities	7 15 16	All offshore discharges associated with the proposed activities, as summarized in Section 7, will be conducted in accordance with regulations implemented by the United States Environmental Protection Agency (USEPA), the U. S. Coast Guard (USCG), the Bureau of Ocean Energy Management (BOEM), and the Bureau of Safety and Environmental Enforcement (BSEE). All wastes generated during proposed activities that do not meet discharge regulations will be properly transported to Berwick, Fourchon, Houma and Lake Charles, Louisiana and Big Hill, Texas, and disposed of as summarized in Section 7.
Category 4: Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities	16	No construction of solid waste facilities and no expansion of existing facilities are proposed in the Texas coastal zone.
Category 5: Prevention, Response, and Remediation of Oil Spills	2 9	Proposed activities will comply with all applicable laws and regulations concerning oil spill prevention, response, and remediation summarized in Section 9. The proposed activities will be covered under the Chevron approved Regional Oil Spill Response Plan (OSRP).
Category 6: Discharge of Municipal and Industrial Waste Water to Coastal Waters	7	No discharges to Texas coastal waters are proposed. The proposed activities will be conducted in accordance with discharge regulations implemented by the USEPA, the USCG, BOEM, and BSEE.
Category 7: Non Point Source Pollution	7	The proposed activities do not include nonpoint sources of water pollution.
Category 8: Development in Critical Areas	6 11 12 16 19	No activities are proposed in critical areas. Proposed activities shall avoid to the maximum extent practicable significant impact to critical areas.

Policy	Plan Section	Evaluation
Category 9: Construction of Waterfront Facilities and Other Structures on Submerge lands	2 8 16 19	No construction of waterfront facilities or other structures on Texas submerged lands is proposed.
Category 10: Dredging and Dredged Material Disposal and Placement	16	No dredging or dredged material disposal or placement is proposed.
Category 11: Construction in the Beach / Dune System	16	No construction in the beach/dune system is proposed.
Category 12: Development in Coastal Hazard Area	16	No development in coastal hazard areas is proposed.
Category 13: Development within Coastal Barrier Resource	16	No development within the Texas coastal barrier resource system is proposed.
Category 14: Development in State Parks, Wildlife Management Areas or Preserves	16	No development in Texas state parks, wildlife management areas, or preserves is proposed.
Category 15: Alteration of Coastal Historic Areas	6 19	The proposed activities do not include any development that would alter or disturb coastal historic areas.
Category 16: Transportation Projects	16	No transportation construction or maintenance projects are proposed.
Category 17: Emission of Air Pollutants	8 19	Air emissions associated with project activities are summarized in Section 8. The proposed activities will be conducted in conformance with applicable air quality laws, standards, and regulations and shall avoid to the maximum extent practicable significant impact to onshore air quality.
Category 18: Appropriations of Water	16	No appropriations, impoundments, or diversions of water resources are proposed.
Category 19: Levee and Control Projects	16	No levee or flood control projects are proposed.
Category 20: Marine Fishery Management	19	Proposed activities shall avoid to the maximum extent practicable significant impact to marine fisheries.
Category 22: Policies for Major Actions	19	The proposed activities are not a “major action”.

19 Environmental Impact Analysis (30 CFR 550.261)

Pursuant to NTL No. 2008-G04, included in **Appendix H** is an Environmental Impact Analysis (EIA) which addresses the activities required for the Anchor FPU.

20 Administrative Information (30 CFR 550.262)

20.1 Exempted Information Description (Public Information Copies only):

Proprietary information excluded from the public information copy is as follows:

- BHL, TVD, and MD information on form MMS-137 (OCS Plan Information Form)
- All items and enclosures under Geological and Geophysical Information

20.2 Bibliography:

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

- Chevron's Regional Oil Spill Response Plan.
- Chevron Initial EP N-09743, GC Block 807, OCS-G 31752, approved December 3, 2013.
- Chevron Revised EP, R-06172, GC Block 807, OCS-G 31752, approved July 31, 2014.
- Chevron Supplemental EP, S-07740, GC Blocks 806 and 807, OCS-G 31751 and 31752, approved April 29, 2015.
- Chevron Supplemental EP, S-07777, GC Blocks 762 and 806, OCS-G 25198 and 31751, approved December 23, 2015.
- Chevron Supplemental EP, S-07803, GC Block 807, OCS-G 31752, approved June 30, 2016.
- Chevron Supplemental EP, S-08022, GC Block 807, OCS-G 31752, submitted September 3, 2020.
- Geoscience Earth & Marine Services, Inc.®, Volume I: Shallow Hazards Assessment, Anchor Prospect, Blocks 762-763 & 806-807, Green Canyon Area, Gulf of Mexico, September 11, 2015 (GEMS Project No. 0515-2530b).
- Geoscience Earth & Marine Services, Inc.®, Volume II: Anchor AUV Survey Area, Archaeological Assessment, Anchor Prospect, Blocks 762-763 & 806-807, Green Canyon Area, Gulf of Mexico, September 11, 2015 (GEMS Project No. 0515-2530c).
- Fugro Interim Geophysical Survey Interpretive Report: Blocks 719, 762-764, 806-807, & 851, Green Canyon Area, Offshore Gulf of Mexico, April 18, 2018 (Fugro Project No. 02.17031201B-Geophys_Anchor.

Appendix A: OCS Plan Information Forms, General Arrangement Drawings, Well Location Plats, and Pay.Gov Receipt

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

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

OCS PLAN INFORMATION FORM

General Information

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

Company Name: Chevron U.S.A. Inc.	BOEM Operator Number: 00078
Address:	Contact Person: Laura E. Hogge / Kelley Pisciola
1500 Louisiana Street	Phone Number: (832) 298-1185 / (281) 698-8519
Houston, Texas 77002	E-Mail Address: laura.hogge@chevron.com / kelley.pisciola@jccteam.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$46,618.00	Receipt No.	

Project and Worst Case Discharge (WCD) Information

Leases: OCS-G 25199	Areas: Green Canyon	Blocks: 763	Project Name: Anchor

Objectives	X	Oil		Gas		Sulphur		Salt	Onshore Support Base: Port Fourchon and Galliano, LA

Platform / Well Name: Anchor FPU	Total Volume of WCD: 50,893 bbls	API Gravity: 26°, 36°

Distance to Closest Land (Miles): 126 miles	Volume from uncontrolled blowout: 33,679 BOPD

Have you previously provided information to verify the calculations and assumptions for your WCD?	XX	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-07777			
Do you propose to use new or unusual technology to conduct your activities?	XX	Yes		No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	XX	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?	XX	Yes		No

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

Proposed Activity	Start Date	End Date	No. of Days
Install pipeline foundation suction piles	06/01/2021	07/01/2021	30
Install facility mooring piles and pre-lay moorings	04/01/2022	05/01/2022	30
Install manifolds	05/01/2022	05/16/2022	15
Install production pipelines	02/01/2022	04/01/2022	60
Install export oil and gas pipelines	07/01/2022	09/14/2022	75
Facility installation	04/15/2023	06/30/2023	75
Install umbilicals, jumpers and flying leads	07/01/2023	09/15/2023	75
Offshore hook-up and commissioning	07/01/2023	12/01/2023	150
First Oil	03/15/2024	N/A	N/A
Commence production at well location AP001 (B)	03/31/2024	12/15/2053	10951
Commence production at well location AP002 (D)	03/15/2024	12/15/2053	10867
Commence production at well location BP003 (G)	12/02/2024	12/15/2053	10605
Commence production at well location AP004 (H)	08/03/2025	12/15/2053	10361
Commence production at well location AP005 (A)	04/12/2026	12/15/2053	10109
Commence production at well location BP006 (E)	12/15/2026	12/15/2053	9862
Commence production at well location AP007 (O)	08/18/2027	12/15/2053	9616
Commence production at well location AP008 (J)	04/18/2028	12/15/2053	9373
Commence production at well location BP009 (C)	12/18/2028	12/15/2053	9130
Commence production at well location BP010 (F)	08/18/2029	12/15/2053	8887
Commence production at well location AP011 (P)	04/18/2030	12/15/2053	8644

**Assumptions: Add 2 weeks to probabilistic P50 first oil date of 29 Feb 2024, and 2 weeks to Operations Planned date of each well (updated schedule assessment August 2020)

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

Description of Drilling Rig				Description of Structure			
	Jackup		Drillship		Caisson		Tension leg platform
	Gorilla Jackup		Platform rig		Fixed platform		Compliant tower
	Semisubmersible		Submersible		Spar		Guyed tower
	DP Semisubmersible		Other (Attach description)	XX	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)
GC 807	GC 763	10.75 OD	34,554
GC 807	GC 763	10.75 OD	33,526
GC 807	GC 807	10.75 OD	120
GC 807	GC 807	10.75 OD	120
GC 806	GC 807	10.75 OD	6,893
GC 806	GC 807	10.75 OD	7,012
GC 807	GC 807	6.81 OD	94
GC 807	GC 807	6.81 OD	117
GC 807	GC 807	6.81 OD	102
GC 807	GC 807	6.81 OD	111
GC 807	GC 807	6.81 OD	117
GC 807	GC 807	6.81 OD	115
GC 807	GC 807	6.81 OD	100
GC 806	GC 806	6.81 OD	117
GC 806	GC 806	6.81 OD	116
GC 806	GC 806	6.81 OD	94
GC 806	GC 806	6.81 OD	120

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): Anchor FPU	Previously reviewed under an approved EP or DOCD?		Yes	XX	No
Is this an existing well or structure? [ ] Yes [X] No	If this is an existing well or structure, list the Complex ID or API No.				
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?			Yes	XX	No

WCD Info	For wells, volume of uncontrolled blowout (Bbls/Day): 33,679 bbls/day	For structures, volume of all storage and pipelines (Bbls): 17,214 bbls	API Gravity of fluid	26°, 36°

	Surface Location	Bottom-Hole Location (For Wells)	Completion (For multiple completions, enter separate lines)
Lease No.	OCS-G 25199		OCS OCS
Area Name	Green Canyon		
Block No.	2763		
Blockline Departures (in feet)	N/S Departure: 167’ FNL	N/S Departure:	N/S Departure F __ L N/S Departure F __ L N/S Departure F __ L
	E/W Departure: 4970’ FEL	E/W Departure:	E/W Departure F __ L E/W Departure F __ L E/W Departure F __ L
Lambert X-Y coordinates	X: 2228470	X:	X: X: X:
	Y: 9883993	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27° 13’ 36.32” N	Latitude:	Latitude Latitude Latitude
	Longitude: 91° 11’ 24.26” W	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 4,570’	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	7135			

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
Anchor - 1	Green Canyon	720	X= 2233938	Y= 9888577	82 ft
Anchor - 2	Green Canyon	720	X= 2233516	Y= 9889039	82 ft
Anchor - 3	Green Canyon	719	X= 2233054	Y= 9889461	82 ft
Anchor - 4	Green Canyon	719	X= 2223885	Y= 9889461	82 ft
Anchor - 5	Green Canyon	719	X= 2223424	Y= 9889039	82 ft
Anchor - 6	Green Canyon	719	X= 2323001	Y= 9888577	82 ft
Anchor - 7	Green Canyon	763	X= 2223001	Y= 9879409	82 ft
Anchor - 8	Green Canyon	763	X= 2223424	Y= 9878947	82 ft
Anchor - 9	Green Canyon	763	X= 2223886	Y= 9878524	82 ft
Anchor - 10	Green Canyon	763	X= 2233054	Y= 9878524	82 ft
Anchor - 11	Green Canyon	764	X= 2233516	Y= 9878947	82 ft
Anchor - 12	Green Canyon	764	X= 2233938	Y= 9879407	82 ft

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): GC 807 AP001 (S-B)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 807 AP002 (S-D)	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.		
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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 807 AP004 (S-H)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	Bottom-Hole Location (For Wells)	Completion (For multiple completions, enter separate lines)
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 851 AP005 (S-A)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 807 AP007 (S-O)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 807 AP008 (S-J)	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.
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): 151,750	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid 27.5	

	Surface Location	Bottom-Hole Location (For Wells)	Completion (For multiple completions, enter separate lines)
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 807 AP012 (S-L)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31752	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	807		
Blockline Departures (in feet)	N/S Departure: F S L 4136	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F W L 4277	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2221877	X:	X: X: X:
	Y: 9856616	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 05.1551	Latitude	Latitude Latitude Latitude
	Longitude W 91 12 41.3567	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4940	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 806 BP006 (SW-G)	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.		
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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid:
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31751	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	806		
Blockline Departures (in feet)	N/S Departure: F S L 5250	N/S Departure: F S L	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 2451	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: 2215149	X:	X: X: X:
	Y: 9857730	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 17.1302	Latitude	Latitude Latitude Latitude
	Longitude W 91 13 55.6549	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4991	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 850 BP006(SW-E)	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.
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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid		
	Surface Location		**Bottom-Hole Location (For Wells)**		**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS G 31751		OCS		OCS OCS
Area Name	Green Canyon				
Block No.	806				
Blockline Departures (in feet)	N/S Departure: 5250	F S L	N/S Departure:		N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: 2451	F E L	E/W Departure:		E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2215149		X:		X: X: X:
	Y: 9857730		Y:		Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 17.1302		Latitude		Latitude Latitude Latitude
	Longitude W 91 13 55.6549		Longitude		Longitude Longitude Longitude
Water Depth (Feet): -4991			MD (Feet):	TVD (Feet):	MD (Feet): TVD (Feet): MD (Feet): TVD (Feet): MD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:			NA		

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): GC 806 BP009 (SW-C)	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.	

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):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	Bottom-Hole Location (For Wells)	Completion (For multiple completions, enter separate lines)
Lease No.	OCS G 31751	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	806		
Blockline Departures (in feet)	N/S Departure: F S L 5250	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 2451	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2215149	X:	X: X: X:
	Y: 9857730	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 17.1302	Latitude	Latitude Latitude Latitude
	Longitude W 91 13 55.6549	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4991	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

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): GC 806 BP010 (SW-F)	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.	

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

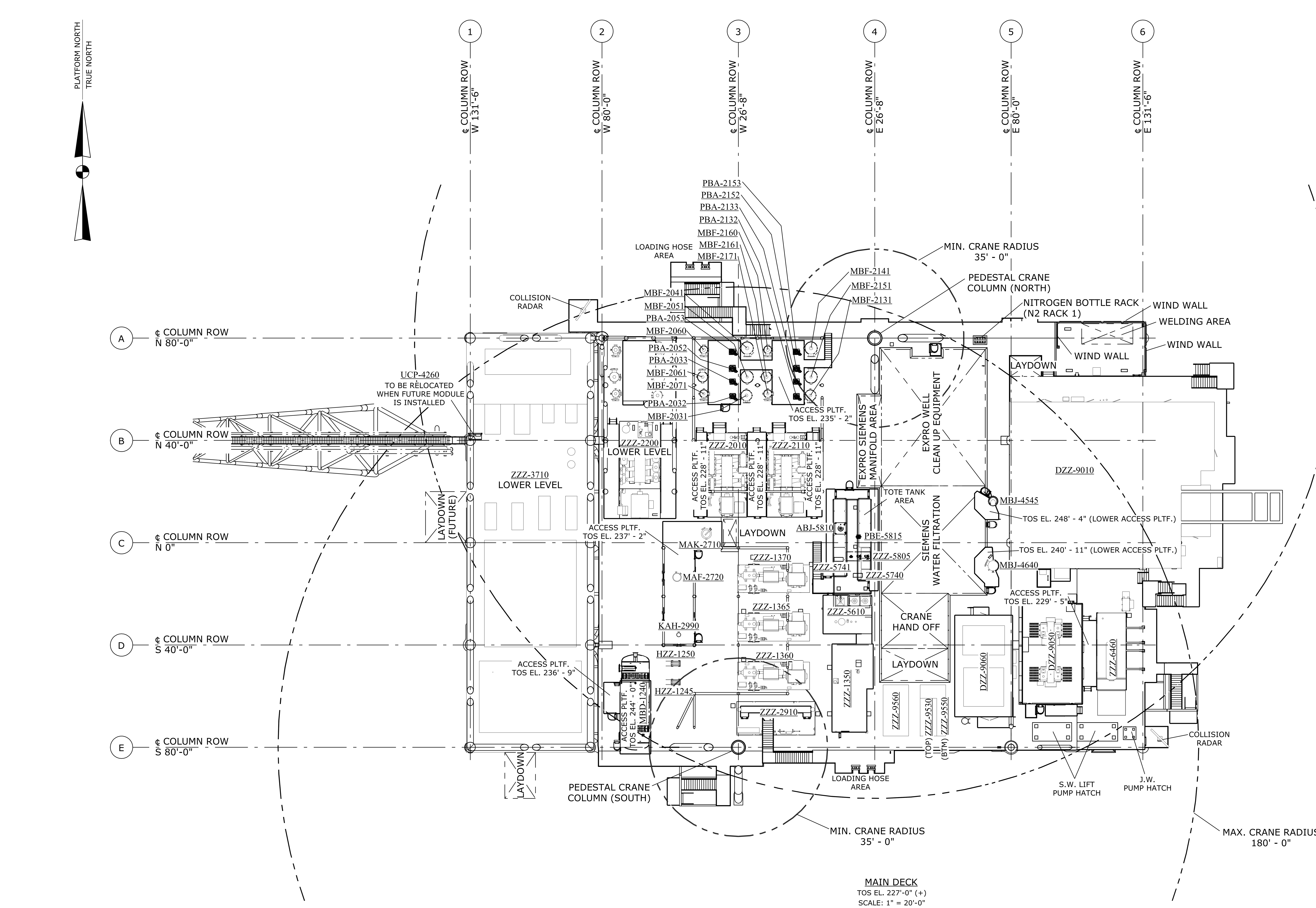
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

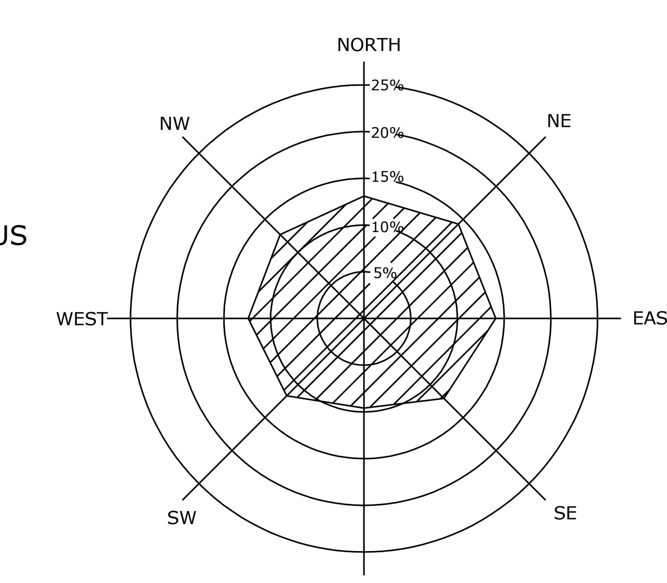
	Surface Location	Bottom-Hole Location (For Wells)	Completion (For multiple completions, enter separate lines)
Lease No.	OCS G 31751	OCS	OCS OCS
Area Name	Green Canyon		
Block No.	806		
Blockline Departures (in feet)	N/S Departure: F S L 5250	N/S Departure:	N/S Departure: F____ L N/S Departure: F____ L N/S Departure: F____ L
	E/W Departure: F E L 2451	E/W Departure:	E/W Departure: F____ L E/W Departure: F____ L E/W Departure: F____ L
Lambert X-Y coordinates	X: 2215149	X:	X: X: X:
	Y: 9857730	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude N 27 09 17.1302	Latitude	Latitude Latitude Latitude
	Longitude W 91 13 55.6549	Longitude	Longitude Longitude Longitude

Water Depth (Feet): -4991	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet:	NA			

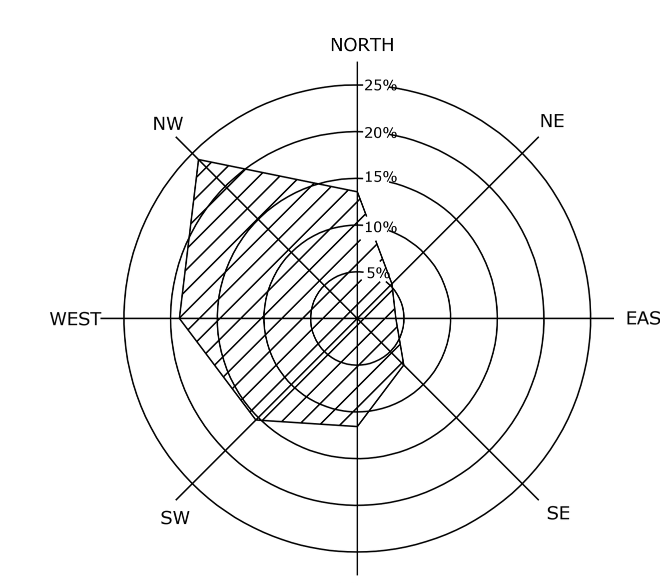
Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)

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 =	





PREVAILING SURFACE CURRENT - BY DIRECTION (TOWARDS)



PREVAILING WINDS - BY DIRECTION (TOWARDS)

SCALE: 1"=20'-0"

EQUIPMENT SCHEDULE

TAG	DESCRIPTION
ABJ-5810	DEIONIZED WATER TANK
DZZ-9010	PERMANENT QUARTERS
DZZ-9050	SUBSEA ELECTRICAL BUILDING
DZZ-9060	SUBSEA ELECTRICAL BUILDING (FUTURE)
HZZ-1245	DRY OIL COOLER
HZZ-1250	DRY OIL COOLER
KAH-2990	SALES GAS PIPELINE PIG LAUNCHER
MAF-2720	GLYCOL CONTACTOR
MAK-2710	GLYCOL CONTACTOR INLET FILTER / SEPARATOR
MBD-1240	DRY OIL SEPARATOR
MBF-2031	MGC No.1 1st STAGE SUCTION SCRUBBER
MBF-2041	MGC No.1 2nd STAGE SUCTION SCRUBBER
MBF-2051	MGC No.1 3rd STAGE SUCTION SCRUBBER
MBF-2060	MGC No.1 4th STAGE DISCHARGE SCRUBBER
MBF-2061	MGC No.1 4th STAGE SUCTION SCRUBBER
MBF-2071	MGC No.1 5th STAGE SUCTION SCRUBBER
MBF-2131	MGC No.2 1st STAGE SUCTION SCRUBBER
MBF-2141	MGC No.2 2nd STAGE SUCTION SCRUBBER
MBF-2151	MGC No.2 3rd STAGE SUCTION SCRUBBER
MBF-2160	MGC No.2 4th STAGE DISCHARGE SCRUBBER
MBF-2161	MGC No.2 4th STAGE SUCTION SCRUBBER
MBF-2171	MGC No.2 5th STAGE SUCTION SCRUBBER
MBJ-4545	COOLING MEDIUM EXPANSION VESSEL
MBJ-4640	HEAT MEDIUM EXPANSION VESSEL
PBA-2032	MGC No.1 1st STAGE SUCTION SCRUBBER PUMP
PBA-2033	MGC No.1 1st STAGE SUCTION SCRUBBER PUMP
PBA-2052	MGC No.1 3rd STAGE SUCTION SCRUBBER PUMP
PBA-2053	MGC No.1 3rd STAGE SUCTION SCRUBBER PUMP
PBA-2132	MGC No.2 1st STAGE SUCTION SCRUBBER PUMP
PBA-2133	MGC No.2 1st STAGE SUCTION SCRUBBER PUMP
PBA-2152	MGC No.2 3rd STAGE SUCTION SCRUBBER PUMP
PBA-2153	MGC No.2 3rd STAGE SUCTION SCRUBBER PUMP
PBE-5815	DEIONIZED WATER PUMP
UCP-4260	FLARE IGNITION PANEL
ZZZ-1350	LACT UNIT
ZZZ-1360	OIL PIPELINE PUMP
ZZZ-1365	OIL PIPELINE PUMP
ZZZ-1370	OIL PIPELINE PUMP
ZZZ-2010	MAIN GAS COMPRESSOR No.1 SKID
ZZZ-2110	MAIN GAS COMPRESSOR No.2 SKID
ZZZ-2200	GAS COMPRESSION MODULE (FUTURE)
ZZZ-2910	SALES GAS METERING SKID
ZZZ-3710	WATER INJECTION SYSTEM SKID (FUTURE)
ZZZ-5610	HELICOPTER FUEL SKID
ZZZ-5740	PAINT STORAGE LOCKER
ZZZ-5741	PAINT STORAGE LOCKER
ZZZ-5805	CONSUMABLES SKID
ZZZ-6460	ESSENTIAL GENERATOR PACKAGE
ZZZ-9530	PUMP HPU - BARRIER FLUID-TIEBACK A (FUTURE)
ZZZ-9550	HYDRAULIC POWER UNIT-TIEBACK C (FUTURE)
ZZZ-9560	HYDRAULIC POWER UNIT-TIEBACK A (FUTURE)

NOTES:

NOTICE

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NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

Chevron U.S.A. Inc.

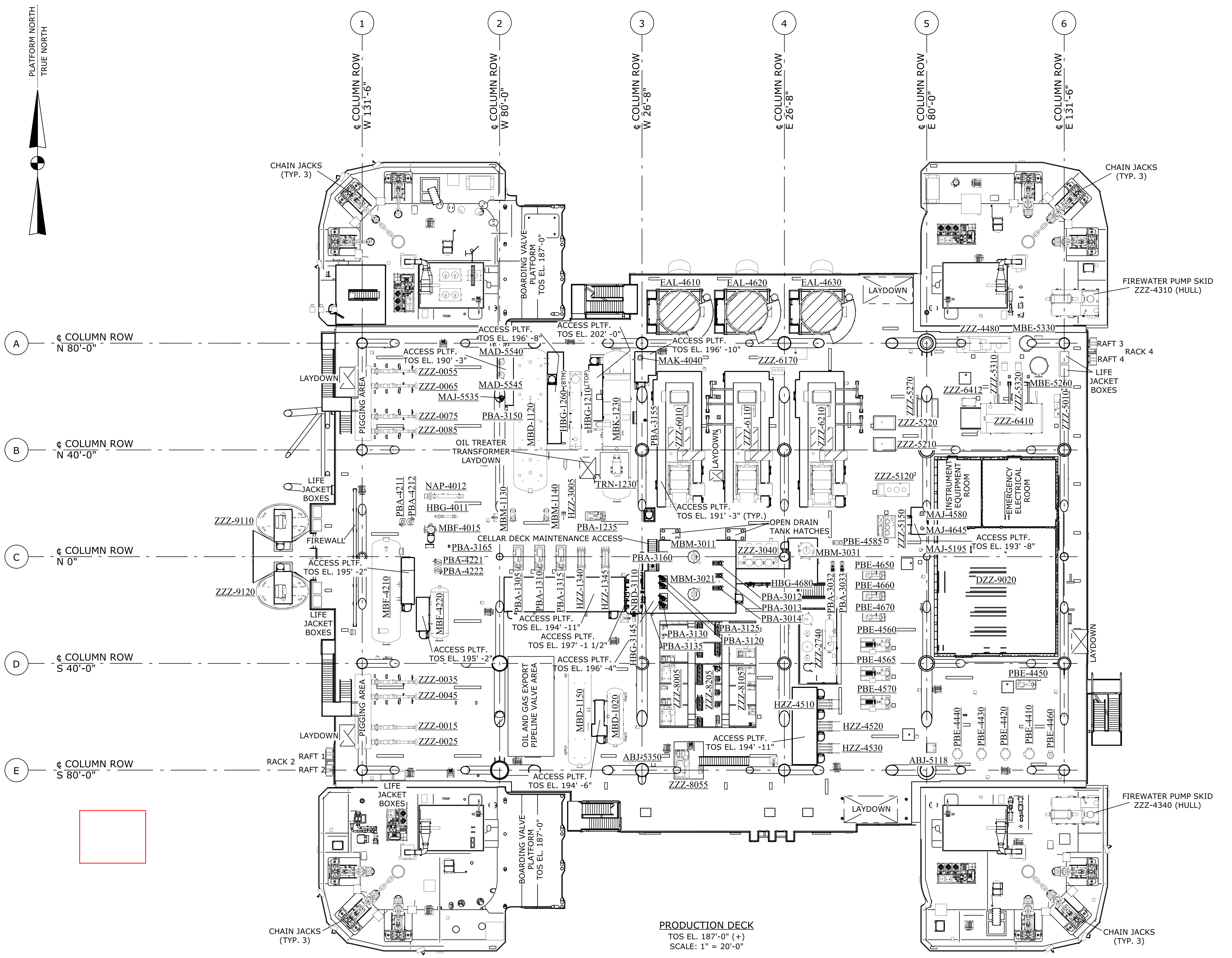
DWG. SCALE: 1" = 20'-0"
ORIG. DATE: 25SEP2017
PLOT SCALE:
DRAWN BY: WOOD
CHECKED BY: M. EDMONDSON
APPROVED BY: D. HANSEN
PLOT DATE:

ALTERNATE DOC. NUMBER — REV

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
MAIN DECK

SHEET: D — DRAWING NUMBER: ANCR-T000-PIP-GAR-WGM-Z0200-00001-00 — REV: B03



EQUIPMENT SCHEDULE

TAG	DESCRIPTION
ABJ-5118	POTABLE WATER CHLORINE TANK
ABJ-5350	CRANE PEDESTAL DIESEL TANK
DZZ-9020	ELECTRICAL BUILDING
EAL-4610	WASTE HEAT RECOVERY UNIT
EAL-4620	WASTE HEAT RECOVERY UNIT
EAL-4630	WASTE HEAT RECOVERY UNIT
HBG-1210	OIL HEATER
HBG-1260	OIL HEATER
HBG-3145	RECOVERED OIL HEATER
HBG-4011	FUEL GAS HEATER
HBG-4680	TRIM COOLER
HZZ-1340	EXPORT OIL COOLER
HZZ-1345	EXPORT OIL COOLER
HZZ-3005	PRODUCED WATER COOLER
HZZ-4510	COOLING MEDIUM COOLER
HZZ-4520	COOLING MEDIUM COOLER
HZZ-4530	COOLING MEDIUM COOLER
MAD-5540	DIESEL FILTER
MAD-5545	DIESEL FILTER
MAJ-4580	COOLING MEDIUM SLIP STREAM FILTER
MAJ-4645	HEAT MEDIUM SLIP STREAM FILTER
MAJ-5195	FRESHWATER LOADING FILTER
MAJ-5535	DIESEL LOADING FILTER
MAK-4040	MAIN GENERATOR FUEL GAS FILTER SEPARATOR
MBD-1020	TEST SEPARATOR
MBD-1120	LP PRODUCTION SEPARATOR
MBD-1150	HP PRODUCTION SEPARATOR
MBE-5260	DRY AIR RECEIVER
MBE-5330	NITROGEN RECEIVER
MBF-4015	FUEL GAS SCRUBBER
MBF-4210	HP FLARE SCRUBBER
MBF-4220	LP FLARE SCRUBBER
MBK-1230	OIL TREATER
MBM-1130	LP PRODUCTION SEPARATOR HYDROCYCLONE

EQUIPMENT SCHEDULE

TAG	DESCRIPTION
MBM-1140	LP PRODUCTION SEPARATOR HYDROCYCLONE
MBM-3011	FLOTATION UNIT
MBM-3021	FLOTATION UNIT
MBM-3031	FLOTATION UNIT (FUTURE)
NAP-4012	BUY BACK GAS HEATER
NBD-3110	RECOVERED OIL SEPARATOR
PBA-1235	OIL TREATER WATER PUMP
PBA-1305	OIL BOOSTER PUMP
PBA-1310	OIL BOOSTER PUMP
PBA-1315	OIL BOOSTER PUMP
PBA-3012	FLOTATION PUMP
PBA-3013	FLOTATION PUMP
PBA-3014	FLOTATION PUMP
PBA-3032	FLOTATION PUMP (FUTURE)
PBA-3033	FLOTATION PUMP (FUTURE)
PBA-3120	RECOVERED OIL SEPARATOR OIL PUMP
PBA-3125	RECOVERED OIL SEPARATOR OIL PUMP
PBA-3130	RECOVERED OIL SEPARATOR WATER PUMP
PBA-3135	RECOVERED OIL SEPARATOR WATER PUMP
PBA-3150	LP PRODUCTION SEPARATOR SAMPLE SINK PUMP
PBA-3155	TREATER SAMPLE SINK PUMP
PBA-3160	RECOVERED OIL SEPARATOR SAMPLE SINK PUMP
PBA-3165	FLOWLINE SAMPLE SINK PUMP
PBA-4211	HP FLARE SCRUBBER PUMP
PBA-4212	HP FLARE SCRUBBER PUMP
PBA-4221	LP FLARE SCRUBBER PUMP
PBA-4222	LP FLARE SCRUBBER PUMP
PBE-4410	SEAWATER LIFT PUMP
PBE-4420	SEAWATER LIFT PUMP
PBE-4430	SEAWATER LIFT PUMP
PBE-4440	SEAWATER LIFT PUMP (FUTURE)
PBE-4450	TOPSIDES JOCKEY PUMP
PBE-4460	SEAWATER LIFT JOCKEY PUMP
PBE-4560	COOLING MEDIUM CIRCULATION PUMP
PBE-4565	COOLING MEDIUM CIRCULATION PUMP
PBE-4570	COOLING MEDIUM CIRCULATION PUMP
PBE-4585	COOLING MEDIUM START-UP PUMP
PBE-4650	HEAT MEDIUM PUMP
PBE-4660	HEAT MEDIUM PUMP
PBE-4670	HEAT MEDIUM PUMP
TRN-1230	OIL TREATER TRANSFORMER
ZZZ-0015	ANCHOR SOUTH 01 LAUNCHER / RECIEVER
ZZZ-0025	ANCHOR SOUTH 02 LAUNCHER / RECIEVER
ZZZ-0035	ANCHOR NORTH 01 LAUNCHER / RECIEVER (FUTURE)
ZZZ-0045	ANCHOR NORTH 02 LAUNCHER / RECIEVER (FUTURE)
ZZZ-0055	TIEBACK C 01 LAUNCHER / RECIEVER (FUTURE)
ZZZ-0065	TIEBACK C 02 LAUNCHER / RECIEVER (FUTURE)
ZZZ-0075	TIEBACK B 01 LAUNCHER / RECIEVER (FUTURE)
ZZZ-0085	TIEBACK B 02 LAUNCHER / RECIEVER (FUTURE)
ZZZ-2740	GLYCOL REGENERATION SKID
ZZZ-3040	TERTIARY PRODUCED WATER TREATMENT PACKAGE (FUTURE)
ZZZ-4480	HYPOCHLORITE GENERATOR PACKAGE
ZZZ-5010	SEWAGE TREATMENT UNIT
ZZZ-5120	POTABLE WATER FILTER SKID
ZZZ-5150	FRESH WATER MAKER PACKAGE
ZZZ-5210	AIR COMPRESSOR SKID
ZZZ-5220	AIR COMPRESSOR SKID
ZZZ-5270	INSTRUMENT AIR DRYER SKID
ZZZ-5310	NITROGEN GENERATOR CABINET
ZZZ-5320	NITROGEN GENERATOR CABINET
ZZZ-6010	MAIN POWER GENERATOR SKID - DUEL FUELED
ZZZ-6110	MAIN POWER GENERATOR SKID - GAS FUELED
ZZZ-6170	LIQUID FUEL FILTER SKID
ZZZ-6210	MAIN POWER GENERATOR SKID - DUEL FUELED
ZZZ-6410	EMERGENCY GENERATOR PACKAGE
ZZZ-6412	EMERGENCY GENERATOR FIRE SUPRESISION SYSTEM
ZZZ-8005	SUBSEA METHANOL PUMP SKID
ZZZ-8055	SUBSEA METHANOL PUMP SKID (FUTURE)
ZZZ-8105	SUBSEA CHEMICAL INJECTION SKID
ZZZ-8205	TOPSIDES CHEMICAL INJECTION SKID
ZZZ-9110	SURVIVAL CRAFT
ZZZ-9120	SURVIVAL CRAFT

SCALE: 1"=20'-0" (0, 20', 40', 60', 80')

ALTERNATE DOC. NUMBER | REV

NOTES:

NOTICE

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

Chevron
Chevron U.S.A. Inc.

DWG. SCALE:	1" = 20'-0"
ORIG. DATE:	25SEP2017
PLOT SCALE:	
DRAWN BY:	WOOD
CHECKED BY:	M. EDMONDSON
APPROVED BY:	D. HANSEN
PLOT DATE:	

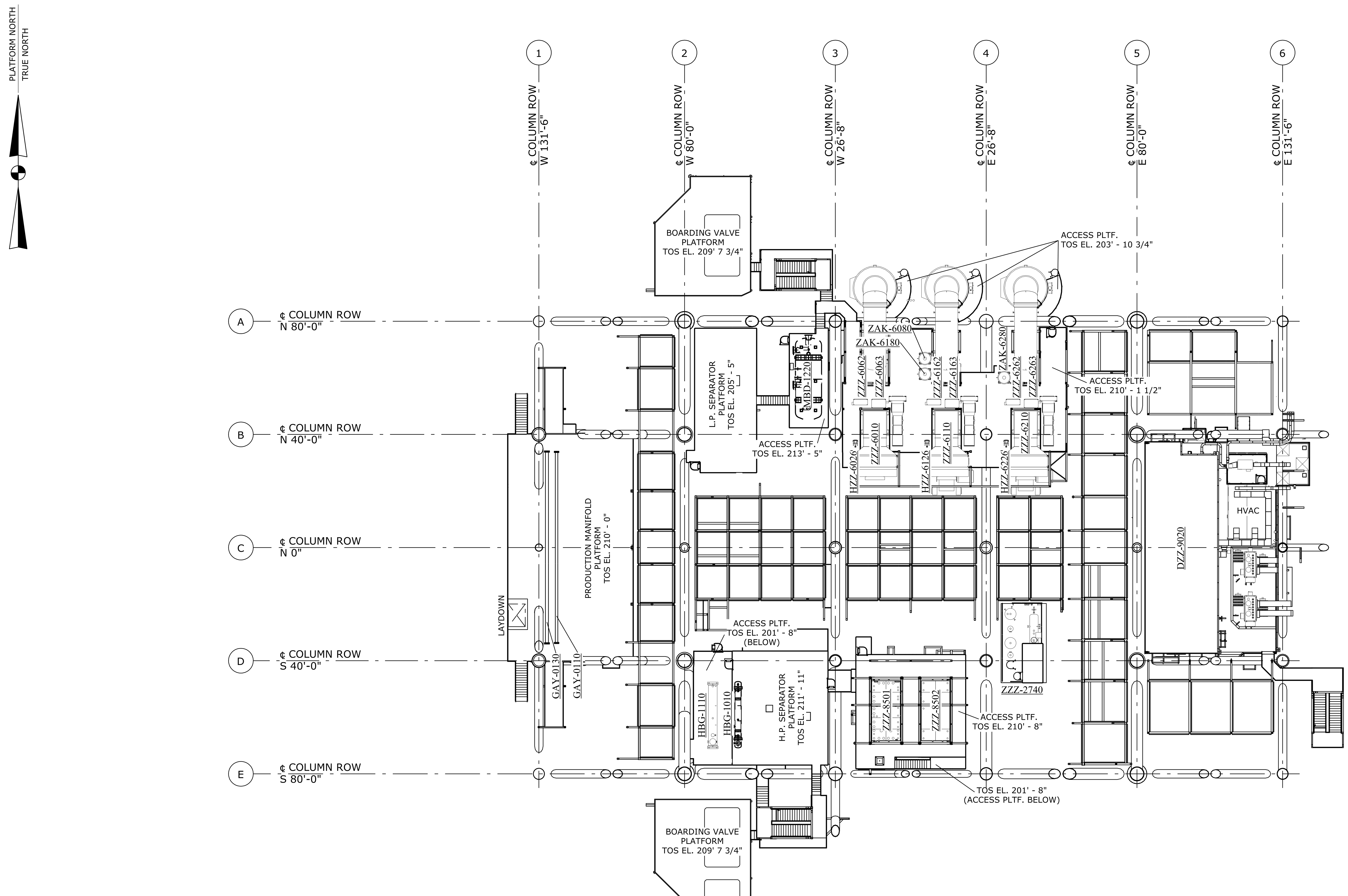
CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
PRODUCTION DECK

SHEET	DRAWING NUMBER	REV
D	ANCR-T000-PIP-GAR-WGM-Z0200-00002-00	B03

EQUIPMENT SCHEDULE

TAG	DESCRIPTION
DZZ-9020	ELECTRICAL BUILDING
GAY-0110	TEST HEADER
GAY-0130	HP PRODUCTION HEADER
HBG-1010	TEST HEATER
HBG-1110	HP PRODUCTION HEATER
HZZ-6026	LUBE OIL COOLER
HZZ-6126	LUBE OIL COOLER
HZZ-6226	LUBE OIL COOLER
MBD-1220	OIL TREATER DEGASSER
ZAK-6080	OIL MIST ELIMINATOR
ZAK-6180	OIL MIST ELIMINATOR
ZAK-6280	OIL MIST ELIMINATOR
ZZZ-2740	GLYCOL REGENERATION SKID
ZZZ-6010	MAIN POWER GENERATOR SKID - DUEL FUELED
ZZZ-6062	FIRE CABINET - CYLINDER A
ZZZ-6063	FIRE SPRAY CABINET - B/C
ZZZ-6110	MAIN POWER GENERATOR SKID - GAS FUELED
ZZZ-6162	FIRE CABINET - CYLINDER A
ZZZ-6163	FIRE SPRAY CABINET - B/C
ZZZ-6210	MAIN POWER GENERATOR SKID - DUEL FUELED
ZZZ-6262	FIRE CABINET - CYLINDER A
ZZZ-6263	FIRE SPRAY CABINET - B/C
ZZZ-8501	CHEMICAL INJECTION TANK NO. 1
ZZZ-8502	CHEMICAL INJECTION TANK NO. 2



MEZZANINE DECK
TOS EL VARIES
SCALE: 1" = 20'-0"

SCALE: 1"=20'-0" (0, 20', 40', 60', 80')

ALTERNATE DOC. NUMBER | REV

NOTES:

NOTICE

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

Chevron U.S.A. Inc.

DWG. SCALE:	1" = 20'-0"
ORIG. DATE:	25SEP2017
PLOT SCALE:	
DRAWN BY:	WOOD
CHECKED BY:	M. EDMONDSON
APPROVED BY:	D. HANSEN
PLOT DATE:	

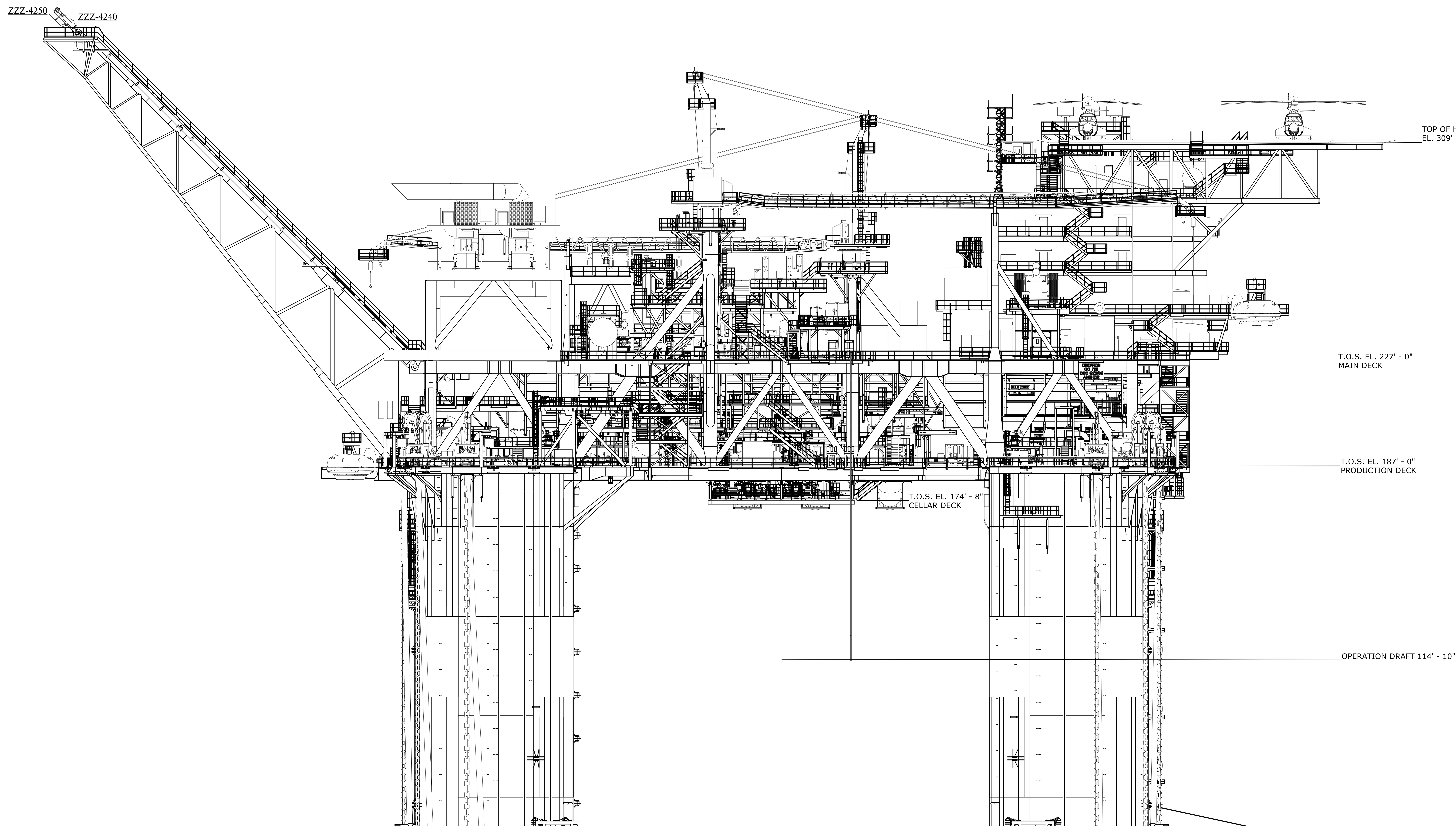
CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
MEZZANINE DECK

SHEET	DRAWING NUMBER	REV
D	ANCR-T000-PIP-GAR-WGM-Z0200-00003-00	B03

EQUIPMENT SCHEDULE

TAG	DESCRIPTION
ZZZ-4240	HP FLARE TIP
ZZZ-4250	LP FLARE TIP



SOUTH ELEVATION
Looking North
SCALE: 1" = 20'-0"

SCALE: 1"=20'-0" (0, 20', 40', 60', 80')

ALTERNATE DOC. NUMBER | REV

NOTES:

NOTICE

THIS DRAWING HAS NOT BEEN PUBLISHED AND IS THE SOLE PROPERTY OF CHEVRON AND IS LENT TO THE BORROWER FOR HIS CONFIDENTIAL USE ONLY. IN CONSIDERATION OF THE LOAN OF THIS DRAWING. THE BORROWER PROMISES AND AGREES TO RETURN IT UPON REQUEST AND AGREES THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT OR OTHERWISE DISPOSED OF DIRECTLY OR INDIRECTLY. NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

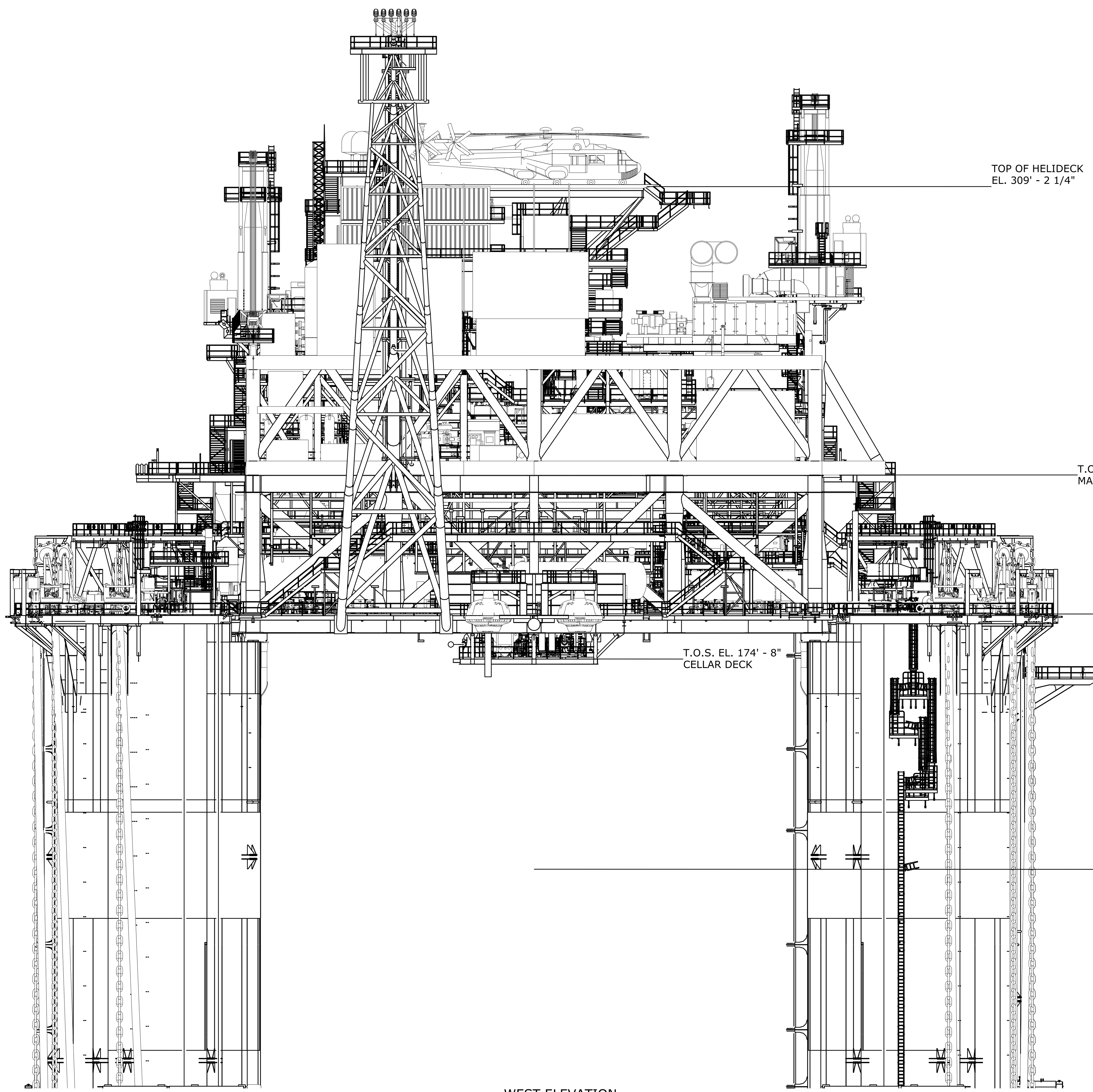
Chevron
Chevron U.S.A. Inc.

DWG. SCALE:	1" = 20'-0"
ORIG. DATE:	25SEP2017
PLOT SCALE:	
DRAWN BY:	WOOD
CHECKED BY:	M. EDMONDSON
APPROVED BY:	D. HANSEN
PLOT DATE:	

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
SOUTH ELEVATION

SHEET	DRAWING NUMBER	REV
D	ANCR-T000-PIP-GAR-WGM-Z0200-00004-00	B03



WEST ELEVATION
Looking East
SCALE: 1" = 20'-0"

NOTES:

NOTICE

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

Chevron
Chevron U.S.A. Inc.

DWG. SCALE: 1" = 20'-0"
ORIG. DATE: 25SEP2017
PLOT SCALE:
DRAWN BY: WOOD
CHECKED BY: M. EDMONDSON
APPROVED BY: D. HANSEN
PLOT DATE:

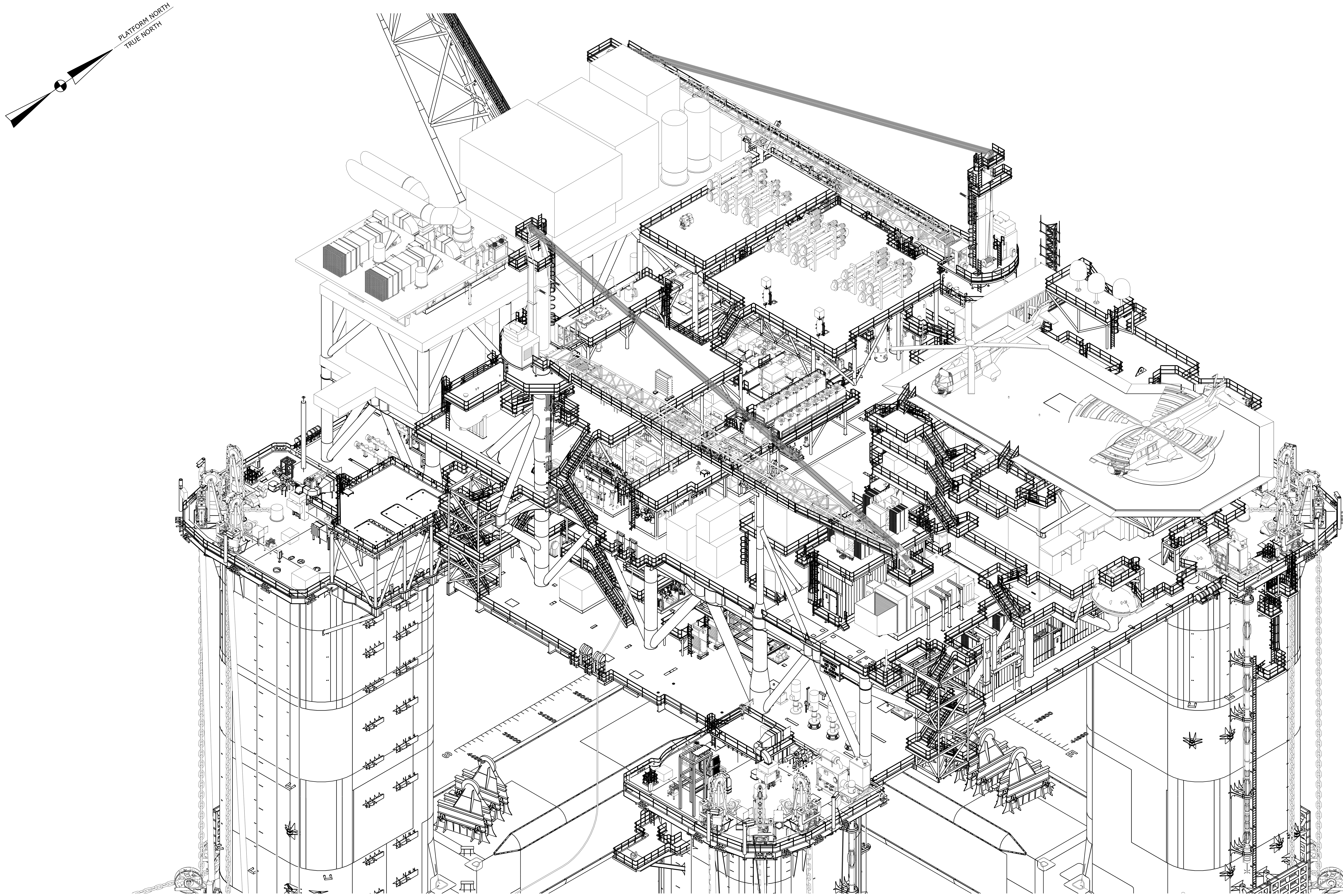
0 20' 40' 60' 80'
SCALE: 1"=20'-0"

ALTERNATE DOC. NUMBER REV

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
WEST ELEVATION

SHEET D | DRAWING NUMBER ANCR-T000-PIP-GAR-WGM-Z0200-00005-00 | REV B03



ISOMETRIC VIEW

Looking Northwest

0 20' 40' 60' 80'
SCALE: 1"=20'-0"

ALTERNATE DOC. NUMBER REV

NOTES:

NOTICE

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

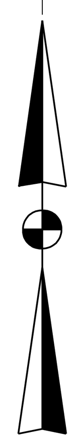
Chevron
Chevron U.S.A. Inc.

DWG. SCALE:	NTS
ORIG. DATE:	25SEP2017
PLOT SCALE:	
DRAWN BY:	WOOD
CHECKED BY:	M. EDMONDSON
APPROVED BY:	D. HANSEN
PLOT DATE:	

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

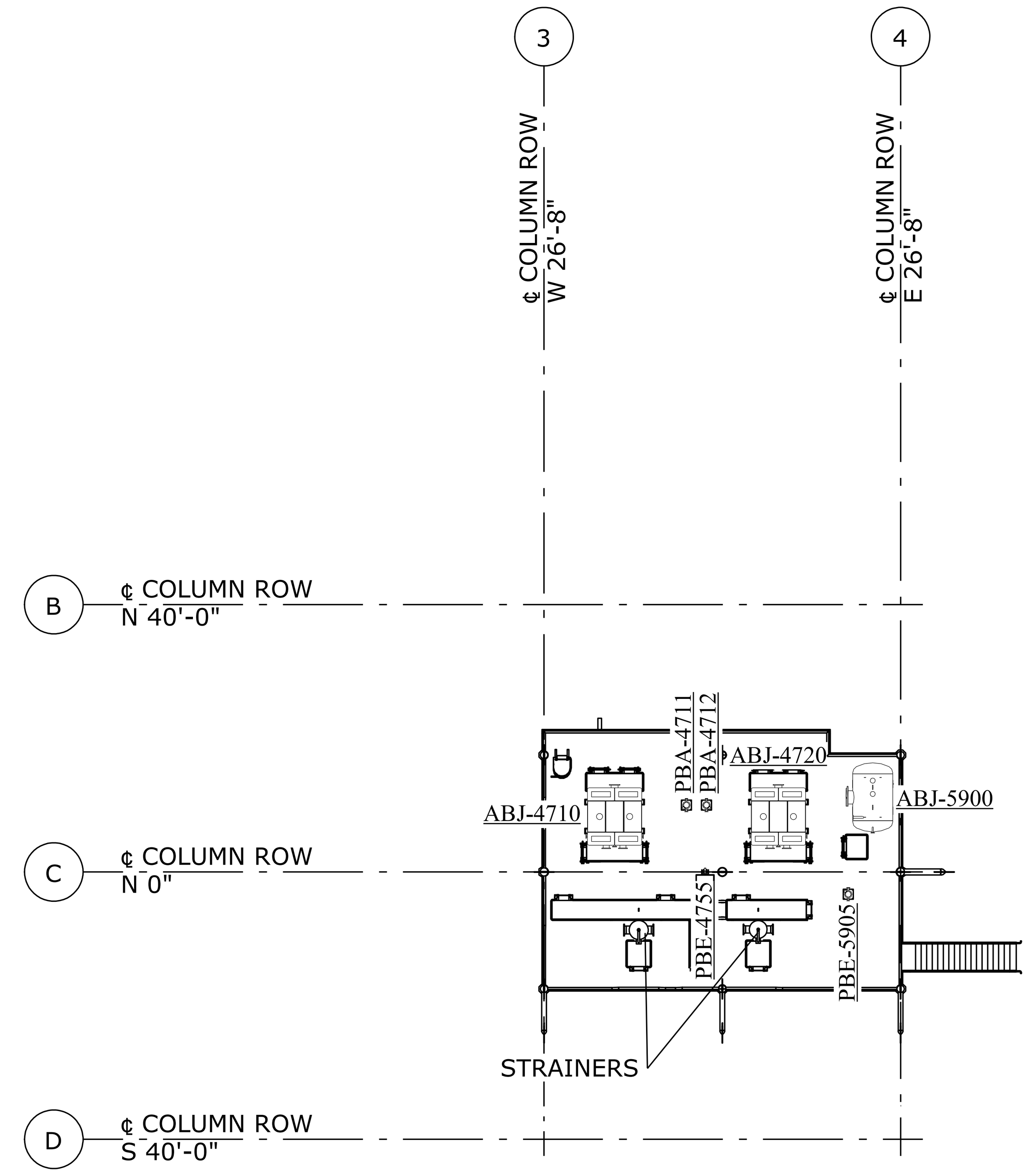
GENERAL ARRANGEMENT PLAN
OVERALL ISOMETRIC VIEW

SHEET	DRAWING NUMBER	REV
D	ANCR-T000-PIP-GAR-WGM-Z0200-00006-00	B03



EQUIPMENT SCHEDULE

TAG	DESCRIPTION
ABJ-4710	OPEN DRAIN TANK
ABJ-4720	OPEN DRAIN TANK
ABJ-5900	WASTE OIL TANK
PBA-4711	OPEN DRAIN PUMP
PBA-4712	OPEN DRAIN PUMP
PBE-4755	CELLAR DECK SUMP PUMP
PBE-5905	WASTE OIL PUMP



CELLAR DECK
TOS EL. 174'-8" (+)
SCALE: 1" = 20'-0"

0 20' 40' 60' 80'
SCALE: 1"=20'-0"

ALTERNATE DOC. NUMBER REV

NOTES:

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	19APR2019	MDE	DKH

Chevron
Chevron U.S.A. Inc.

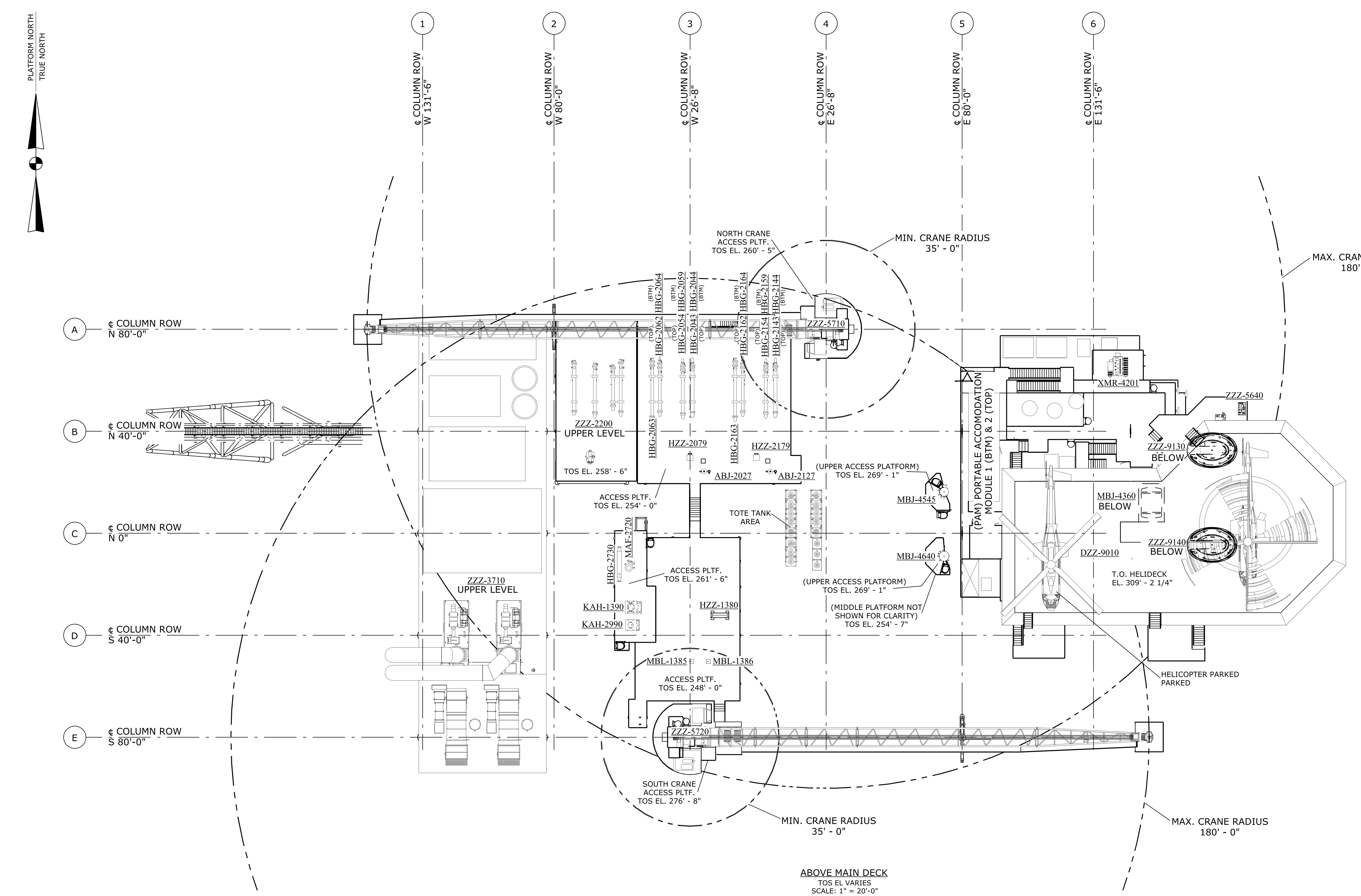
DWG. SCALE:	1" = 20'-0"
ORIG. DATE:	26MAR2018
PLOT SCALE:	
DRAWN BY:	WOOD
CHECKED BY:	M. EDMONDSON
APPROVED BY:	D. HANSEN
PLOT DATE:	

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
CELLAR DECK

SHEET	DRAWING NUMBER	REV
D	ANCR-T000-PIP-GAR-WGM-Z0200-00007-00	B03

WGMI Project:109197 Drawing:ANCR-T000-PIP-GAR-WGM-Z0200-00008-00 Revised:03/08/2020 08:06 jimee.burns



ABOVE MAIN DECK
TOS EL VARIES
SCALE: 1" = 20'-0"

EQUIPMENT SCHEDULE

TAG	DESCRIPTION
ABJ-2027	MGC NO.1 LUBE OIL DAY TANK
ABJ-2127	MGC NO.2 LUBE OIL DAY TANK
DZZ-9010	PERMANENT QUARTERS
HBG-2043	MGC No.1 2nd STAGE SUCTION COOLER
HBG-2044	MGC No.1 2nd STAGE SUCTION COOLER
HBG-2054	MGC No1 3rd STAGE SUCTION COOLER
HBG-2059	MGC No.1 3rd STAGE SUCTION COOLER
HBG-2062	MGC No.1 4th STAGE SUCTION COOLER
HBG-2063	MGC No.1 4th STAGE DISCHARGE COOLER
HBG-2064	MGC No.1 4th STAGE SUCTION COOLER
HBG-2143	MGC No.2 2nd STAGE SUCTION COOLER
HBG-2144	MGC No.2 2nd STAGE SUCTION COOLER
HBG-2154	MGC No 2 3rd STAGE SUCTION COOLER
HBG-2159	MGC No.2 3rd STAGE SUCTION COOLER
HBG-2162	MGC No.2 4th STAGE SUCTION COOLER
HBG-2163	MGC No.2 4th STAGE DISCHARGE COOLER
HBG-2164	MGC No.2 4th STAGE SUCTION COOLER
HBG-2730	GAS / GLYCOL EXCHANGER
HZZ-1380	OIL RECYCLE COOLER
HZZ-2079	MGC No.1 5TH STAGE DISCHARGE COOLER
HZZ-2179	MGC No.2 5TH STAGE DISCHARGE COOLER
KAH-1390	OIL PIPELINE PIG LAUNCHER
KAH-2990	SALES GAS PIPELINE PIG LAUNCHER
MAF-2720	GLYCOL CONTACTOR
MBJ-4360	FRESH WATER SPRINKLER SUPPLY TANK
MBJ-4545	COOLING MEDIUM EXPANSION VESSEL
MBJ-4640	HEAT MEDIUM EXPANSION VESSEL
MBL-1385	SURGE ABSORBER
MBL-1386	SURGE ABSORBER
XMR-4201	TRANSFORMER
ZZZ-2200	GAS COMPRESSION MODULE (FUTURE)
ZZZ-3710	WATER INJECTION SYSTEM SKID (FUTURE)
ZZZ-5640	HELICOPTER FUEL DISPENSING SKID
ZZZ-5710	NORTH CRANE
ZZZ-5720	SOUTH CRANE
ZZZ-9130	SURVIVAL CRAFT
ZZZ-9140	SURVIVAL CRAFT

NOTES:

NOTICE

NO	BY	REVISION DESCRIPTION	DATE	CHK	APP
		PRELIMINARY FOR 60% MODEL REVIEW			
B03	KR	ISSUED FOR DESIGN	06DEC2019	MDE	DKH
B02	KR	ISSUED FOR DESIGN	09AUG2019	MDE	DKH
B01	KR	ISSUED FOR DESIGN	10APR2019	MDE	DKH

Chevron U.S.A. Inc.

DWG. SCALE: 1" = 20'-0"
ORIG. DATE: 07NOV2018
PLOT SCALE:
DRAWN BY: WOOD
CHECKED BY: M. EDMONDSON
APPROVED BY: D. HANSEN
PLOT DATE:

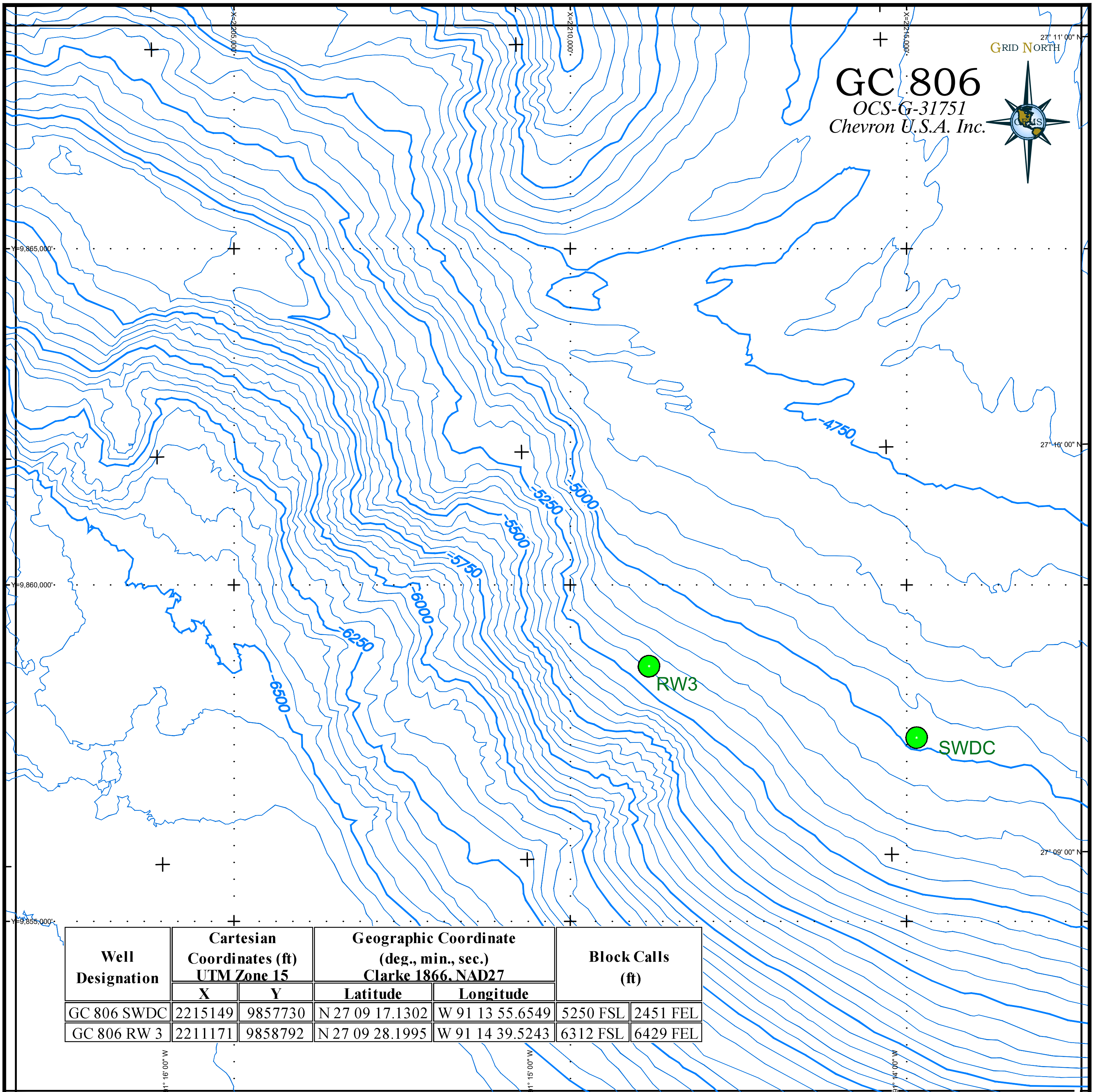
SCALE: 1"=20'-0" (0, 20', 40', 60', 80')

ALTERNATE DOC. NUMBER REV

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION COMPANY
ANCHOR PROJECT

GENERAL ARRANGEMENT PLAN
ABOVE MAIN DECK

SHEET D | DRAWING NUMBER ANCR-T000-PIP-GAR-WGM-Z0200-00008-00 | REV B03



Well Designation	Cartesian Coordinates (ft) UTM Zone 15		Geographic Coordinate (deg., min., sec.) Clarke 1866, NAD27		Block Calls (ft)	
	X	Y	Latitude	Longitude		
GC 806 SWDC	2215149	9857730	N 27 09 17.1302	W 91 13 55.6549	5250 FSL	2451 FEL
GC 806 RW 3	2211171	9858792	N 27 09 28.1995	W 91 14 39.5243	6312 FSL	6429 FEL

● PROPOSED WELL LOCATION.

WATER DEPTH CONTOUR IN FEET.

DATE : 16 JULY 2020
GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15 NORTH
GRID UNITS: US FEET

0 1000 2000 3000 4000

SCALE 1 : 24,000 or 1" = 2,000'

PROJECT NO.: 0220-2942

FILE NAME: 2942_PLAT.DWG

Chevron

CHEVRON U.S.A. INC.

SURFACE LOCATION PLAT

BLOCK 806
GREEN CANYON AREA
GULF OF MEXICO

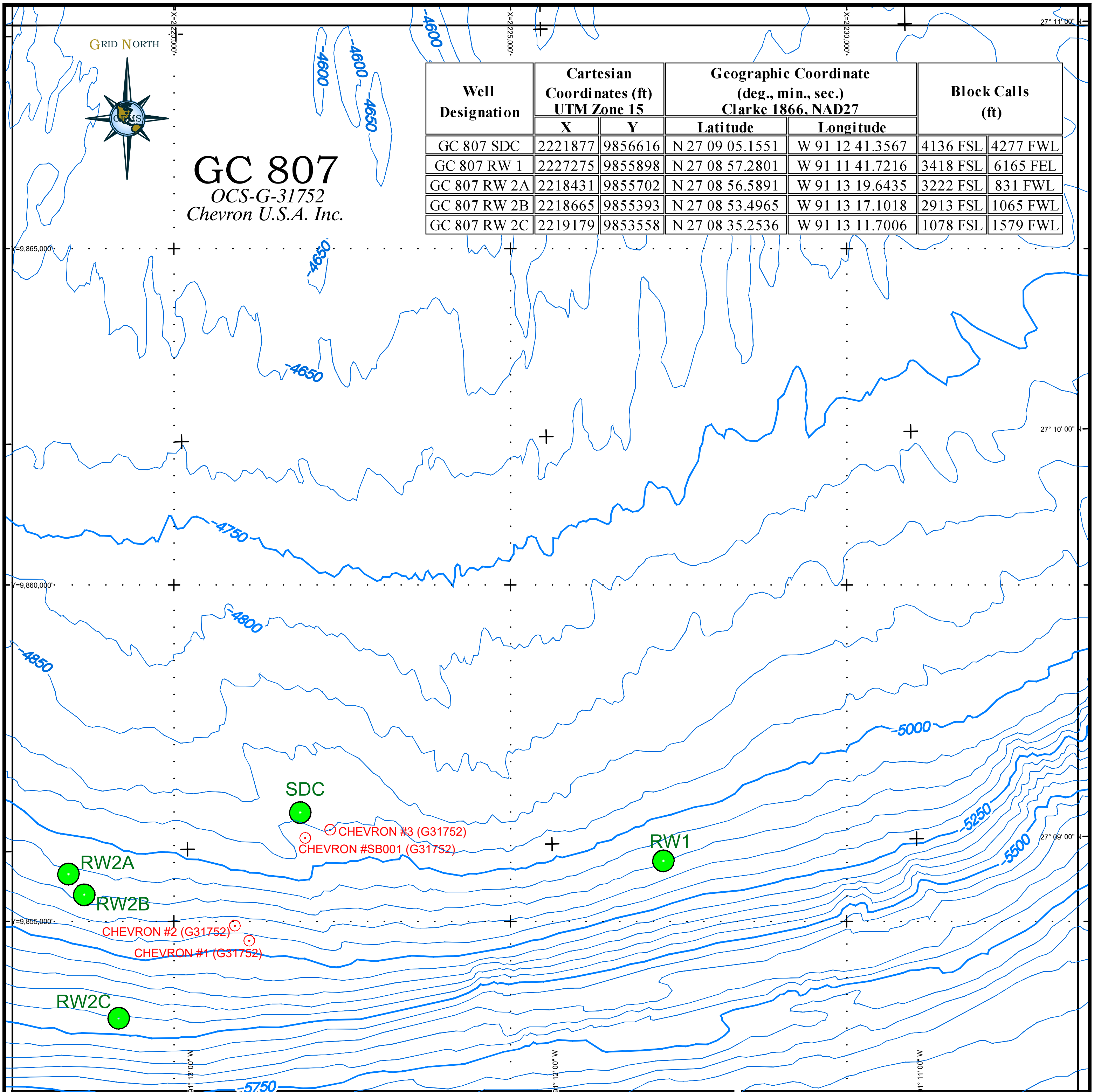
GEOSCIENCE EARTH & MARINE SERVICES, INC.

LOCATION MAP

GC 807

OCS-G-31752
Chevron U.S.A. Inc.

Well Designation	Cartesian Coordinates (ft) UTM Zone 15		Geographic Coordinate (deg., min., sec.) Clarke 1866, NAD27		Block Calls (ft)	
	X	Y	Latitude	Longitude		
GC 807 SDC	2221877	9856616	N 27 09 05.1551	W 91 12 41.3567	4136 FSL	4277 FWL
GC 807 RW 1	2227275	9855898	N 27 08 57.2801	W 91 11 41.7216	3418 FSL	6165 FEL
GC 807 RW 2A	2218431	9855702	N 27 08 56.5891	W 91 13 19.6435	3222 FSL	831 FWL
GC 807 RW 2B	2218665	9855393	N 27 08 53.4965	W 91 13 17.1018	2913 FSL	1065 FWL
GC 807 RW 2C	2219179	9853558	N 27 08 35.2536	W 91 13 11.7006	1078 FSL	1579 FWL



PROPOSED WELL LOCATION.

EXISTING CHEVRON WELL LOCATION, AS REPORTED BY BOEM.

WATER DEPTH CONTOUR IN FEET.

0 1000 2000 3000 4000

SCALE 1 : 24,000 or 1" = 2,000'

DATE : 16 JULY 2020
GEODETIC DATUM: NAD 1927
ELLIPSOID: CLARKE 1866
PROJECTION: UTM
ZONE: 15 NORTH
GRID UNITS: US FEET

PROJECT NO.: 0220-2942

FILE NAME: 2942_PLAT.DWG

Chevron

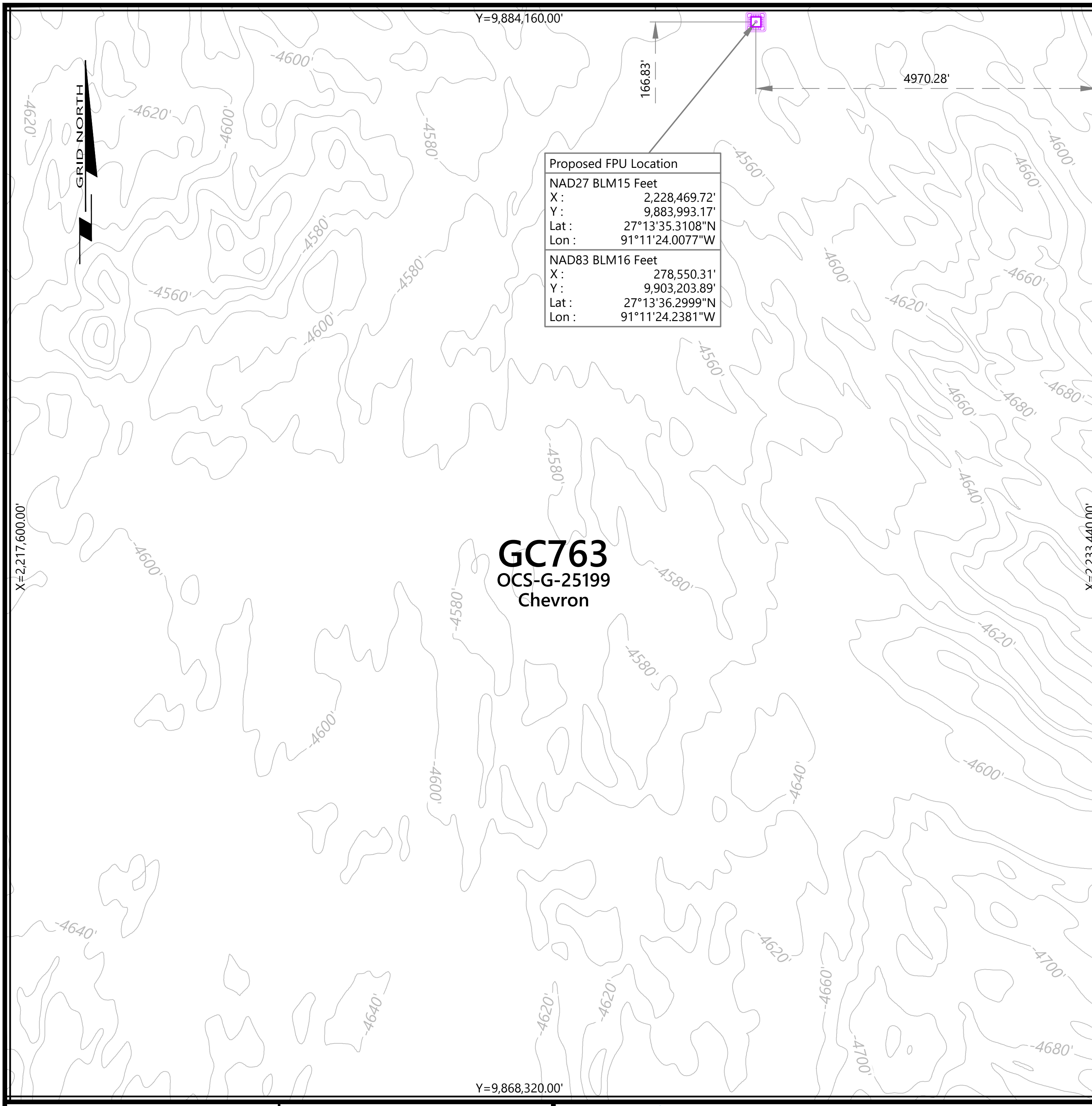
CHEVRON
U.S.A. INC.

SURFACE LOCATION PLAT

BLOCK 807
GREEN CANYON AREA
GULF OF MEXICO

GEOSCIENCE EARTH & MARINE SERVICES, INC.

LOCATION MAP



NOTES

1. THIS PLAT WAS PREPARED FOR PERMIT PURPOSES ONLY, AND IS NOT A PROPERTY BOUNDARY SURVEY.
2. COORDINATES TRANSFORMED USING NADCON (VER. 2.1).
3. PROPOSED FPU INFORMATION PROVIDED BY CLIENT AND DOES NOT REPRESENT A FUGRO FIELD SURVEY.

Chevron U.S.A. Inc.

ANCHOR PROJECT
PROPOSED FPU LOCATION

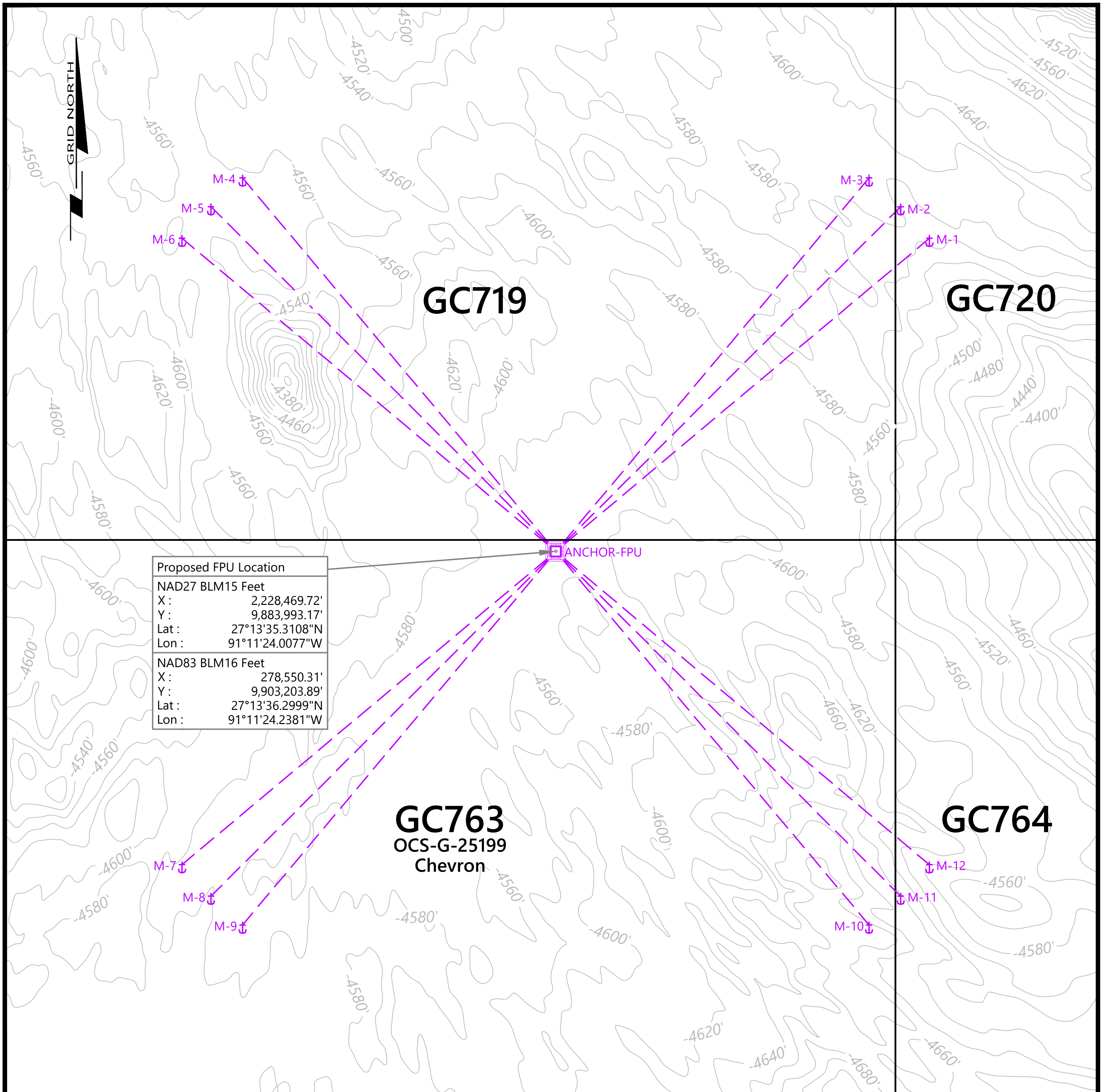
BLOCK 763
GREEN CANYONAREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 15 (NORTH)
Grid Units: US SURVEY FEET

SCALE 1:24000 — 0 — 2000 FEET

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

Job No.: 19031536	Date: 9/29/2020	Drwn: EA	Chart: 1 Of: 2
DWG File: 19031536_GC763_Proposed-FPU		REV.2	9/30/2020



PROPOSED MOORING PILE LOCATIONS

Tie	X Coordinate	Y Coordinate
M-1	2,233,938.00'	9,888,577.00'
M-2	2,233,516.00'	9,889,039.00'
M-3	2,233,054.00'	9,889,461.00'
M-4	2,223,885.00'	9,889,461.00'
M-5	2,223,424.00'	9,889,039.00'
M-6	2,223,001.00'	9,888,577.00'
M-7	2,223,001.00'	9,879,409.00'
M-8	2,223,424.00'	9,878,947.00'
M-9	2,223,886.00'	9,878,524.00'
M-10	2,233,054.00'	9,878,524.00'
M-11	2,233,516.00'	9,878,947.00'
M-12	2,233,938.00'	9,879,407.00'

NOTES

1. PROPOSED FPU LOCATION AND MOORING PILE LOCATIONS OBTAINED FROM CLIENT DRAWING ANCR-M000-MAR-GAR-KBR-Z0230-00002-00 REVA03.

LEGEND

- PROPOSED FPU
- PROP. MOORING LINE
- ANCH. / PILE

Chevron U.S.A. Inc.

ANCHOR PROJECT
PROPOSED FPU MOORING ANCHOR PLAN

BLOCK 763
GREEN CANYONAREA
GULF OF MEXICO

Geodetic Datum: NAD27
Projection: BLM 15 (NORTH)
Grid Units: US SURVEY FEET

SCALE 1:24000 — 0 — 2000 FEET

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

Job No.: 19031536 | Date: 9/29/2020 | Drwn: EA | Chart: 2 Of: 2

DWG File: 19031536_GC763_Proposed-FPU REV.2

9/30/2020

FW: Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

Hogge, Laura E [Laura.Hogge@chevron.com]
Sent: Wednesday, November 04, 2020 9:04 AM
To: Christensen, Laura A. [Laura.Christensen@boem.gov]
Cc: Kelley Pisciola

Laura,

Attached is the Anchor pay.gov receipt for you!

L.

From: notification@pay.gov <notification@pay.gov>
Sent: Wednesday, November 4, 2020 8:55 AM
To: Hogge, Laura E <Laura.Hogge@chevron.com>
Subject: [**EXTERNAL**] Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

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Pay.gov

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: 26QCIAQC
Agency Tracking ID: 76047611212

Account Holder Name: Chevron U.S.A.
Transaction Type: ACH Debit
Transaction Amount: $46,618.00
Payment Date: 11/05/2020

Account Type: Business Checking
Routing Number: 071000013
Account Number: ************1704

Transaction Date: 11/04/2020 09:55:00 AM EST
Total Payments Scheduled: 1
Frequency: OneTime

Region: Gulf of Mexico
Contact: Laura Hogge 832-298-1185
Company Name/No: Chevron USA, 0078
Lease Number(s): 25199, 25198, 31751, 31752, 31757
Area-Block: Green Canyon GC, 762: Green Canyon GC, 806: Green Canyon GC, 807: Green Canyon GC, 850: Green Canyon GC, 851
Type-Wells: Initial Plan, 11

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Appendix B: Interim Geophysical Survey Interpretive Report

Chevron

Anchor Project

Interim Geophysical Survey Interpretive Report

DOCUMENT NO.: ANCR-G000-GEO-RPT-FGI-Z0060-00004-00

Alternate Doc. No: 02.17031201B-Geophys_Anchor

B01	18 April 2018	Issued for Use	KB	SS	SS
A01	23 Feb 2018	Issued for Review	KB	SS	SS
REV	**DATE**	**DESCRIPTION**	**ORIG**	**CHK**	**APPR**

APPROVED BY:

DATE:

Change Log

REV	SECTION	CHANGE DESCRIPTION
B01	Exec Summary, 1.2.1.3, 3.2.1, 3.2.2, 3.2.4, 3.3.4, Section 4, Conclusions, Figure 7, Figure 9, Chart 9, Archeological Assessment	Text, chart, and figure edits as requested.

April 18, 2018
Report No. 02.17031201B-Geophys_Anchor

Chevron North America E & P Company
C/O Deepwater Exploration and Projects
1500 Louisiana Street
Houston, TX 77002

Attention: Bryan Clevenger

Fugro USA Marine Inc. (Fugro) is pleased to present this report containing a geohazard assessment of the seafloor and near-surface geologic conditions that may have an impact on the design and placement of infrastructure within the Anchor Development Area, Blocks 719-720, 762-764, 806-807, 850-851 and vicinity, Green Canyon Area, Gulf of Mexico. This assessment is based on Autonomous Underwater Vehicle (AUV)-acquired high-resolution multibeam echosounder, SSS, and SBP data collected from three different AUV surveys acquired in 2015 (2) and 2017, two AUV 3D micro (AUV3Dm) surveys, and two 3D exploration seismic datasets. All relevant information was integrated to assess conditions within the study area.

This report complies with the latest Bureau of Ocean Energy Management (BOEM) specifications for shallow hazard assessments detailed in publications NTLs 2008-G05 and 2009-G40 (both extended by NTL 2015-N02) for shallow drilling hazards and deepwater benthic community assessment, respectively. The study area lies within an area designated as archaeologically sensitive according to NTL 2005-G07 and NTL 2011-JOINT-G01. An Archaeological Assessment was completed by Fugro (Report No. 02.17031201B-Geophys_Anchor) addressing the high-resolution AUV data collected in 2017 is included as Appendix B in this report. Separate Archaeological Assessments were completed by C & C Technologies, Inc. (Project No. 120008) and by Fugro (Report No. 2415-5092), both addressing AUV data collected in 2015. Mr. Brian Clevenger authorized this study, which was conducted under Chevron Service Order No. CW1550524.

We appreciate the opportunity to be of service to you on this project. Please do not hesitate to contact us if you have any questions or if we can be of further assistance.

Sincerely,

FUGRO USA MARINE, INC

Kelly Bates
Project Geoscientist
Office: (713) 369-5817
Email: k.bates@fugro.com

STATE OF TEXAS
SHANE B. SMITH
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2017 Geophysical & Geotechnical Site Development Survey

Interim Geophysical Survey Interpretive Report

Blocks 719, 762–764, 806–807, & 851
Green Canyon Area, Offshore Gulf of Mexico

18 April 2018
Fugro Project No.: 02.17031201B-Geophys_Anchor

Chevron North America E & P Company

Prepared for:

Chevron North America E & P Company
1500 Louisiana Street
Houston, TX 77002

EXECUTIVE SUMMARY

Purpose and Scope

This report describes seafloor and shallow geologic conditions in the Anchor Development Area. The study area is located approximately 225 miles south of Baton Rouge, Louisiana, and encompasses OCS Blocks 719-720, 762-764, 806-807, 850-851 and vicinity, Green Canyon, northern Gulf of Mexico. As currently proposed, the Anchor Development may comprise up to three drill centers tied back to a floating host platform. Flowlines and umbilicals will connect the drill centers to the host platform. Drill centers will include a central manifold, two or more production wells, pipeline end terminations and other subsea equipment platforms. The proposed infrastructure shown on the subsequent charts and figures was provided from Chevron as of February 2, 2018.

The primary results from this study are that the seafloor and near-seafloor geologic conditions are generally favorable for development activities with certain constraints. These constraints during lease activities and development planning include consideration and further evaluation of geohazards such as seafloor and near surface faults, areas with pockmarks, and areas of hardgrounds possibly associated with deepwater benthic communities.

Geophysical Data

Three high-resolution AUV geophysical datasets were acquired within the Anchor Development Area. These data were acquired in 2015 by C & C Technologies, Inc. (C&C, 2015), and in 2015 and 2017 by Fugro Marine GeoServices, Inc. (Fugro, 2015a; Fugro, 2018a). Each survey campaign includes multibeam echosounder (MBES) bathymetry and backscatter, SSS, and SBP data. For enhanced interpretation for future anchor piles, two 3D volumes were developed from 4-meter spaced 2D AUV SBP lines from the 2017 Fugro subbottom data. In addition to the AUV geophysical datasets, two 3D seismic datasets were provided by Chevron for integration and interpretation alongside the AUV data.

Archaeological Assessment

Two previous archaeology assessments have been conducted for the C & C 2015 and Fugro 2015 AUV datasets (GEMS, 2015; Fugro, 2015b) and an additional assessment has been conducted for the AUV data collected in 2017 (Appendix B). From the three assessments, no seafloor outcrops or potential archaeological avoidance sites are identified on the seafloor within the Anchor Development Area.

Seafloor Geomorphology and Geohazard Summary

From the AUV and 3D seismic data provided, water depths range from 4,119 ft BSL in the southern portion of block 762 to approximately 6,725 ft BSL in the northern portion of block GC 849 within St. Tammany Basin, located outside of the Anchor Development Area. The seafloor generally dips to the south towards St. Tammany Basin with slopes typically less than 6°. However, slope values commonly exceed 30° locally along irregular seafloor topography, mainly at steep headwall scarps and fault scarps.

Concerning geohazards, the Anchor Development Area exhibits a wide range of topographic features on the seafloor including: seafloor or near-seafloor normal fault scarps, headwall scarps, gullies, surface expressions of buried MTDs, seafloor slides, pockmarks, and hardgrounds.

Seafloor faults and near-surface faults are the main features identified within the development area and traversing fault lines on the seafloor with tubular infrastructure (e.g. flowlines and umbilicals) is unavoidable. Detailed investigations required to site piles to avoid fault intersection where possible, including fault slip rates and additional fault analysis will be addressed in future studies (Fugro, 2018c to Fugro, 2018i). Avoidance may not be possible in some cases, and faults will be geotechnically and geologically characterized in these cases.
In GC 763, a proposed export gas riser and umbilical comes within 250 ft of a small concentration of pockmarks and hardgrounds indicative of possible active expulsion. Areas identified as hardground and have associated pockmarks/and or acoustic voids may support deepwater benthic communities and should be avoided or inspected by ROV or AUV camera prior to any seafloor disturbance.

Overall, the seafloor and near-seafloor geologic conditions in the study area appear generally favorable for field development depending on desired seafloor infrastructure, and provided potential hazards and constraints are avoided or mitigated by the development design program.

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ABBREVIATIONS

AUV	Autonomous Underwater Vehicle
BML	Below mudline
BSS	Below Sea Surface
C & C	C & C Technologies, Inc.
CTD	Conductivity-temperature-depth sensor
Chevron	Chevron North America Exploration and Production Company
DLI	Depth Limit of Investigation
Fugro	Fugro USA Marine GeoServices, Inc.
MBES	Multibeam echosounder
MTD	Mass transport deposit
SBP	Subbottom Profiler
SSS	Side scan sonar

1. INTRODUCTION

1.1 Scope of Document

The purpose of this report is to provide results of the seafloor and near-seafloor geologic conditions and identify potential hazards, constraints, and cultural resources that may impact the design and placement of planned subsea installations and to advance Chevron's Front-End Engineering Design (FEED) within the Anchor Development Area in Green Canyon (GC) Area, Northern Gulf of Mexico. The study area is located approximately 225 miles south of Baton Rouge, Louisiana, and encompasses Outer Continental Shelf (OCS) Blocks 719-720, 762-764, 806-807, 850-851 and vicinity (Figures 1 and 2).

This assessment is based on the interpretation of three high-resolution Autonomous Underwater Vehicle (AUV) surveys acquired in 2015 (2) and 2017, two AUV 3D micro (AUV3Dm) surveys, two 3D exploration seismic datasets, and geotechnical information from subsurface exploration performed in the area.

This report meets the Bureau of Ocean Energy Management (BOEM) requirements as stipulated in Notice to Lessees (NTLs) Nos. 2008-G05 (Shallow Hazards Program) and 2009-G40 (Deepwater Benthic Communities) (both extended by NTL 2015-N02). An Archaeological Assessment was completed by Fugro (Report No. 02.17031201B-Geophys_Anchor) addressing the high-resolution AUV data collected in 2017 and is included as Appendix B in this report.

1.2 Datasets

1.2.1 AUV High-Resolution Geophysical Data

Three high-resolution geophysical datasets were acquired within the Anchor Development Area: a dataset collected by C & C Technologies, Inc. in 2015 (C&C, 2015), and datasets in 2015 and 2017 collected by Fugro (Fugro, 2015a; Fugro, 2018a). Each survey campaign included MBES bathymetry and backscatter, SSS, and SBP data.

The survey navigation data for the three AUV surveys were collected in World Geodetic System 1984 (WGS84), Lambert Projection, Universal Transverse Mercator Zone 15 (North), grid units in meters. Final deliverables were converted to North American Datum of 1927 (NAD27), Bureau of Land Management Zone 15 (North), grid units in US Feet. For additional geodetic parameters, please refer to Appendix A.

1.2.1.1 <u>2015 C & C AUV Campaign</u>

C & C collected the 2015 AUV data (C & C, 2015) between April 5-13, 2015 aboard the *M/V Miss Ginger* operating the Kongsberg Hugin *C-Surveyor V*™ AUV. The AUV remote-sensing instruments include a Kongsberg EM 2040 Swath Multibeam Sonar (200, 300 or 400 kHz), an EdgeTech Dual Frequency SSS (120/410 kHz), and an EdgeTech DW-106 SBP System (1 to 6 kHz) (C & C, 2015).

The 2015 survey covered OCS blocks GC 762, 763, 806, and 807 (Chart 2). The AUV survey altitude was ~40 m (~131 ft) above the seafloor. The 2015 C & C AUV grid consists forty-nine primary tracklines trending east to west at 200-meter spacing and eleven tie lines trending north to south at 900-meter spacing

(Chart 2). Additional east-west tracklines spaced at 100 meters were surveyed around the western, southwestern, and southern perimeter of the survey site in order to ensure full coverage over areas of heightened bathymetric relief. Shotpoints were recorded at 125 m (410 ft) intervals.

1.2.1.2 2015 FUGRO AUV Campaign

Fugro collected AUV data for the Gator Lake Prospect, Project No. 2415-5092 (Fugro, 2015a), between October 10 to 13, 2015 aboard the *Fugro Enterprise* using the *Echo Surveyor II* (Fugro's Kongsberg Hugin 3000-class AUV). The Kongsberg EM2000 MBES was utilized to collect accurate water depths and was run at an operating frequency of 200 kHz (generating a swath coverage of 150°). The EdgeTech Triple Frequency SSS system simultaneously collected data at 230 kHz and 540 kHz frequencies, and the EdgeTech DW-106 SBP System system collected data within a frequency range of 1–10 kHz.

The 2015 Fugro survey covered OCS block GC 720, the eastern half of GC 719, and minor portions of surrounding blocks (Chart 2). The AUV was maintained at an altitude of approximately 42 meters above the seafloor. The 2015 Fugro AUV grid consists of twenty-five east–west primary tracklines, nominally spaced 200 meters (656 ft) apart, and nine north–south tie lines, nominally spaced 900 meters (2,953 ft) apart. Shotpoints were recorded at 125 m (410 ft) intervals (Chart 2; Fugro; 2015a).

1.2.1.3 2017 FMGI AUV Campaign

Fugro collected AUV data for the Anchor Development Area, between December 11-17, 2017 aboard the *Fugro Enterprise* using the *Echo Surveyor IV* (Fugro's Kongsberg Maritime Hugin 1000-class AUV). The Kongsberg EM2040 MBES was utilized to collect accurate water depths. The EdgeTech 2200 dual-frequency SSS system collected data at 120 kHz and 400 kHz frequencies depending on the AUV's altitude, and the EdgeTech DW-106 SBP System system collected data within a frequency range of 0.5–10.5 kHz depending on the survey area.

Data was collected within the southwest quadrant of GC 719 and northwest quadrant of GC 763 to provide additional coverage for the Anchor Development Area's host facility area. The additional coverage for the host facility area consisted of sixteen primary track lines spaced 150 meters (492 feet) apart and four tie lines spaced 500 meters (1,640 feet) apart. Within the southern portion of GC 807 and the north central portion GC851, investigation lines were run to determine the slope stability. Six primary northwest-southeast track lines spaced were run 175 meters (574 feet) apart and four tie lines at varying spacing were run southwest to northeast. Host facility area coverage and slope stability coverage were collected at an altitude of generally 42 meters above the seafloor (Fugro, 2018a).

Regional tie lines were run in GC 762, GC 763, GC 806, and GC 807 and additional lines were run around Anchor 1, 2, and 4 drill centers. The regional tie lines were run at an altitude of 20 meters above the seafloor and the additional lines around the drill centers were run at an altitude of 42 meters above the seafloor. AUV navigational fixes (shot points) were recorded at 125-meter (410-foot) intervals (Fugro, 2018a).

Micro surveys were performed within the SE and SW cluster areas located in GC763, and the survey grids consisted of primary track lines spaced 4-meters (13.1 feet) apart and tie lines spaced 500 meters

(1,640 feet) apart. Micro 3D surveys were run twice at 10 and 20-meter altitudes with pulse ID settings of 5037 (20 m altitude, 20 ms pulse length) and pulse ID setting 5121 (10 m altitude,10 ms pulse length; Fugro, 2018a). The desired pulse lengths were agreed upon between Chevron and Fugro to have the highest resolution and deepest penetration possible in order to best characterize shallow reflectors and fault offsets. A general 3D micro processing sequence used to generate the depth volumes is shown in Appendix A.

1.2.2 Geohazard and Geotechnical Core Data

The geotechnical field investigation conducted by Fugro within the Anchor Prospect Area occurred between December 11-17, 2017, from the *R/V Fugro Enterprise* AUV (Fugro, 2018a). Details of this program are included in Fugro's field report (2018a). The methodology and primary results related to the cores can be found in Fugro's core logging report (Fugro, 2018g).

1.2.3 Data Provided by Chevron

Chevron provided Fugro with the preliminary anchor pattern, which is current as of February 2, 2018. The line patterns to the central Floating Production Unit (FPU) are present on all the charts and on several figures. This proposed infrastructure is considered notional and final infrastructure locations have not been confirmed.

An IHS Kingdom project was provided to Fugro by Chevron, which included two 3D seismic time datasets to be used for general correlation of seafloor and subsurface features. The 3D seismic datasets were only used as a guide for stratigraphic and structural features and detailed interpretations were not made. Both 3D seismic datasets have seismic inlines oriented east-west with a numerical increment of 1, and a line spacing of 10 meters (32.8 feet). Seismic crosslines are oriented north-south, have a numerical increment of 1, and a line spacing of 12.5 meters (41.1 feet). Every 50th inline and crossline is shown on Chart 1. The 3D seismic datasets are judged to be of adequate quality and resolution to make an assessment of the geologic conditions and potential hazards that may constrain operations within the study area. The 3D seismic datasets exceed current BOEM standards for deepwater shallow hazards identification and reporting. The IHS Kingdom project provided by Chevron also included interpreted horizons from previous assessments conducted within the Anchor Prospect Area.

1.3 Method of Analysis

Large-format, seafloor-related charts accompanying this report are presented at a scale of 1:24,000 and include: AUV Navigation Pre-Plot (Chart 1), AUV Navigation Post-Plot (Chart 2), Seafloor Rendering (Chart 3), Seafloor Water Depth (Chart 4), Seafloor Gradient (Chart 5), AUV MBES Backscatter (Chart 6), AUV SSS Mosaic (Chart 7), Seafloor Features (Chart 8), and Subsurface Geologic Features (Chart 9).

1.4 Project Participants

Mr. Morgan John, Supervising Geoscientist, provided onboard data QC and preliminary interpretation during the 2017 AUV survey acquisition aboard the *M/V Enterprise*. Mr. Mike Kucera, Senior Consultant, carried out the AUV3Dm data processing and provided related technical support. Mrs. Kelly Bates, conducted additional onshore geophysical data interpretation, figure generation, and reporting. Dr. Shane Smith, P.G., Deputy Geoscience Manager, provided technical guidance, project oversight, client coordination, and provided a technical review of the report. GIS Analyst Cedric Noel drafted the final large-format ESRI ArcMap charts.

1.5 Report Format

Following this introductory section, the report contains sections detailing the regional setting, descriptions of the seafloor features and shallow geologic conditions, integrated geologic and geotechnical assessment of foundation zone sediments, geohazard considerations and favorability, conclusions and recommendations. Supporting figures follow the main report text. A discussion of interpretative procedures and software used for this study is found in Appendix A. Appendix B is the Archaeological Assessment for the Anchor Development Area. The equipment specifications, descriptions, boat setback diagram and geophysical logs are included in as separate survey operations reports (C & C, 2015; Fugro, 2015a; Fugro, 2018a). The large-format charts are provided at the end of this report.

1.6 Future work

To follow this report, additional integrated geotechnical studies will be conducted within the Anchor Development Area. For a full list, please refer to the following references (Fugro, 2018c to Fugro, 2018i).

2. REGIONAL GEOLOGIC SETTING

2.1 Physiography, Diapirism, and Faulting

The Anchor Development Area area is located approximately 225 miles southwest of Baton Rouge, offshore south Louisiana (Figure 1). More specifically, the study area is in the west-central region of the Green Canyon Protraction Area, northern Gulf of Mexico (Figure 1) and consists of Blocks GC 719, 720, 762-764, 806-807, 850-851 and vicinity (Figure 2). Seafloor morphology in this part of the Gulf of Mexico is dominated by large diapiric highs consisting of masses of Jurassic salt and Tertiary shale and adjacent basin-like topography (Figure 1).

The Mississippi Fan was deposited during the late Pliocene and Pleistocene on the outer shelf, slope, and deep basin of the eastern Gulf of Mexico during glacial sea level low-stands. The Mississippi Fan is a broad arcuate accumulation of more than seven fan lobes of sediments with a thin Holocene cover (Moore and Woodbury, 1978). The fan is divided into three physiographic units: upper, middle, and lower – each with distinct channel and morphology characteristics. The movement of Jurassic salt has influenced the deposition of these sediments, seafloor morphology, and shallow geology. The result is a complex terrain composed of intraslope basins, valleys, and canyons, intermixed with highly deformed bathymetric rises that characterize the shelf and upper continental slope of the Gulf of Mexico today (Martin, 1976; Martin and Bouma, 1982; Diegel et al., 1995). Deposition rates, diapiric salt movements, faulting, and canyon formation have significantly influenced the stratigraphic and structural character of these sediments. Uplifted salt is present in much of the study area. The southern edge of the study area includes the northern margins of withdrawal basin entitled St. Tammany Basin and the southwestern margins of Handcock Basin located northeastern portion of the Anchor Development Area (Figures 2 and 3).

Tectonics within the northern Gulf of Mexico have greatly influenced the style and amount of faulting within shallow and deep sediments (Diegel et al., 1995). The continued loading by overlying continental shelf-derived sediment has caused underlying salt deposits and shale masses to migrate to areas of lower confining pressure. Salt tongues and downslope movement of salt can cause substantial extension of overlying sediments and subsequent faulting (Tauvers, 1995). Salt uplifts may cause doming of the overlying sediments with little sediment disturbance or may highly deform the overlying strata resulting in un-recognizable bedding on seismic profiles. Large, deep-seated faults related to basin subsidence can be traced for long distances and frequently show evidence of movement concurrent with deposition direction. These faults are termed "growth faults" and exhibit displacement that increases with depth. Seafloor fault scarps may exceed heights of 300 ft on faults produced by salt movement. Continual salt movement may generate slow or intermittent movement along faults within the shallow stratigraphy and at the seafloor. The study area shows a complex history of faulting, with many of the faults located above shallow salt, often rooted in the top or near the salt body.

2.2 Slope Failure and Mass Transport Deposition

Slope failures are common features along the continental slope of the northern Gulf of Mexico. Areas that have been especially prone to slope failure are those where low shear strength sediments were deposited rapidly upon relatively steep slopes. Such steep slopes occur along the flanks of diapiric uplifts, the shelf-margin deltas, and channel forms that have prograded onto the upper continental slope during periods of low sea level. Additional failures may occur along the margins of large canyons generated by massive submarine channels. The resulting mass transport deposits (MTDs) vary greatly in size, thickness, and morphology. The seismic character of these deposits ranges from large-scale tilted, fractured, and displaced bedding to acoustically chaotic reflectors, with highly discontinuous internal reflectors of varying amplitude or even possibly devoid of internal reflectors. MTDs may also show internal, varying localized amplitudes consistent with rafted blocks which commonly create hummocky to irregular seafloor topography. Several authors have described these mass movement features, including Brand et al. (2003), Coleman et al. (1983), Garrison et al. (1977), Sangree et al. (1976), and Woodbury et al. (1973). Within the study area, mass transport deposits and near-surface slope failures are found on the margins of St. Tammany Basin and Handcock Basin directly relating to salt uplift (Figure 3).

2.3 Shallow Gas Accumulations

Faults and salt margins can act as vertical migration pathways for gas and other fluids in the shallow section. Fluids may travel along fault planes to the seafloor or may become entrapped within the sediment column. If upward migration is blocked, the gas may travel laterally along porous bedding planes. Additionally, biogenic methane gas can also accumulate within shallow sediments, although often in lower concentrations than thermogenic gas sourced from deeper reservoirs.

2.4 Expulsion Features, Authigenic Carbonates, Deepwater Benthic Communities, and Gas Hydrates

Venting gases can also react with the interstitial, near-surface pore water in shallow sediments to produce carbon dioxide and bicarbonates (Roberts et al., 1990). Under proper conditions, this reaction catalyses the production of calcium and magnesium carbonates. The result is the generation of cemented, boulder-scale hard-rock outcrops, which can also act as large caps or seals over vented areas. Outcrops of authigenic rock have been recognized in many areas along the upper continental slope in association with diapiric uplifts and seafloor fault scarps. Such outcrops are often imaged on AUV MBES backscatter data and the AUV SSS Mosaic as zones of either high-amplitude or variable high- and low-amplitude returns (Wei-Huu et al., 2007).

Deepwater benthic communities in the Gulf of Mexico may be present where gas vents to the seafloor. These communities may also be associated with gas hydrate accumulations and/or outcrops of authigenic carbonate. Deepwater benthic communities typically include tubeworms, clams, mussels and/or bacterial mats, which appear to use hydrocarbons as an energy source. However, not all gas hydrate accumulations and authigenic carbonate outcrops along the seafloor are associated with deepwater benthic communities. Visual inspections of certain sites using deep diving submersibles have documented a lack of benthic communities in favorable zones (Roberts et al., 1990; Hewitt et al., 2008).

3. DESCRIPTION OF SEAFLOOR AND SHALLOW GEOLOGIC CONDITIONS

Seafloor features within the Anchor Development Area were mapped and analysed using the Seafloor Rendering, Water Depth, Seafloor Gradient, AUV MBES Backscatter, AUV SSS Mosaic, and Seafloor and Subsurface Geologic Features Charts (Charts 3 through 9) as well as review of the AUV SBP data. The AUV MBES Backscatter Chart and AUV SSS Mosaic (Charts 6 and 7) were reviewed for indications of possible seafloor fluid expulsion features, which may include hardground conditions such as possible authigenic carbonates, surficial gas hydrates, and/or deepwater benthic communities. The locations of annotated figures of AUV SBP data examples discussed in this section are shown on Figure 2 and support in the discussion of the seafloor and shallow geologic conditions. Figure 3 is a 3D prospective view showing multiple geohazards identified within in the study area.

3.1 Water Depth and Seafloor Morphology

The seafloor topography in this area is directly related to the depth and complexity of the underlying shallow salt. Seafloor morphology is dominated by highly chaotic and faulted sediments above near-surface salt in the central and northern portions of the study area on the northern flank of St. Tammany Basin to the south, and the southwestern flank of Handcock Basin to the northeast (Figures 2 and 3).

From the AUV and 3D seismic data provided, water depths range from 4,119 ft BSL in the southern portion of block 762 to about 6,725 ft BSL in the northern portion of block GC 849 within St. Tammany Basin, located outside of the Anchor Development Area (Figures 2 and 3; Charts 3 and 4).

The seafloor within the study area generally dips to the south towards St. Tammany Basin with slopes typically less than 6°. However, slope values commonly exceed 30° locally along irregular seafloor topography, mainly at steep headwall scarps and fault scarps (Figure 3; Chart 5).

3.2 Seafloor Features

The Anchor Development Area exhibits a wide range of topographic features on the seafloor. The seafloor features in the study area include: seafloor or near-seafloor normal fault scarps, headscarps, gullies, surface expression of MTDs and shallow debris flows, pockmarks, and hardgrounds (Figures 3 through 10; Chart 8). Descriptions of these seafloor features are contained in the subsections that follows. Several features in the survey area have been described as buried. A seafloor feature that is considered "buried" has at least some hemipelagic drape or layered sediment on top suggesting the feature is not considered active during the Holocene.

3.2.1 Seafloor and Near-Seafloor Faults

The seafloor within the Anchor Development Area appears to be heavily faulted with seafloor and near-seafloor faults with seafloor expression attributed to underlying mobile shallow salt. Faults were assessed based on a combination of high-resolution AUV MBES data, slope angles, and SBP data.

Seafloor fault scarps within the Anchor Development Area range in length from less than 20 ft to over a mile and have apparent seafloor offsets ranging from less than 1 ft to 70 ft with seafloor gradients between less than 1° and 53° (Charts 5 and 8). For classification purposes, the seafloor faults identified within the Anchor

Development Area were separated into two general categories: Seafloor faults (faults that have observable seafloor offset in the nearest SBP line) and seafloor expression of buried faults (faults that have seafloor expression but do not appear to have seafloor offset on the nearest SBP line). The seafloor faults identified are considered potentially active based on their associated seafloor expression, showing narrow bands of steep gradients along their scarps (Charts 5 and 8), and apparent offsets of the near-seafloor drape on the SBP data (Figures 4 and 5).

The seafloor and the near-surface buried faults with seafloor expression identified in the southern portion of GC 719, the northeast portion of GC 762, all of GC 763, and the northern portion of GC 807 display a general trend of north-south or northwest-southeast, dipping in various directions. The seafloor and near-surface faults appear to conform to a northwest-southwest trend along the edges of the headscarps identified in the western portions of GC 762 and GC 806 and in the central portion of GC 720 (Chart 8). Within the northeast portion of GC 762, fault scarps appear in multiple orientations likely due to past movement and the localized changes in shape and dip of the underlying salt.

The current infrastructure proposed by Chevron will traverse multiple fault lines on the seafloor with tubular infrastructure (e.g. flowlines and umbilicals) (Chart 8). Slip rates and additional fault analysis will be addressed in future studies, including a Probabilistic Fault Displacement Study and Integrated Geotechnical Studies (Fugro, 2018c to Fugro, 2018i).

3.2.2 Expulsion Features, Authigenic Carbonates, and Deepwater Benthic Communities

Natural fluid expulsion features (hydrocarbon seepage sites) are often characterized by anomalous seafloor depressions and mounds, such as pockmarks and mud volcanoes, which are readily detected in high-resolution bathymetry and SSS data. Natural hardground areas in the deepwater Gulf of Mexico are generally found with or near seafloor fluid expulsion features. The hardgrounds usually consist of authigenic carbonates, but may also include gas hydrates, asphalt or tar mounds (degraded heavy hydrocarbons), and shells of chemosynthetic organisms (mussel beds). Occasionally, older sediments get exposed at large slump or fault scarps, resulting in relatively harder seabed compared with normal seabed sediments. These various types of hardground features can result in strong acoustic returns in multibeam backscatter and SSS data. Fluid expulsion/hardground areas are also often associated with an acoustic "wipeout" zone beneath the seafloor in SBP data. The wipeout zone results from limited signal penetration caused by attenuation in the hardground (including buried hardground) and/or near-seafloor gas.

Pockmarks and potential hardgrounds were identified within the Anchor Development Area (Chart 8). Most of these expulsion related features within the study area show varying levels of past and potentially active expulsion. Indicators observed within the AUV data for potentially active expulsion features include: 1) high-intensity backscatter and SSS reflectivity indicating hardgrounds of authigenic carbonates and/or gas hydrates at seafloor, and 2) shallow acoustic masking indicative of gaseous sediments, hardgrounds, and/or gas hydrate attenuating the acoustic signal in the SBP data (Figures 6 and 7). Indicators from the 3D seismic data included acoustic voids, anomalous peak over trough amplitudes near the seafloor related to hardgrounds and trough over peak subsurface amplitudes indicative of shallow gas.

3.2.2.1 Pockmarks

Pockmarks are identified in the Anchor Development Area as rounded to irregular features occurring as individual pockmarks and coalesced pockmarks. Higher concentrations of pockmarks occur in the west-central portion of GC 764 and eastern portion of GC 763. Smaller scattered pockmarks are scattered throughout GC 720 and GC 807 (Chart 8). Individual pockmarks are circular to irregular features that measure 10 ft to 580 ft long, 9 ft to 230 ft wide, and up to 15 ft deep. Large pockmark zones (with coalesced or clusters of individual pockmarks) can be up to 1,010 ft long and 900 ft wide.

The pockmarks identified within the Anchor Development Area are associated with significant backscatter intensity, SSS reflectivity signatures, and acoustic masking in the SBP data. These pockmarks are interpreted to be potential authigenic carbonates and/or gas hydrates indicative of possible active expulsion and a potential for deepwater high-density benthic communities (Figure 6; Chart 8). These pockmarks also displayed subsurface acoustic voids and trough over peak amplitudes within the 3D seismic data (Figure 6).

From the current infrastructure provided from Chevron as of February 2, 2018, a proposed export gas riser and umbilical comes within 250 ft of a small concentration of pockmarks in GC 763 indicative of possible active expulsion and has a potential for deepwater high-density benthic communities (Chart 8).

3.2.2.2 Hardgrounds

Areas of potential hardgrounds with no associated pockmarks were identified in the south-central portion of GC 764, the north-central portion of GC 806, and scattered throughout GC 720 (Chart 8). These features appear to have high-intensity returns on the SSS and MBES backscatter records (Figure 7; Charts 6 and 7).

The hardgrounds identified in GC 764 and GC 806 are located near the vicinity of seafloor headscarps and localized seafloor uplift and do not appear to have acoustic masking in the nearest SBP records (Figure 7). These hardgrounds do not exhibit signs of recent activity in the SBP data and may be related to localized unconsolidated slump deposits or sediment changes rather than possible active expulsion features.

The scattered elongated hardgrounds identified in GC 720 are located in the proximity to seafloor and near-surface faults and are associated with linear, high-intensity backscatter and SSS reflectivity along some fault scarps (Charts 6, 7, and 8). These faults may act as vertical fluid migration pathways to the seafloor and to be potential authigenic carbonates and/or gas hydrates indicative of possible active expulsion and a potential for deepwater high-density benthic communities.

From the current infrastructure provided from Chevron, an export gas riser and an umbilical comes within 250 ft of a small concentration of hardgrounds with affiliated acoustic voids and pockmarks in GC 763, indicative of possible active expulsion and a potential for deepwater high-density benthic communities (Chart 8).

3.2.3 Buried Headwall Scarps and Seafloor MTDs

Prominent headwall scarps are identified in south and western portions of the Anchor Development Area outlining the rim of St. Tammany Basin in GC 762, GC 806, and GC 807, and Handcock Basin in GC 720 and GC 764. These arcuate-shaped features are interpreted to be the catastrophic result of gradual sediment oversteepening due to shallow salt movement. The headscarps identified on the rim of St. Tammany Basin generally trend northwest to southeast in GC 806 and east to west in GC 807, with sediment failure/flow to the south (Figure 8; Chart 8). The headscarps identified on the rim of Handcock Basin generally trends northwest to southeast with sediment failure/flow to the east, located directly outside the Anchor Development Area boundary (Chart 8). Displacements across the mapped headscarps approaches 1,400 feet in some areas (Figure 3). A thin layer of hemipelagic drape is interpreted to cover the headscarps identified, indicating relative stability in the recent past (Figure 8). However, extremely steep gradients may pose engineering constraints.

Seafloor MTDs associated with the seafloor slope failure events were mapped along the steep slopes of the rim of St. Tammany and Handcock Basin. These features are characterized by lobes of chaotically-bedded sediment that fan out downslope and laterally from the source of the disturbance. Increased seafloor backscatter intensity and discontinuous subsurface reflectors were noted in the AUV dataset over these areas (Charts 6 and 7). These MTDs range in length from 1,000 ft to 3,200 ft and in width from 200 ft to 850 ft.

An anthropogenic MTD is located along a drag scar associated with the Amos Runner (semi-submersible drilling rig) in the southwestern quadrant of GC 720 (Figure 9; Chart 8). This sediment failure is about 1,000 ft long and 300 ft wide. Direction of the debris flow is to the northeast. The origin of the debris flow is thought to be bottom-disturbing activity associated with anchors being dragged by the Amos Runner and will be further addressed in Section 3.2.6 (Fugro, 2015b).

The current infrastructure provided by Chevron will not intersect any headwall scarps or seafloor MTDs (Chart 8).

3.2.4 Surface Expression of Shallow Slide Deposits and MTDs

The surface expression of shallow slide deposits and near-surface MTDs is evident along multiple headwall scarps and near localized seafloor uplifts throughout the study area (Chart 8). MTDs and shallow slide deposits result from gravity-driven movement of large amounts of material that is deposited downslope. Through past instability in the Anchor Development Area, multiple MTD events have occurred along the same headwall creating a stacked surface expression (Figures 8 and 10; Chart 9). MTDs identified on the SBP data within the Anchor Development Area are considered to be buried, with the anthropogenic MTD in the western portion of GC 806 being the lone exception.

The northwest and northeast mooring lines from the current infrastructure provided by Chevron as of February 2, 2018 are located in the vicinity the shallow slide deposits influenced from localized uplifts (Chart 9); however, these lines should not come into contact with the shallow slide deposits.

3.2.5 Gullies

Gullies are identified on the seafloor on the steep flanks of St. Tammany Basin and Handcock Basin in the western portion of GC 806, southwestern portion of GC 762, and in GC 720 (Figure 3; Chart 8). These erosional features range from approximately 20 to 300 feet in width, are about 350 to 4,500 feet in length, and are incised up to 50 feet deeper than the surrounding seafloor. Seafloor gullies are interpreted to represent major turbidity flow/sediment transport pathways along the flanks of a basin and into local bathymetric lows of the surrounding areas. A layer of hemipelagic clay was not resolved over all of the seafloor gullies mapped within the study area, indicating active (or at least intermittent) sediment and brine transport. It is possible that a thin layer of unresolvable clay exists over these features, which would indicate recent inactivity. Seafloor gullies are displayed on Chart 8 with arrows indicating the interpreted sediment/fluid transport directions. The current infrastructure provided by Chevron will not intersect any gullies (Chart 8).

3.2.6 Man-Made Conditions

Within the Anchor Development Area, four wells (Anchor 1 to 4 in GC 806 and 807) are present (Charts 1 through 8). Drill cuttings and drilling mud splayed around the Anchor 1 and 2 wells in GC 806 is observed as high returns on the backscatter data and on the SSS mosaic (Figure 9; Charts 7 and 8). One active 20-inch gas pipeline operated by Discovery is located in the southern portion of the Development Project running southwest to northeast in GC 850 and 851. According to Fugro's internal GIS database, there is no additional existing infrastructure within the development area.

A prominent northwest–southeast trending drag scar was mapped in the multibeam bathymetry and SSS data in the northeastern portion of the Anchor Development Area in GC 719 and GC 720 (Figures 9 and 10; Chart 8). The drag scar is associated with a large semi-submersible drilling rig (the Amos Runner). The Amos Runner was originally located in GC 955 and was subsequently dislodged from its original location during Hurricane Ike in September of 2008 (Fugro, 2015b). The storm carried the Amos Runner through the Anchor Development Area, possibly dragging anchors. An anthropogenic debris flow derived from the drag scar is identified in the southwestern portion of GC 720 and trends northwest (Figure 9). The identified drag scar and resulting debris flow should not constrain development activities.

Two east to west trending marine debris cables are identified in the southern portion of the Anchor Development Area in the central portion of GC 806 and GC 807 (Figure 9; Chart 8) and are faintly observed on the SSS data. These cables are marine debris potentially from a past hurricane.

Two previous archaeology assessments have been conducted for the C & C 2015 and Fugro 2015 AUV datasets (GEMS, 2015; Fugro, 2015b) and an additional assessment has been conducted for the AUV data collected in 2017 (Appendix B). No seafloor outcrops or potential archaeological avoidance sites are identified on the seafloor within the Anchor Development Area. The study area does not pass through any known dumping areas (BOEM, 2010). No cores were, nor will be attempted within 500-feet of a known pipeline, cable, well, or surface facility.

3.3 Shallow Stratigraphy and Geologic Features

This section of the report discusses the shallow stratigraphy and subsurface geologic conditions that could potentially affect development operations within the Anchor Development Area. Interpretation of lithology and subsurface conditions were reviewed down to the penetration depth of the SBP data - approximately 130 ft to 350 ft below mud line (BML). All depths are approximate and were derived using a constant sediment velocity of 4,917 ft/sec.

3.3.1 Shallow Stratigraphy

In general, the SBP data in the study area display a series of conformable reflectors locally with buried MTDs. The main horizon identified; Horizon 01 (H01), is a high-amplitude continuous reflector that occurs throughout the development area (Figures 4 through 9). This reflector has been identified as the possible Triplet originally identified by Brand et al (2003). The Triplet has been dated between 23,000 yrs BP and 19,000 yrs BP.

Figure 11 is an isopach (sediment thickness) chart from the seafloor to the top of Horizon 01, which ranges from 0 ft (near headscarps) to 20 ft BML across the development area.

Sediment between the seafloor and Horizon 01 is generally composed of parallel bedded, low- to high-amplitude reflectors spaced at varied intervals. This unit is inferred to represent hemipelagic drape interbedded with silty turbidites that were deposited during fluctuating sea level conditions that occurred during late Pleistocene transition and early Holocene, between low stand and high stand environments. More accurate age dates concerning the sediments between the seafloor and Horizon 01 will follow in subsequent age dating studies (Fugro, 2018g) obtained within the geohazard cores collected within the development area. The sediments between Horizon 01 and the SBP limit are generally interpreted to be well layered sediments with localized MTDs above a regional buried MTD at the base of the SBP limit. Sediments between H01 and the SBP limit are interpreted to consist of interbedded hemipelagic drape and silty turbidites and locally interbedded with MTDs.

3.3.2 Buried Mass Transport Deposits

Numerous buried mass transport deposits are found throughout the study area. The buried MTDs were identified in the AUV SBP data as discontinuous reflector packages typically with a slightly weaker acoustic response compared to the surrounding parallel laminated sediments (Figures 8 and 10). MTD events were identified according to their relative stratigraphic position and multiple MTDs may occur throughout the study area within an individual event. Multiple MTD events along steep, shallowly buried headwall scarps are common throughout the area (Figures 8 and 10). The subtle acoustic response in the SBP that is not too dissimilar to surrounding sediment and proximity to headwall scarps near the flanks of St. Tammany Basin and Handcock Basin indicates that most MTDs are locally derived. The MTDs identified could potentially extend further than identified, especially in the northern portion of GC 850, however, they are only mapped in the limits of the high resolution data.

MTD deposits denoted as MTD 1 have been deposited above H01 and are found near the flanks of St. Tammany Basin (Chart 9). MTD 1 is identified above the Triplet and is potentially less than ~19,000 years old and may be Holocene in age. MTD 2 to MTD 5 are identified below the Horizon 01 and are interpreted as Pleistocene in age. The depth ranges for to the top of all identified buried MTDs BML are found in Table 3-1 and are observed in Figures 8 and 10 and on Chart 9.

Table 3.1. Depths to Top of Buried MTDs

Mass Transport Event	Depth to Top (ft BML)
Buried Mass Transport Deposit 1	0 ft to 12 ft
Buried Mass Transport Deposit 2	2 ft to 43 ft
Buried Mass Transport Deposit 3	14 ft to 116 ft
Buried Mass Transport Deposit 4	24 ft to 80 ft
Buried Mass Transport Deposit 5	60 ft to 119 ft

3.3.3 Buried Faults

The Anchor Development Area is heavily faulted with seafloor and near-seafloor buried faults attributed to underlying mobile shallow salt and mapped on Charts 8 and 9. Faults were assessed based on a combination of high-resolution AUV MBES data, slope angles, and SBP data. It is important to note that some faults may not be detectable within the limits of resolution of the data and therefore, faults may exist in areas of planned development.

Within the two AUV3D study areas in GC 763, buried faults were mapped within the limits of the subbottom data (Figures 12 and 13; Chart 9). The faults trend approximately northwest-southeast in the southeastern GC 763 AUV3D area and mainly dip towards the southwest (Figure 12). Depths to the top of the faults in the southeastern GC 763 AUV3D area range from approximately 3 ft to over 30 ft BML (Figure 12). Within the southwestern GC 763 AUV3D area, the faults trend approximately north-south and primarily dip towards the east (Figure 13). Depths to the top of the faults in the southwestern GC 763 AUV3D area range from less than 1 ft to over 39 ft BML (Figure 13).

As stated in section 3.2.1, additional fault analysis will be addressed in future studies, including a Probabilistic Fault Displacement Study and Integrated Geotechnical Studies (Fugro, 2018c to Fugro, 2018f).

3.3.4 Gas Signature

Acoustic masking observed in the SBP data and has associated shallow acoustic voids in the 3D seismic is interpreted as possible shallow gas is identified on Chart 9 within the Anchor Development Area. Figure 6 displays an example of acoustic masking in the SBP data and also displays subsurface acoustic voids and trough over peak amplitudes within the 3D seismic data. These potential gaseous areas occur at or very near the seafloor and are generally associated with faulting, pockmarks, and potential hardgrounds.

3.3.5 Shallow Salt

A dynamic shallow salt body is located throughout the Anchor Development Area and is the major controlling mechanism of depositional processes, faulting, and seafloor geomorphology in the region. The top of salt was reviewed with the 3D seismic data provided by Chevron. Top of salt above 350 ft BML is presented on Chart 9.

4. CONCLUSIONS AND RECOMMENDATIONS

No seafloor outcrops or potential archaeological avoidance sites are identified on the seafloor within the Anchor Development Area.Seafloor and near-seafloor geologic conditions in the study area appear generally favorable for field development depending on desired seafloor infrastructure, and provided potential hazards and constraints are avoided or mitigated by the development design program.

Seafloor faults and near-surface faults are the main features identified within the development area and traversing fault lines on the seafloor with tubular infrastructure (e.g. flowlines and umbilicals) is unavoidable. Detailed investigations required to site piles to avoid fault intersection where possible, including fault slip rates and additional fault analysis will be addressed in future studies (Fugro, 2018c to Fugro, 2018i). Avoidance may not be possible in some cases, and faults will be geotechnically and geologically characterized in these cases.

In GC 763, a proposed export gas riser and umbilical comes within 250 ft of a small concentration of pockmarks and hardgrounds indicative of shallow gas. Areas identified as hardground and have associated pockmarks/and or acoustic voids may support deepwater benthic communities and should be avoided or inspected by ROV or AUV camera prior to any seafloor disturbance. High-density deepwater benthic communities should be no closer than 2,000 ft from mud and cuttings discharge locations and no closer than 250 ft from seafloor disturbances (BOEM, 2009, extended by BOEM, 2015).

Buried MTDs were identified throughout the survey area. Buried MTDs are not considered hazardous to the installation of a pipeline, however, areas with multiple buried MTDs should be considered for the possibility of future occurrences. Slope stability assessments are recommended prior to the selection of the final pipeline route. Shallow buried MTDs (~0 ft to 20 ft BML) should be taken into consideration prior to the design the installation of mudmats and all buried MTDs should be considered for the installation of anchors. buried MTDs may have variable geotechnical properties.

It is recommended that an ROV be used to inspect the seafloor at proposed infrastructure locations to confirm no seafloor obstruction have been added since the AUV surveys were completed.

5. REFERENCES

Brand, J.R., Lanier, D.L., Angell, M.M., Hanson, K., Lee, E., and George, R.A., 2003, Indirect methods of dating seafloor activity: geology, regional stratigraphic markers, and seafloor current processes: Proceedings, Offshore Technology Conference, 5-8 May 2003, OTC 15200.

Bureau of Ocean Energy Management, 2009, "Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases in the 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.

Bureau of Ocean Energy Management, 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), Gulf of Mexico OCS Region, "Revision to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports", United States Department of the Interior, Gulf of Mexico, NTL 2011-JOINT-G01.

Bureau of Ocean Energy Management, 2015, "Notice to Lessees and Operators (NTL) of Federal Oil and Gas Leases in the Outer Continental Shelf (OSC), "Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance", United States Department of the Interior, Gulf of Mexico, NTL 2015-N02.

C & C Technologies, Inc., 2015, AUV Archarological Hazard Site Survey, Green Canyon Area (C&C Project No. 14181)

Coleman, J.M., Prior, D.B., and Lindsay, J.F., 1983, Deltaic Influences on Shelf Edge Instability Process: SEPM Special Publication Number 33, p. 121 137.

Diegel, F.A., J.F. Karlo, D.C. Schuster, R.C. Shoup, and P.R. Tauvers, 1995, Cenozoic structural evolution and tectono-stratigraphic framework of the northern Gulf coast continental margin.

Fugro GeoServices, Inc. (Fugro), 2015a, Operations Report, Gator Lake Prospect, Green Canyon Area, Gulf of Mexico: Report No. 2415-5092

Fugro GeoServices, Inc. (Fugro), 2015b, Shallow Geohazards Archaeological Assessment, Gator Lake Prospect, Green Canyon Area, Gulf of Mexico: Report No. 2415-5092

Fugro, 2018a, Interim Geophysical Survey Field Operations Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201A-Ops_Anchor

Fugro, 2018b, Interim Geophysical Interpretative Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201B-Geophys_Anchor, this report

Fugro, 2018c, Volume I, Interim Geotechnical Field Operations Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C Vol_I_Anchor, in preparation

Fugro, 2018d, Volume IIa, Interim Geotechnical Engineering and Design Parameter Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIa_Anchor, in preparation

Fugro, 2018e, Volume IIb, Interim Presentation and Interpretation of Specialized (Advanced Static and Cyclic Laboratory Test Data Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIb_Anchor, in preparation

Fugro, 2018f, Volume IIc, Interim Soil Parameters for PSI Assesssment, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIc_Anchor, in preparation

Fugro, 2018g, Interim Geohazard Core Logging Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201D_Geohaz_Anchor, in preparation

Fugro, 2018h, Interim Probabilistic Fault Displacement Hazard Analysis, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201E-PFDHA_Anchor, in preparation

Fugro, 2018i, Interim Integrated Site Characterization Report, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201F_Int_AnchorHewitt, A.T., Smith, J.L, Weiland, R., 2008, AUV and ROV data integration to identify environmentally sensitive biological communities in deepwater: Proceedings, Offshore Technology Conference, Houston, Paper Number 19358.

GEMS, 2015, Anchor AUV Survey Area, Archaeological Assessment, Blocks 762–763 and 806–807, Green Canyon Area (GEMS Project No. 0515-2530c

Garrison, L.E., Tatum, T.E., Booth, J.S., and Casby, S.M., 1977, Geologic Hazards of the Upper Continental Slope of the Gulf of Mexico: Proceedings, Ninth Offshore Technology Conference, Houston, vol. 1, p. 51 58.

Hewitt, A.T., Smith, J.L, Weiland, R., 2008. AUV and ROV data integration to identify environmentally sensitive biological communities in deepwater: Proceedings, Offshore Technology Conference, Houston, Paper Number 19358.

Martin, R.G., 1976, Geologic Framework of Northern and Eastern Continental Margins, Gulf of Mexico: Beyond the Shelfbreak, American Association of Petroleum Geologists Short Course, New Orleans, Louisiana, vol. 2, p. A1 A28.

Martin, R.G., and Bouma, A. H., 1982, Active Diapirism and Slope Steepening, Northern Gulf of Mexico Continental Slope: Marine Geotechnology, vol. 5, no. 1, p. 63-91.

Moore, G., and Woodbury, H., 1978, Mississippi Fan Morphology, Sedimentation History, Petroleum Potential, In Offshore Technology Conference.

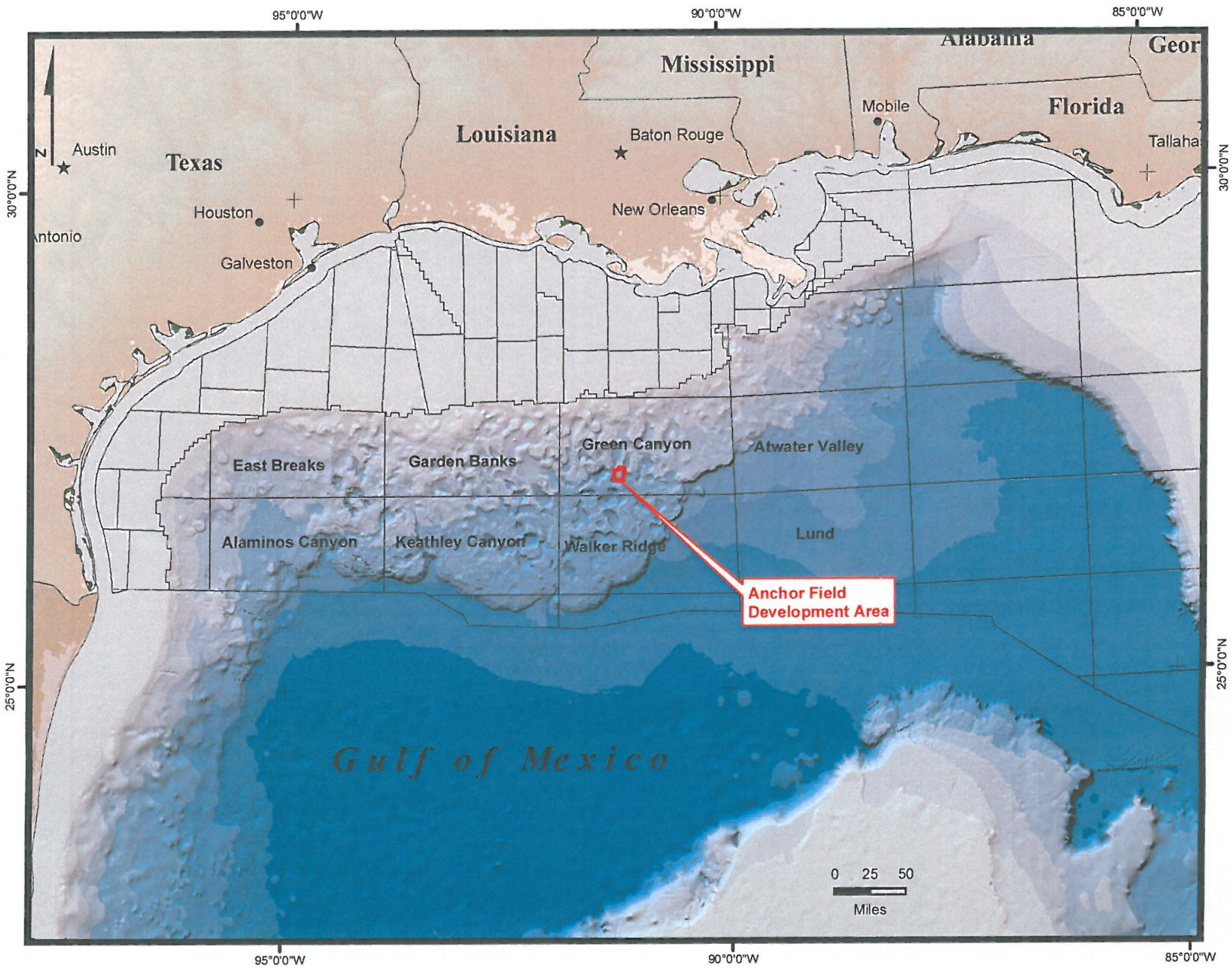
Roberts, H.H., P. Aharn, J. Carney, J. Larkin, and R. Sassen, 1990, Seafloor responses to hydrocarbon seeps, Texas Continental Slope: Geo Marine Letters, v. 10, p. 232-243.

Sangree, J.B., Waylett, D.C., Frazier, D.E., Amery, G.B. and Fennessy, W.J., 1976, Recognition of Continental Slope Seismic Facies, Offshore Texas Louisiana: Beyond the Shelfbreak, American Association of Petroleum Geologists Short Course, New Orleans, Louisiana, vol. 2, p. F1 F54.

Tauvers, P.R., 1995, Salt geometry and kinematics, Texas, Louisiana lower slope, northwest Gulf of Mexico, Salt sediment and hydrocarbons. Gulf Coast Section Soc. Econ. Paleontol. Min Foundation 16th. Ann. Conf. 1995.

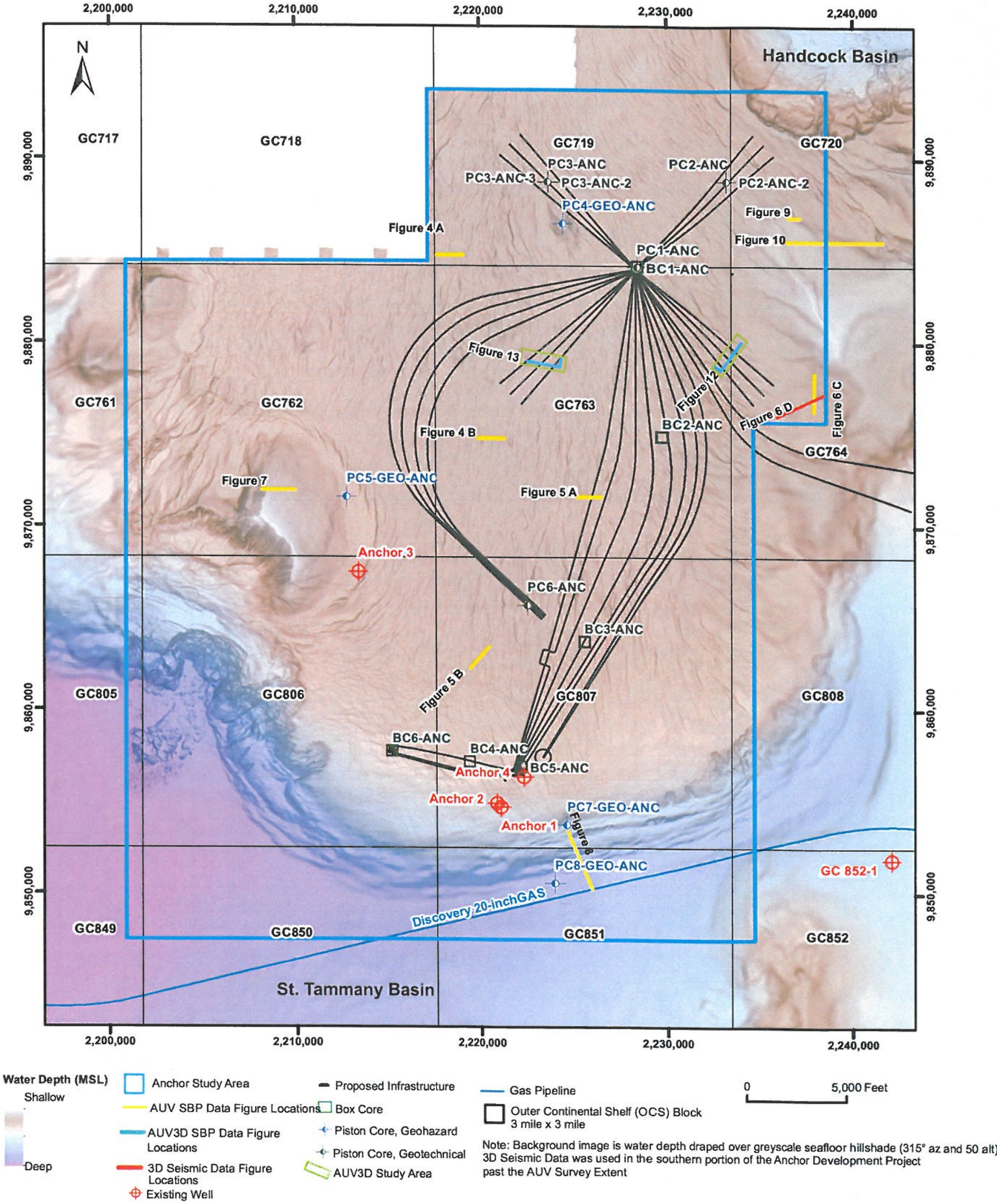
Wei-Huu Kou, W., M.A. Smith, A. Ahmd, and R. Kuzela, 2007, Direct seismic indicators of gas hydrates in the Walker Ridge and Atwater Valley areas, deepwater Gulf of Mexico: The Leading Edge, vol. 26, no. 2, p. 152-155.

Woodbury, H.O., Murray, I.B., Jr., Pickford, P.J., and Akers, W.H., 1973, Pliocene and Pleistocene Depocenters, Outer Continental Shelf, Louisiana and Texas: American Association of Petroleum Geologists Bulletin, vol. 69, no. 1, p. 77 91.



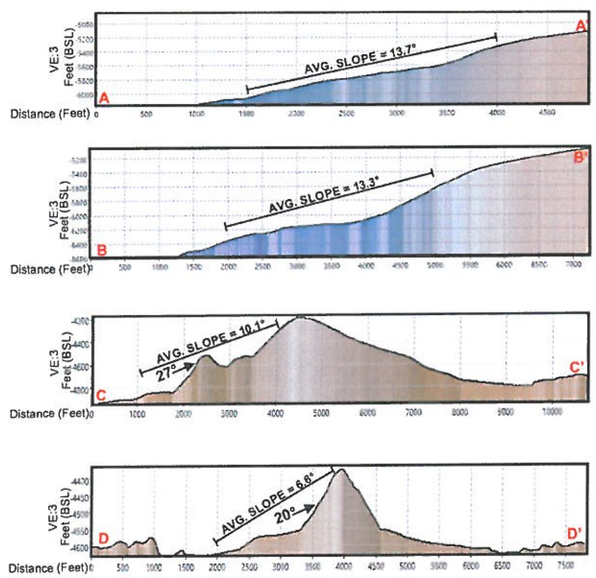
LOCATION MAP

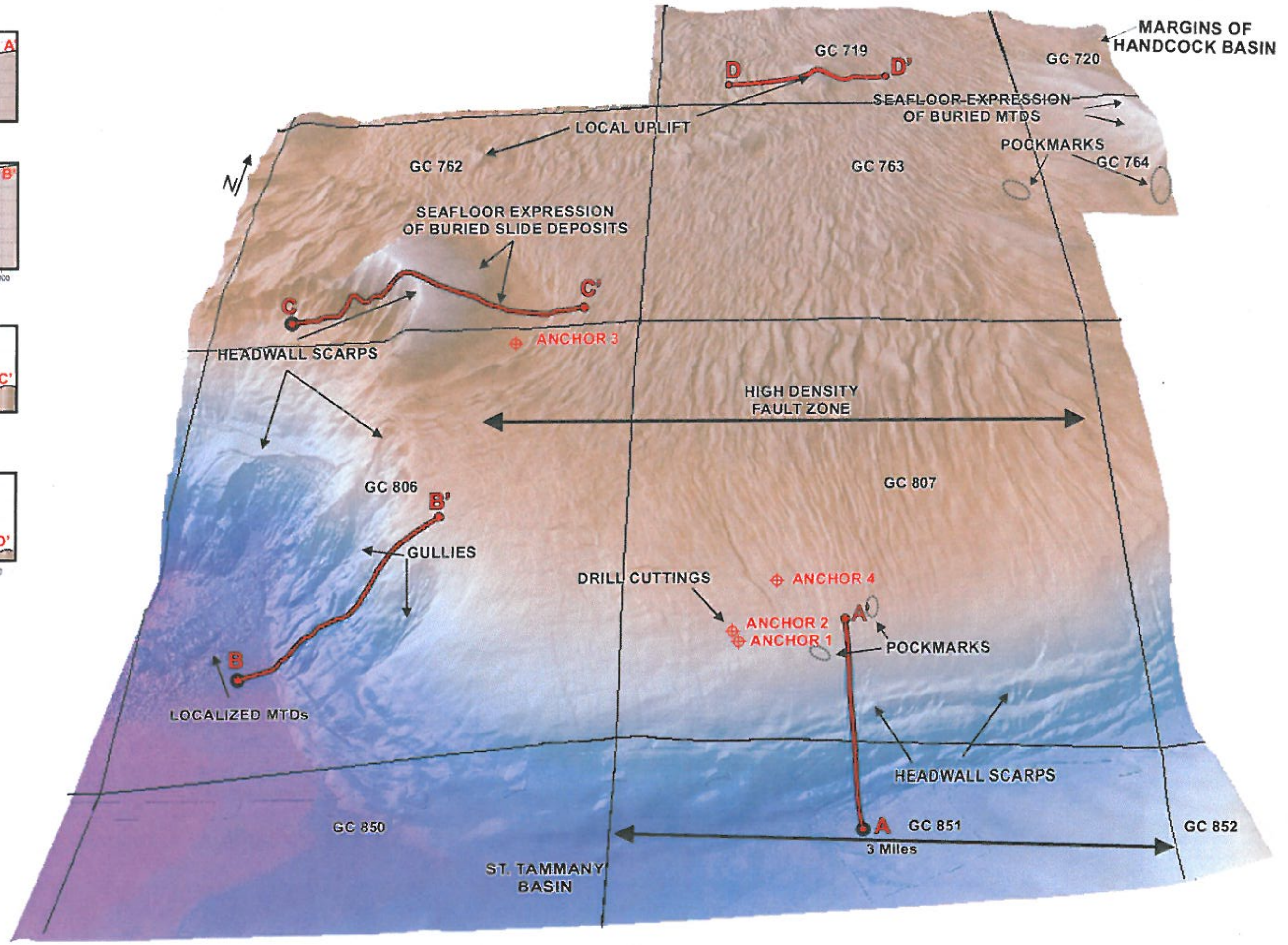
Figure 1



PLAN VIEW OF SEAFLOOR WATER DEPTH DRAPED OVER GREYSCALE HILLSHADE SHOWING AUV SUBBOTTOM PROFILER FIGURE LOCATIONS

Figure 2





Water Depth

- Shallow: 4,132 ft
- Deep: 6,725 ft

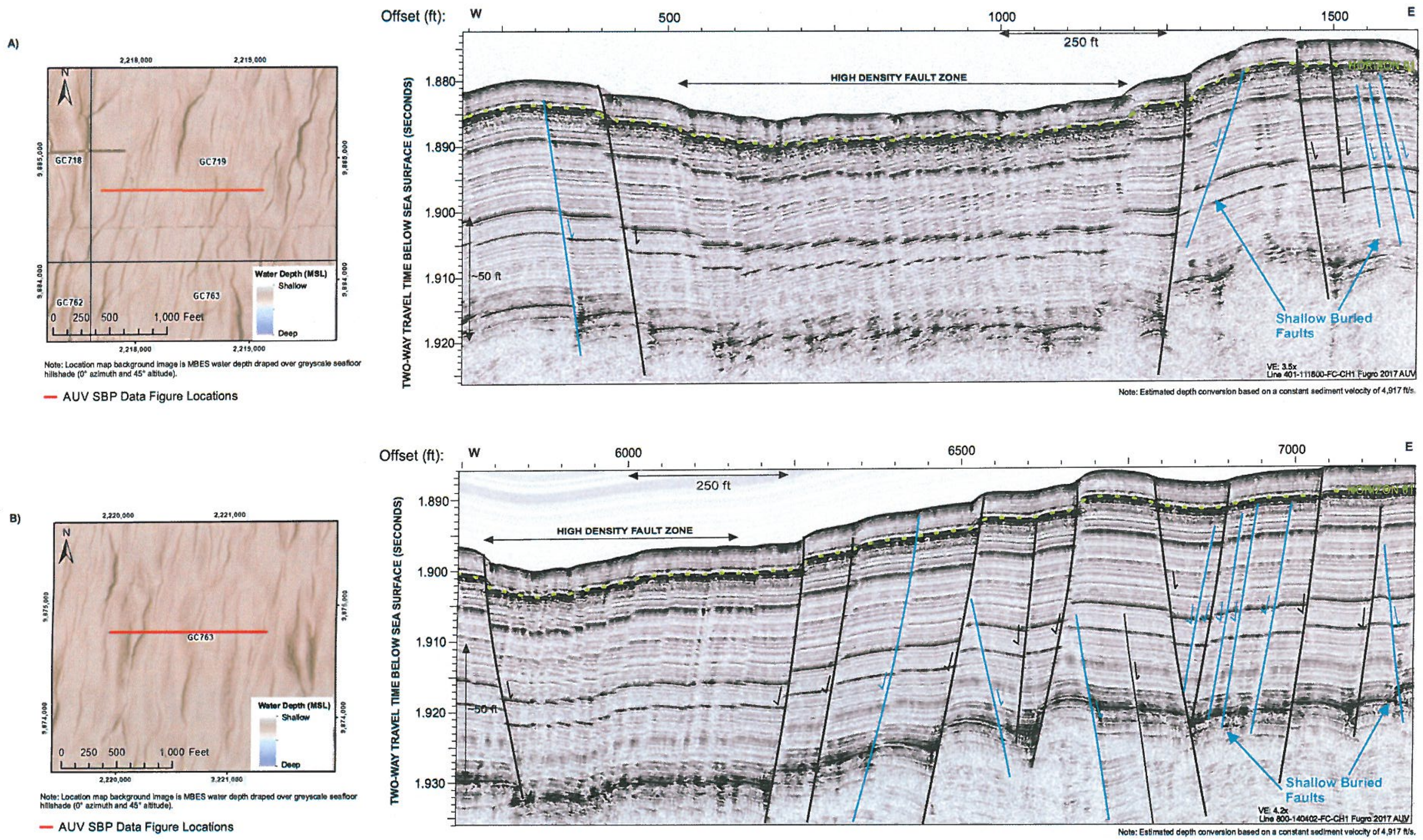
Outer Continental Shelf (OCS) Block 3 mile x 3 mile

Existing Well

NOTES:
1. Perspective image is based on the final water depths
2. Image Parameters: Illumination azimuth: 270°, Illumination Inclination: 70°, Vertical scale factor: 3x.
3. Horizontal scale varies with perspective.

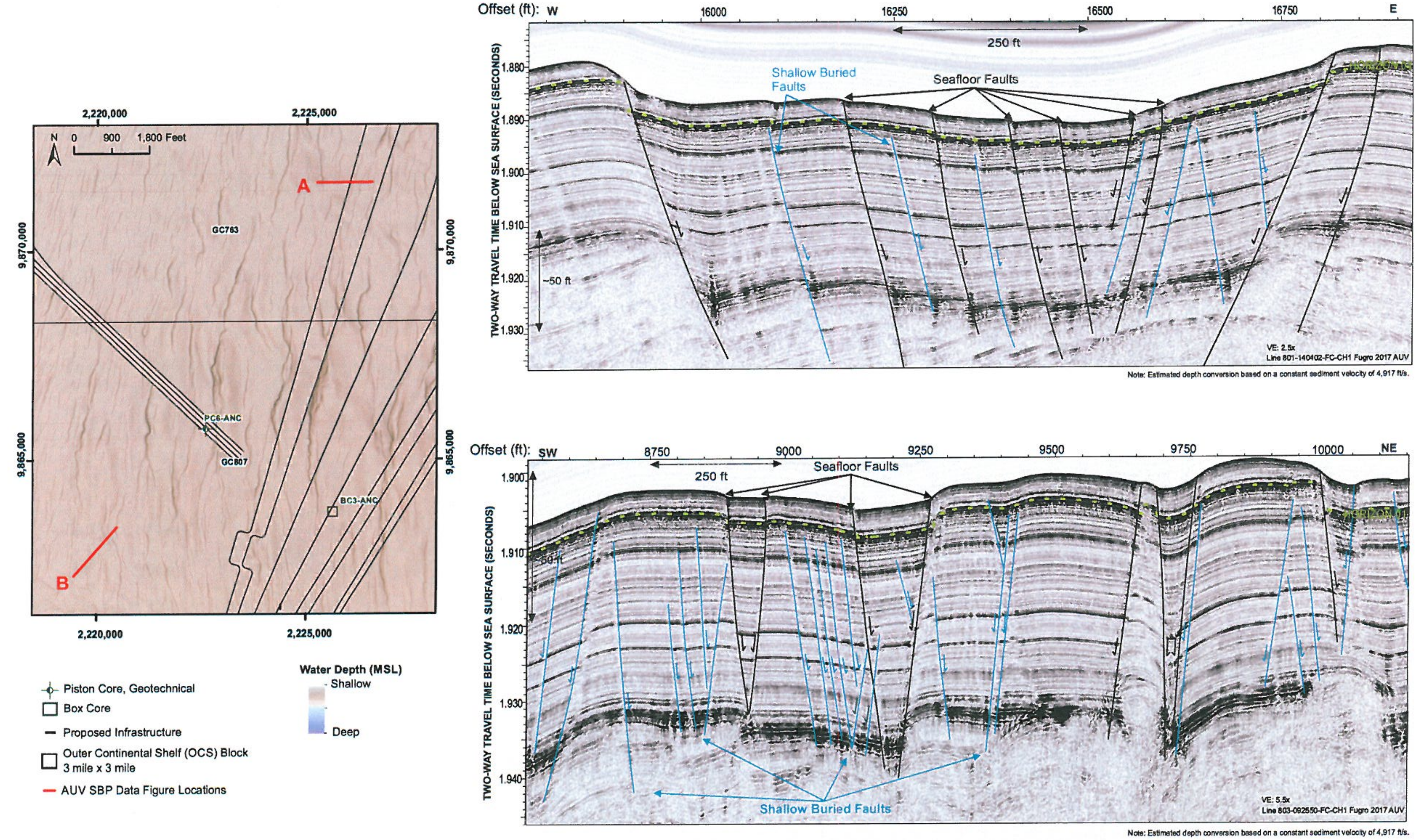
3D PERSPECTIVE VIEW OF SEAFLOOR RENDERING FROM AUV MBES AND 3D SEISMIC DATA SHOWING ANNOTATED SEAFLOOR FEATURES AND VERTICAL PROFILES

Figure 3



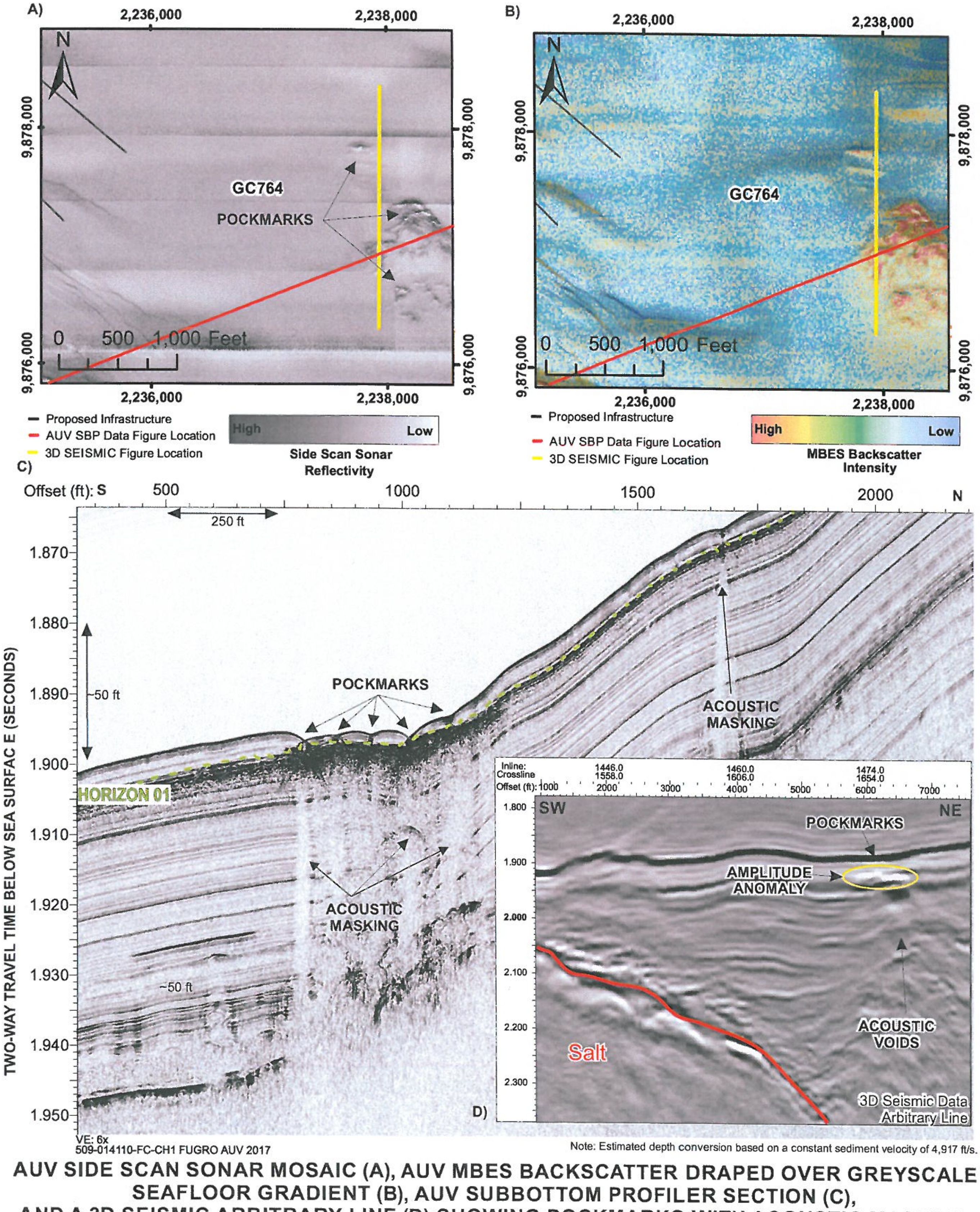
LOCATION MAP AND AUV SUBBOTTOM PROFILER SECTIONS SHOWING EXAMPLES OF HIGH DENSITY FAULT ZONES

Figure 4



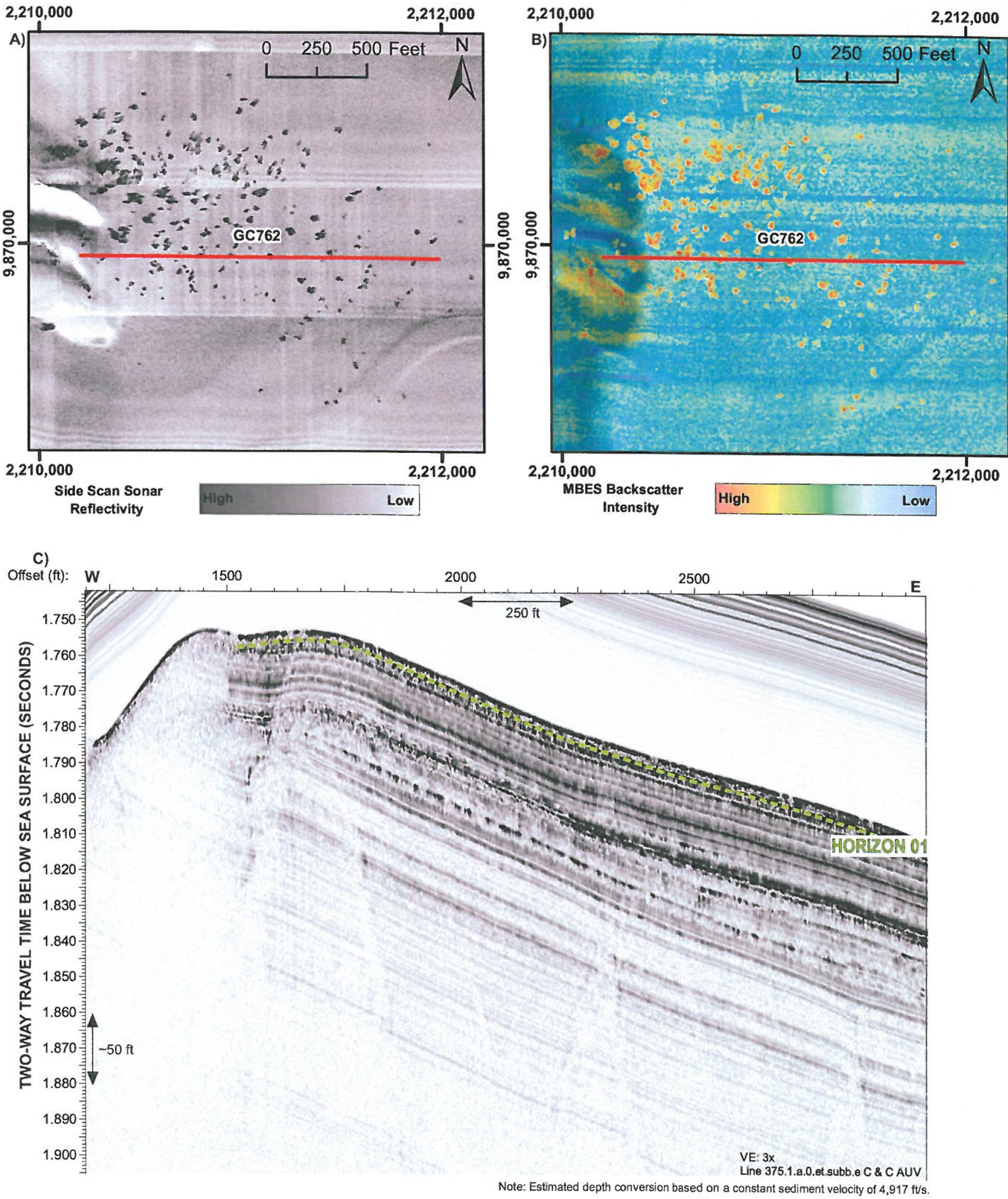
LOCATION MAP AND AUV SUBBOTTOM PROFILER SECTIONS SHOWING EXAMPLES OF SEAFLOOR AND SUBSURFACE FAULTS

Figure 5

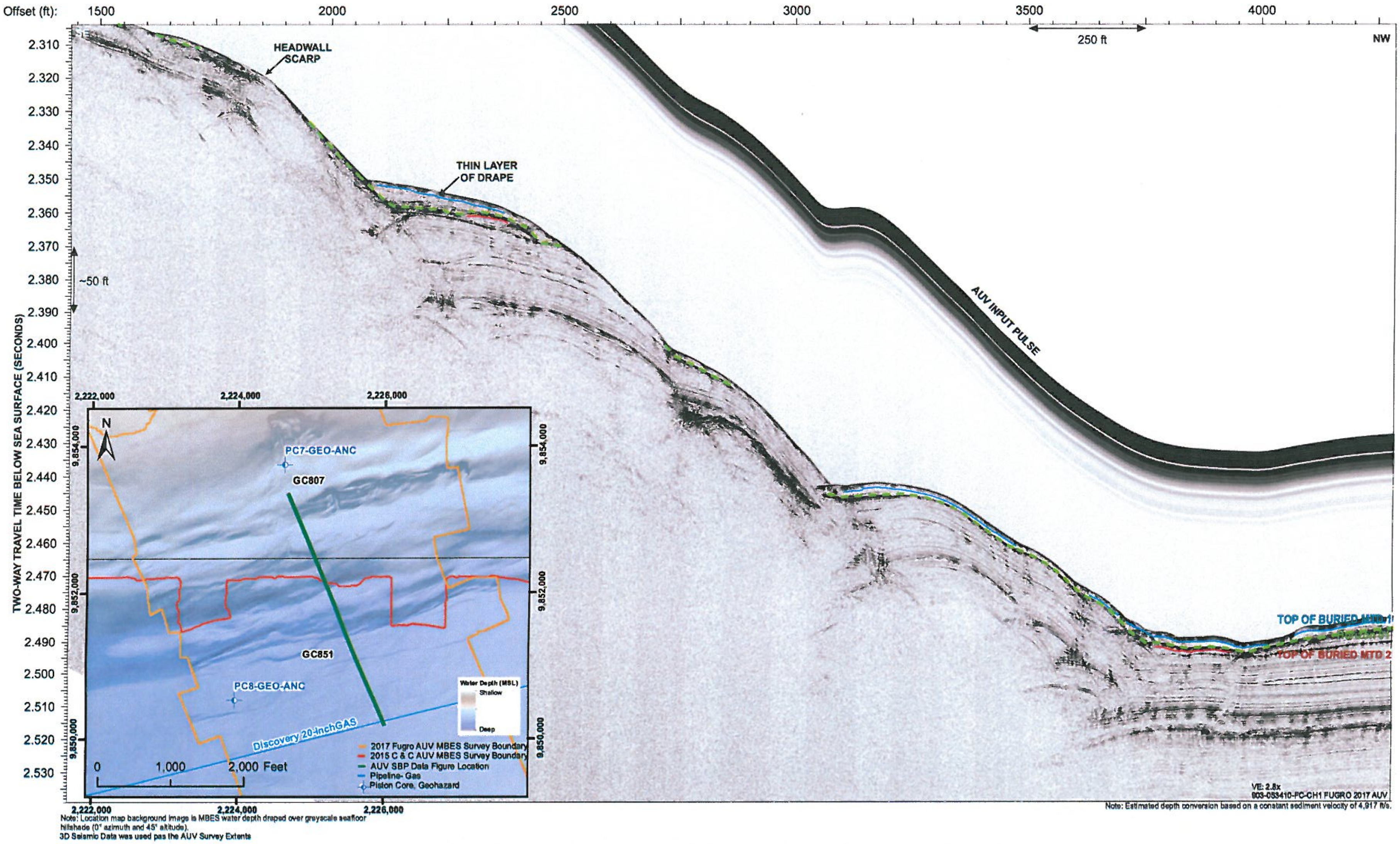


Note: Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

AUV SIDE SCAN SONAR MOSAIC (A), AUV MBES BACKSCATTER DRAPED OVER GREYSCALE SEAFLOOR GRADIENT (B), AUV SUBBOTTOM PROFILER SECTION (C), AND A 3D SEISMIC ARBITRARY LINE (D) SHOWING POCKMARKS WITH ACOUSTIC MASKING

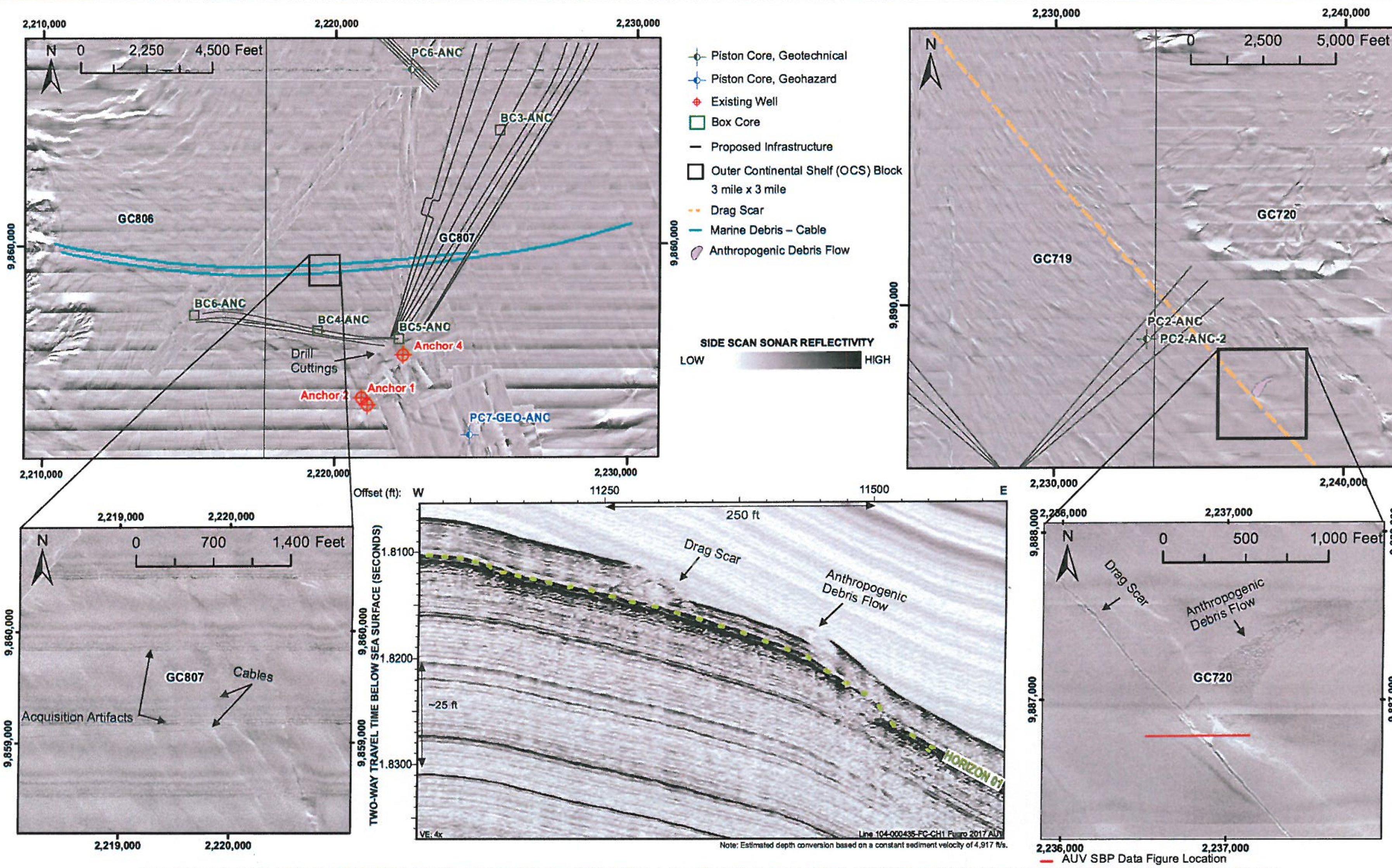


AUV SIDE SCAN SONAR MOSAIC (A), AUV MBES BACKSCATTER DRAPED OVER GREYSCALE SEAFLOOR GRADIENT (B), AND AUV SUBBOTTOM PROFILER SECTION (C) SHOWING HARDGROUNDS



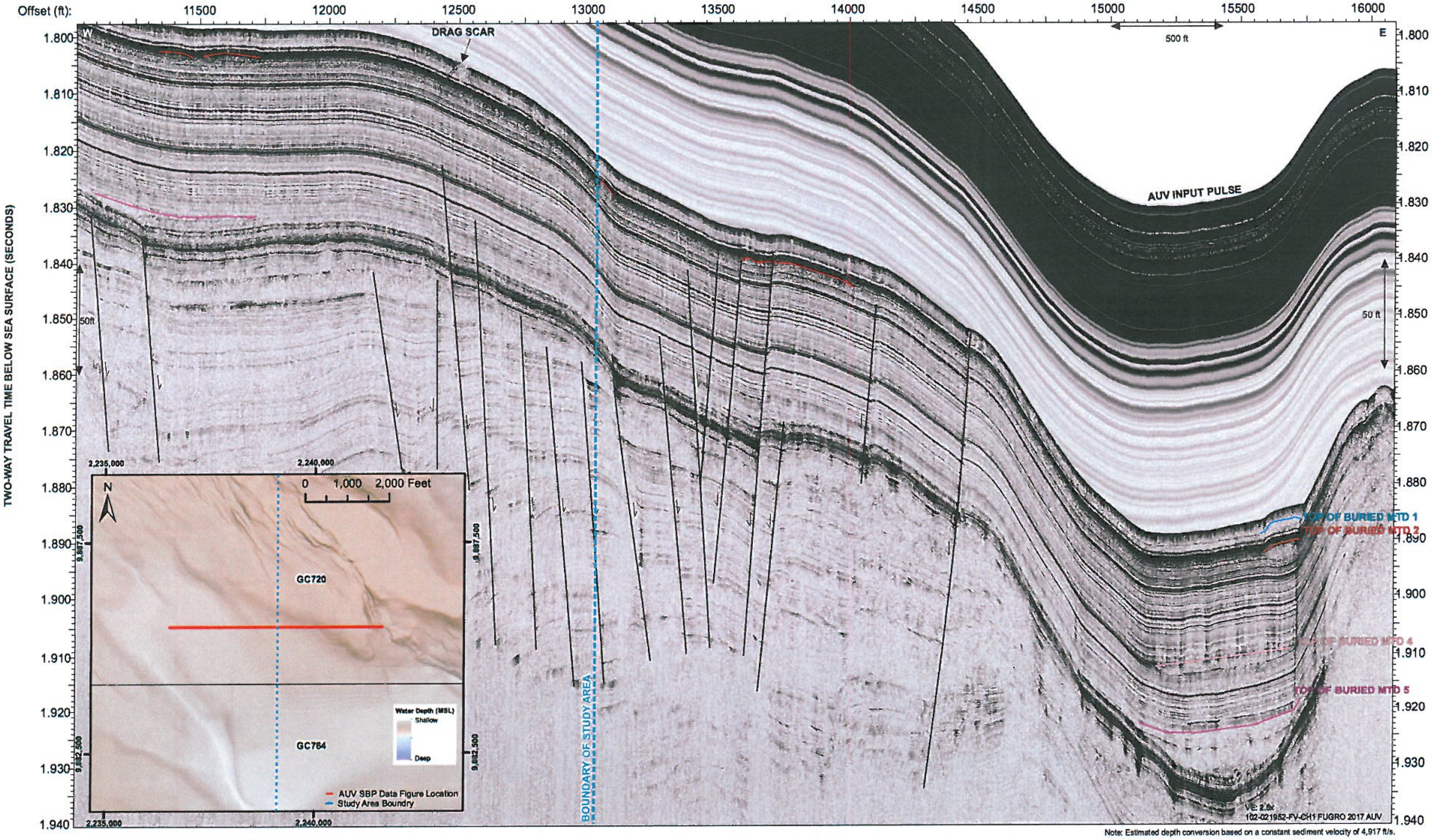
AUV SUBBOTTOM PROFILER SECTION SHOWING HEADWALL SCARP WITH BURIED MTDS

Figure 8



SSS MOSAIC AND AUV SUBBOTTOM PROFILER SECTION DISPLAYING A SEAFLOOR DRAG SCAR, MARINE DEBRIS AND AN ANTHROPOGENIC DEBRIS FLOW

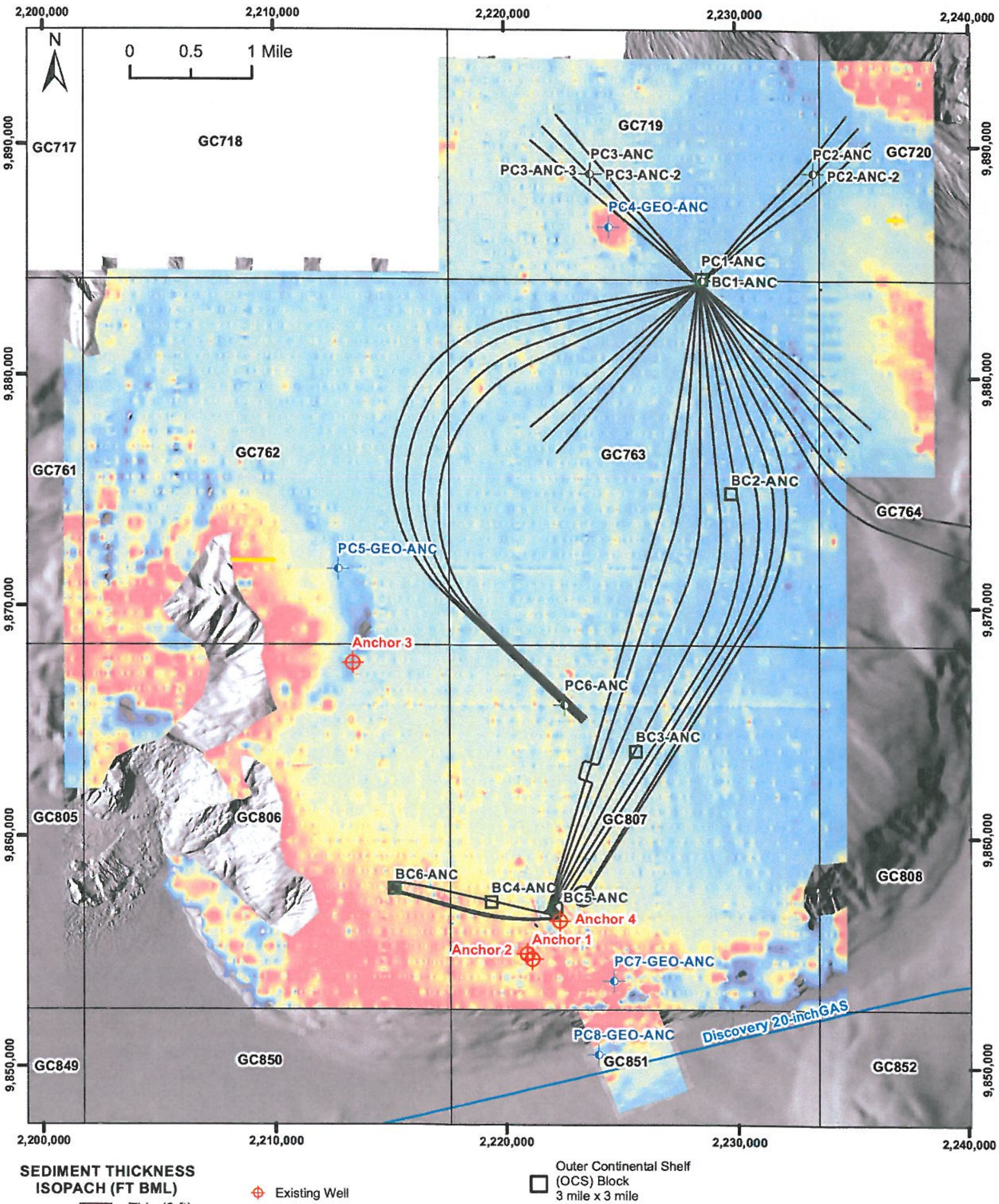
Figure 9



Note: Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

AUV SUBBOTTOM PROFILER SECTION SHOWING BURIED MTDS, FAULT SCARPS

Figure 10



Notes:
-Background image is greyscale seafloor hillshade (0° azimuth and 45° altitude).

Thicknesses are approximate. Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

SEDIMENT THICKNESS ISOPACH SEAFLOOR TO HORIZON 1

4. CONCLUSIONS AND RECOMMENDATIONS

No seafloor outcrops or potential archaeological avoidance sites are identified on the seafloor within the Anchor Development Area.Seafloor and near-seafloor geologic conditions in the study area appear generally favorable for field development depending on desired seafloor infrastructure, and provided potential hazards and constraints are avoided or mitigated by the development design program.

Seafloor faults and near-surface faults are the main features identified within the development area and traversing fault lines on the seafloor with tubular infrastructure (e.g. flowlines and umbilicals) is unavoidable. Detailed investigations required to site piles to avoid fault intersection where possible, including fault slip rates and additional fault analysis will be addressed in future studies (Fugro, 2018c to Fugro, 2018i). Avoidance may not be possible in some cases, and faults will be geotechnically and geologically characterized in these cases.

In GC 763, a proposed export gas riser and umbilical comes within 250 ft of a small concentration of pockmarks and hardgrounds indicative of shallow gas. Areas identified as hardground and have associated pockmarks/and or acoustic voids may support deepwater benthic communities and should be avoided or inspected by ROV or AUV camera prior to any seafloor disturbance. High-density deepwater benthic communities should be no closer than 2,000 ft from mud and cuttings discharge locations and no closer than 250 ft from seafloor disturbances (BOEM, 2009, extended by BOEM, 2015).

Buried MTDs were identified throughout the survey area. Buried MTDs are not considered hazardous to the installation of a pipeline, however, areas with multiple buried MTDs should be considered for the possibility of future occurrences. Slope stability assessments are recommended prior to the selection of the final pipeline route. Shallow buried MTDs (~0 ft to 20 ft BML) should be taken into consideration prior to the design the installation of mudmats and all buried MTDs should be considered for the installation of anchors. buried MTDs may have variable geotechnical properties.

It is recommended that an ROV be used to inspect the seafloor at proposed infrastructure locations to confirm no seafloor obstruction have been added since the AUV surveys were completed.

5. REFERENCES

Brand, J.R., Lanier, D.L., Angell, M.M., Hanson, K., Lee, E., and George, R.A., 2003, Indirect methods of dating seafloor activity: geology, regional stratigraphic markers, and seafloor current processes: Proceedings, Offshore Technology Conference, 5-8 May 2003, OTC 15200.

Bureau of Ocean Energy Management, 2009, "Notice to Lessees and Operators of Federal Oil, Gas, and Sulphur Leases in the 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.

Bureau of Ocean Energy Management, 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), Gulf of Mexico OCS Region, "Revision to the List of OCS Lease Blocks Requiring Archaeological Resource Surveys and Reports", United States Department of the Interior, Gulf of Mexico, NTL 2011-JOINT-G01.

Bureau of Ocean Energy Management, 2015, "Notice to Lessees and Operators (NTL) of Federal Oil and Gas Leases in the Outer Continental Shelf (OSC), "Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance", United States Department of the Interior, Gulf of Mexico, NTL 2015-N02.

C & C Technologies, Inc., 2015, AUV Archarological Hazard Site Survey, Green Canyon Area (C&C Project No. 14181)

Coleman, J.M., Prior, D.B., and Lindsay, J.F., 1983, Deltaic Influences on Shelf Edge Instability Process: SEPM Special Publication Number 33, p. 121 137.

Diegel, F.A., J.F. Karlo, D.C. Schuster, R.C. Shoup, and P.R. Tauvers, 1995, Cenozoic structural evolution and tectono-stratigraphic framework of the northern Gulf coast continental margin.

Fugro GeoServices, Inc. (Fugro), 2015a, Operations Report, Gator Lake Prospect, Green Canyon Area, Gulf of Mexico: Report No. 2415-5092

Fugro GeoServices, Inc. (Fugro), 2015b, Shallow Geohazards Archaeological Assessment, Gator Lake Prospect, Green Canyon Area, Gulf of Mexico: Report No. 2415-5092

Fugro, 2018a, Interim Geophysical Survey Field Operations Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201A-Ops_Anchor

Fugro, 2018b, Interim Geophysical Interpretative Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201B-Geophys_Anchor, this report

Fugro, 2018c, Volume I, Interim Geotechnical Field Operations Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C Vol_I_Anchor, in preparation

Fugro, 2018d, Volume IIa, Interim Geotechnical Engineering and Design Parameter Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIa_Anchor, in preparation

Fugro, 2018e, Volume IIb, Interim Presentation and Interpretation of Specialized (Advanced Static and Cyclic Laboratory Test Data Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIb_Anchor, in preparation

Fugro, 2018f, Volume IIc, Interim Soil Parameters for PSI Assesssment, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201C-Vol_IIc_Anchor, in preparation

Fugro, 2018g, Interim Geohazard Core Logging Report, Anchor Project, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201D_Geohaz_Anchor, in preparation

Fugro, 2018h, Interim Probabilistic Fault Displacement Hazard Analysis, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201E-PFDHA_Anchor, in preparation

Fugro, 2018i, Interim Integrated Site Characterization Report, Gulf of Mexico, OCS Blocks GC 719, 762-764, 806-807, & 851, Fugro Document NO. 02.17031201F_Int_AnchorHewitt, A.T., Smith, J.L, Weiland, R., 2008, AUV and ROV data integration to identify environmentally sensitive biological communities in deepwater: Proceedings, Offshore Technology Conference, Houston, Paper Number 19358.

GEMS, 2015, Anchor AUV Survey Area, Archaeological Assessment, Blocks 762–763 and 806–807, Green Canyon Area (GEMS Project No. 0515-2530c

Garrison, L.E., Tatum, T.E., Booth, J.S., and Casby, S.M., 1977, Geologic Hazards of the Upper Continental Slope of the Gulf of Mexico: Proceedings, Ninth Offshore Technology Conference, Houston, vol. 1, p. 51 58.

Hewitt, A.T., Smith, J.L, Weiland, R., 2008. AUV and ROV data integration to identify environmentally sensitive biological communities in deepwater: Proceedings, Offshore Technology Conference, Houston, Paper Number 19358.

Martin, R.G., 1976, Geologic Framework of Northern and Eastern Continental Margins, Gulf of Mexico: Beyond the Shelfbreak, American Association of Petroleum Geologists Short Course, New Orleans, Louisiana, vol. 2, p. A1 A28.

Martin, R.G., and Bouma, A. H., 1982, Active Diapirism and Slope Steepening, Northern Gulf of Mexico Continental Slope: Marine Geotechnology, vol. 5, no. 1, p. 63-91.

Moore, G., and Woodbury, H., 1978, Mississippi Fan Morphology, Sedimentation History, Petroleum Potential, In Offshore Technology Conference.

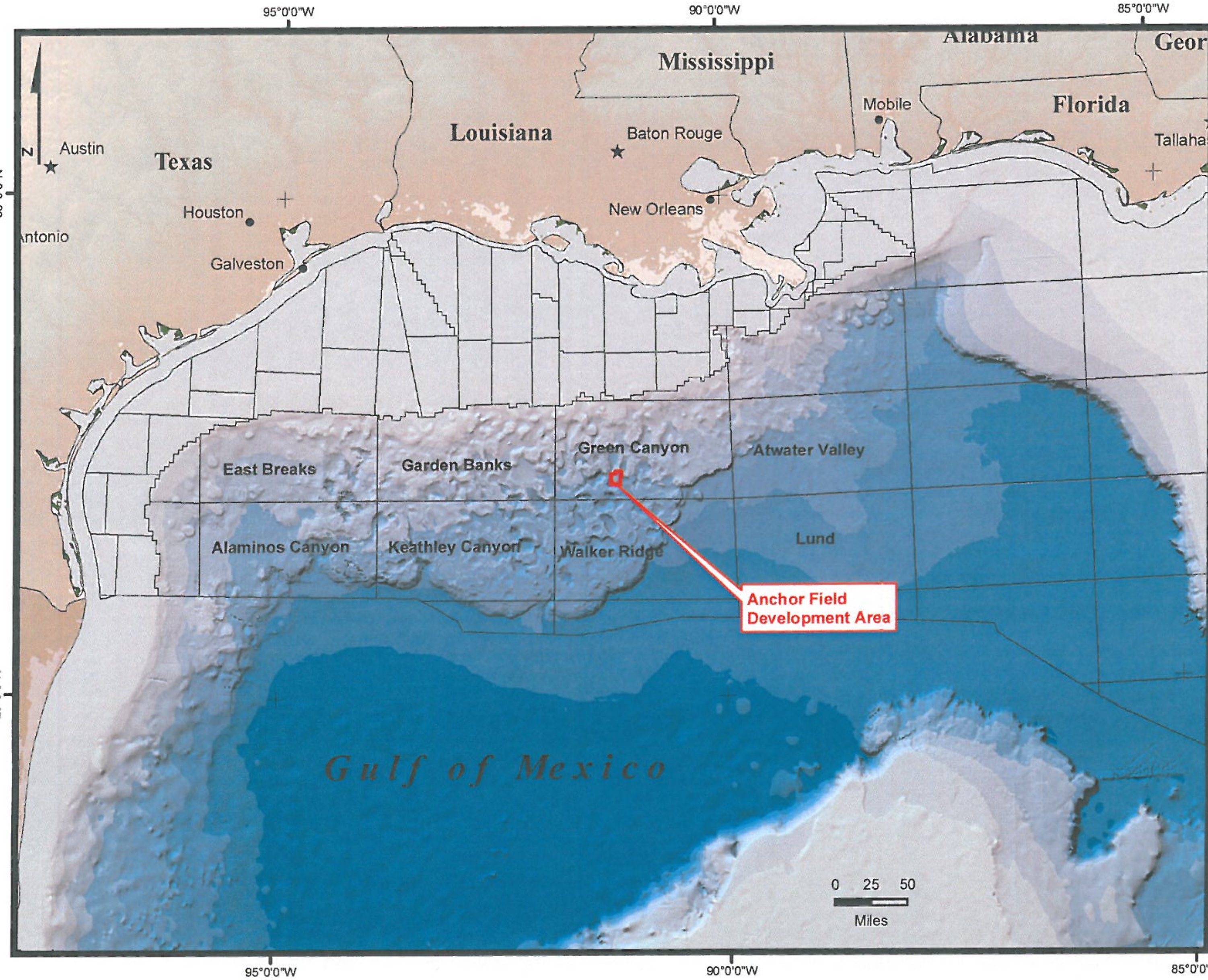
Roberts, H.H., P. Aharn, J. Carney, J. Larkin, and R. Sassen, 1990, Seafloor responses to hydrocarbon seeps, Texas Continental Slope: Geo Marine Letters, v. 10, p. 232-243.

Sangree, J.B., Waylett, D.C., Frazier, D.E., Amery, G.B. and Fennessy, W.J., 1976, Recognition of Continental Slope Seismic Facies, Offshore Texas Louisiana: Beyond the Shelfbreak, American Association of Petroleum Geologists Short Course, New Orleans, Louisiana, vol. 2, p. F1 F54.

Tauvers, P.R., 1995, Salt geometry and kinematics, Texas, Louisiana lower slope, northwest Gulf of Mexico, Salt sediment and hydrocarbons. Gulf Coast Section Soc. Econ. Paleontol. Min Foundation 16th. Ann. Conf. 1995.

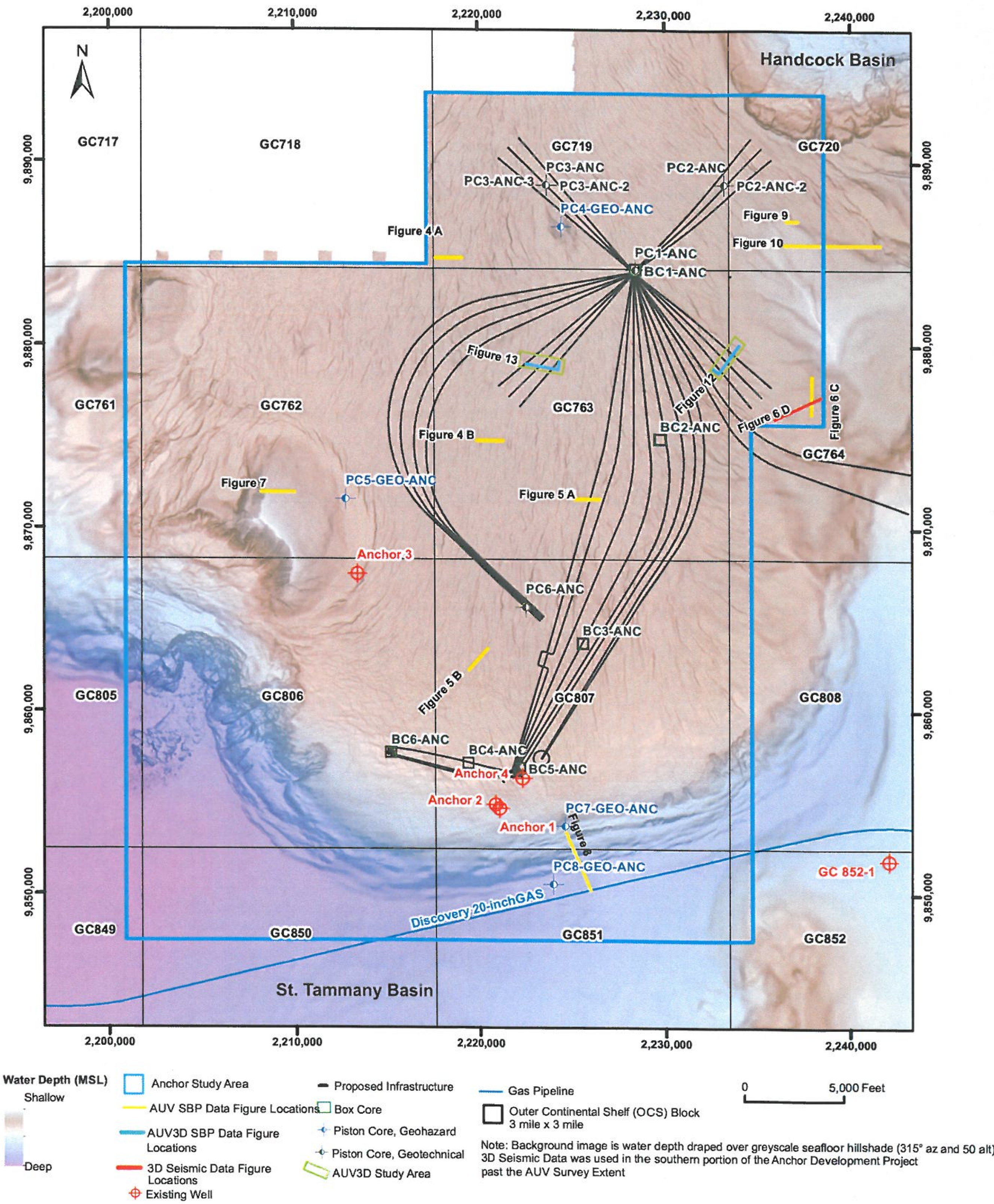
Wei-Huu Kou, W., M.A. Smith, A. Ahmd, and R. Kuzela, 2007, Direct seismic indicators of gas hydrates in the Walker Ridge and Atwater Valley areas, deepwater Gulf of Mexico: The Leading Edge, vol. 26, no. 2, p. 152-155.

Woodbury, H.O., Murray, I.B., Jr., Pickford, P.J., and Akers, W.H., 1973, Pliocene and Pleistocene Depocenters, Outer Continental Shelf, Louisiana and Texas: American Association of Petroleum Geologists Bulletin, vol. 69, no. 1, p. 77 91.

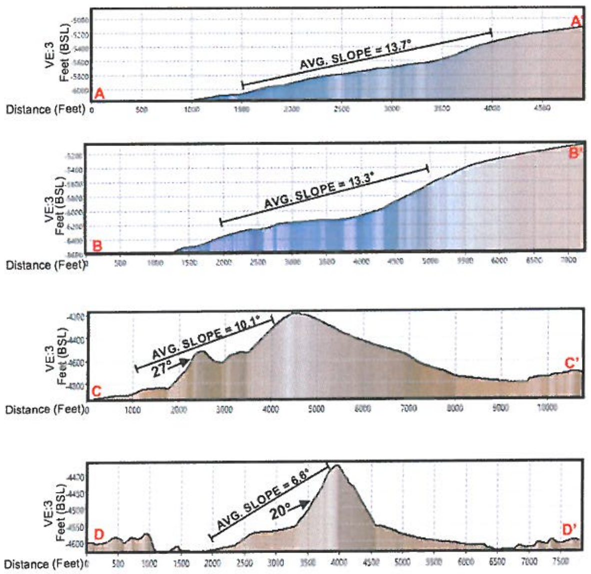


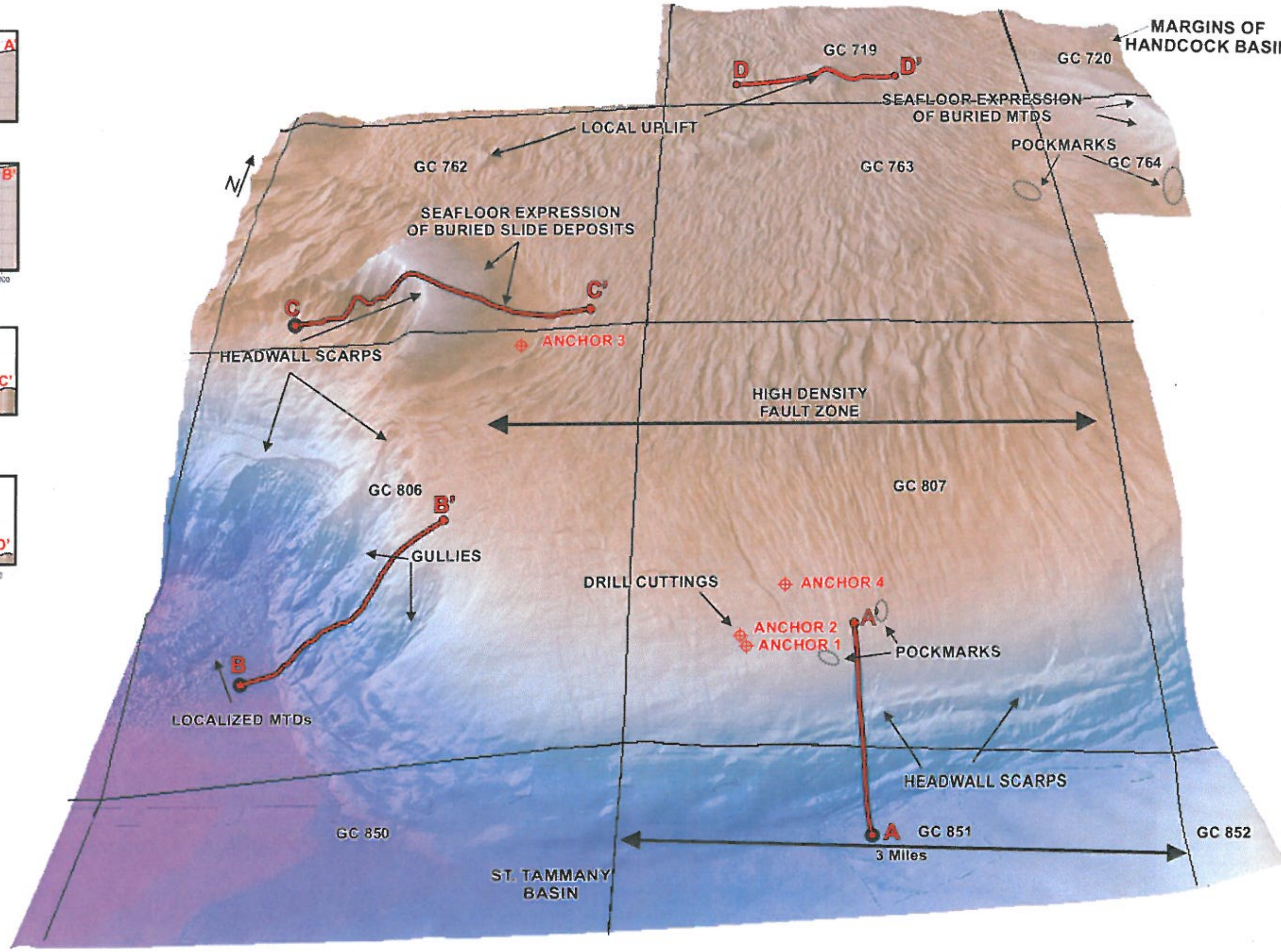
LOCATION MAP

Figure 1



PLAN VIEW OF SEAFLOOR WATER DEPTH DRAPED OVER GREYSCALE HILLSHADE SHOWING AUV SUBBOTTOM PROFILER FIGURE LOCATIONS





Water Depth

- Shallow: 4,132 ft
- Deep: 6,725 ft

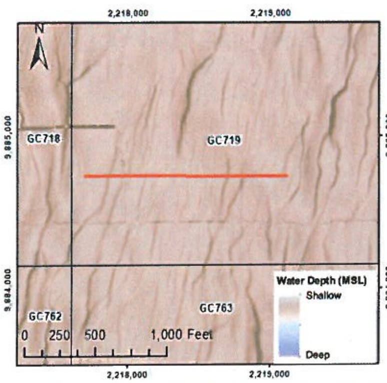
Outer Continental Shelf (OCS) Block 3 mile x 3 mile

Existing Well

NOTES:
1. Perspective image is based on the final water depths
2. Image Parameters: Illumination azimuth: 270°, Illumination Inclination: 70°, Vertical scale factor: 3x.
3. Horizontal scale varies with perspective.

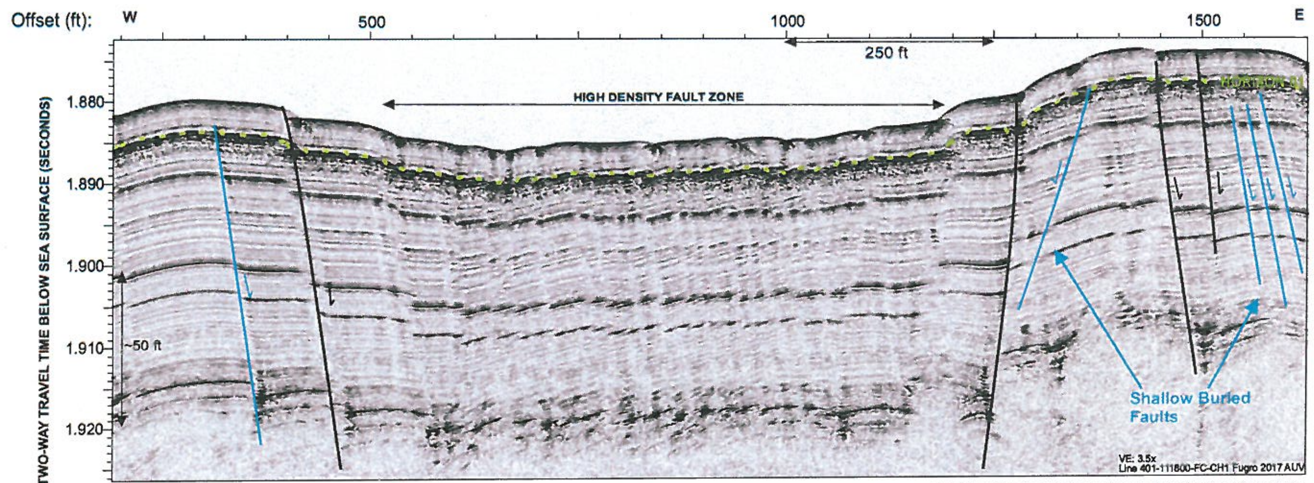
3D PERSPECTIVE VIEW OF SEAFLOOR RENDERING FROM AUV MBES AND 3D SEISMIC DATA SHOWING ANNOTATED SEAFLOOR FEATURES AND VERTICAL PROFILES

A)



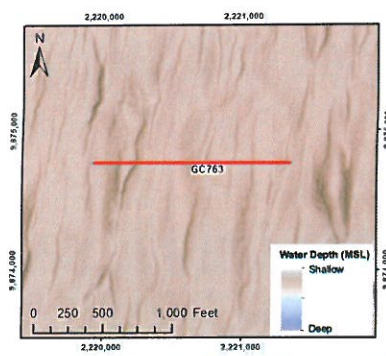
Note: Location map background image is MBES water depth draped over greyscale seafloor hillshade (0° azimuth and 45° altitude).

— AUV SBP Data Figure Locations



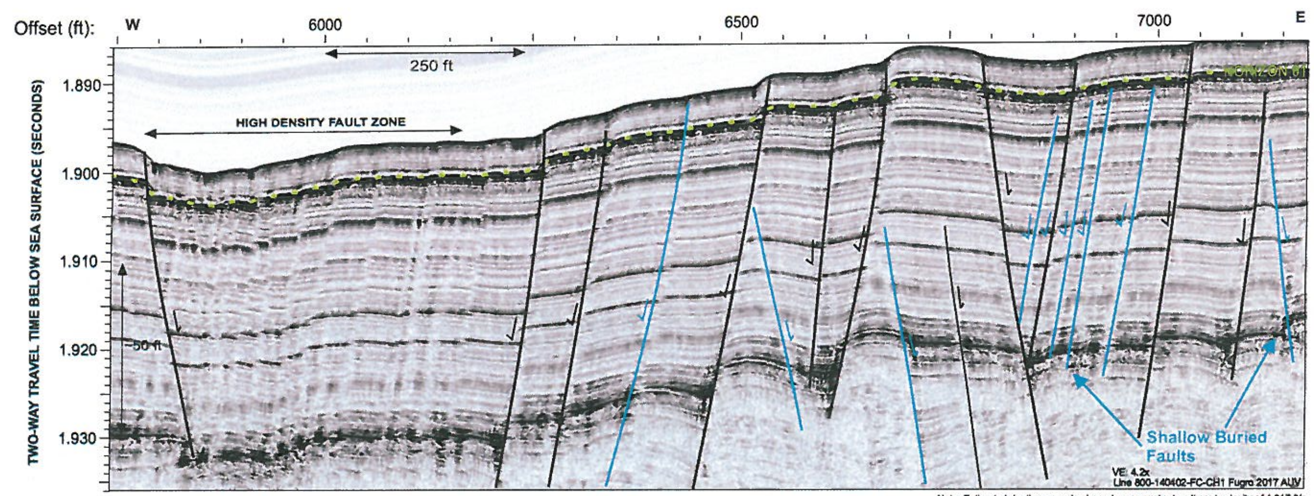
Note: Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

B)



Note: Location map background image is MBES water depth draped over greyscale seafloor hillshade (0° azimuth and 45° altitude).

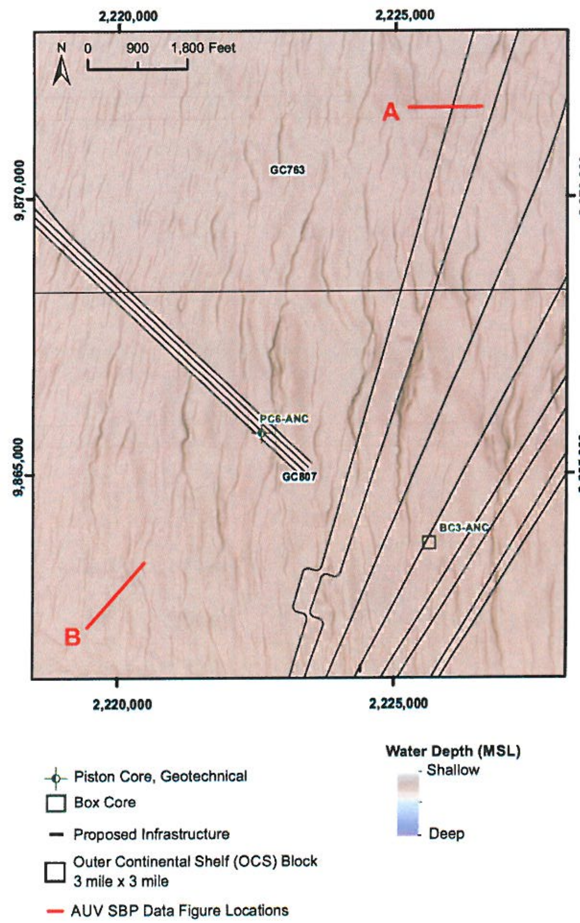
— AUV SBP Data Figure Locations

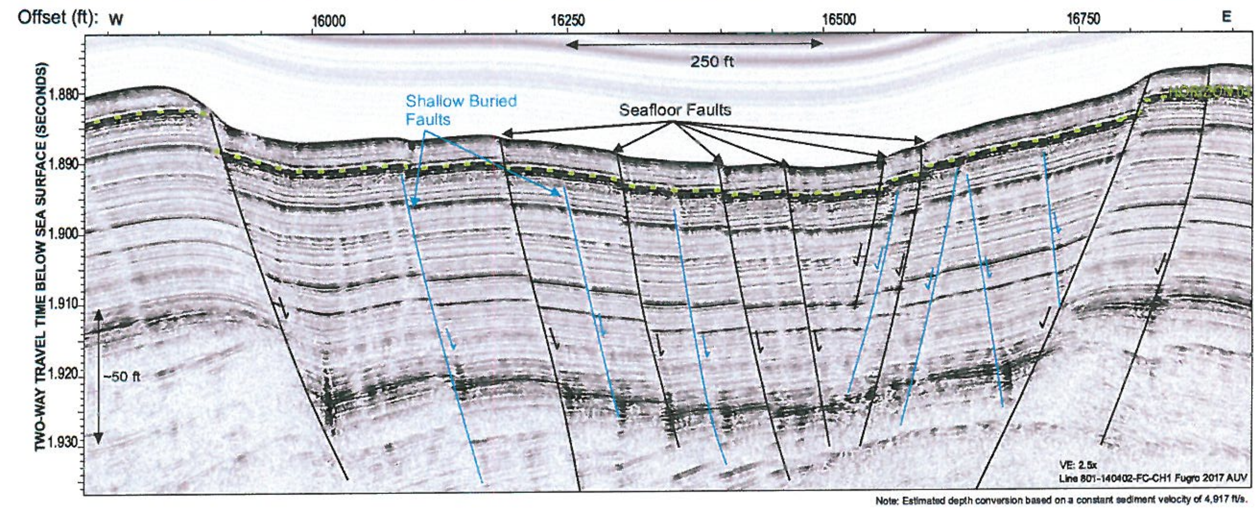


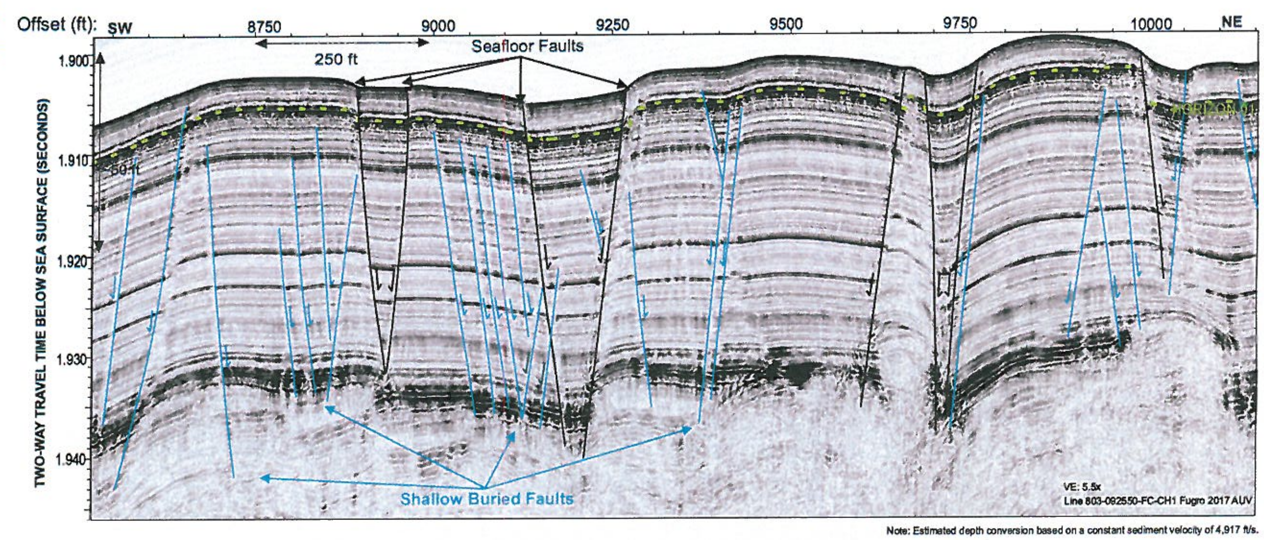
Note: Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

LOCATION MAP AND AUV SUBBOTTOM PROFILER SECTIONS SHOWING EXAMPLES OF HIGH DENSITY FAULT ZONES

Figure 4

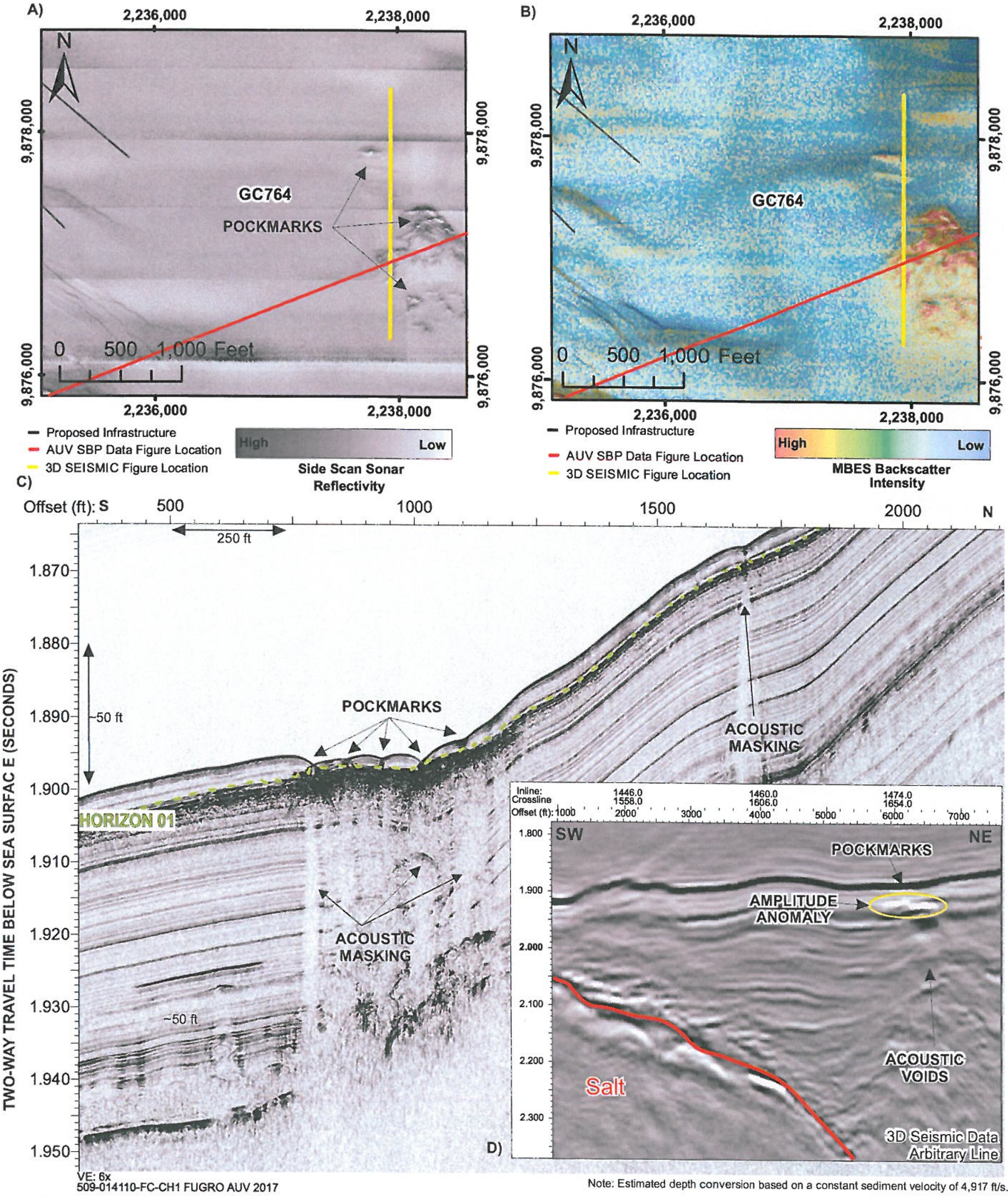




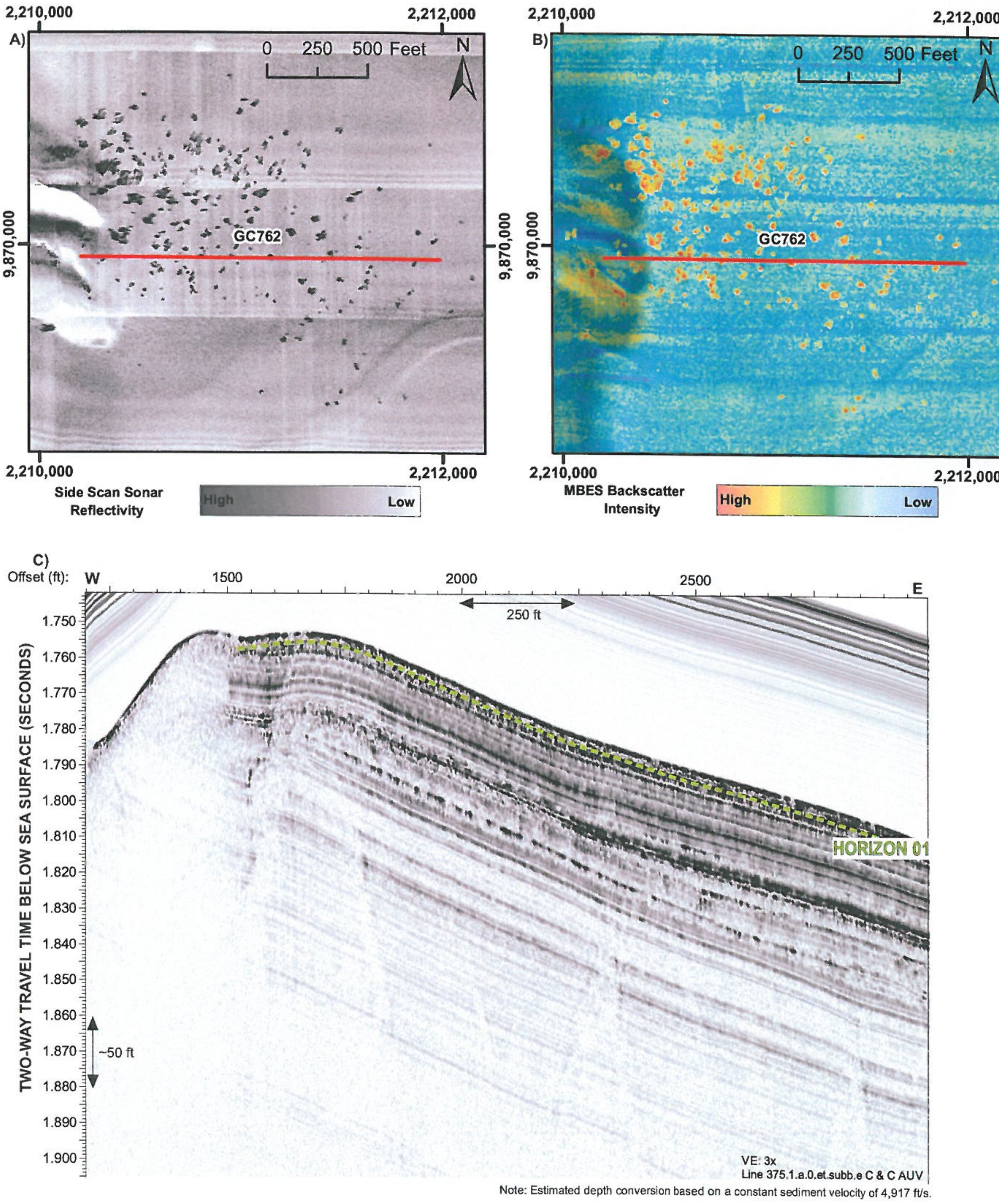


LOCATION MAP AND AUV SUBBOTTOM PROFILER SECTIONS SHOWING EXAMPLES OF SEAFLOOR AND SUBSURFACE FAULTS

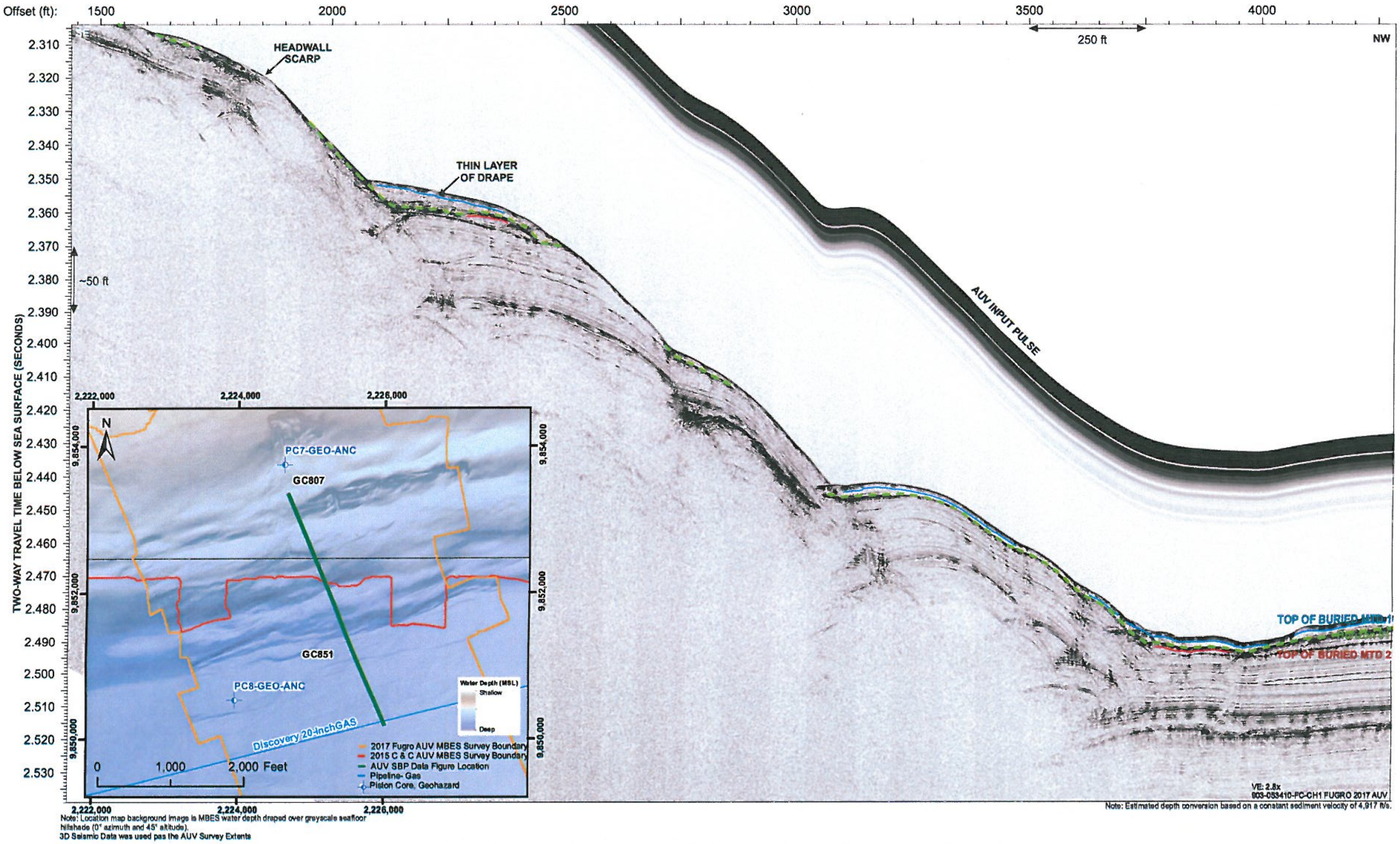
Figure 5



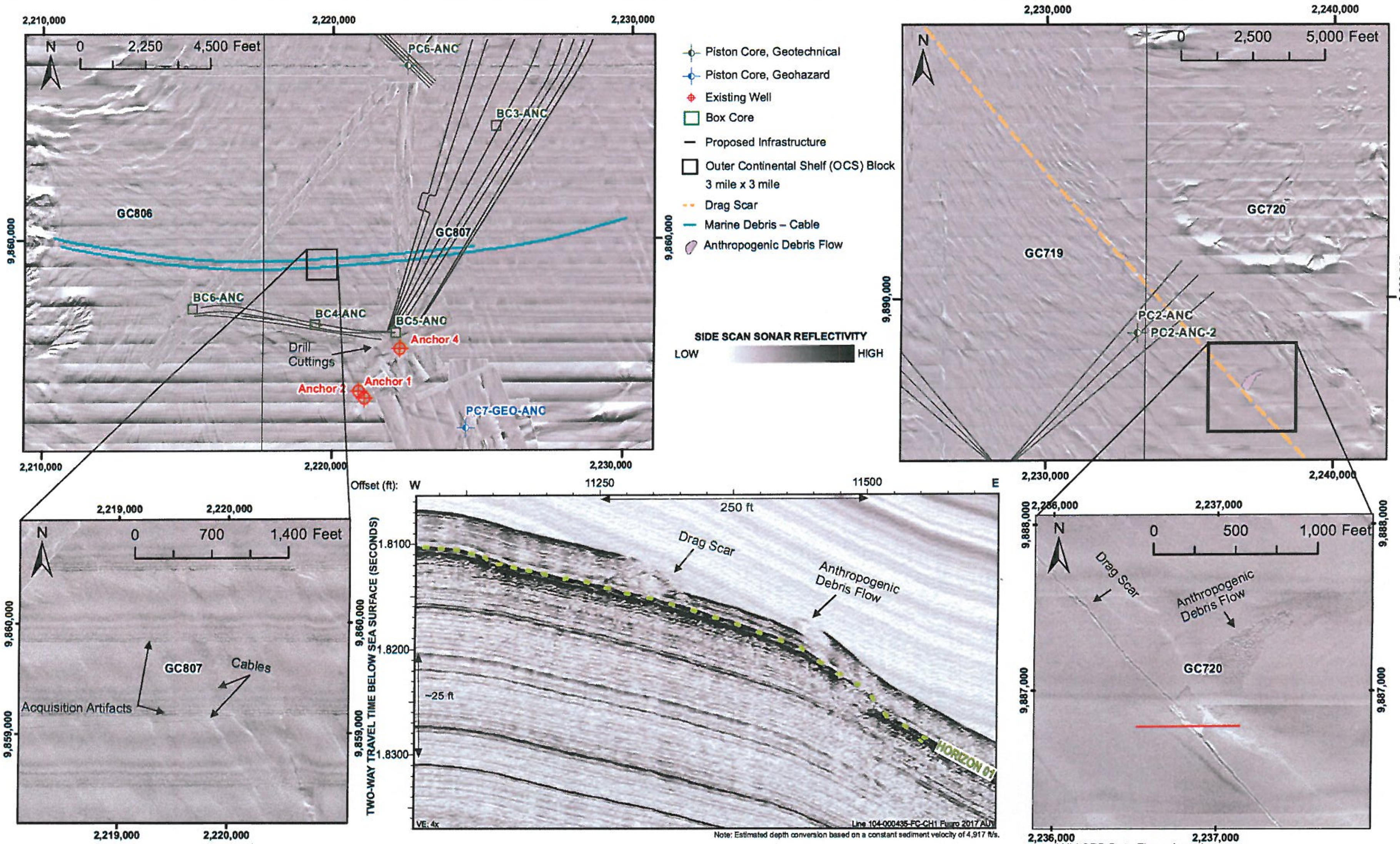
AUV SIDE SCAN SONAR MOSAIC (A), AUV MBES BACKSCATTER DRAPED OVER GREYSCALE SEAFLOOR GRADIENT (B), AUV SUBBOTTOM PROFILER SECTION (C), AND A 3D SEISMIC ARBITRARY LINE (D) SHOWING POCKMARKS WITH ACOUSTIC MASKING



AUV SIDE SCAN SONAR MOSAIC (A), AUV MBES BACKSCATTER DRAPED OVER GREYSCALE SEAFLOOR GRADIENT (B), AND AUV SUBBOTTOM PROFILER SECTION (C) SHOWING HARDGROUNDS

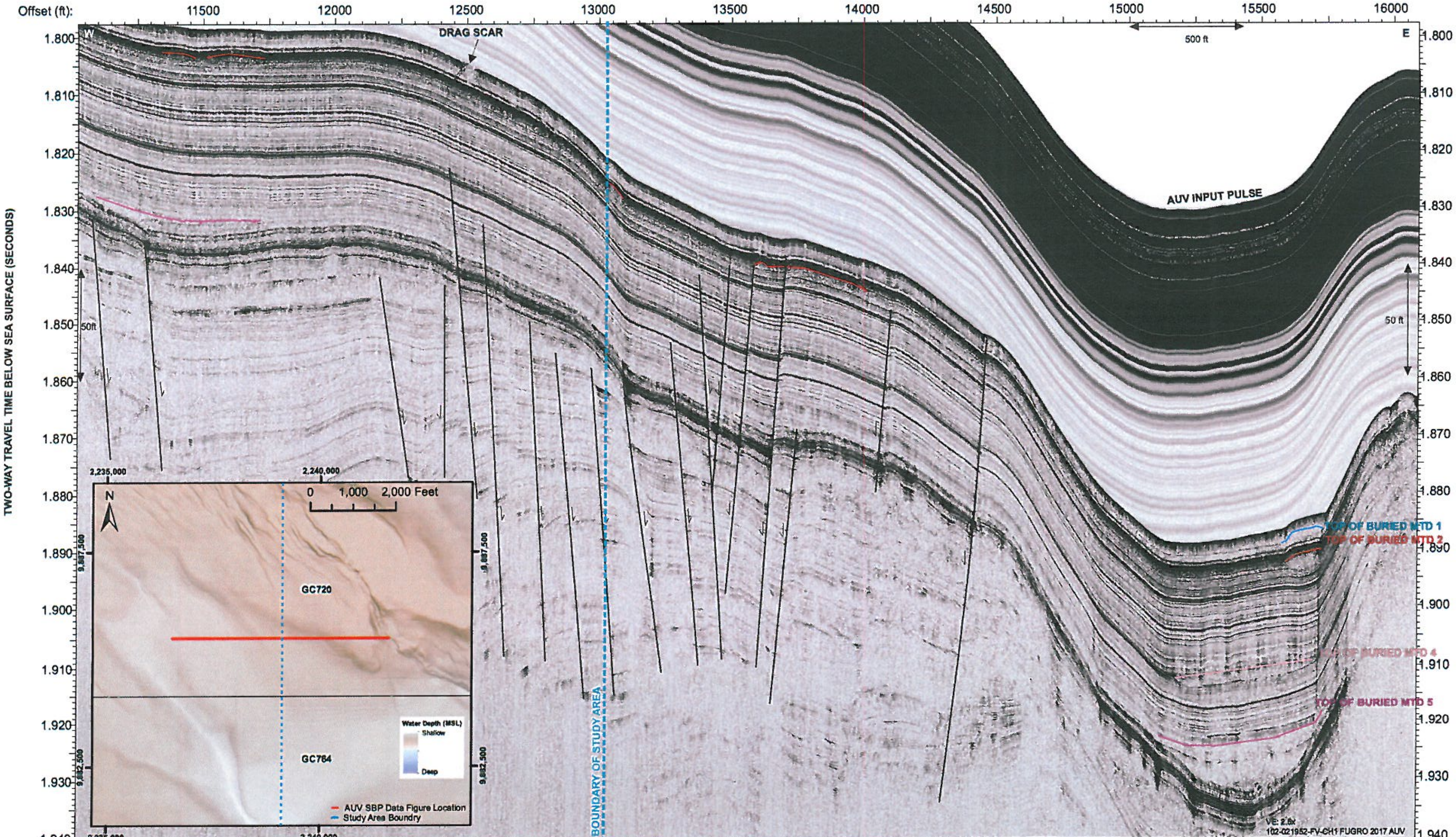


AUV SUBBOTTOM PROFILER SECTION SHOWING HEADWALL SCARP WITH BURIED MTDS



SSS MOSAIC AND AUV SUBBOTTOM PROFILER SECTION DISPLAYING A SEAFLOOR DRAG SCAR, MARINE DEBRIS AND AN ANTHROPOGENIC DEBRIS FLOW

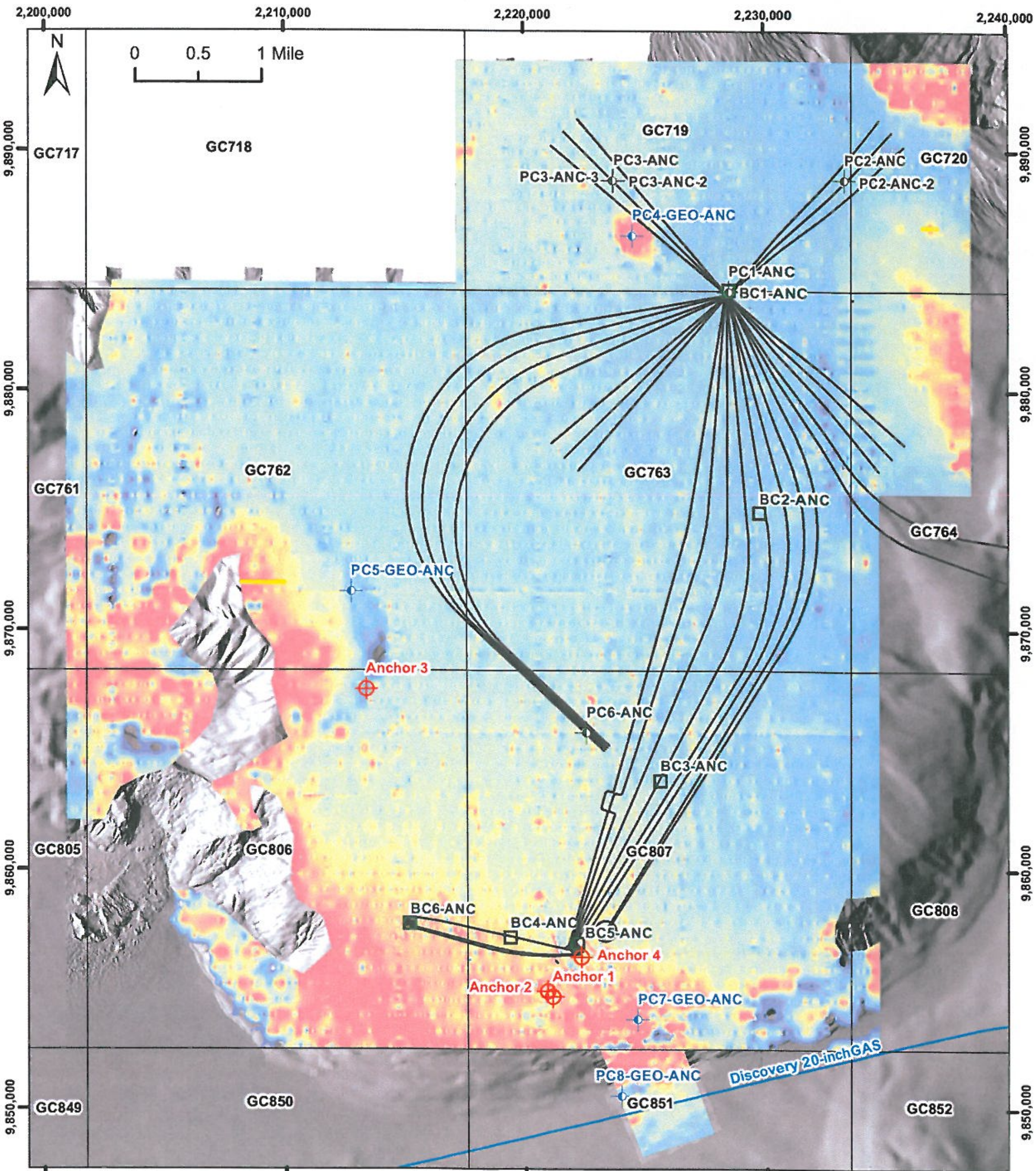
Figure 9



Note: Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

AUV SUBBOTTOM PROFILER SECTION SHOWING BURIED MTDS, FAULT SCARPS

Figure 10



SEDIMENT THICKNESS ISOPACH (FT BML)

Thin (0 ft)

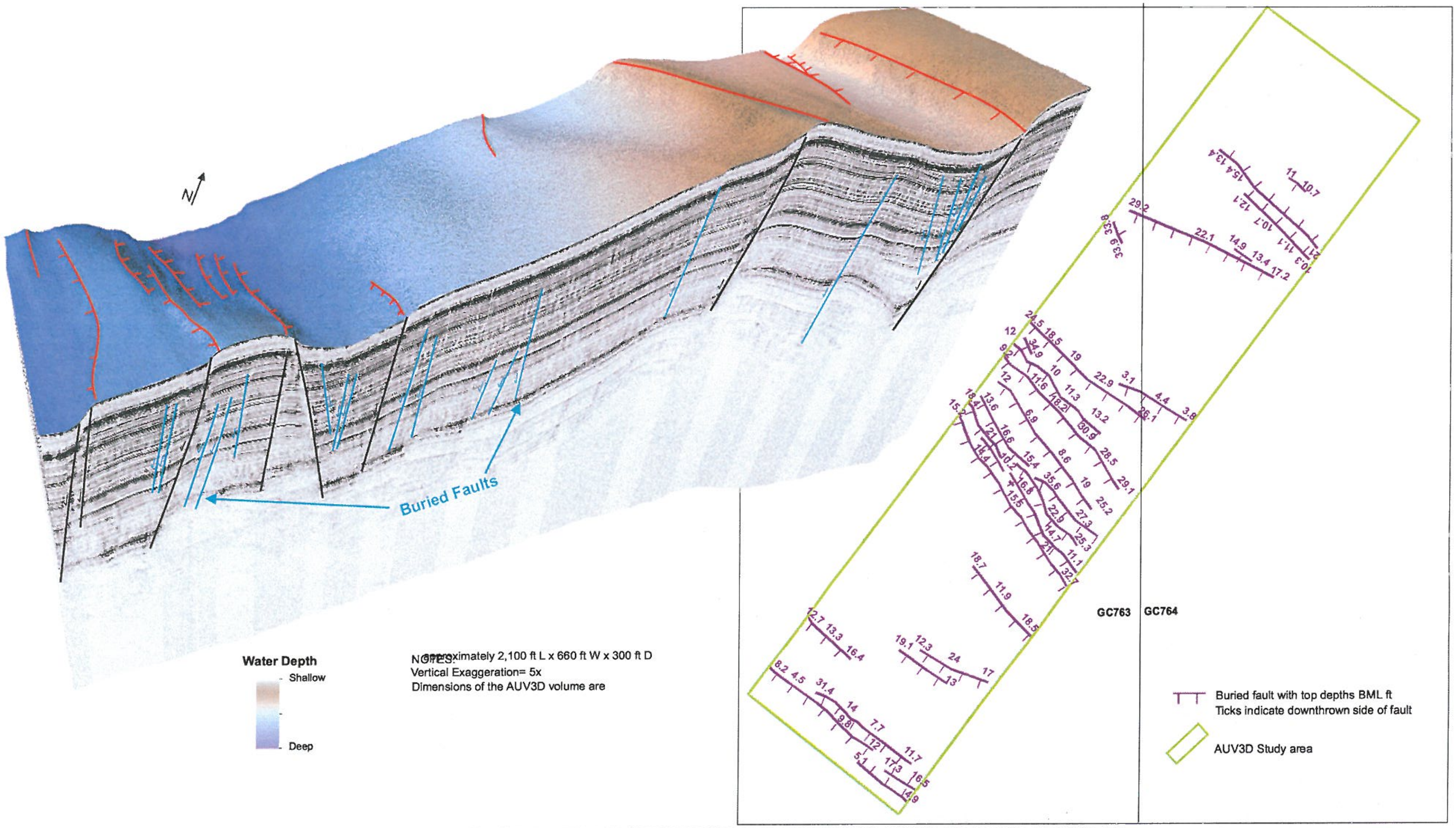
Thick (20 ft)

- Existing Well
- Gas Pipeline
- Proposed Infrastrcture
- Box Core
- Piston Core, Geohazard
- Piston Core, Geotechnical
- Outer Continental Shelf (OCS) Block 3 mile x 3 mile

Notes:
-Background image is greyscale seafloor hillshade (0° azimuth and 45° altitude).

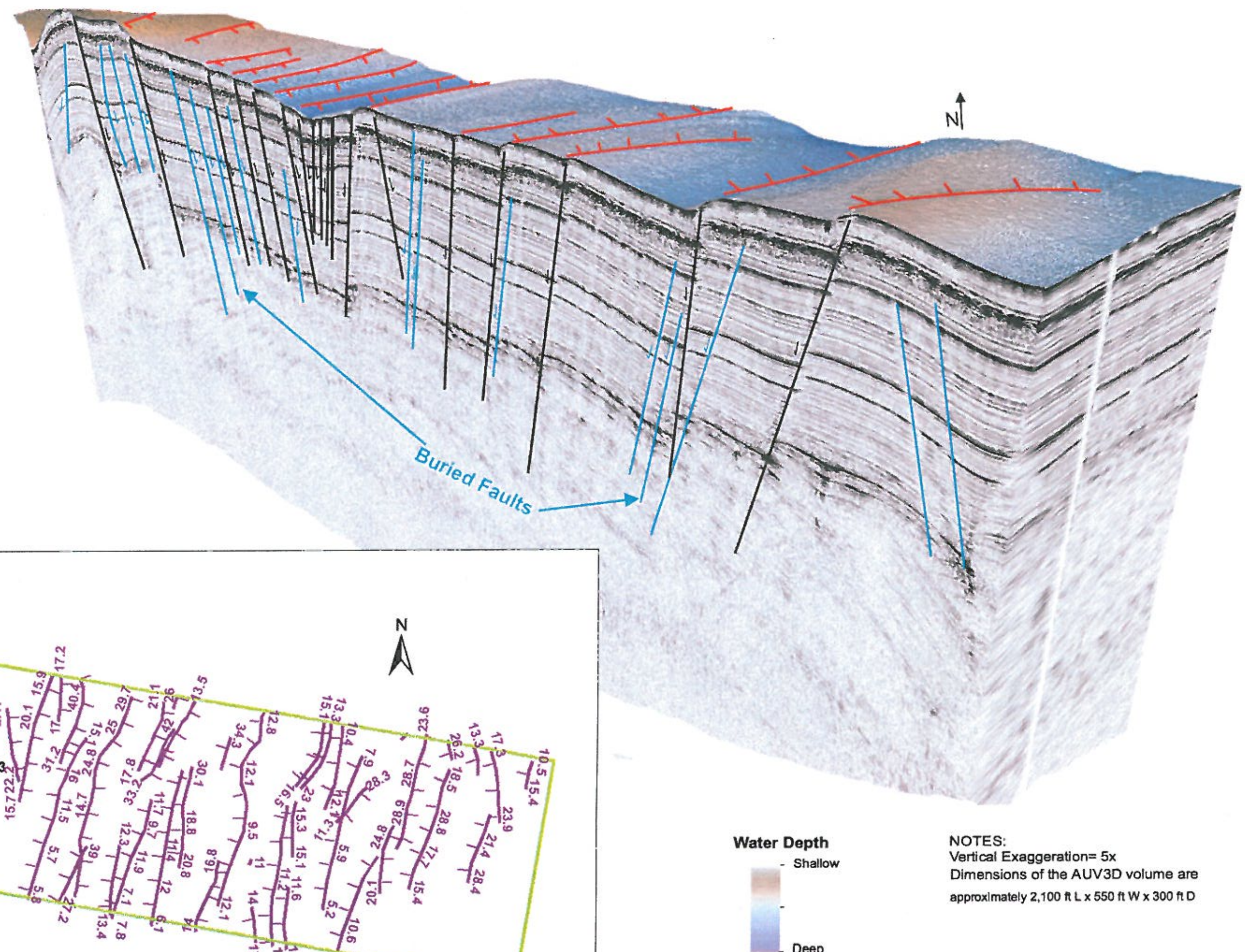
Thicknesses are approximate. Estimated depth conversion based on a constant sediment velocity of 4,917 ft/s.

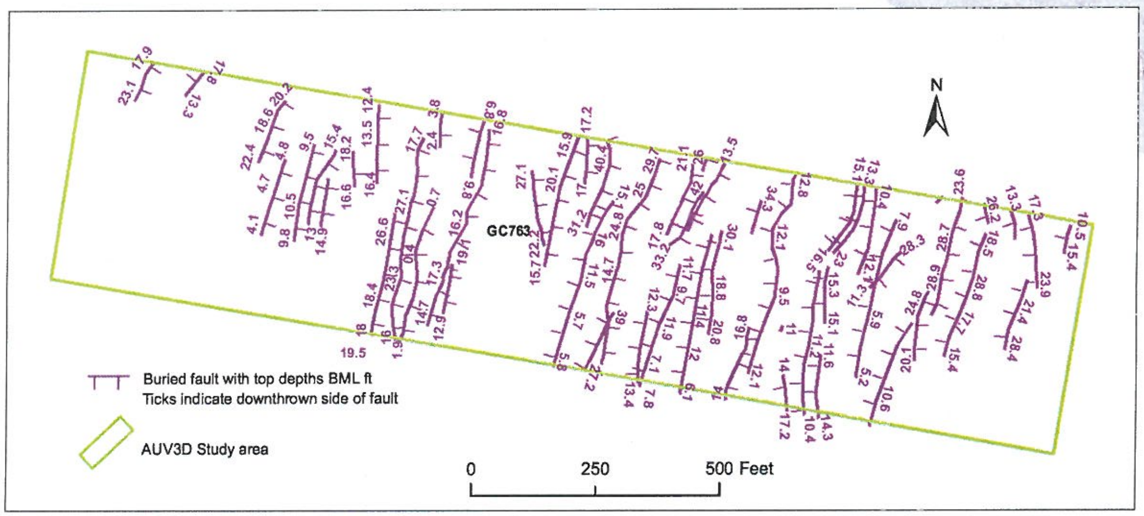
SEDIMENT THICKNESS ISOPACH SEAFLOOR TO HORIZON 1



3D PERSPECTIVE VIEW AND SUBSURFACE FAULTS WITHIN THE SOUTHEAST AUV3D STUDY AREA

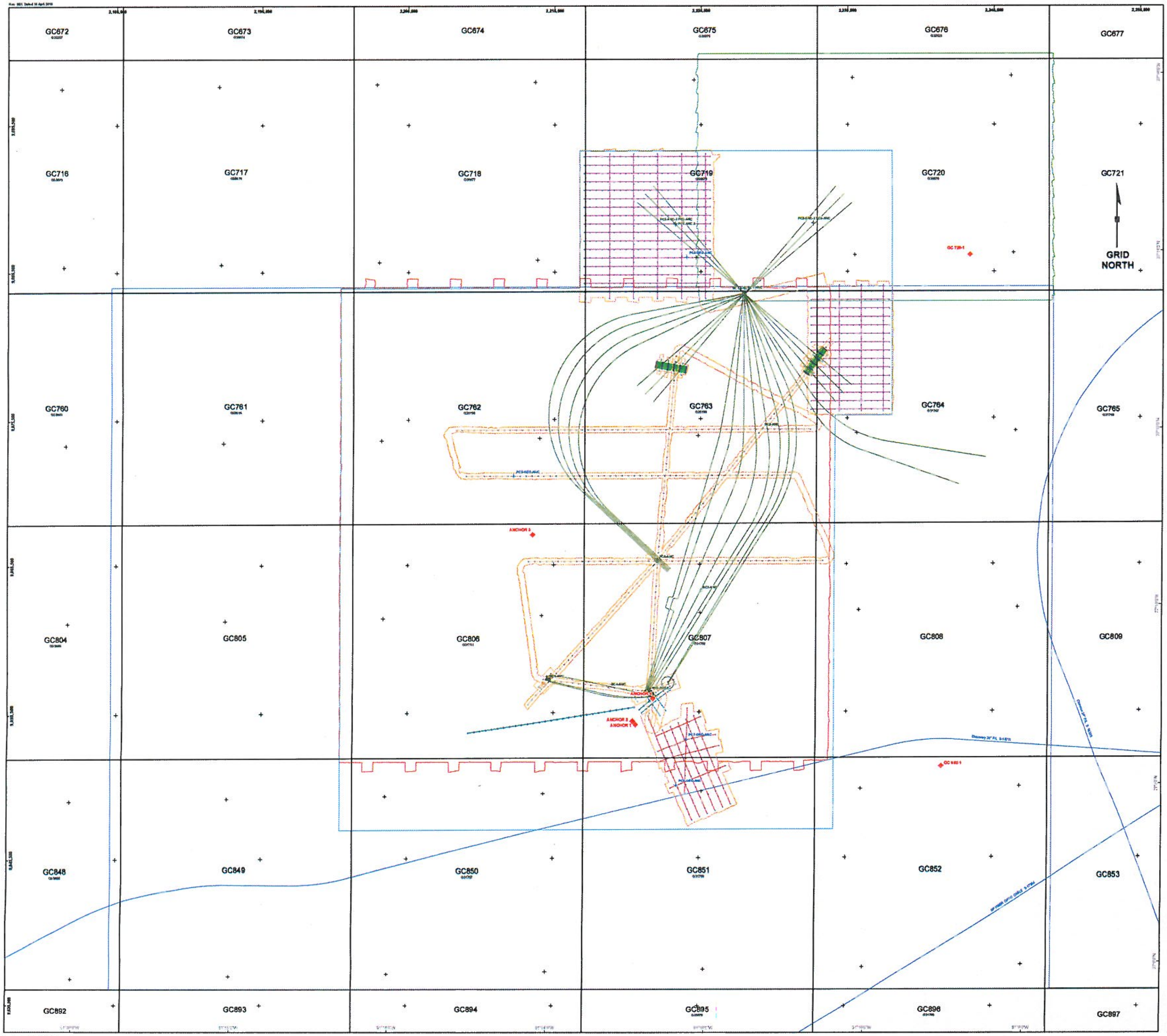
Figure 12





NOTES:
Vertical Exaggeration= 5x
Dimensions of the AUV3D volume are approximately 2,100 ft L x 550 ft W x 300 ft D

3D PERSPECTIVE VIEW AND SUBSURFACE FAULTS WITHIN THE SOUTHWEST AUV3D STUDY AREA



BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- ANCHOR 3D SEISMIC SURVEY AREA
- 2017 AUV ANCHOR MBES EXTENT
- OCS BLOCK WITH LEASE INFORMATION
- 2011 AUV C & C MBES EXTENT
- EXISTING PIPELINES / CABLES
- 2015 AUV GATOR LAKE EXTENT
- PROPOSED INFRASTRUCTURE
- BOX CORE, GEOTECHNICAL
- ANCHOR 1 EXISTING WELL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD

- LINE-101 >>> AUV30m - TRACKLINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACK LINES.
- LINE-101 >>> DVL CALIBRATION TRACKLINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACK LINES
- LINE-101 >>> HOST FPU - NE EXPANSION TRACKLINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACKLINES.
- LINE-101 >>> REGIONAL TIELINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACKLINES.
- LINE-101 >>> SLOPE STABILITY TRACKLINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACKLINES.

NOTES:

1. FUGRO PLANNED TO COLLECT THE 2017 AUV DATA FOR THE ANCHOR DEVELOPMENT PROSPECT ABOARD THE R/V FUGRO ENTERPRISE OPERATING THE KONGSBERG HUGIN (ECHO SURVEYOR IV) AUV. ADDITIONAL COVERAGE FOR A HOST FACILITY AREA CONSISTED OF 14 EAST-WEST PRIMARY TRACKLINES WITH A LINE SPACING OF 150 m (492 ft) AND 4 NORTH-SOUTH TIELINES WITH A LINE SPACING OF 500 m (1,640 ft). INVESTIGATION LINES WERE RUN IN THE SOUTHERN PORTION OF GC 807 AND THE NORTHERN PORTION OF GC 851 TO DETERMINE SLOPE STABILITY. SIX PRIMARY NORTHWEST-SOUTHEAST TRACKLINES WERE RUN 175 m (574 ft) APART AND FOUR TIELINES AT VARYING SPACING WERE RUN SOUTHWEST TO NORTHEAST. THESE LINES WERE RUN AT AN ALTITUDE OF GENERALLY 42 m (138 ft) ABOVE THE SEAFLOOR. ADDITIONAL REGIONAL TIELINES WERE RUN ACROSS THE AREA AT AN ALTITUDE OF 20 m (65.6 ft) ABOVE THE SEAFLOOR.

2. THE LEASE BLOCK INFORMATION AND EXISTING INFRASTRUCTURE ARE BASED ON FUGRO'S GIS DATABASE SEARCH CONDUCTED FEBRUARY 2018. THERE ARE FOUR EXISTING WELLS AND AN EXISTING CABLE WITHIN THE ANCHOR DEVELOPMENT PROJECT. IT IS POSSIBLE THERE ARE OTHER MAN-MADE FEATURES IN THE STUDY AREA THAT ARE NOT LISTED IN THE FUGRO DATABASE AND NOT ON THE MAP.

3. CHEVRON PROVIDED FUGRO WITH PROPOSED INFRASTRUCTURE, WHICH IS CURRENT AS OF FEBRUARY 2, 2018.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000

FEET

NAVIGATION PRE-PLOT

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851
GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: N/A	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES	CHECKED BY: S. SMITH / M. JOHN
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031208-Geophys_Anchor	GIS: 1301 Anchor Chart 01 Navigation Pre Plot

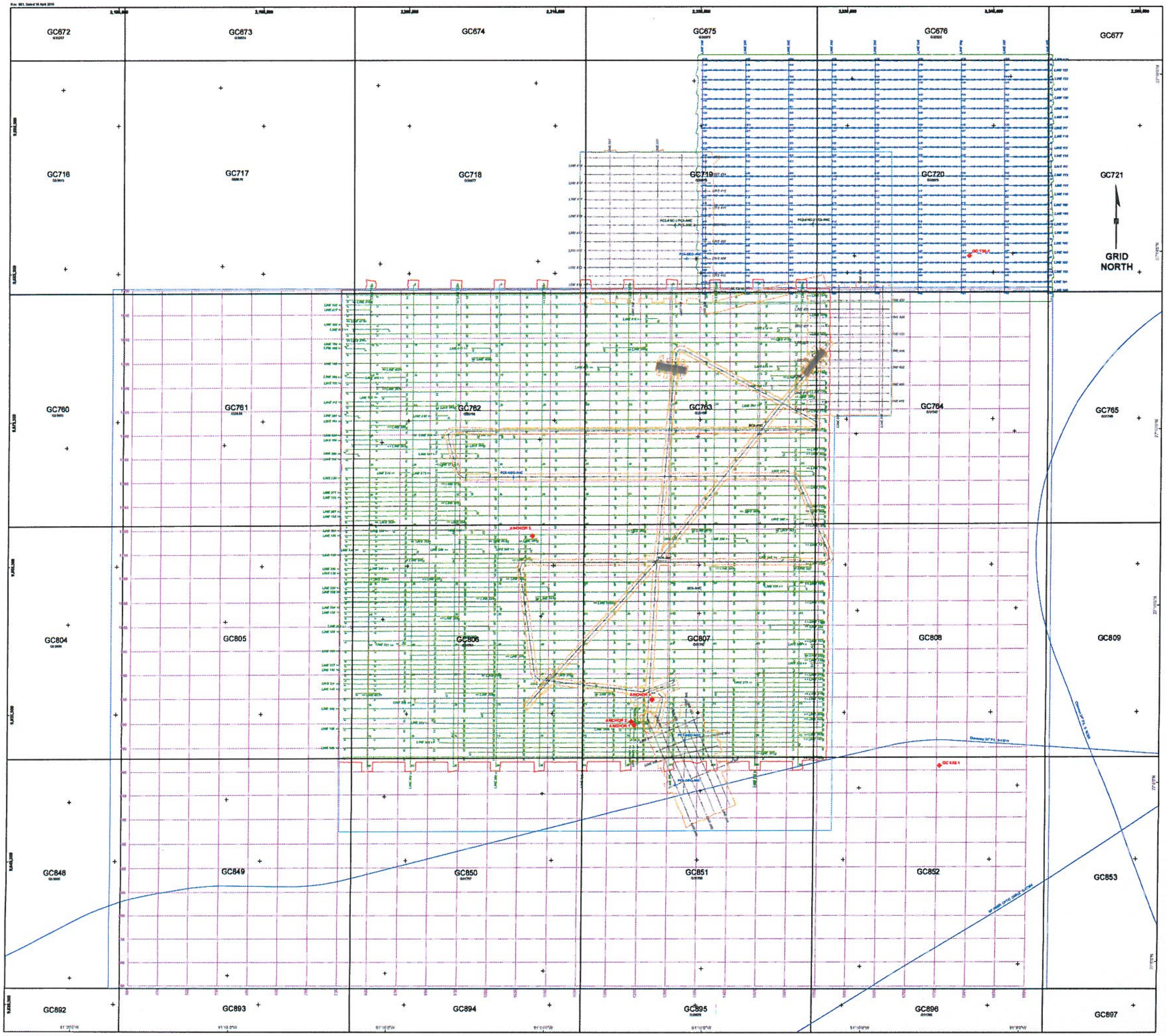
CHART 1 — SHEET NO. 1 OF 9

Chevron

MAP PREPARED BY

FUGRO USA MARINE, INC.
6100 HILLCROFT
HOUSTON, TEXAS 77081
PHONE: 713-369-5600
WWW.FUGRO.COM

FUGRO



BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
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- 2015 AUV C & C MBES EXTENT
- 2015 AUV GATOR LAKE EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

LINE 100 — ANCHOR 3D SEISMIC SURVEY LINE AND NUMBER

LINE-101 >>> — ANCHOR 2017 TRACK LINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACK LINES.

LINE-101 >>> — C & C 2015 TRACK LINES. AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACK LINES.

LINE-101 >>> — GATOR LAKE TRACK LINES: AUV SURVEY LINE NUMBER, HEADING AND NAVIGATION FIX / NUMBER. NAVIGATION FIXES ARE SPACED 125 METER (410 ft) INTERVALS ALONG TRACK LINES.

NOTES:

1. THE ANCHOR DEVELOPMENT PROJECT CONSISTS OF HIGH-RESOLUTION AUV GEOPHYSICAL DATA FROM THREE DIFFERENT AUV SURVEYS. AUV NAVIGATION FOR THE C & C TECHNOLOGIES (C & C) 2015 SURVEY WAS PROVIDED BY C-NAV®, -BAND GLOBALLY CORRECTED DGPS (SEE C & C PROJECT NO. 14181). AUV NAVIGATION FOR THE 2015 AND 2017 FUGRO SURVEYS WAS PROVIDED BY FUGRO STARFIX DGPS (SEE FUGRO REPORT NOS. 2415-5092 and 02.17031201A-Gps_Anchor)

2. C&C COLLECTED THE 2015 AUV DATA BETWEEN APRIL 5-13, 2012 ABOARD THE M/V MISS GINGER OPERATING THE KONGSBERG HUGIN (C-SURVEYOR V) AUV. THE AUV SURVEY ALTITUDE WAS ~40 m (~131 ft) ABOVE THE SEAFLOOR. THE 2015 C&C AUV GRID CONSISTS OF 49 EAST-WEST PRIMARY TRACKLINES WITH A LINE SPACING OF 200 m (656 ft), AND 11 NORTH-SOUTH TIELINES WITH A LINE SPACING OF 900 m (2,953 ft). IN ADDITION, EAST-WEST INFILL LINES WERE COLLECTED AROUND THE WESTERN, SOUTHWESTERN, AND SOUTHERN PERIMETER OF THE SURVEY SITE SPACED 100 m (328 ft) IN ORDER TO ENSURE FULL COVERAGE. SHOTPOINTS WERE RECORDED AT 125-m (410-ft) INTERVALS.

3. FUGRO COLLECTED THE 2015 AUV DATA FOR THE GATOR LAKE PROSPECT FROM OCTOBER 10-13, 2015 ABOARD THE R/V FUGRO ENTERPRISE OPERATING THE KONGSBERG HUGIN (ECHO SURVEYOR II) AUV. THE AUV SURVEY ALTITUDE WAS ~42 m (~138 ft) ABOVE THE SEAFLOOR. THE 2015 FUGRO AUV GRID CONSISTS OF 25 EAST-WEST PRIMARY TRACKLINES WITH A LINE SPACING OF 200 m (656 ft), AND 9 NORTH-SOUTH TIELINES WITH A LINE SPACING OF 900 m (2,953 ft). SHOTPOINTS WERE RECORDED AT 125-m (410-ft) INTERVALS.

4. FUGRO COLLECTED THE 2017 AUV DATA FOR THE ANCHOR DEVELOPMENT PROSPECT FROM DECEMBER 11-17, 2017 ABOARD THE R/V FUGRO ENTERPRISE OPERATING THE KONGSBERG HUGIN (ECHO SURVEYOR IV) AUV. ADDITIONAL COVERAGE FOR A HOST FACILITY AREA CONSISTED OF 16 EAST-WEST PRIMARY TRACKLINES WITH A LINE SPACING OF 150 m (492 ft) AND 4 NORTH-SOUTH TIELINES WITH A LINE SPACING OF 500 m (1,640 ft). INVESTIGATION LINES WERE RUN IN THE SOUTHERN PORTION OF GC 807 AND THE NORTHERN PORTION OF GC 851 TO DETERMINE SLOPE STABILITY. SIX PRIMARY NORTHWEST-SOUTHEAST TRACKLINES WERE RUN 175 m (574 ft) APART AND FOUR TIELINES AT VARYING SPACING WERE RUN SOUTHWEST TO NORTHEAST. THESE LINES WERE RUN AT AN ALTITUDE OF GENERALLY 42 m (138 ft) ABOVE THE SEAFLOOR. ADDITIONAL REGIONAL TIELINES WERE RUN ACROSS THE AREA AT AN ALTITUDE OF 20 m (65.6 ft) ABOVE THE SEAFLOOR.

5. TWO AUV MICRO SURVEYS WERE PERFORMED IN GC 763. SURVEY GRIDS CONSISTED OF PRIMARY TRACKLINES SPACED AT 4 m (13.1 ft) AND TIELINES AT 500 m (1,640 ft). THE MICROSURVEYS WERE RUN TWICE AT AN ALTITUDE OF 10 m (32.8 ft) AND 20 m (65.6 ft) ABOVE THE SEAFLOOR WITH 10 ms and 20 ms PULSE LENGTHS. SHOTPOINTS WERE RECORDED AT 125-m (410-ft) INTERVALS.

6. 3D SEISMIC DATA WERE PROVIDED TO FUGRO BY CHEVRON. SEISMIC INLINES ARE ORIENTED EAST-WEST, HAVE A NUMERICAL INCREMENT OF 1, AND A LINE SPACING OF 10 METERS (32.8 FEET). SEISMIC CROSSLINES ARE ORIENTED NORTH-SOUTH, HAVE A NUMERICAL INCREMENT OF 1, AND A LINE SPACING OF 12.5 METERS (41.1 FEET). EVERY 80TH INLINE AND CROSSLINE IS SHOWN.

7. THE LEASE BLOCK INFORMATION AND AN EXISTING INFRASTRUCTURE ARE BASED ON FUGRO'S GIS DATABASE SEARCH CONDUCTED FEBRUARY 2018. THERE ARE FOUR EXISTING WELLS AND AN EXISTING CABLE WITHIN THE ANCHOR DEVELOPMENT PROJECT. IT IS POSSIBLE THERE ARE OTHER MAN-MADE FEATURES IN THE STUDY AREA THAT ARE NOT LISTED IN THE FUGRO DATABASE AND NOT ON THE MAP.

8. CHEVRON PROVIDED FUGRO WITH PROPOSED INFRASTRUCTURE, WHICH IS CURRENT AS OF FEBRUARY 2, 2018.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:84,000

0 1,000 2,000 4,000 6,000 8,000 10,000 FEET

NAVIGATION POST-PLOT

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851
GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: N/A	
VELOCITY: N/A	
POSITIONING BY: SEE NOTES 2 TO 5	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES	CHECKED BY: S. SMITH / M.JOHN
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 02 Navigation Post Plot

CHART 2 SHEET NO. 2 OF 9

MAP PREPARED BY
FUGRO USA MARINE, INC.
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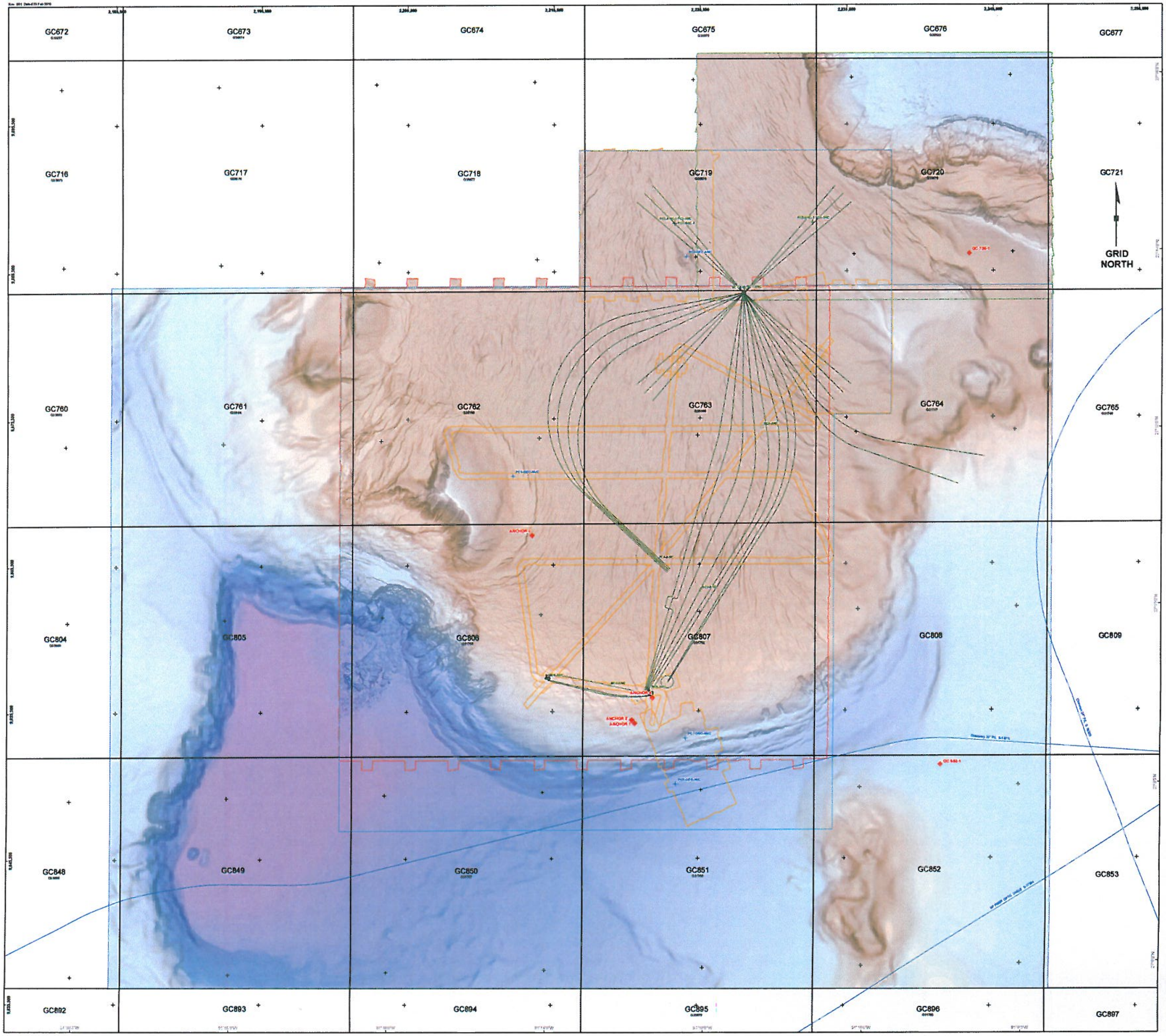

BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- 2017 AUV ANCHOR MBES EXTENT
- 2015 AUV C & C MBES EXTENT
- 2015 AUV GATOR LAKE EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

INTERPRETIVE INFORMATION

WATER DEPTH

SHALLOW 4,119 ft

DEEP 6,735 ft

NOTES:

1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.

2. THE WATER DEPTHS WITHIN THE ANCHOR DEVELOPMENT AREA WERE ADJUSTED TO MATCH THE 2017 FUGRO MBES DATA AS IT BEST CORRELATED TO THE KNOWN DEPTHS OF EXISTING WELLS WITHIN THE SURVEY AREA. THE 2015 C & C MBES DATA WAS ADJUSTED 3.8 m (12.5 ft) SHALLOWER. THE 2015 FUGRO MBES DATA WAS ADJUSTED 1.4 m (4.3 ft) DEEPER, AND THE 3D SEISMIC DATA WAS SHIFTED 15 m (49.2 ft) DEEPER.

3. THE WATER DEPTHS ARE DERIVED FROM THE THREE AUV MBES DATASETS AND 3D SEISMIC DATA AND GRIDDED at 25 cm (0.8 ft) BIN SPACING WITHIN THE AUV/3D MICRO SURVEYS, 1-m (3.28-ft) BIN SPACING WITHIN THE 2017 ANCHOR AUV SURVEY, 3-m (9.8 ft) BIN SPACING WITHIN THE 2015 AUV SURVEYS, AND 30-m (98.4-ft) BIN SPACING WITHIN THE 3D SEISMIC DATA. ALL DEPTHS ARE APPROXIMATE.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-87°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000

FEET

SEAFLOOR RENDERING

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851
GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEA SURFACE	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: R. BATES	CHECKED BY: S. SMITH / M.JOHN
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 03 Rendering

CHART 3 SHEET NO. 3 OF 9

MAP PREPARED BY
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HOUSTON, TEXAS 77081
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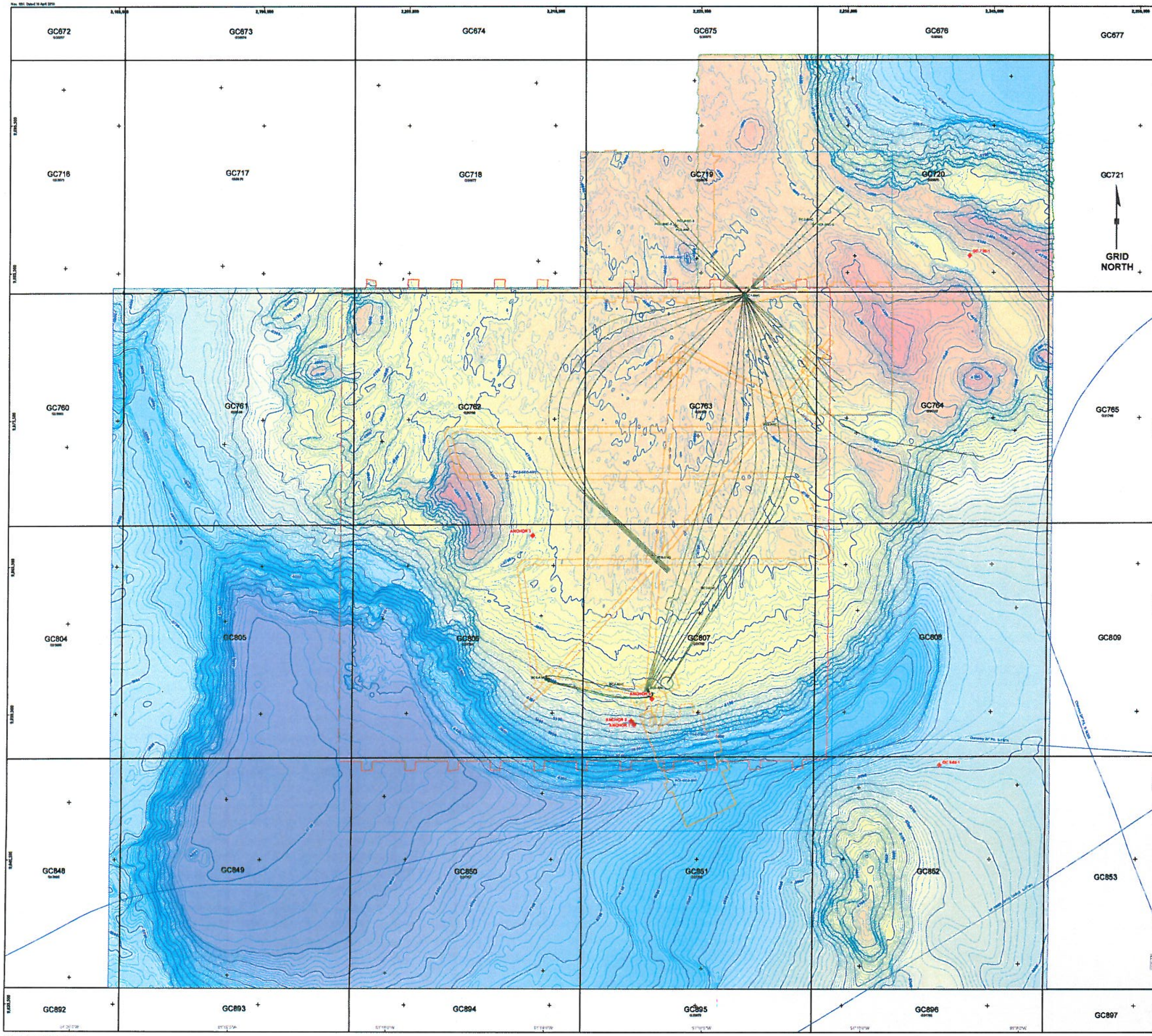

BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- ANCHOR 3D SEISMIC SURVEY AREA
- 2017 AUV ANCHOR MBES EXTENT
- OCS BLOCK WITH LEASE INFORMATION
- 2015 AUV C & C MBES EXTENT
- EXISTING PIPELINES / CABLES
- 2015 AUV GATOR LAKE EXTENT
- PROPOSED INFRASTRUCTURE
- BOX CORE, GEOTECHNICAL
- ANCHOR 1 EXISTING WELL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD

INTERPRETIVE INFORMATION

BATHYMETRY CONTOURS

- MAJOR CONTOUR - 100 ft INTERVAL
- MINOR CONTOUR - 20 ft INTERVAL

WATER DEPTH

SHALLOW 4,119 ft

DEEP 6,725 ft

NOTES:

1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.

2. THE WATER DEPTHS WITHIN THE ANCHOR DEVELOPMENT AREA WERE ADJUSTED TO MATCH THE 2017 FUGRO MBES DATA AS IT BEST CORRELATED TO THE KNOWN DEPTHS OF EXISTING WELLS WITHIN THE SURVEY AREA. THE 2015 C & C MBES DATA WAS ADJUSTED 3.8 m (12.5 ft) SHALLOWER. THE 2015 FUGRO MBES DATA WAS ADJUSTED 1.4 m (4.5 ft) DEEPER, AND THE 3D SEISMIC DATA WAS SHIFTED 15 m (49.2 ft) DEEPER.

3. THE WATER DEPTHS ARE DERIVED FROM THE THREE AUV MBES DATASETS AND 3D SEISMIC DATA AND GRIDDED at 25 cm (0.8 ft) BIN SPACING WITHIN THE AUV3D MICRO SURVEYS, 1-m (3.28-ft) BIN SPACING WITHIN THE 2017 ANCHOR AUV SURVEY, 3-m (9.8 ft) BIN SPACING WITHIN THE 2015 AUV SURVEYS, AND 30-m (98.4-ft) BIN SPACING WITHIN THE 3D SEISMIC DATA. ALL DEPTHS ARE APPROXIMATE.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000

FEET

WATER DEPTH

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851
GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: 20 FT	
DATUM: SEA SURFACE	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES	CHECKED BY: S. SMITH / M.JOHN
DATE: 25 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 04 Water Depth

CHART 4 SHEET NO. 4 OF 9

MAP PREPARED BY:

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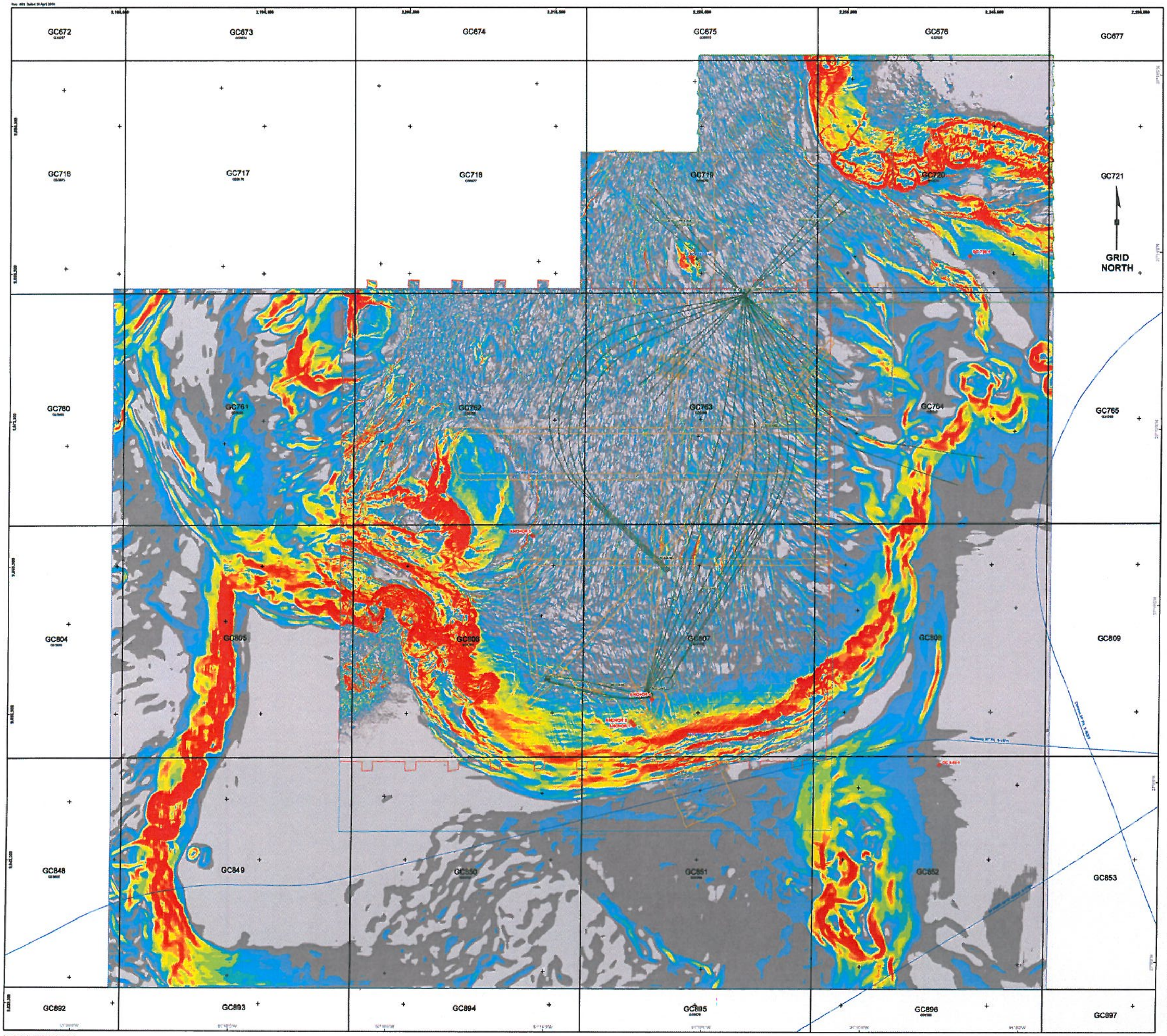

BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- 2017 AUV ANCHOR MBES EXTENT
- 2015 AUV C & C MBES EXTENT
- 2013 AUV GATOR LAKE EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

INTERPRETIVE INFORMATION

GRADIENT IN PERCENT AND SLOPE IN DEGREES

PERCENT	DEGREES
0 - 3.5%	0 - 2°
3.5 - 7%	2 - 4°
7 - 10.5%	4 - 6°
10.5 - 14.1%	6 - 8°
14.1 - 17.6%	8 - 10°
17.6 - 21.3%	10 - 12°
21.3 - 24.9%	12 - 14°
24.9 - 28.7%	14 - 16°
28.7 - 32.5%	16 - 18°
32.5 - 36.4%	18 - 20°
> 36.4%	>20°

NOTES:

1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.

2. SEAFLOOR GRADIENTS ARE DERIVED FROM THE THREE AUV MBES DATASETS AND 3D SEISMIC DATA AND GRIDDED at 25 cm (0.8 ft) BIN SPACING WITHIN THE AUV3D MICRO SURVEYS, 1-m (3.28-ft) BIN SPACING WITHIN THE 2017 ANCHOR AUV SURVEY, 3-m (9.8 ft) BIN SPACING WITHIN THE 2015 AUV SURVEYS, AND 30-m (98.4-ft) BIN SPACING WITHIN THE 3D SEISMIC DATA.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000
FEET

SEAFLOOR GRADIENT

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851
GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA
EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEAFLOOR	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: X. BATES	CHECKED BY: S. SMITH / M JOHN
DATE: 23 FEBRUARY 2018	REVISION NO:
JOB NO: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 05 Seafloor Slope

CHART 5 SHEET NO 5 OF 9

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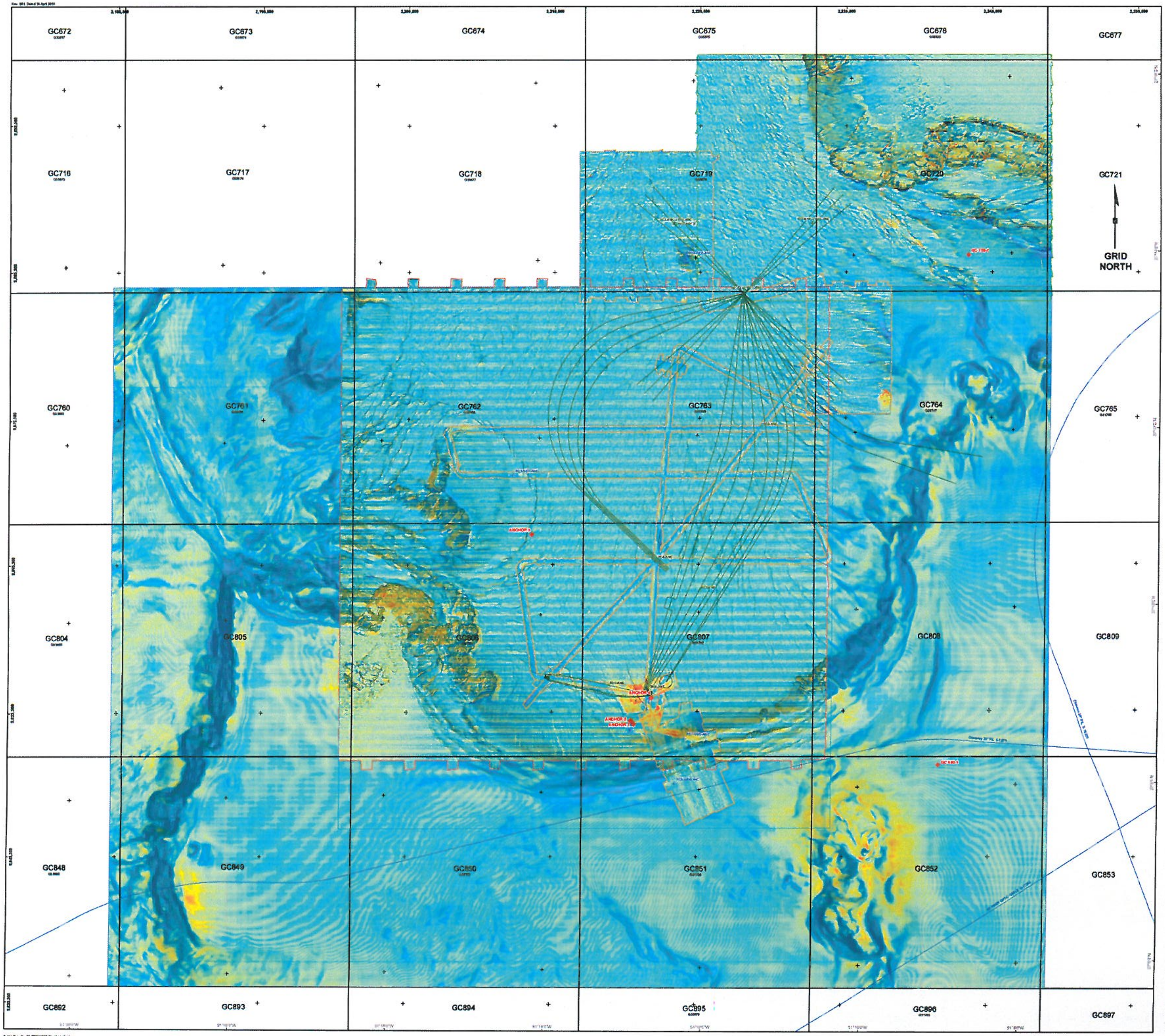

BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- 2017 AUV ANCHOR MBES EXTENT
- 2018 AUV C & C MBES EXTENT
- 2015 AUV GATOR LAKE EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

INTERPRETIVE INFORMATION

AUV MBES BACKSCATTER INTENSITY AND RELATIVE SEAFLOOR AMPLITUDE

HIGH

LOW

NOTES:

1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.

2. THE BACKSCATTER DATASETS WERE GRIDDED AT 1 m (3.28 ft) to 3 m (9.84 ft) SPACING AND WERE DERIVED FROM THE AUV MBES DATA. THE 3D AMPLITUDE WERE EXTRACTED FROM 3D DATA PROVIDED BY CHEVRON.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000

FEET

AUV MBES BACKSCATTER AND 3D SEAFLOOR AMPLITUDE

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851 GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEAFLOOR	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES	CHECKED BY: S. SMITH / M JOHN
DATE: 23 FEBRUARY 2018	REVISION NO:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 05 Backscatter and 3D Seafloor

CHART 5 SHEET NO 5 OF 9

Chevron

MAP PREPARED BY
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HOUSTON, TEXAS 77081
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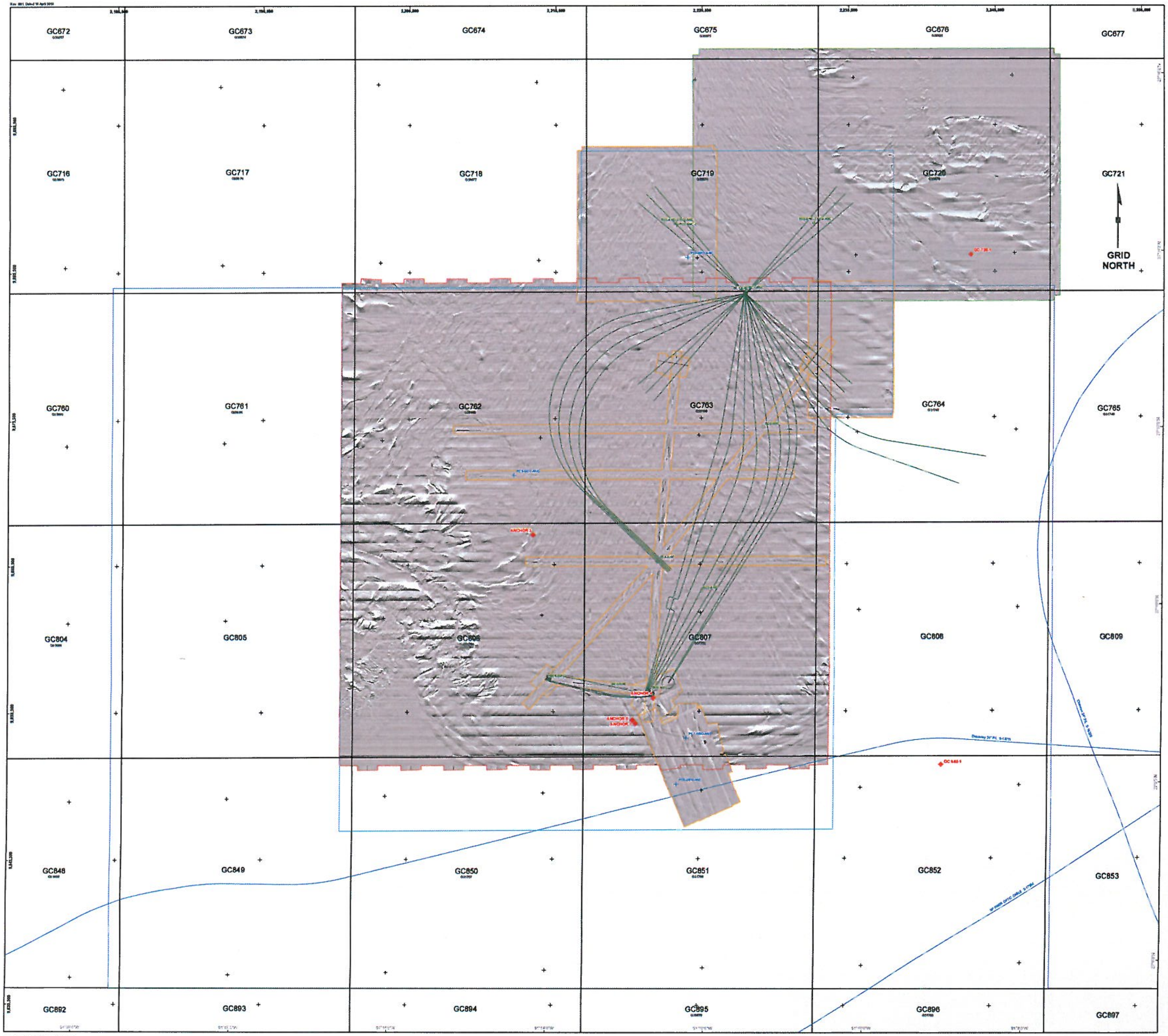
WWW.FUGRO.COM

FUGRO



BASE MAP INFORMATION

- ANCHOR DEVELOPMENT FIELD
- 2017 AUV ANCHOR SSS EXTENT
- 2015 AUV C & C SSS EXTENT
- 2015 AUV GATOR LAKE SSS EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

INTERPRETIVE INFORMATION

SIDE SCAN SONAR REFLECTIVITY

HIGH

LOW

NOTES:

1. REFER TO CHART 1 FOR DETAILED NOTES REGARDING AUV SURVEY GRID INFORMATION.

2. SONAR MOSAIC WAS GENERATED FROM INDIVIDUAL AND OVERLAPPING SIDE SCAN SONAR LINE DATA AT A 0.25 m PER PIXEL RESOLUTION FROM THE 2017 FUGRO AUV30m SURVEYS AND THE 2017 FUGRO AUV SURVEYS CONDUCTED AROUND THE EXISTING AND PROPOSED ANCHOR WELL LOCATIONS, AND AT A 0.50 m PER PIXEL RESOLUTION FOR THE ADDITIONAL DATA COLLECTED FROM THE 2017 FUGRO SURVEY AND FROM THE 2015 C & C AND FUGRO AUV SURVEYS

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-93°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000

FEET

SIDE SCAN SONAR MOSAIC

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851 GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEAFLOOR	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES	CHECKED BY: S. SMITH / M. JOHN
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 07 Side Scan Sonar

CHART 7 SHEET NO. 7 OF 9

MAP PREPARED BY
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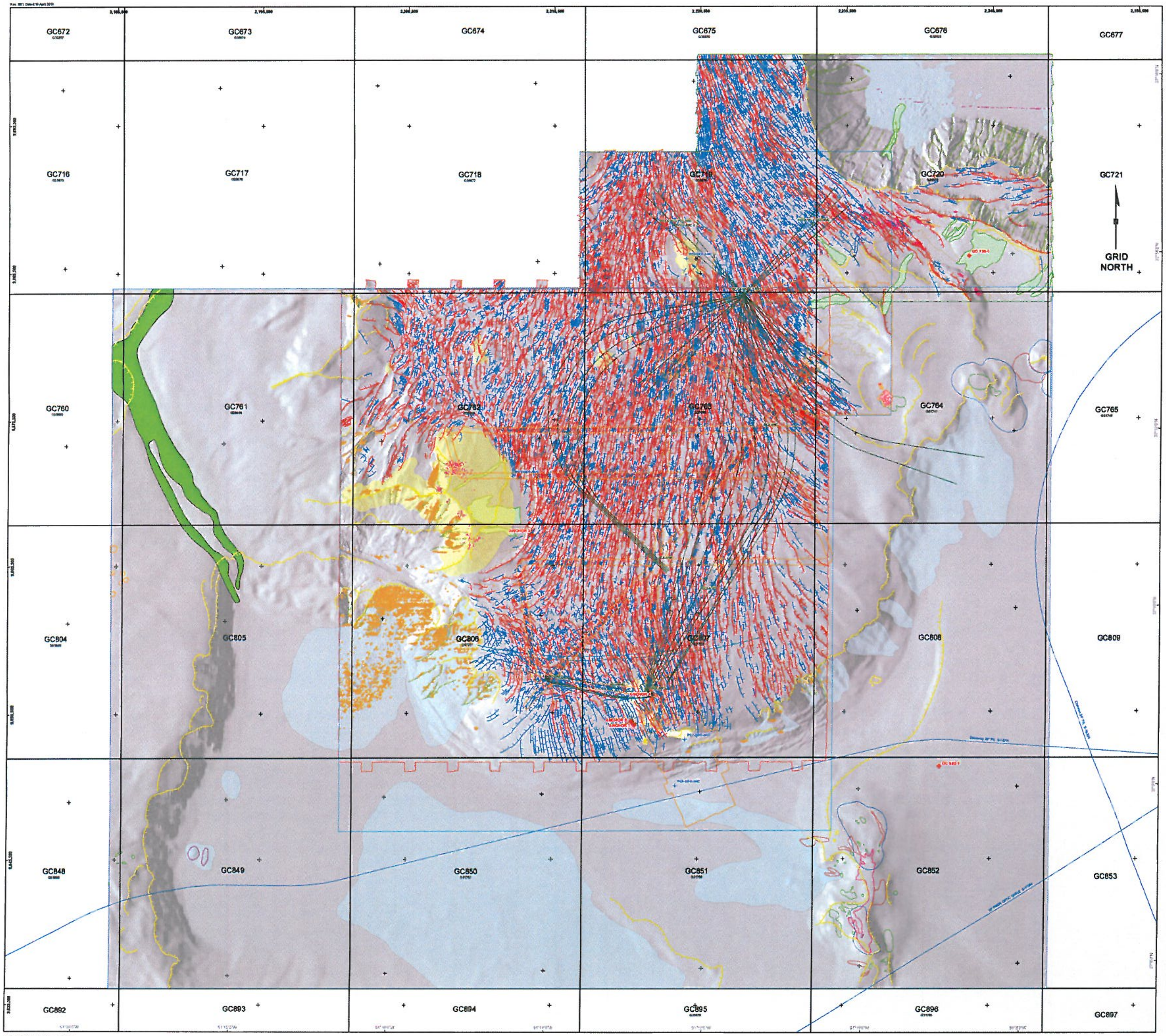

BASE MAP INFORMATION

- ANCHOR DEVELOPMENT AREA
- 2017 AUV ANCHOR MBES EXTENT
- 2015 AUV C & C MBES EXTENT
- 2015 AUV GATOR LAKE EXTENT
- BOX CORE, GEOTECHNICAL
- PISTON CORE, GEOTECHNICAL
- PISTON CORE, GEOHAZARD
- ANCHOR 3D SEISMIC SURVEY AREA
- OCS BLOCK WITH LEASE INFORMATION
- EXISTING PIPELINES / CABLES
- PROPOSED INFRASTRUCTURE
- ANCHOR 1 EXISTING WELL

INTERPRETIVE INFORMATION

- SEAFLOOR FAULT
- SURFACE EXPRESSION OF BURIED FAULT
- HEADWALL SCARP
- UNIDENTIFIED LINEAR DEBRIS
- DRAG SCAR
- MARINE DEBRIS - SEAFLOOR CABLE
- SEAFLOOR GULLY
- SEAFLOOR POCKMARKS
- SEAFLOOR DRILL CUTTINGS
- SEAFLOOR DRILLING MUD
- SEAFLOOR COARSELY ERODED
- ANTHROPOGENIC DEBRIS FLOW
- SEAFLOOR EXPULSION FLUID MUD
- SEAFLOOR BRINE POOL
- SEAFLOOR HARDGROUND
- SEAFLOOR LOCAL UPLIFT
- SHALLOW MTD DEPOSIT
- SEAFLOOR DEBRIS FLOW – SHALLOW DEPOSIT
- SEAFLOOR SLIDE - DEEP-SEATED DEPOSIT
- SEAFLOOR CHANNEL
- SEAFLOOR MOUND

BOEM ANOMALIES

- SEEP ANOMALY FLOWS
- SEEP ANOMALY NEGATIVES POSSIBLE OIL
- SEEP ANOMALY POSITIVES POSSIBLE OIL
- SEEP ANOMALY CONFIRMED ORGANISMS
- SEEP ANOMALY POSITIVES
- SEEP ANOMALY POCKMARKS

NOTES:
1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.
2. SEMI-TRANSPARENT SEAFLOOR HILLSHADE BACKGROUND IMAGE WAS DERIVED FROM THE MBES AND 3D SEISMIC DATA WITH AN AZIMUTH OF 270° AND AN ALTITUDE OF 45°.

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-87°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000
FEET

SEAFLOOR FEATURES

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851 GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEAFLOOR	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES / M. JOHN	CHECKED BY: S. SMITH
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geophys_Anchor	GIS: 1201 Anchor Chart 08 Seafloor Features

CHART 8 — SHEET NO. 8 OF 8

Chevron

MAP PREPARED BY:
FUGRO USA MARINE, INC.
6100 HILLCROFT
HOUSTON, TEXAS 77081
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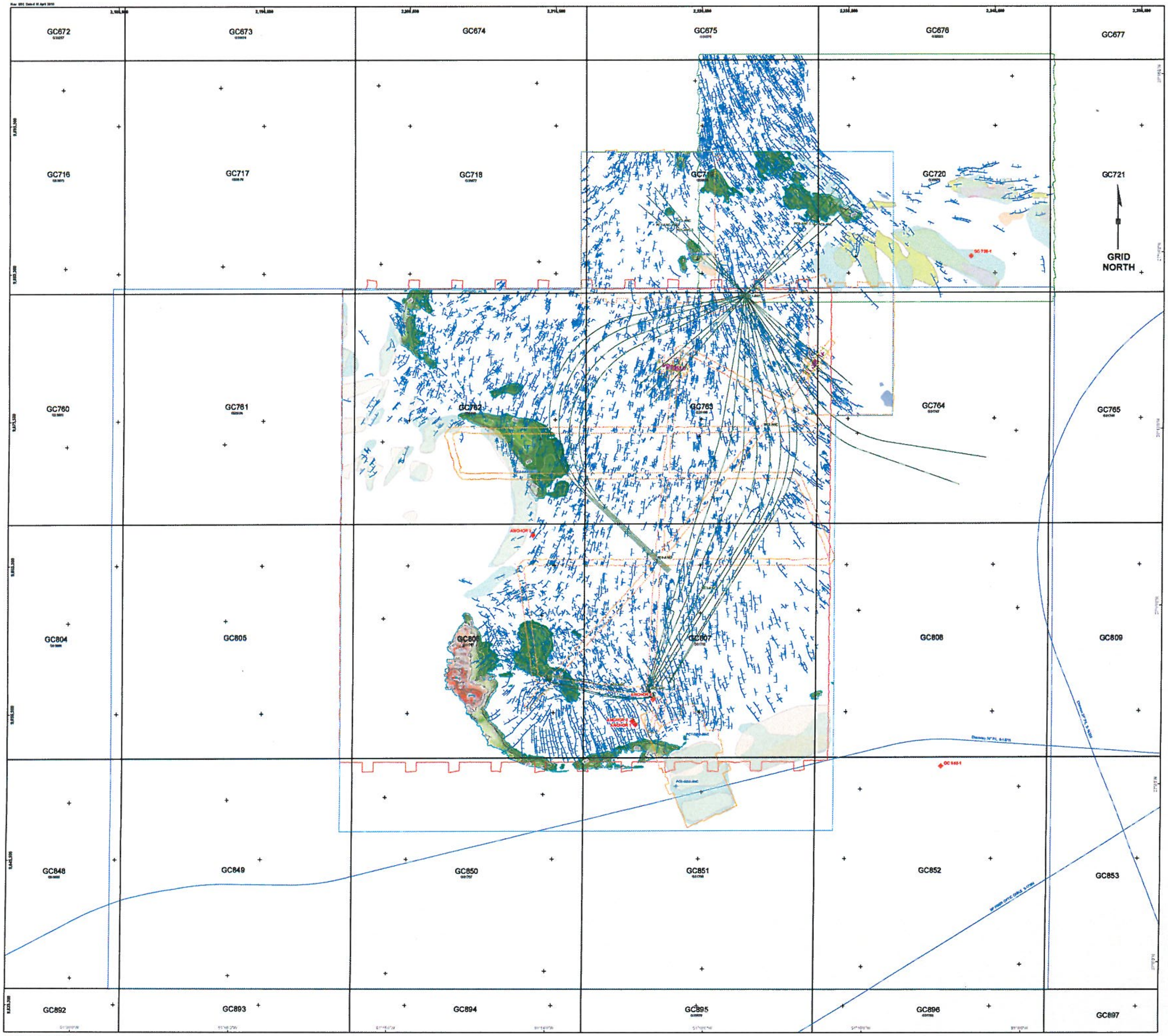
FUGRO



BASE MAP INFORMATION

- ANCHOR DEVELOPMENT FIELD
- ANCHOR 3D SEISMIC SURVEY AREA
- 2017 AUV ANCHOR MBES EXTENT
- OCS BLOCK WITH LEASE INFORMATION
- 2014 AUV C & C MBES EXTENT
- AUV3D MICRO VOLUME EXTENT
- 2013 AUV GATOR LAKE EXTENT
- EXISTING PIPELINES
- BOX CORE, GEOTECHNICAL
- PROPOSED INFRASTRUCTURE
- PISTON CORE, GEOTECHNICAL
- EXISTING WELL
- PISTON CORE, GEOHAZARD

INTERPRETIVE INFORMATION

TOP OF SALT ISOPACH CONTOURS

- MAJOR CONTOUR - 100 ft INTERVAL
- MINOR CONTOUR - 20 ft INTERVAL

ISOPACH SEAFLOOR TO THE TOP OF SALT

THIN 0 ft BML — THICKNESS — THICK 350 ft BML

- BURIED FAULTS
- SUBSURFACE FAULTS WITHIN THE AUV3D MICRO EXTENT
- ACOUSTIC MASKING
- MTD 1 (0 - 12 ft BML)
- MTD 2 (3 - 43 ft BML)
- MTD 3 (14 - 116 ft BML)
- MTD 4 (34 - 90 ft BML)
- MTD 5 (60 - 119 ft BML)
- TOP OF SALT POLYGON ABOVE 350 ft BML

NOTES:

1. REFER TO CHART 2 FOR DETAILED NOTES REGARDING AUV AND 3D SEISMIC GRID INFORMATION.

2. TIME-TO-DEPTH CONVERSIONS FOR THE TOP OF MTD DEPTHS WERE BASED ON AN ASSUMED 4,917 ft/sec VELOCITY.

3. TOP OF SALT DEPTHS WERE PROVIDED TO FUGRO FROM CHEVRON AND SUBTRACTED FROM THE MBES SEAFLOOR. THE 3D SEISMIC TOP OF SALT DEPTHS WERE ADJUSTED 15 m (49.21 ft) DEEPER TO COINCIDE WITH THE MBES SEAFLOOR CALCULATED DEPTHS.

4. FOR THE TOP OF FAULT DEPTHS FOR THE AUV3D MICRO SURVEYS, PLEASE REFER TO FIGURES 12 AND 13 IN THE ANCHOR INTERIM GEOPHYSICAL SURVEY INTERPRETATIVE REPORT

SPHEROID:	CLARKE 1866	FLATTENING:	1/294.98
SEMI MAJOR AXIS:	6,378,206.4	SCALE FACTOR:	0.9996
PROJECTION:	TRANSVERSE MERCATOR	CENTRAL MERIDIAN:	-87°00'00" W
DATUM:	NAD 1927	LAT. ORIGIN:	00°00'00" N
ZONE:	BLM ZONE 15N	FALSE EASTING:	1,640,416.67 ft
GRID UNITS:	U.S. SURVEY FEET	FALSE NORTHING:	0.0 ft

SCALE = 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000 FEET

SUBSURFACE FEATURES

ANCHOR DEVELOPMENT AREA

BLOCKS 719, 762, 763, 764, 806, 807, & 851 GREEN CANYON AREA, GULF OF MEXICO

CHEVRON NORTH AMERICA EXPLORATION AND PRODUCTION CO.

CONTOUR INTERVAL: N/A	
DATUM: SEAFLOOR	
VELOCITY: N/A	
POSITIONING BY: SEE NOTE 1	DRAFTED BY: C. NOEL
INTERPRETATION BY: K. BATES / M. JOHN	CHECKED BY: S. SMITH
DATE: 23 FEBRUARY 2018	REVISION NO.:
JOB NO.: 02.17031201B-Geoplays_Anchor	GIS: 1201 Anchor Chart 09 Subsurface Features

CHART 9 — SHEET NO. 9 OF 9

MAP PREPARED BY

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APPENDICES

A. INTERPRETIVE PROCEDURES

B. ANCHOR DEVELOPMENT AREA ARCHAEOLOGICAL ASSESSMENT

A. INTERPRETIVE PROCEDURES

A.1 SOFTWARE

This appendix provides details of the procedures and criteria used during interpretation of three high-resolution AUV datasets. Interpretation of the subbottom data was performed using a PC based workstation running the IHS Kingdom version 15 software. Further processing of the interpretation was performed using a software suite including Fledermaus v7.4, Global Mapper v14.1, and ArcGIS v10.4. All large-format charts were produced using ArcGIS v10.4.

A.2 GEODETIC PARAMETERS

Datum : NAD 1927
Spheroid: Clarke 1866
Semi-major axis: 6,378,206.4 m
Inverse Flattening (1/f): 294.98
Projection: UTM
Zone: 15 North (ft)
Scale Factor: 0.09996
Central Meridian: -93°00'00" W
Latitude Origin: 00°00'00" N
False Easting: 1,640,416.67 US Survey ft
False Northing: 0.0 US Survey ft

A.3 SEAFLOOR AND SUBSURFACE DEPTHS METHODLOGY

The water depths within the Anchor Development Area were adjusted to match the 2017 Fugro MBES data as it best correlated to the known depths of existing wells within the survey area. The 2015 C & C MBES data was adjusted 3.8 m (12.5 ft) shallower. The 2015 Fugro Gator Lake MBES data was adjusted 1.4 m (4.5 ft) deeper, and the 3D Seismic data was shifted 15 m (42.2 ft) deeper.

All AUV subbottom profiler subsurface depths used a time-to-depth conversion based on an assumed 4,917 ft/sec velocity, which was agreed upon by Fugro and Chevron.

The top of salt isopach above 350 ft BML shown on Chart 9 is from derived from a structure horizon provided to Fugro from Chevron. The horizon was adjusted 15 m (42.2 ft) deeper prior to being subtracted from the MBES Seafloor to produce the isopach.

A.4 SUBBOTTOM PROFILER 3D MICRO PROCESSING

The processing sequence required to produce the two AUV 3D micro (AUV3Dm) volumes generated for this project is straight forward but required extreme attention to detail to produce the high-quality result needed for detailed engineering interpretation and analysis. The principal steps followed are:

1.Load 2-D SEGY data (high and low frequency) into Kingdom project

2.Data QC check

3.QC off-line positioning (2-D line spacing is nominally 13.1 ft, with maximum ±6.6 ft acceptable deviation from pre-plotted line)

4.Correct all 2-D lines to uniform seafloor datum

5. Determine nominal trace-spacing range to calculate crossline bin size
6. Bin data to 13.1 ft (Inline) x 0.9 ft (Xline) to produce time (amplitude) volume for both high and low frequency data sets
7. Apply constant sub-seafloor velocity of 4,917 ft/sec for time-to-depth conversion to produce depth volume
8. Apply filtering and generate attribute depth volumes as appropriate (examples: envelope, AGC, band-pass filtered, etc.)

B. ANCHOR DEVELOPMENT AREA ARCHEOLOGICAL ASSESSMENT

2017 Geophysical & Geotechnical Site Development Survey

Archaeological Assessment

Blocks 719-720, 762–764, 806–807, & 851
Green Canyon Area, Offshore Gulf of Mexico

18 April 2018
Fugro Project No.: 02.17031201_Arch_Anchor

Chevron North America E & P Company

18 April 2018
Fugro Document No. 17031201_Arch_Anchor

Chevron North America Exploration and Production Company
C/O Deepwater Exploration and Projects
1500 Louisiana Street
Houston, Texas 77002

Attention: Brian Clevenger

Archaeological Assessment
Anchor Prospect
Green Canyon Area, Gulf of Mexico

We are pleased to present this final report detailing an Archaeological Assessment of the Anchor Prospect within Blocks 719–720, 762–764, 806–807, 851, and vicinity of the Green Canyon Area, Gulf of Mexico.

This Archaeological Assessment was written to satisfy Bureau of Ocean Energy Management/Bureau of Safety and Environmental Enforcement (BOEM/BSEE) regulations concerning the potential damage to archaeological resources by bottom-disturbing activities associated with oil and gas operations within the Gulf of Mexico (Mitigation 3.20, BOEM 2010). According to Notice to Lessees (NTL) 2005-G07 and NTL 2011-Joint-G01, the study area does not lie within a high probability zone for the existence of historic cultural resources. This report and associated fieldwork comply with NTL 2005-G07 for Archaeological Surveys and Reports, which requires the archaeological assessment to be prepared and signed by a professional archaeologist (as defined in the Code of Federal Regulations [CFR] 36 part 61 [36 CFR 61]).

Findings submitted in this report are based on the interpretation of Autonomous Underwater Vehicle (AUV) side scan sonar and multibeam bathymetry data sets.

Sixteen sonar contacts were recorded within the survey area. None of the targets were deemed archaeologically significant.

We appreciate the opportunity to work with you on this project and look forward to continuing as your geohazards consultants. Please contact me if you have any questions of if I can be of further assistance.

Sincerely,
FUGRO MARINE GEOSERVICES, INC.

Ray Blackmon
Supervising Archaeologist
Phone: 337-268-3357

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. SUMMARY

General

Fugro Marine Geoservices, Inc. (FMGI) was contracted by Chevron North America Exploration and Production Company (Chevron) to perform an Archaeological Assessment for the Anchor Prospect within Blocks 719–720, 762–764, 806–807, 851, and vicinity of the Green Canyon Area, Gulf of Mexico.

Purpose and Scope

This report describes seafloor conditions and potential anthropogenic debris within the Anchor Prospect in Green Canyon Area. This assessment is based on an interpretation of Autonomous Underwater Vehicle (AUV) side scan sonar and multibeam bathymetry data sets.

Man-Made Infrastructure

The as-built database position of a variety of infrastructure was confirmed in the geophysical data. No additional infrastructure was reported or observed within the survey area.

Seafloor Conditions

Water depths range from about 4,119 to 6,725 feet in the entire combined study area (zero datum equal to Sea Level). Regional seafloor gradients range from less than 6° to over 30°.

Sixteen side scan sonar contacts (Nos. 1–16) were noted within the study area. All sonar targets noted within the survey area are interpreted as possible disturbed sediments or debris associated with former shipping or fishing activities, and are not deemed archaeologically significant.

Conclusions and Recommendations

The evaluation of the 2017 high-resolution geophysical survey data collected within the Anchor Prospect Area indicates that there were no unusual depressions, scours, sediment changes, or unidentified seafloor targets observed within the survey area that could represent resolved unidentified shipwreck remains or cultural resources. Additional objects may exist on the seafloor that are below the imaging resolution of the collected geophysical data.

Eleven sonar contacts were recorded within the 2015 Fugro survey area. None of the targets were deemed archaeologically significant.

Forty-six sonar contacts were recorded within the 2015 C&C survey area (GEMS 2015). None of the targets were deemed archaeologically significant.

2. INTRODUCTION

Fugro Marine Geoservices, Inc. (FMGI) was contracted by Chevron North America Exploration and Production Company (Chevron) to perform an Archaeological Assessment within the Anchor Prospect in Blocks 719–720, 762–764, 806–807, 851, and vicinity of the Green Canyon Area, Gulf of Mexico.

This report and the accompanying charts provide a seafloor and debris assessment. The study area is located about 225 miles southwest of Baton Rouge, Louisiana (Figure 1). This report is based on the interpretation of Autonomous Underwater Vehicle (AUV) side scan sonar and multibeam bathymetry data sets.

2.1 Purpose and Scope

This report was written to comply with the latest guidelines established by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) in Notice to Lessees (NTL) 2005-G07 for Archaeological Surveys and Reports, which requires the report to be prepared and signed by a professional archaeologist (as defined in the Code of Federal Regulations [CFR] 36 part 61 [36 CFR 61]).

The 2017 data have been assessed for evidence of shipwrecks. According to NTLs 2005-G07 and 2011-Joint-G01, the study area does not lie within a high probability zone for the existence of historic cultural resources. This Archaeological Assessment was written to satisfy BOEM/BSEE regulations concerning the potential damage to archaeological resources by bottom-disturbing activities associated with oil and gas operations within the Gulf of Mexico (Mitigation 3.20, BOEM 2010).

2.2 Datasets

Three high-resolution AUV geophysical datasets were acquired within the Anchor Development Area. These data were acquired in 2015 by C & C Technologies, Inc. and in 2015 and 2017 by FMGI (Fugro, 2015a; Fugro, 2018a). GEMS completed the Archaeological Assessment for the 2015 C&C data (GEMS 2015). Each survey campaign includes multibeam echosounder (MBES) bathymetry and backscatter, side scan sonar, and sub-bottom profiler data.

This Archaeological Assessment was only completed for the AUV data acquired in 2017.

Eleven sonar contacts were recorded within the 2015 Fugro survey area (Fugro 2015a). None of the targets were deemed archaeologically significant.

Forty-six sonar contacts were recorded within the 2015 C&C survey area (GEMS 2015). None of the targets were deemed archaeologically significant.

Please refer to the GEMS 2015 and the FMGI 2015 Archaeological Assessments for further details concerning the 2015 AUV data.

FMGI acquired the 2017 high-resolution geophysical survey data utilizing the *Echo Surveyor IV,* a Kongsberg Hugin 1000 class AUV, aboard the *Fugro Enterprise* from December 11 to 17, 2017. Maritime conditions during data acquisition were variable with winds ranging from approximately six to 23 knots and wave heights from one to six feet. The quality of the collected geophysical data was excellent, and the data were suitable for interpretation. Although weather is a factor during the launch and recovery of the AUV, sea states do not affect data acquisition at depth. Survey operations were conducted without any health, safety, or environmental (HSE) incidents.

High-resolution geophysical systems used during this survey included an Edgetech 2200 Full Spectrum Chirp side scan sonar/sub-bottom profiler and a Kongsberg EM 2040 Multibeam Echo Sounder (MBES). Horizontal positioning of the survey vessel was accomplished with the Fugro Starfix Differential Global Positioning System (DGPS), which has a field accuracy of <1 meter. The AUV navigates using a Global Positioning System (GPS) while on the surface and an Internal Navigation System (INS) coupled with a Doppler velocity logger when submerged. In addition, the AUV is tracked with an Ultra-Short Baseline (USBL) system and sent position updates via an acoustic modem to augment the INS navigation. The AUV performed pre-programmed survey missions collecting 200 kHz multibeam bathymetry, 105 and 410 kHz side scan sonar, and 1–10 kHz chirp sub-bottom profiler data.

All survey data were collected in World Geodetic System of 1984 (WGS84) datum, Universal Transverse Mercator (UTM) Zone 15 (North) Coordinate System, with grid units in meters. Final deliverables were converted (using North American Datum Conversion [NADCON] software) to the North American Datum of 1927 (NAD27), Universal Transverse Mercator (UTM) Zone 15 (North) Coordinate System, with grid units in US Feet. All coordinates given are presented in this projection on the study charts and referenced within this report. All grid units (as well as scales and measurements) are in U.S. survey feet.

The 2017 AUV data was collected within portions of Blocks 719–720, 762–764, 806–807, and 851 of the Green Canyon Area. Coverage within the southwest portion of GC719 consisted of 16 primary tracklines spaced at 150 meter (492 feet) intervals and five tie lines spaced at 500 meter (1,640 feet) intervals. Coverage within the northwest portion of GC764 consisted of 14 primary tracklines spaced at 150 meter (492 feet) intervals and three tie lines spaced at 500 meter (1,640 feet) intervals. Investigation lines were acquired within the southern portion of GC807 and the north central portion GC851. This coverage consisted of six primary northwest-southeast tracklines spaced at 175 meter (574 feet) intervals and four tie lines at varying spacing were run southwest to northeast. Regional tie lines were acquired in GC762, GC763, GC806, and GC807 with additional investigation lines acquired at the Anchor 1, 2, and 4 drill centers.

All survey tracklines are displayed on the Navigation Post-Plot (Chart 2). The 2017 AUV tracklines are plotted in black on Chart 2. Each geophysical system was run on all survey lines with the AUV operated at an altitude of approximately 20 and 42 meters above the seafloor. Navigational fixes (shot points) were recorded at 125 meter (410 feet) intervals and annotated on all geophysical data. The survey grid was designed to provide comprehensive coverage of the seafloor with the multibeam and side scan sonar while providing a representative sampling with the sub-bottom profiler.

2.3 Method of Analysis

Large-format charts (1:24,000 scale) accompany this Archaeological Assessment, and include: Navigation Pre-Plot (Chart 1), Navigation Post-Plot (Chart 2), Seafloor Rendering (Chart 3), Water Depth (Chart 4), Seafloor Gradient (Chart 5), AUV MBES Backscatter and 3D Seafloor Amplitude (Chart 6), AUV Side Scan Sonar Mosaic (Chart 7), Seafloor Features (Chart 8), and Subsurface Geologic Features (Chart 9). All charts referenced within this assessment are included behind the appendices.

2.4 Project Organization

FMGI was contracted by Chevron to perform an Archaeological Assessment for the Anchor Prospect within Green Canyon Area, Gulf of Mexico. Ray Blackmon (Supervising Archaeologist) conducted data interpretation and authored the Archaeological Assessment. Cedric Noel (Senior CAD Specialist) completed the large-format charts. Dean Gresham, Deputy Geoscience Department Manager, conducted the final report review.

2.5 Report Format

This introduction is followed by sections describing the seafloor conditions, man-made features and debris targets, and conclusions and recommendations. References follow the main text. Large-format charts are included in pockets behind the appendices. This Archaeological Assessment and the Side Scan Sonar Contact Table are presented in Appendix B of the Geophysical Survey Interpretive Report. All charts and figures referenced within this assessment are included within the main Geophysical Survey Interpretive Report.

2.6 Acronyms Defined

APE	Area of Potential Effect
AWOIS	Automated Wreck and Obstruction Information System
B.P.	Years Before Present
BLM	Bureau of Land Management
BML	Below Mudline
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CEI	Coastal Environments, Inc.
CFR	Code of Federal Regulations
CONUS	Continental United States
ENC	Electronic Navigation Chart
et al.	et alii (and others)
FMGI	Fugro Marine Geoservices, Inc.
Ft.	Foot (Feet)
GIS	Geographic Information System
GPS	Global Positioning System
GC	Green Canyon
HO	Hangs and Obstructions
Hz	Hertz
kHz	Kilohertz
kya	Thousand Years Ago
m	Meter(s)
m^2	Square Meters
MLLW	Mean Lower Low Water
mm	Millimeter(s)
MSL	Mean Sea Level
NAD27	North American Datum of 1927
NADCON	North American Datum Conversion
NAV	Navigation
NOAA	National Oceanic and Atmospheric Administration
No(s).	Number(s)
NTL	Notice to Lessees
SSS	Side Scan Sonar
SBP	Sub-bottom Profiler
SOI	Secretary of the Interior of the United States of America
UTM	Universal Transverse Mercator
USBL	Ultra-Short Base Line
USCG	United States Coast Guard
WGS84	World Geodetic System of 1984

3. CULTURAL RESOURCES OVERVIEW

3.1 Historic Cultural Resources Background

According to a study by Pearson et al. (2003), Green Canyon Area is not in a high probability zone for historic shipwrecks. Research into trade routes in the Gulf of Mexico indicate that Spanish navigation and later domestic routes did cross near and/or through this area consistently from 1536 to 1862 (Krivor et al. 2011, Lugo-Fernandez et al. 2007, and Pearson et al. 2003) (Figure B.1). A representative section of these routes is displayed in Figure B.1, as these were documented shipping routes plotted/planned by ships' captains from 1605–1862.

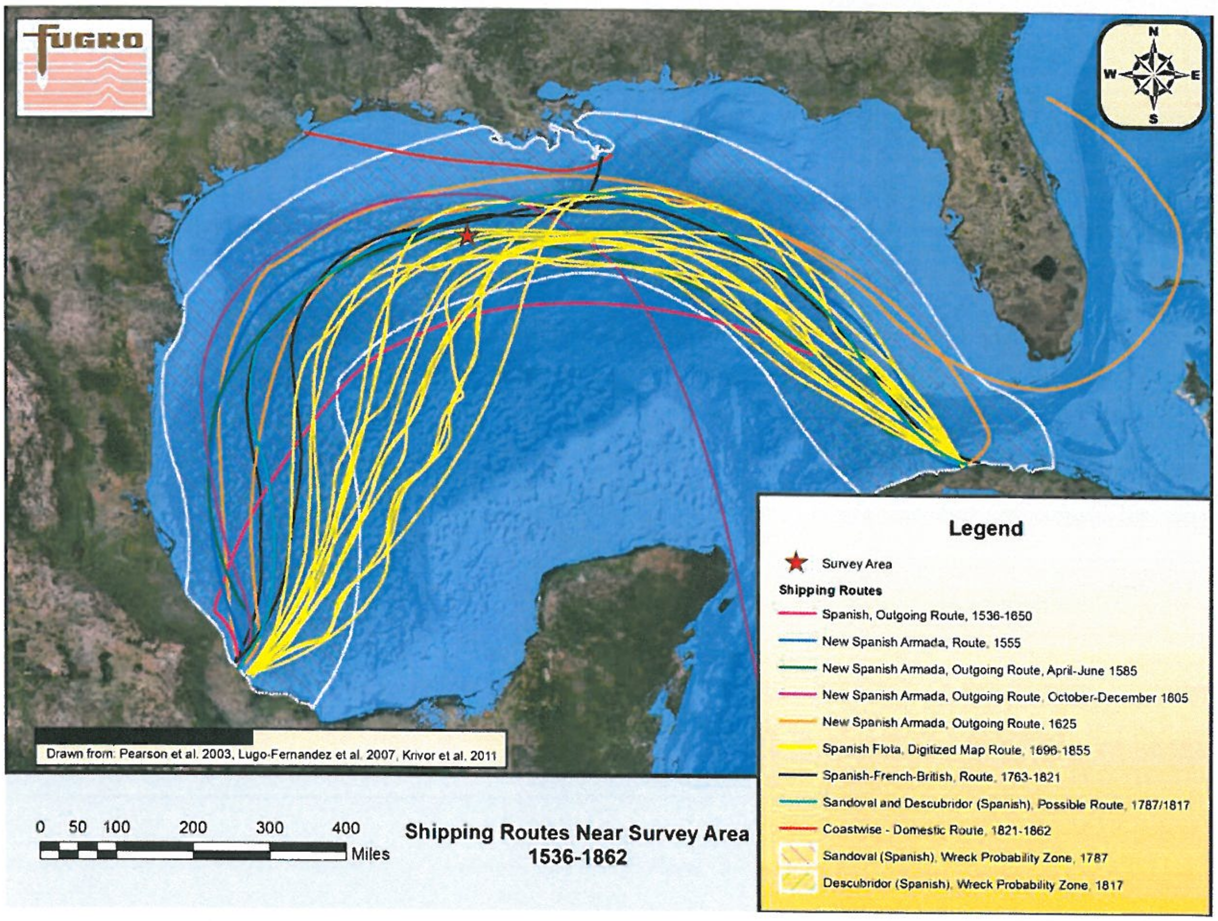


Figure B.1: Map of historic shipping routes drawn from Krivor et al. 2011, Lugo–Fernandez et al. 2007, and Pearson et al. 2003 within a 100-mile radius of the survey area.

While this figure may only show a selected corridor of trade routes, it is important to note that these routes and other similar courses were used for centuries. The ships that sailed along these routes encountered many events that resulted in a number of shipwrecks. In addition to these events, accurate methods for calculating longitude were not common until the mid-19th century, and navigational hazards along with confusing sea conditions could cause a ship to run aground or become lost (Sobel & Andrewes 1998). Weather patterns were largely unpredictable until the 20th century, and entire fleets of ships encountered hurricanes with virtually no advanced warning (Smith et al. 1998). Trade vessels in the 17th–19th centuries were also threatened by piracy, rarely protected by any military presence in the area (Vogel 1990, Weiner et al. 2008). This is only a brief list of some of the risks that ships faced while sailing within the Gulf of Mexico during the past 500 years and should be considered as a baseline primer for the potential of historic shipwrecks in the region.

It can be inferred through the studies by Lugo-Fernandez et al. (2007) and Pearson et al. (2003) that the number of historic maps demonstrating common routes over this region indicate that this area has the potential to be the location of shipwrecks that have little to no record of a sinking location (Figure B.1). A report by Krivor et al. (2011) furthered the progress in the identification of significant Spanish trade routes and losses in the Gulf of Mexico. Pearson et al. (2003) demonstrated that modern shipping routes still cross these areas frequently; therefore, there is a high probability that shipwreck sites will continue to be found and occur in these areas over time (Figure B.2).

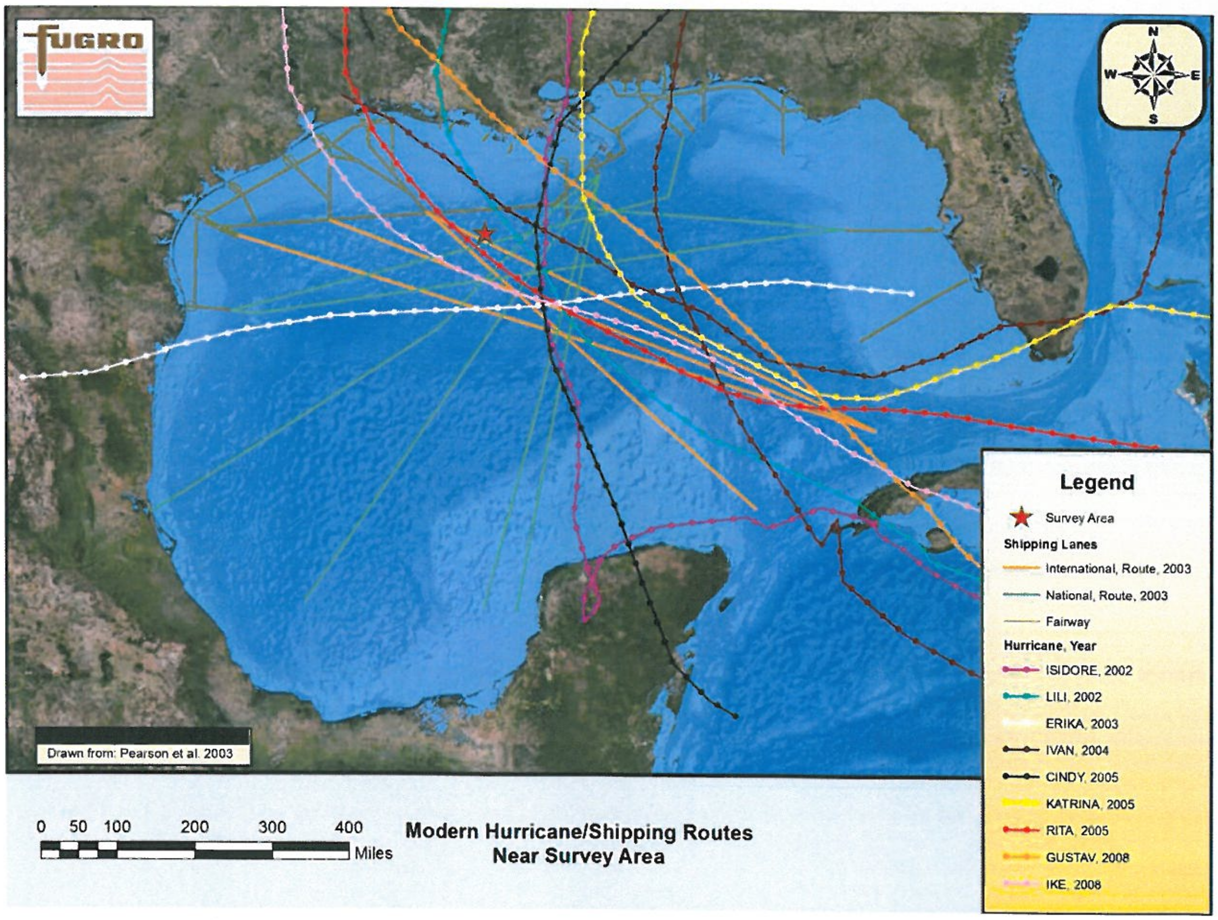


Figure B.2: Map of modern shipping routes drawn from Pearson et al. 2003 and hurricane tracks within a 100-mile radius of the survey area from 2000 to 2012.

When this report is used in conjunction with modern recorded hurricane tracks, it can be illustrated that the current and historical impact of hurricanes on shipping in the area is direct, as well as demonstrate the impact that hurricanes have on oil and gas structures and archaeological resources in shallow water within the storms' paths (Figure B.2).

Shipwreck location coordinates are often inaccurate, and many only contain information concerning large, twentieth-century commercial craft. Many incidents of historic period vessels and small craft losses have been overlooked in the aforementioned references. There have been numerous commercial vessels from colonial and other historic periods reported in the Gulf of Mexico whose wreck sites remain undetermined. The reported coordinates for many wrecks before the mid-20th century are often imprecise, and the wrecks may drift and settle some distance from the reported locations. It is therefore possible for earlier commercial craft and/or private vessels to be located within the survey area. Examples of shipwreck sites located several hundred feet to over one hundred miles from their reported locations emphasize the importance of taking reported shipwrecks in the vicinity of the survey location into consideration during analysis (Pearson et al. 2003).

Analysis of available shipwreck sources from the files maintained by the BOEM/BSEE archaeological resource database, National Oceanic and Atmospheric Administration Office of Coast Survey's Wrecks and Obstructions Database, and the Fugro Chance hazard database indicate that no shipwrecks have been reported within the survey area. Information regarding the nearest reported shipwrecks are listed in Table 1. The location reliability is rated between 1 and 4 (with 1 being most reliable and 4 being least reliable).

Table B.1: Shipwrecks in Vicinity of Survey Area

Name/Description	Date	Source	Location Reliability	Approximate Distance & Direction To Study Area
Vainqueur	1969	NIMA	3	~30 miles Northwest
Kodiak II	1998	USCG	3	~37 miles Northeast
Unknown	N/A	BOEM	1	~43 miles Southeast
Unknown	N/A	BOEM	1	~37 miles Southwest

It is important to note that although there are many sources of information for reported shipwreck locations in the Gulf of Mexico Region (i.e.: Hangs and Obstructions [HO], lists and charts published by the U.S. Department of Transportation Coast Guard [1984 to Present], the National Ocean Service Charts, Berman [1972], the cultural resource baseline studies by Coastal Environments Inc. (CEI) [1977] and Garrison et al. [1989a and b]), many of these lists are based on secondary sources and have already been incorporated into the three aforementioned composite databases used in this report.

The degree to which a shipwreck is preserved is dependent upon multiple factors. Hull composition, sediment type, water depth, wave energy, depth of burial, and biological activity all play a vital role in determining the preservation of a vessel and its associated cargo. Studies conducted by Garrison et al. (1989), Muckelroy (1998), and others suggest that shipwrecks located in low energy environments with fine-grained seafloor sediments have the highest probability for preservation. Conversely, shipwrecks located in high-energy, dynamic environments with coarser-grained seafloor sediments have the lowest probability for preservation. Based on this model, the areas within the Gulf of Mexico region that would afford the highest probability for shipwreck preservation would include the continental shelf region in the northwestern portion of the Gulf, specifically the area west of the Mississippi River delta. The area of the Gulf where shipwreck preservation would be considered to be low would include the majority of the Gulf of

Mexico region east of the Mississippi River delta. While this model is generally applicable to most parts of the continental shelf region of the Gulf of Mexico, exceptions would include coastal areas such as bays and lagoons where protection from full exposure to wave energy would be anticipated.

As stated, hull composition is an important factor in determining a vessel's preservation potential. Wooden-hulled vessels are subject to biological degradation, such as toredo worms, and destruction of exposed vessel sections by wave action, currents, and storms. While metal-hulled vessels largely remain intact, corrosion and colonization can have detrimental effects on the structural integrity of the ship's hull and superstructure.

Identification and interpretation of shipwreck remains based on high-resolution geophysical data is a complex and highly variable process. Attempts to differentiate between modern ferromagnetic debris and shipwrecks have been conducted by numerous marine archaeologists such as Arnold (1982), Saltus (1986), Gearhart (1988), and others, with variable degrees of success. An analysis and compilation of these studies by Garrison et al. (1989) resulted in the outlining of several salient criteria in differentiating between the two types of anomalies. The study found that magnetic anomalies indicative of shipwreck sites include the following: multiple peak anomalies, anomalies with high spatial frequency, anomalies spread over a 10,000 m^2 area or greater, anomalies with long durations, and anomalies with axial or linear configurations. Individually, these anomaly types may not be indicative of high probabilities for the existence of a shipwreck within a given area; however, the probability for the presence of a shipwreck should be considered high where these types of anomalies co-occur.

Side scan sonar, when used in conjunction with a magnetometer, can aid in identifying shipwreck remains. Seafloor depressions, scours, and geometrically complex targets are common sonar contacts associated with known shipwreck sites throughout the Gulf of Mexico region. In areas where hard bottoms exist, wreck debris may be visually identifiable resting on the seafloor.

Bathymetric and sub-bottom profiler systems may also prove useful in the identification of shipwreck remains within a survey area. In those instances where a survey trackline passes directly over a buried shipwreck, a diffraction anomaly, much like those observed over pipelines, may be visible. Where multibeam bathymetric systems are used, shipwrecks partially or fully exposed may appear as topographic anomalies.

4. DESCRIPTION OF ARCHAEOLOGICAL FINDINGS

The Seafloor Features Chart (Chart 8) shows seafloor topographic features, infrastructure, and man-made debris in the study areas. Bathymetric contours are displayed on Chart 4. Water depths displayed on Charts 3 and 4 are based on the final multibeam bathymetry data, which were calibrated using real-time velocimeter cast information. The Seafloor Rendering (Chart 3) and the Side Scan Sonar Mosaic (Chart 7) were used to delineate seafloor debris targets, provide indicators of seafloor sediment distribution, and aid in the interpretation of other seafloor features.

4.1 Water Depths and Seafloor Morphology

The Kongsberg EM2040 Multibeam Bathymetric System was used to determine water depths across the survey area at an operating frequency of 200 kHz and a swath of 150° (~200-meter range at 42-meter altitude). Four velocimeter casts were taken near the survey area to calibrate the multibeam time-to-depth conversions. For quality control purposes, two velocimeters were included on each of the casts (for a total of eight velocity profiles).

The depth of the AUV at each node within the multibeam grid was derived from a vehicle-mounted Digiquartz barometer while surveying. An atmospheric pressure reading was measured on the mother vessel during each dive and was subtracted from the barometric readings collected by the AUV. The resulting pressure values were converted to depth via a dynamic hydrostatic conversion formula. Two-way acoustic travel times from the AUV to the seafloor recorded by the multibeam bathymetric system were converted to depths (utilizing harmonic mean velocities derived from the previously-described velocity profiles). The sounding depths were then added to the depth-converted pressure readings to produce raw bathymetry values. Subsequently, a Fugro proprietary software package was used to model tidal fluctuations within the survey area and convert the data to sea level.

The seafloor topography in this area is directly related to the depth and complexity of the underlying shallow salt. Seafloor morphology is dominated by chaotically-bedded and faulted sediments overlying near-surface salt in the central and northern portions of the study area on the northern flank of St. Tammany Basin to the south, and the southwestern flank of Hancock Basin to the northeast (Figures 2 and 3).

The Seafloor Rendering presents a color-shaded visualization of the bathymetry over the area (Chart 3). The colors range from white and tan (which depict the shallowest water depths) to blue and purple (for the deepest water depths). Areas of increased seafloor slope and topographic relief are delineated by their shaded and sometimes illuminated appearance, depending on their orientation to the azimuth of the light source.

Water depths in the combined survey area range from about 4,119 feet BSL (Below Sea Level) in the southern portion of GC762 to about 6,725 feet BSL in the northern portion of GC849 within St. Tammany Basin, located outside of the Anchor Development Area (Figures 2 and 3; Charts 3 and 4).

The seafloor within the study area dips to the south towards St. Tammany Basin with slopes less than 6°. However, slope values commonly exceed 30° locally along irregular seafloor topography, mainly at steep headwall scarps and fault scarps (Figure 3; Chart 5).

For additional information concerning seafloor and shallow geologic features, please refer to Section 3 of the Geophysical Survey Interpretive Report (Fugro Document No. 02.17031201B_Geophys_Anchor).

There were no irregular seafloor features identified in the multibeam bathymetry data that showed immediate evidence of unidentified cultural resources or shipwreck remains.

4.2 Seafloor Features

4.2.1 Side Scan Sonar Analysis

The sonar data were collected at 105 and 410 kHz; data quality was excellent (Figures 6, 7, and 9, Chart 7). The AUV was operated at an altitude of 42 meters above the seafloor while collecting sonar data. The 42-meter altitude of the AUV and 200 meter sonar range were set to optimize the quality and coverage of the 105 kHz data.

The side scan sonar records exhibit moderate reflectivity across a majority of the survey area (Figures 6, 7, and 9, Chart 7). In general, the side scan sonar images exhibit uniform reflectivity, which indicates a homogenous soil type, likely of fine grained seafloor sediments. Localized areas of increased acoustic reflectivity indicate seafloor textural changes consisting of "rough" or "grainy" textured sediments.

Multiple areas of higher sonar reflectivity (darker returns) interpreted as pockmarks and potential hardgounds were noted within the survey area. Other areas of higher sonar reflectivity (including drill cuttings and drill mud) were noted surrounding multiple Wellsite locations within the study area.

Numerous seafloor and near-seafloor faults were noted throughout the study area. All faults are plotted in red and blue on Chart 8.

Other seafloor features noted within the study area include: gullies, headwall scarps, seafloor mass transport deposits, surface expression of shallow slide deposits, and irregular seafloor topography.

All seafloor features have been plotted on Chart 8.

For additional information concerning seafloor and shallow geologic features, please refer to Section 3 of the Geophysical Survey Interpretive Report (Fugro Document No. 02.17031201B_Geophys_Anchor).

Sixteen side scan sonar contacts (Nos. 1–16) were noted within the 2017 AUV data (Chart 8). To aid in the discussion of these contacts, all sonar targets have been categorized by size: small, medium, or large. Further details concerning these categories are provided below.

Of the 16 sonar contacts noted within the study area, three (Nos. 3, 6, and 8) are relatively small in size (less than 10 feet in length and width). These three sonar contacts are irregular in shape and were interpreted as modern debris or disturbed seafloor sediments. These contacts range in length from 7.8 feet to 7.9 feet in length, 3.8 feet to 7.4 feet in width, and none displayed a height above the seafloor.

Eleven sonar contacts (Nos. 1, 4, 5, 7, 9–12, and 14–16) noted within the survey area are considered medium in size. These contacts are linear or irregular in shape and range in length from 10.3 feet to 19.7 feet, 2.1 feet to 13.5 feet in width, and none displayed a height above the seafloor.

The remaining two sonar contacts (Nos. 2 and 13) are considered large in size (greater than 20 feet in any dimension).

Sonar Contact No. 2 is located in GC807 and measures 20.5 feet in length, 11.4 feet in width, with no height above the seafloor. Sonar Contact No. 13 is located in GC719 and measures 27.3 feet in length, 8.6 feet in width, with no height above the seafloor. Both contacts are irregular in shape and may represent disturbed seafloor sediments or modern debris.

All sonar targets noted within the survey area are interpreted as possible disturbed sediments or debris associated with former construction, shipping, or fishing activities, and are not deemed archaeologically significant. Known infrastructure or seafloor features such as drag scars were not interpreted as sonar contacts. No unusual depressions, scours, sediment changes, or unidentified seafloor targets were observed that could represent unidentified shipwreck remains.

The contacts are listed and described with X-Y coordinates and a digital reproduction in the table in Appendix B.

4.3 Seafloor-Based Infrastructure and Other Man-Made Features

Fugro's database and public files were reviewed in conjunction with the acquired geophysical field records for evidence of prior drilling, platforms, wells, and pipelines within the study area. The as-built database position of a variety of infrastructure was confirmed in the geophysical data. No additional infrastructure was noted within the Fugro database or in the geophysical dataset collected during this survey. Although a majority of the infrastructure imaged in the geophysical data was consistent with the Fugro-Chance database, the data may not be able to resolve all seafloor debris and man-made objects.

5. CONCLUSIONS AND RECOMMENDATIONS

The evaluation of the high-resolution geophysical survey data indicates that there were no unusual depressions, scours, sediment changes, or unidentified seafloor targets observed within the survey area that could represent resolved unidentified shipwreck remains or cultural resources.

It is possible that historic shipwreck materials may not be detected by the geophysical instruments or may be obscured by modern debris. If wooden planking or other cultural materials that could represent shipwreck remains should be encountered as described by BOEM/BSEE below, operations must cease until proper procedures are followed (as detailed in the following section).

5.1 Required Notification of the Discovery of Shipwrecks on the Seafloor (30 CFR 250.194(c) and 30 CFR 250.1010(c))

If you discover man-made debris that appears to indicate the presence of a shipwreck (i.e., a sonar image or visual confirmation of an iron, steel, or wooden hull, wooden timbers, anchors, concentrations of man–made objects such as bottles or ceramics, piles of ballast rock) within or adjacent to your lease area or pipeline right-of-way during your shallow hazard survey, diver inspection, or remotely operated vehicle (ROV) inspection, you must immediately halt operations, take steps to ensure that the site is not disturbed in any way, and contact the Regional Supervisor, Leasing and Environment, within 48 hours of its discovery. You must cease all operations within 1,000 feet (305 meters) of the site until the Regional Director instructs you on what steps you must take to assess the site's potential historic significance and what steps you must take to protect it.

6. REFERENCES

Arnold, J. Barto, III. 1982. A Matagorda Bay Magnetometer Survey and Site Test Excavation Project. Publication No. 9. Texas Antiquities Committee. Austin, Texas.

Aten, Lawrence. 1983. Indians of the Upper Texas Coast. Academic Press. New York, New York.

Belknap, D.F. and J.C. Kraft. 1981. Preservation Potential of Transgressive Coastal Lithosomes on the U.S. Atlantic Shelf. Marine Geology 42: 429–442.

Belknap, D.F. and J.C. Kraft. 1985. Influence of Antecedent Geology on Stratigraphic Preservation Potential and Evaluation of Delaware's Barrier System. Marine Geology 63: 235–262.

Bense, Judith A. 1994. Archaeology of the Southeastern United States; Paleoindian to World War 1. Academic Press. New York, New York.

Berman, Bruce D. 1972. Encyclopedia of American Shipwrecks. The Mariners Press Incorporated. Boston, MA.

Bernard, H. A. 1970. Recent Sediments of Southeast Texas: A Field Guide to the Brazos alluvial and deltaic plains and the Galveston barrier island complex. Shell Development Company. Bureau of Economic Geology. University of Texas. Austin, Texas.

Berryhill, Henry L., Jr., John R. Suter, and Nancy S. Hardin. 1986. Late Quaternary Facies and Structure, Northern Gulf of Mexico. Interpretations from Seismic Data. AAPG Studies in Geology #23. Tulsa, Oklahoma.

Berryhill, Henry L., Jr. 1984. Distribution and Thickness of Holocene Sediments. Prepared by the Minerals Management Service, Department of the Interior, Gulf of Mexico Regional Office, OCS Map Series MMS 84–003. Sheet VI.

Berryhill, Henry L., Jr., D. E. Owen and J. R. Suter. 1984. Distribution of Ancient Fluvial Sediments of Probable Early and Late Wisconsinan Age. Prepared by the USDI MMS, Gulf of Mexico Regional Office. OCS Map Series MMS 84–003. Sheet II. New Orleans, Louisiana.

Breiner, S. 1999. Applications Manual for Portable Magnetometers, GeoMetrics, Sunnyvale California.

Coastal Environments, Inc., (CEI). 1977. Cultural Resources Evaluation of the Northern Gulf of Mexico. Prepared for Interagency Archaeological Services, Office of Archaeology and Historical Preservation, National Park Service, U.S. Department of the Interior. Baton Rouge, Louisiana.

Coastal Environments, Inc., (CEI). 1982. Sedimentary Studies of Prehistoric Archaeological Sites. Prepared for the Division of State Plans and Grants, National Park Service, U.S. Department of the Interior. Baton Rouge, Louisiana.

Coastal Environments, Inc., (CEI). 1986. Archaeological Investigations on the Outer Continental Shelf: A Study Within the Sabine River Valley, Offshore Louisiana and Texas. Prepared for the Minerals Management Service, U.S. Department of the Interior. Baton Rouge, Louisiana.

Donoghue, Joseph F. 2011. Sea Level History of the Northern Gulf of Mexico Coast and Sea Level Rise Scenarios for the Near Future. Climatic Change 107:17-33.

Frazier, David E. 1967. Recent Deltaic Deposits of the Mississippi River: Their Development and Chronology. Transactions of the Gulf Coast Association of Geological Societies, Volume 17.

Frazier, David E. 1974. Depositional Episodes: Their Relationship to the Quaternary Stratigraphic Framework in the Northwestern Portion of the Gulf Basin. Bureau of Economic Geology, the University of Texas. Austin, Texas.

Gagliano, Sherwood M. 1984. Geoarchaeology of the Northern Gulf Shore. In Perspectives on Gulf Coast Prehistory, Dave D. Davis, editor. University Presses of Florida, Gainesville, Florida.

Garrison, Ervin G., C. P. Giammona, F. J. Kelly, A. R. Tripp, and G. A. Wolff. 1989a. Historic Shipwrecks and Magnetic Anomalies of the Northern Gulf of Mexico: Reevaluation of Archaeological Resource Management Zone 1. Volume II: Technical Narrative. OCS Study 89–0024. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office. New Orleans, Louisiana.

Garrison, E. G., C. P. Giammona, J. Jobling, A. R. Tripp, E. N. Weinstein and G. A. Wolff. 1989b. An Eighteenth–Century Ballast Pile Site, Chandeleur Islands, Louisiana. OCS Study/MMS 89–0092. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office, New Orleans, Louisiana.

Gearhart, R. L. 1988. Cultural Resources Magnetometer Survey and Testing Great Highway/Ocean Beach Seawall Project, San Francisco, California. Espey, Huston & Associates Inc. Austin, Texas.

GEMS, 2015, Anchor AUV Survey Area, Archaeological Assessment, Blocks 762–763 and 806–807, Green Canyon Area (GEMS Project No. 0515-2530c)

Grebmeier, Jacqueline M. 1983. A Predictive Model for Marine Sites in Washington State, in Proceedings Fourth Annual Gulf of Mexico Information Trasfer Meeting. Minerals Management Service, U.S. Department of the Interior. Metairie, Louisiana.

Kraft, J.C., D.F. Belknap and I. Kayan. 1983. Potentials of Discovery of Human Occupation Sites on the Continental Shelves and Nearshore Coastal Zones. In Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves, edited by P.M. Masters and N.C. Flemming, pp 87–120. Academic Press, London.

Ludwick, J.C. 1960. Sediments in Northeastern Gulf of Mexico. In Papers in Marine Geology: Shepard Commemorative Volume, edited by R.L. Miller. MacMillan Company. New York.

McClelland Engineers, Inc. 1979. Strength Characteristics of Near Seafloor Continental Shelf Deposits of North Central Gulf of Mexico. Houston, Texas.

Muckelroy, Keith. 1998. The Archaeology of Shipwrecks. In Maritime Archaeology; A Reader of Substantive and Theoretical Contributions, edited by L. E. Babits & H. Van Tilburg. Plenum Press. New York, New York.

National Ocean Service. 1994. Nautical Chart 1116A Mississippi River to Galveston. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Washington, D.C.

National Ocean Service. 2001. Automated Wreck and Obstruction Information System. Standard Area 4B. Western Gulf Coast. Washington, D.C.

Nelson, H.F., Bray, E.E., 1970, Stratigraphy and History of the Holocene Sediments in the Sabine–High Island Area, Gulf of Mexico, in Deltaic Sedimentation: Modern and Ancient, Society of Economic Paleontologists and Mineralogists, Special Publication No. 15.

Pearson, C.E., D.B. Kelley, R.A. Weinstein, and S.W. Gagliano. 1986. Archaeological investigations on the outer continental shelf: A study within the Sabine River valley, offshore Louisiana and Texas. U.S. Dept. of the Interior, Minerals Management Service, Reston, VA. OCS Study MMS 86–0119. 314 pp.

Pearson, Charles E., George J. Castille, Donald Davis, Thomas E. Redard, and Allen R. Saltus. 1989. A History of Waterborne Commerce and Transportation Within the U.S. Army Corps of Engineers New Orleans District and an Inventory of Known Underwater Cultural Resources. Report submitted to the New Orleans District U.S. Army Corps of Engineers, New Orleans, Louisiana.

Pearson, Charles E. and Paul E. Hoffman. 1995. The Last Voyage of El Nuevo Constante. Louisiana University Press. Baton Rouge, Louisiana.

Pearson, Charles E., S.R. James, Jr., M.C. Krivor, S.D. El Darragi, and L. Cunningham. 2003a. Refining and Revising the Gulf of Mexico Outer Continental Shelf Region High–Probability Model for Historic Shipwrecks: Final Report. Volumes I–III. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003–060.

Pearson, Charles E., S.R. James, Jr., M.C. Krivor, S.D. El Darragi, and L. Cunningham. 2003b. Refining and Revising the Gulf of Mexico Outer Continental Shelf Region High–Probability Model for Historic Shipwrecks: Final Report. Access Shipwreck Database. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003–060.

Ricklis, Robert A. 1996. The Karankawa Indians of Texas: An Ecological Study of Cultural Tradition and Change. University of Texas Press, Austin.

Saltus, Allen. 1982. Spatial Magnetics of Shipwrecks. In Proceedings Third Annual Gulf of Mexico Information Transfer Meeting. U.S. Department of the Interior, Minerals Management Service. Metairie, Louisiana.

Saltus, Allen. 1986. Response to a Problematic Approach to Resolution of Unidentified Magnetic Anomalies. In Proceedings Seventh Annual Gulf of Mexico Information Transfer Meeting. U.S. Department of the Interior, Minerals Management Service. Metairie, Louisiana.

Stright, M. J. 1986. Evaluation of Archaeological Site Potential on the Gulf of Mexico Continental Shelf Using High Resolution Seismic Data. Geophysics. Vol. 51, No. 3, p. 605–622.

Stright, M. J. 1990. Archaeological Sites on the North American Continental Shelf. In Archaeological Geology of North America, Centennial Special Volume 4, edited by Norman P. Lasca and Jack Donahue. The Geological Society of America. Boulder Colorado.

U.S. Department of the Interior, Minerals Management Service (MMS). 1983. Visual 3. Bottom Sediments and Endangered and Threatened Species. Gulf of Mexico, OCS Regional Office. New Orleans, Louisiana.

U.S. Department of the Interior, Minerals Management Service (MMS). 1986. Visual No. 5. Geologic and Geomorphic Features. Gulf of Mexico, OCS Regional Office. New Orleans, Louisiana.

U.S. Department of the Interior, Bureau of Ocean Energy Management (USDI BOEM). 2005. Notice to Lessees NTL 2005–G07. Gulf of Mexico, OCS Regional Office. New Orleans, Louisiana.

U.S. Department of the Interior, Bureau of Ocean Energy Management / Bureau of Safety Environment Enforcement (USDI BOEM/BSEE). 2010. Mitigation 3.20 Avoidance of Archaeological Resources. Gulf of Mexico, OCS Regional Office. New Orleans, Louisiana

U.S. Department of the Interior, Bureau of Ocean Energy Management (USDI BOEM). 2011. Revisions to the list of OCS Lease Blocks requiring Archaeological Resource Surveys and Reports. Notice to Lessees NTL 2011–JOINT–G01. Gulf of Mexico, OCS Regional Office. New Orleans, Louisiana.

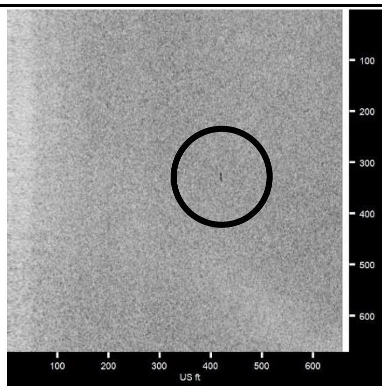
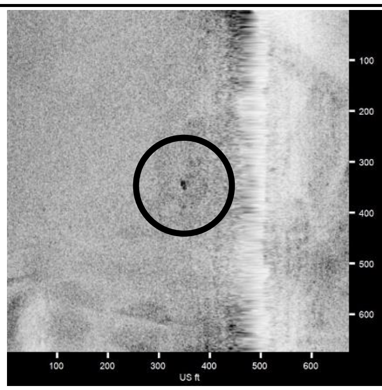
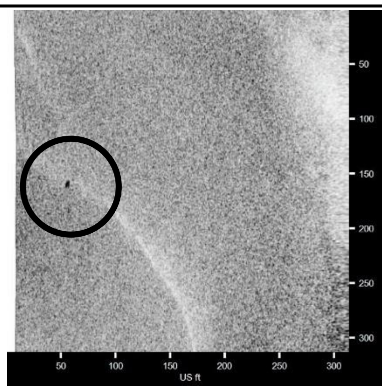
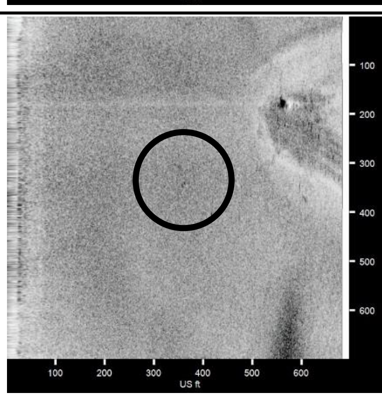
U. S. Department of Transportation. U. S. Coast Guard. 1984 to Present. Notice to Mariners. New Orleans, Louisiana.

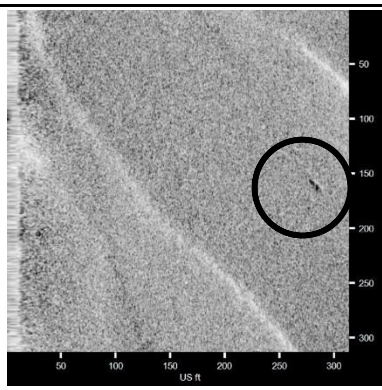
Waters, M.R. 1985. Early Man in the New World: An Evaluation of the Radiocarbon Dated Pre–Clovis Sites in the Americas. In Environments and Extinctions: Man in Late Glacial North America. J.I. Mead and D.J. Meltzer (editors). Center for the Study of Early Man. University of Maine, Orono.

Weight, Robert W. R. 2010. The Texas Mud Blanket: Understanding fine-grained sediment flux in the NW Gulf of Mexico during the Previous Transgression. Rice University. Houston, Texas.

Whelan, Thomas III, J. M. Coleman, J. N. Suhayda, and H. H. Roberts, 1977. Acoustical Penetration and Shear Strength in Gas–Charged Sediment. Marine Geotechnology, Volume 2, Marine Slope Stability.

Sonar Contact Table

Target Image	Target Info	User Entered Info
	**Contact 1** • Sonar Time at Target: 12/12/2017 5:51:46 AM • Click Position 27.1304325271 -91.1990775330 (WGS84) 27.1301552624 -91.1990167226 (NAD27LL) (X) 2226043.22 (Y) 9848940.32 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 71492 • Range to target: 445.41 US ft • Fish Height: 142.54 US ft • Heading: 0.000 Degrees • Event Number: 100.95 • Line Name: 903-053410-LF	**Dimensions and attributes** • Target Width: 2.1 US ft • Target Height: 0.0 US ft • Target Length: 16.6 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - linear • Area: Green Canyon • Block: 851 • Description: linear seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 2** • Sonar Time at Target: 12/12/2017 5:41:02 AM • Click Position 27.1411671756 -91.2019918324 (WGS84) 27.1408901922 -91.2019305540 (NAD27LL) (X) 2225039.68 (Y) 9852828.68 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 69558 • Range to target: 135.79 US ft • Fish Height: 200.97 US ft • Heading: 0.000 Degrees • Event Number: 110.63 • Line Name: 903-053410-LF	**Dimensions and attributes** • Target Width: 11.4 US ft • Target Height: 0.0 US ft • Target Length: 20.5 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 807 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 3** • Sonar Time at Target: 12/12/2017 10:44:29 AM • Click Position 27.1492470190 -91.2102060256 (WGS84) 27.1489702477 -91.2101442216 (NAD27LL) (X) 2222326.71 (Y) 9855727.45 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 137734 • Range to target: 266.66 US ft • Fish Height: 72.72 US ft • Heading: 0.000 Degrees • Event Number: 101.74 • Line Name: 806-101715-LF	**Dimensions and attributes** • Target Width: 4.2 US ft • Target Height: 0.0 US ft • Target Length: 7.9 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 807 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 4** • Sonar Time at Target: 12/12/2017 8:19:24 AM • Click Position 27.1513400105 -91.2108880416 (WGS84) 27.1510632940 -91.2108261431 (NAD27LL) (X) 2222094.12 (Y) 9856485.06 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 98099 • Range to target: 354.42 US ft • Fish Height: 143.10 US ft • Heading: 0.000 Degrees • Event Number: 102.27 • Line Name: 811-081617-LF	**Dimensions and attributes** • Target Width: 6.7 US ft • Target Height: 0.0 US ft • Target Length: 13.3 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 807 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.



Contact 5

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- Click Position
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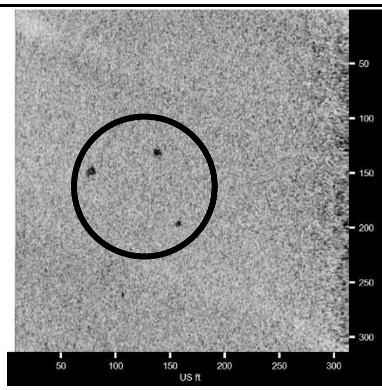
  27.1715563214 -91.2128210099 (NAD27LL)
  (X) 2221339.34 (Y) 9863924.63 (Projected Coordinates)
- Map Projection: UTM27-15F
- Ping Number: 121753
- Range to target: 282.42 US ft
- Fish Height: 66.33 US ft
- Heading: 0.000 Degrees
- Event Number: 126.68
- Line Name: 803-092550-LF

Dimensions and attributes

- Target Width: 4.0 US ft
- Target Height: 0.0 US ft
- Target Length: 13.6 US ft
- Target Shadow: 0.0 US ft
- Mag Anomaly: N/A
- Avoidance Area: N/A
- Classification1: Man-made
- Classification2: debris - irregular
- Area: Green Canyon
- Block: 807
- Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.



Contact 6

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  (X) 2218837.27 (Y) 9865921.38 (Projected Coordinates)
- Map Projection: UTM27-15F
- Ping Number: 163123
- Range to target: 201.73 US ft
- Fish Height: 71.13 US ft
- Heading: 0.000 Degrees
- Event Number: 112.34
- Line Name: 802-114031-LF

Dimensions and attributes

- Target Width: 7.4 US ft
- Target Height: 0.0 US ft
- Target Length: 7.8 US ft
- Target Shadow: 0.0 US ft
- Mag Anomaly: N/A
- Avoidance Area: N/A
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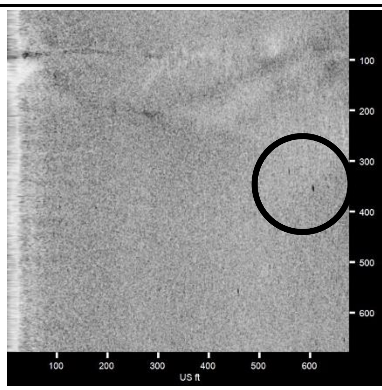
- Classification2: debris - irregular
- Area: Green Canyon
- Block: 807
- Description: three irregular seafloor targets. Possible modern debris target or disturbed seafloor sediments.



Contact 7

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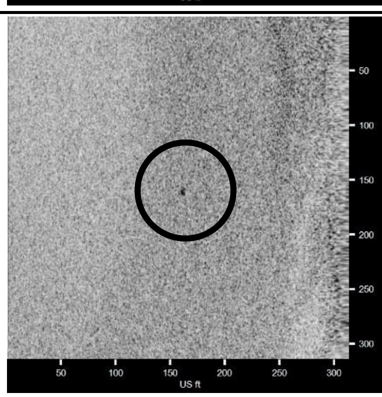
  (X) 2223086.45 (Y) 9866428.08 (Projected Coordinates)
- Map Projection: UTM27-15F
- Ping Number: 125253
- Range to target: 607.00 US ft
- Fish Height: 144.69 US ft
- Heading: 0.000 Degrees
- Event Number: 102.71
- Line Name: 813-100654-LF

Dimensions and attributes

- Target Width: 4.1 US ft
- Target Height: 0.0 US ft
- Target Length: 15.4 US ft
- Target Shadow: 0.0 US ft
- Mag Anomaly: N/A
- Avoidance Area: N/A
- Classification1: Man-made
- Classification2: debris - irregular
- Area: Green Canyon
- Block: 807
- Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.



Contact 8

- Sonar Time at Target: 12/12/2017 4:08:47 PM
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  (X) 2223099.49 (Y) 9869887.74 (Projected Coordinates)
- Map Projection: UTM27-15F
- Ping Number: 254974
- Range to target: 155.08 US ft
- Fish Height: 68.88 US ft
- Heading: 0.000 Degrees
- Event Number: 124.2
- Line Name: 805-154138-LF

Dimensions and attributes

- Target Width: 3.8 US ft
- Target Height: 0.0 US ft
- Target Length: 7.8 US ft
- Target Shadow: 0.0 US ft
- Mag Anomaly: N/A
- Avoidance Area: N/A
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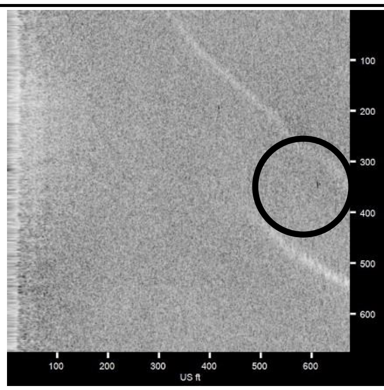
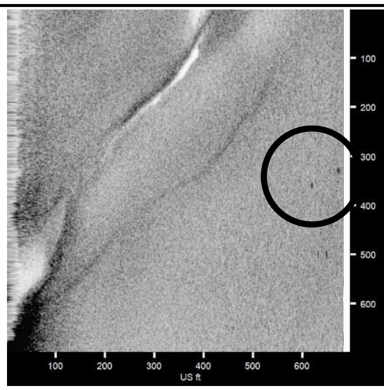
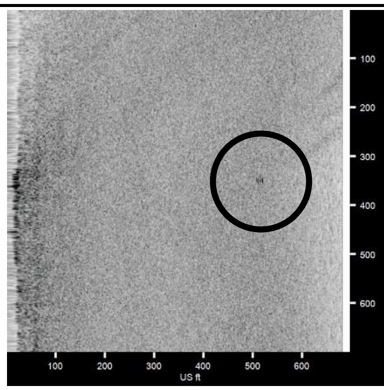
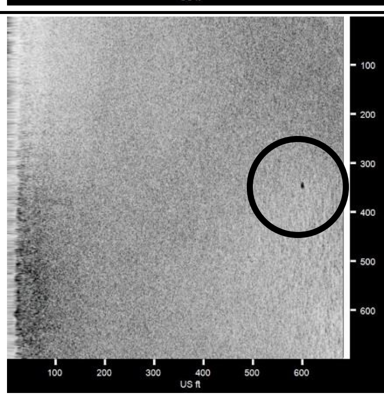
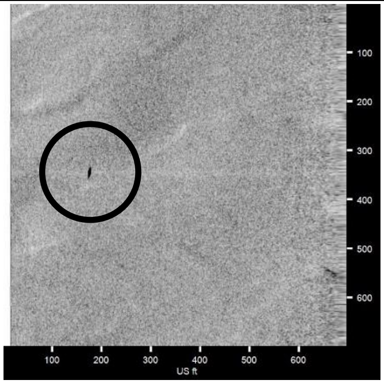
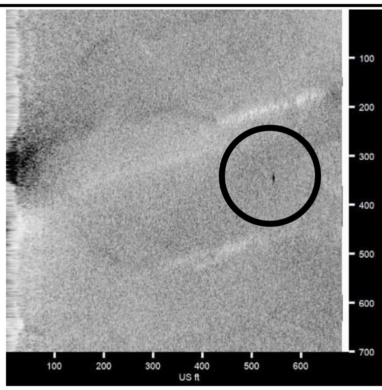
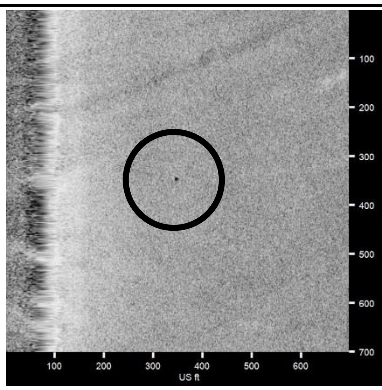
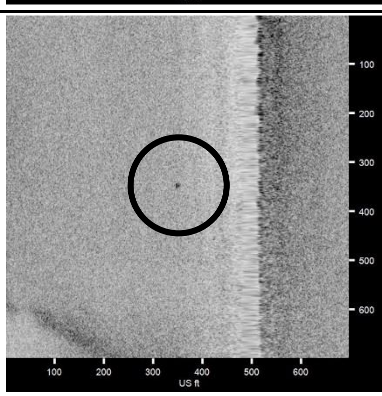
- Classification2: debris - irregular
- Area: Green Canyon
- Block: 763
- Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.

	**Contact 9** • Sonar Time at Target: 12/13/2017 2:33:20 AM • Click Position 27.2055108680 -91.1677710494 (WGS84) 27.2052355669 -91.1677084530 (NAD27LL) (X) 2235827.14 (Y) 9876378.20 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 408853 • Range to target: 609.72 US ft • Fish Height: 140.33 US ft • Heading: 0.000 Degrees • Event Number: 100.94 • Line Name: 508-021038-LF	**Dimensions and attributes** • Target Width: 8.3 US ft • Target Height: 0.0 US ft • Target Length: 16.6 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 764 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 10** • Sonar Time at Target: 12/12/2017 11:13:07 PM • Click Position 27.2177601167 -91.1756162071 (WGS84) 27.2174851369 -91.1755529467 (NAD27LL) (X) 2233212.68 (Y) 9880793.54 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 372770 • Range to target: 647.74 US ft • Fish Height: 142.38 US ft • Heading: 0.000 Degrees • Event Number: 100.47 • Line Name: 424-225840-LF	**Dimensions and attributes** • Target Width: 7.4 US ft • Target Height: 0.0 US ft • Target Length: 18.7 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 764 • Description: two irregular seafloor targets. Possible modern debris target or disturbed seafloor sediments.
	**Contact 11** • Sonar Time at Target: 12/12/2017 9:11:17 PM • Click Position 27.2268583179 -91.1751647644 (WGS84) 27.2265835762 -91.1751011912 (NAD27LL) (X) 2233311.29 (Y) 9884102.85 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 350812 • Range to target: 513.30 US ft • Fish Height: 142.21 US ft • Heading: 0.000 Degrees • Event Number: 100.72 • Line Name: 430-205707-LF	**Dimensions and attributes** • Target Width: 13.5 US ft • Target Height: 0.0 US ft • Target Length: 15.9 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 764 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 12** • Sonar Time at Target: 12/13/2017 2:12:04 AM • Click Position 27.2273754151 -91.1673540092 (WGS84) 27.2271006860 -91.1672906421 (NAD27LL) (X) 2235846.63 (Y) 9884327.89 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 405022 • Range to target: 598.85 US ft • Fish Height: 140.51 US ft • Heading: 0.000 Degrees • Event Number: 120.33 • Line Name: 508-021038-LF	**Dimensions and attributes** • Target Width: 7.2 US ft • Target Height: 0.0 US ft • Target Length: 14.3 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 764 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.

	**Contact 13** • Sonar Time at Target: 12/13/2017 7:41:59 AM • Click Position 27.2430624848 -91.2056674045 (WGS84) 27.2427881711 -91.2056023749 (NAD27LL) (X) 2223315.35 (Y) 9889849.69 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 464479 • Range to target: 521.45 US ft • Fish Height: 141.26 US ft • Heading: 0.000 Degrees • Event Number: 114.22 • Line Name: 409-072542-LF	**Dimensions and attributes** • Target Width: 8.6 US ft • Target Height: 0.0 US ft • Target Length: 27.3 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 719 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 14** • Sonar Time at Target: 12/13/2017 6:41:05 AM • Click Position 27.2433227162 -91.2089432923 (WGS84) 27.2430484098 -91.2088781592 (NAD27LL) (X) 2222249.67 (Y) 9889929.04 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 453504 • Range to target: 545.89 US ft • Fish Height: 140.64 US ft • Heading: 0.000 Degrees • Event Number: 111.58 • Line Name: 411-062741-LF	**Dimensions and attributes** • Target Width: 5.3 US ft • Target Height: 0.0 US ft • Target Length: 19.7 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 719 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 15** • Sonar Time at Target: 12/13/2017 4:50:18 AM • Click Position 27.2503170320 -91.2028233122 (WGS84) 27.2500429081 -91.2027581049 (NAD27LL) (X) 2224201.59 (Y) 9892499.95 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 433539 • Range to target: 268.87 US ft • Fish Height: 138.74 US ft • Heading: 0.000 Degrees • Event Number: 116.35 • Line Name: 415-043142-LF	**Dimensions and attributes** • Target Width: 6.6 US ft • Target Height: 0.0 US ft • Target Length: 10.3 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 719 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.
	**Contact 16** • Sonar Time at Target: 12/13/2017 4:24:15 AM • Click Position 27.2524896879 -91.2209856120 (WGS84) 27.2522156233 -91.2209198127 (NAD27LL) (X) 2218289.91 (Y) 9893205.35 (Projected Coordinates) • Map Projection: UTM27-15F • Ping Number: 428845 • Range to target: 148.02 US ft • Fish Height: 142.36 US ft • Heading: 0.000 Degrees • Event Number: 101.93 • Line Name: 416-040231-LF	**Dimensions and attributes** • Target Width: 8.1 US ft • Target Height: 0.0 US ft • Target Length: 14.4 US ft • Target Shadow: 0.0 US ft • Mag Anomaly: N/A • Avoidance Area: N/A • Classification1: Man-made • Classification2: debris - irregular • Area: Green Canyon • Block: 719 • Description: irregular seafloor target. Possible modern debris target or disturbed seafloor sediments.

Appendix C: Waste Tables

TABLE 1. WASTE ESTIMATED TO BE GENERATED, TREATED AND/OR DOWNHOLE DISPOSED OR DISCHARGED TO THE GOM

Please specify if the amount reported is a total or per well amount and be sure to include appropriate units.

Projected generated waste			Projected ocean discharges		Projected Downhole Disposal
Type of Waste	**Composition**	**Projected Amount**	**Discharge rate**	**Discharge Method**	**Answer *yes* or *no***
Will drilling occur ? If yes, you should list muds and cuttings					
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	n/a	n/a	n/a	n/a	no
Cuttings wetted with water-based fluid	n/a	n/a	n/a	n/a	no
Cuttings wetted with synthetic-based fluid	n/a	n/a	n/a	n/a	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	Grey water from living quarters, control rooms, operating areas, and common areas; food waste from galley	1,914,686 bbl/yr	5,246 bbl/d	Food grinder, intermittant discharge through day, 3060 gpm capacity assumed, 5% use	no
Sanitary waste	Sanitary waste from living quarters, control rooms, and common areas	29,548 bbl/yr	81 bbl/d	USCG-approved MSD with chlorination Unit capability 3400 gpd	no
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Deck drainage from drilling floor, operating areas, and vessel decks	20,571 bbl/yr	82,286 bbl/d	Hull discharge overboard two open drain tanks at capacity 1200 gpm each, 25% use	no
Will you conduct well treatment, completion, or workover?					
Well treatment fluids	n/a	n/a	n/a	n/a	no
Well completion fluids	n/a	n/a	n/a	n/a	no
Workover fluids	n/a	n/a	n/a	n/a	no
Ballast water	Uncontaminated seawater used to maintain proper draft	625,714 bbl/yr	41,143 bbl/d	Intermittent discharge on location. Upper rate based on 1200 gpm. Annual projected discharge based on occurrence 1 hr per day	no

Projected generated waste			Projected ocean discharges		Downhole Disposal
Type of Waste	Composition	Projected Amount	Discharge rate	Discharge Method	Answer *yes* or *no*
Bilge water	Water from inside hull due to maintenance activities	22,943 bbl/yr	1,509 bbl/d	Intermittent discharge. Upper rate based on 44 gpm for inside hull. Normal condition would be no discharge. Routine maintenance and flooding of system would require pumping. Annual projected volume based on discharge 1 hr per day	no
Excess cement at seafloor	n/a	n/a	n/a	n/a	no
Fire water	Seawater treated with only hypochlorite for firewater	460,571 bbl/yr	212,571 bbl/d	Fire water pumps, testing system. Intermittent discharge based on 1 hr per week at full discharge rate of 6200 gpm	no
Chemically treated seawater	Seawater treated with hypochlorite, Non-contact cooling water, uncontaminated freshwater for coolers	145,866,514 bbl/yr	399,634 bbl/d	Discharge overboard based on seawater lift pump capacity of 11,656 gpm	no
Hydrate inhibitor	Methanol used for replacing chokes	0.05 bbl/yr	0.05 bbl/d	Intermittent discharge at seafloor from subsea choke replacement. Estimated one occurance per year (<0.05 bbl)	no
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Chemically treated seawater	Base case is no addition of chemical for hydrotesting pipelines. However, if holding times are extended, corrosion inhibitor and biocide will be added to seawater	58,962 bbl	14,741 bbl/d	export of line discharge during commissioning, estimated once over 4 day commisionng period	no
Chemically treated seawater	Base case is no addition of chemical for hydrotesting pipelines. However, if holding times are extended, corrosion inhibitor and biocide will be added to seawater	44,434 bbl	11,108 bbl/d	export of gas line during commissioning, estimated once over 4 day commisionng period	no
Chemically treated seawater	Hydrotest fluids of treated seawater with biocide and dye	1,506 bbl	1,506 bbl/d	hydrotest for infield flowlines, estimated 1 / day	no

Projected generated waste			Projected ocean discharges		Downhole Disposal
Type of Waste	**Composition**	**Projected Amount**	**Discharge rate**	**Discharge Method**	**Answer *yes* or *no***
Chemically treated seawater	Hydrotest and dewatering infield flowlines of treated seawater with biocide and dye	26,347 bbl	1,882 bbl/d	potential during commissioning, estimated to occur over 2 week period	no
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	Formation fluids separated from oil commingled with seawater	71,175,000 bbl/yr	195,000 bbl/d	discharged overboard through diffuser, commingled with seawater	no
Please enter *individual* or *general* to indicate which type of NPDES permit you will be covered by?			*general*		
NOTE: If you will not have a type of waste for the activity being applied for, enter NA for all columns in the row.			NOTE: All discharged wastes should comply with the requirements of the NPDES permit.		

TABLE 2. WASTE AND SURPLUS ESTIMATED TO BE TRANSPORTED AND/OR DISPOSED OF ONSHORE

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

	Projected generated waste	Solid and Liquid Wastes transportation	Waste Disposal		
Type of Waste	**Composition**	**Transport Method**	**Name/Location of Facility**	**Amount**	**Disposal Method**
Will drilling occur ? If yes, fill in the muds and cuttings.					
EXAMPLE: Synthetic-based drilling fluid or mud	*internal olefin, ester*	*Below deck storage tanks on offshore support vessels*	*Newport Environmental Services Inc., Ingleside, TX*	*X bbl/well*	*Recycled*
Oil-based drilling fluid or mud	No drilling activity	n/a	n/a	n/a	n/a
Synthetic-based drilling fluid or mud	No drilling activity	n/a	n/a	n/a	n/a
Cuttings wetted with Water-based fluid	No drilling activity	n/a	n/a	n/a	n/a
Cuttings wetted with Synthetic-based fluid	No drilling activity	n/a	n/a	n/a	n/a
Cuttings wetted with oil-based fluids	No drilling activity	n/a	n/a	n/a	n/a
Will you produce hydrocarbons? If yes fill in for produced sand.					
Produced sand	Oil contaminated produced sand	Transport to shorebase by marine vessel in cutting boxes	Newpark, Fourchon, LA	100 bbls	Liquids are injected into a disposal well and the solids are landfilled
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.					
EXAMPLE: trash and debris (recylables)	*Plastic, paper, aluminum*	*barged in a storage bin*	*ARC, New Iberia, LA*	*X lb/well*	*Recycled*
Trash and debris	Plastic, paper, aluminum	Transport to shorebase by marine vessel in trash bins	IESSI, Houma, LA	1500 cubic ft	Local landfill
Used oil	Waste oil, i.e. refined oil, cooking oil and oily rags	Transport to shorebase by marine vessel in drums, cutting boxes	Aaron Oil, Berwick, LA	400 bbls	Recycled
Wash water	n/a	n/a	n/a	n/a	n/a
Chemical product wastes, hazardous wastes	Contaminated glycol, paint waste and various production chemicals	Transport to shorebase by marine vessel in MPT tanks or drums	Waste Management Inc, Lake Charles/Sulfur, LA	100 bbls (during installation, up to 200 metric tonnes)	Incineration, dependent on product
Non hazardous wastes	Sandblast media and other maintenance waste, nonhazardous chemicals	Trasnport to shorebase by marine vessel in MPT tanks or drums	Waste Management Inc, Woodside Landfill, Walker, LA	Up to 200 metric tonnes during startup	Landfill
NORM-contaminated waste	Sands and scale	Transport to shorebase by marine vessel in drums or seal equipment	>30 MR - Newpark, Fourchon, LA <30 MR - Newpark, Big Hill, TX	1 ton	Slurred and injected into a disposal well
RCRA-exempt E&P wastes	Treatment, completion, workover fluids	Transport to shorebase by marine vessel in MPT tanks, cutting boxes, or drums	Newpark, Fourchon, LA	150 bbls	Liquids injected into a disposal well and the solids are landfilled
Zinc Bromide Completion Fluids	Treatment, completion, workover fluids	Transport to shorebase by marine vessel in MPT tanks	Newpark, Fourchon, LA	8,000 bbl per well	Liquids injected into a disposal well and the solids are landfilled

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

Appendix D: Air Emissions Spreadsheets

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

COMPANY	Chevron
AREA	Green Canyon
BLOCK	806
LEASE	OCS-G 31751
FACILITY	NA - DP Drillship
WELL	BP009, BP006, BP010, BP003
COMPANY CONTACT	Kathy Sharp
TELEPHONE NO.	985-773-6230
REMARKS	

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:		
YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2021		
2022	2	26
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		

AIR EMISSIONS COMPUTATION FACTORS

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

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

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

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

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		806	OCS-G 31751	NA - DP Drillsh	BP009, BP006, BP010, BP003					Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	66	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	30.41	18.35	17.80	0.44	728.66	20.95	0.00	114.29	0.21
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	66	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	11.03	6.65	6.45	0.16	264.24	7.60	0.00	41.45	0.08
	VESSELS - Light Construction Diesel	TBD	13340	686.2896	16470.95	24	66	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	7.45	4.50	4.36	0.11	178.58	5.13	0.00	28.01	0.05
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COLD VENT				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	FUGITIVES				0	0	0	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	GLYCOL DEHYDRATOR				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	WASTE INCINERATOR		0			0	0	–	0.00	0.00	0.00	0.00	–	–	0.00	–	–	0.00	0.00	0.00	0.00	–	–	0.00	–
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
2021	**Facility Total Emissions**							**61.74**	**37.25**	**36.13**	**0.90**	**1,479.16**	**#DIV/0!**	**0.00**	**232.00**	**0.43**	**48.90**	**29.50**	**28.61**	**0.71**	**1,171.49**	**33.68**	**0.00**	**183.75**	**0.34**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Foundation Piles Barge Tug Diesel	TBD	12000	617.352	14816.45	24	66	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
INSTALLATION	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	66	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	4.47	2.70	2.62	0.07	107.10	3.08	0.00	16.80	0.03
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	**Non-Facility Total Emissions**							**14.11**	**8.51**	**8.26**	**0.21**	**338.05**	**9.72**	**0.00**	**53.02**	**0.10**	**11.17**	**6.74**	**6.54**	**0.16**	**267.74**	**7.70**	**0.00**	**41.99**	**0.08**

AIR EMISSIONS CALCULATIONS - 2ND YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL						CONTACT		PHONE		REMARKS									
Chevron	Green Canyon		806	OCS-G 31751	NA - DP Drillsh	BP009, BP006, BP010, BP003						Kathy Sharp		985-773-6230											
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Flowline / Riser Pipeline Diesel, Laying	TBD	55342	2847.125	68330.99	24	26	39.04	23.56	22.85	0.57	935.43	26.90	0.00	146.72	0.27	12.37	7.46	7.24	0.18	296.34	8.52	0.00	46.48	0.09
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	30	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	13.82	8.34	8.09	0.20	331.21	9.52	0.00	51.95	0.10
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	30	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	5.01	3.02	2.93	0.07	120.11	3.45	0.00	18.84	0.04
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.000	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW	GAL/HR	GAL/D	HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2022	**Facility Total Emissions**							**91.37**	**55.12**	**53.47**	**1.33**	**2,189.10**	**62.94**	**0.01**	**343.36**	**0.64**	**31.21**	**18.83**	**18.26**	**0.45**	**747.67**	**21.50**	**0.00**	**117.27**	**0.22**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Pre-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	5	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	2.32	1.40	1.36	0.03	55.58	1.60	0.00	8.72	0.02
	VESSELS - Post-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	2	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	1.16	0.70	0.68	0.02	27.79	0.80	0.00	4.36	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	4	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.24	0.15	0.14	0.00	5.84	0.17	0.00	0.92	0.00
FACILITY INSTALLATION	VESSELS - Manifold and IMPS Barge Tug Diesel	TBD	12000	617.352	14816.45	24	12	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	12	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.81	0.49	0.48	0.01	19.47	0.56	0.00	3.05	0.01
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	**Non-Facility Total Emissions**							**100.30**	**60.51**	**58.70**	**1.46**	**2,403.02**	**69.09**	**0.01**	**376.91**	**0.70**	**5.76**	**3.47**	**3.37**	**0.08**	**137.89**	**3.96**	**0.00**	**21.63**	**0.04**

AIR EMISSIONS CALCULATIONS - 3RD YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		806	OCS-G 31751	NA - DP Drillsh	BP009, BP006, BP010, BP003					Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Umbilcal Pipeline Diesel, Laying	TBD	36582	1881.998	45167.94	24	14	25.81	15.57	15.10	0.38	618.33	17.78	0.00	96.98	0.18	4.18	2.52	2.45	0.06	100.17	2.88	0.00	15.71	0.03
	VESSELS - Light Construction 1 Diesel	TBD	13340	686.2896	16470.95	24	14	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	1.63	0.98	0.95	0.02	38.96	1.12	0.00	6.11	0.01
	VESSELS - Light Construction 2 Diesel	TBD	13340	686.2896	16470.95	24	29	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	3.25	1.96	1.90	0.05	77.93	2.24	0.00	12.22	0.02
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2023	**Facility Total Emissions**							**44.63**	**26.93**	**26.12**	**0.65**	**1,069.30**	**30.74**	**0.00**	**167.72**	**0.31**	**9.06**	**5.47**	**5.30**	**0.13**	**217.06**	**6.24**	**0.00**	**34.05**	**0.06**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Supply Diesel	TBD	8000	411.568	9877.63	24	24	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.63	0.98	0.95	0.02	38.94	1.12	0.00	6.11	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	39	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.65	1.00	0.97	0.02	39.55	1.14	0.00	6.20	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	21	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.42	0.86	0.83	0.02	34.08	0.98	0.00	5.34	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	24	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
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
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	**Non-Facility Total Emissions**							**29.63**	**17.88**	**17.34**	**0.43**	**709.91**	**20.41**	**0.00**	**111.35**	**0.21**	**7.66**	**4.62**	**4.49**	**0.11**	**183.64**	**5.28**	**0.00**	**28.80**	**0.05**

AIR EMISSIONS CALCULATIONS - 4TH YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		806	OCS-G 31751	NA - DP Drillsh	BP009, BP006, BP010, BP003					Kathy Sharp		985-773-6230												
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*	TBD	61800	3179.363	76304.71	24	180	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	94.17	56.82	55.11	1.37	2256.31	64.87	0.01	353.90	0.66
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2024-2031	**Facility Total Emissions**							**43.60**	**26.30**	**25.51**	**0.63**	**1,044.59**	**30.03**	**0.00**	**163.84**	**0.30**	**94.17**	**56.82**	**55.11**	**1.37**	**2,256.31**	**64.87**	**0.01**	**353.90**	**0.66**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
DRILLING	VESSELS- Crew Diesel	TBD	10800	555.6168	13334.80	7	60	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	1.60	0.97	0.94	0.02	38.34	1.10	0.00	6.01	0.01
	VESSELS - Supply Diesel	TBD	6600	339.5436	8149.05	19	90	4.66	2.81	2.72	0.07	111.56	3.21	0.00	17.50	0.03	3.98	2.40	2.33	0.06	95.38	2.74	0.00	14.96	0.03
	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
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024-2031	**Non-Facility Total Emissions**							**12.28**	**7.41**	**7.18**	**0.18**	**294.11**	**8.46**	**0.00**	**46.13**	**0.09**	**5.58**	**3.37**	**3.27**	**0.08**	**133.72**	**3.84**	**0.00**	**20.97**	**0.04**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Chevron	806	OCS-G 31751	NA - DP Drills	BP009, BP006, BP010, BP003		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	48.90	29.50	28.61	0.71	1171.49	33.68	0.00	183.75	0.34
2022	31.21	18.83	18.26	0.45	747.67	21.50	0.00	117.27	0.22
2023	9.06	5.47	5.30	0.13	217.06	6.24	0.00	34.05	0.06
2024-2031	94.17	56.82	55.11	1.37	2256.31	64.87	0.01	353.90	0.66
Allowable	4195.80			4195.80	4195.80	4195.80		85452.73	

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

COMPANY	Chevron
AREA	Green Canyon
BLOCK	807
LEASE	OCS-G 31752
FACILITY	NA - DP Drillship
WELL	AP005, AP001, AP002, AP004, AP008, AP012, AP007
COMPANY CONTACT	Kathy Sharp
TELEPHONE NO.	985-773-6230
REMARKS	

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:		
YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2021		
2022	2	26
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		

AIR EMISSIONS COMPUTATION FACTORS

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

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

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 Valu	19,300	Btu/lb

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL				CONTACT	PHONE	REMARKS
Chevron	Green Canyon		807	OCS-G 31752	NA - DP Drillshi	AP005, AP001, AP002, AP004, AP008, AP012, AP007				Kathy Sharp	985-773-6230	

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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	66	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	30.41	18.35	17.80	0.44	728.66	20.95	0.00	114.29	0.21
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	66	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	11.03	6.65	6.45	0.16	264.24	7.60	0.00	41.45	0.08
	VESSELS - Light Construction Diesel	TBD	13340	686.2896	16470.95	24	66	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	7.45	4.50	4.36	0.11	178.58	5.13	0.00	28.01	0.05
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COLD VENT				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	FUGITIVES				0	0	0	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	GLYCOL DEHYDRATOR				0	0	0	–	–	–	–	–	#DIV/0!	–	–	–	–	–	–	–	–	0.00	–	–	–
	WASTE INCINERATOR		0			0	0	–	0.00	0.00	0.00	0.00	–	–	0.00	–	–	0.00	0.00	0.00	0.00	–	–	0.00	–
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
2021	**Facility Total Emissions**							**61.74**	**37.25**	**36.13**	**0.90**	**1,479.16**	**#DIV/0!**	**0.00**	**232.00**	**0.43**	**48.90**	**29.50**	**28.61**	**0.71**	**1,171.49**	**33.68**	**0.00**	**183.75**	**0.34**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Foundation Piles Barge Tug Diesel	TBD	12000	617.352	14816.45	24	66	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	66	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	4.47	2.70	2.62	0.07	107.10	3.08	0.00	16.80	0.03
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	**Non-Facility Total Emissions**							**14.11**	**8.51**	**8.26**	**0.21**	**338.05**	**9.72**	**0.00**	**53.02**	**0.10**	**11.17**	**6.74**	**6.54**	**0.16**	**267.74**	**7.70**	**0.00**	**41.99**	**0.08**

AIR EMISSIONS CALCULATIONS - 2ND YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		807	OCS-G 31752	NA - DP Drillshi	AP005, AP001, AP002, AP004, AP008, AP012, AP007					Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Flowline / Riser Pipeline Diesel, Laying	TBD	55342	2847.125	68330.99	24	26	39.04	23.56	22.85	0.57	935.43	26.90	0.00	146.72	0.27	12.37	7.46	7.24	0.18	296.34	8.52	0.00	46.48	0.09
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	30	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	13.82	8.34	8.09	0.20	331.21	9.52	0.00	51.95	0.10
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	30	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	5.01	3.02	2.93	0.07	120.11	3.45	0.00	18.84	0.04
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2022	**Facility Total Emissions**							**91.37**	**55.12**	**53.47**	**1.33**	**2,189.10**	**62.94**	**0.01**	**343.36**	**0.64**	**31.21**	**18.83**	**18.26**	**0.45**	**747.67**	**21.50**	**0.00**	**117.27**	**0.22**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Pre-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	5	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	2.32	1.40	1.36	0.03	55.58	1.60	0.00	8.72	0.02
	VESSELS - Post-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	2	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	1.16	0.70	0.68	0.02	27.79	0.80	0.00	4.36	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	4	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.24	0.15	0.14	0.00	5.84	0.17	0.00	0.92	0.00
FACILITY INSTALLATION	VESSELS - Manifold and IMPS Barge Tug Diesel	TBD	12000	617.352	14816.45	24	12	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	12	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.81	0.49	0.48	0.01	19.47	0.56	0.00	3.05	0.01
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	**Non-Facility Total Emissions**							**100.30**	**60.51**	**58.70**	**1.46**	**2,403.02**	**69.09**	**0.01**	**376.91**	**0.70**	**5.76**	**3.47**	**3.37**	**0.08**	**137.89**	**3.96**	**0.00**	**21.63**	**0.04**

AIR EMISSIONS CALCULATIONS - 3RD YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		807	OCS-G 31752	NA - DP Drillsh	AP005, AP001, AP002, AP004, AP008, AP012, AP007					Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Umbilcal Pipeline Diesel, Laying	TBD	36582	1881.998	45167.94	24	14	25.81	15.57	15.10	0.38	618.33	17.78	0.00	96.98	0.18	4.18	2.52	2.45	0.06	100.17	2.88	0.00	15.71	0.03
	VESSELS - Light Construction 1 Diesel	TBD	13340	686.2896	16470.95	24	14	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	1.63	0.98	0.95	0.02	38.96	1.12	0.00	6.11	0.01
	VESSELS - Light Construction 2 Diesel	TBD	13340	686.2896	16470.95	24	29	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	3.25	1.96	1.90	0.05	77.93	2.24	0.00	12.22	0.02
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–	–	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COLD VENT				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	FUGITIVES				0	0	0	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	GLYCOL DEHYDRATOR				0	1	1	–	–	–	–	–	0.00	–	–	–	–	–	–	–	–	0.00	–	–	–
	WASTE INCINERATOR		0			0	0	–	0.00	0.00	0.00	0.00	–	–	0.00	–	–	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
2023	**Facility Total Emissions**							**44.63**	**26.93**	**26.12**	**0.65**	**1,069.30**	**30.74**	**0.00**	**167.72**	**0.31**	**9.06**	**5.47**	**5.30**	**0.13**	**217.06**	**6.24**	**0.00**	**34.05**	**0.06**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Supply Diesel	TBD	8000	411.568	9877.63	24	24	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.63	0.98	0.95	0.02	38.94	1.12	0.00	6.11	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	39	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.65	1.00	0.97	0.02	39.55	1.14	0.00	6.20	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	21	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.42	0.86	0.83	0.02	34.08	0.98	0.00	5.34	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	24	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
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
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	–	0.00	0.00	0.00	0.00	0.00	0.00	–	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	**Non-Facility Total Emissions**							**29.63**	**17.88**	**17.34**	**0.43**	**709.91**	**20.41**	**0.00**	**111.35**	**0.21**	**7.66**	**4.62**	**4.49**	**0.11**	**183.64**	**5.28**	**0.00**	**28.80**	**0.05**

AIR EMISSIONS CALCULATIONS - 4TH YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		807	OCS-G 31752	NA - DP Drillshi	AP005, AP001, AP002, AP004, AP008, AP012, AP007					Kathy Sharp		985-773-6230												
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*	TBD	61800	3179.363	76304.71	24	180	43.60	26.30	25.51	0.63	1044.59	30.03	0.00	163.84	0.30	94.17	56.82	55.11	1.37	2256.31	64.87	0.01	353.90	0.66
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2024-2031	**Facility Total Emissions**							**43.60**	**26.30**	**25.51**	**0.63**	**1,044.59**	**30.03**	**0.00**	**163.84**	**0.30**	**94.17**	**56.82**	**55.11**	**1.37**	**2,256.31**	**64.87**	**0.01**	**353.90**	**0.66**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
DRILLING	VESSELS- Crew Diesel	TBD	10800	555.6168	13334.80	7	60	7.62	4.60	4.46	0.11	182.55	5.25	0.00	28.63	0.05	1.60	0.97	0.94	0.02	38.34	1.10	0.00	6.01	0.01
	VESSELS - Supply Diesel	TBD	6600	339.5436	8149.05	19	90	4.66	2.81	2.72	0.07	111.56	3.21	0.00	17.50	0.03	3.98	2.40	2.33	0.06	95.38	2.74	0.00	14.96	0.03
	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		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024-2031	**Non-Facility Total Emissions**							**12.28**	**7.41**	**7.18**	**0.18**	**294.11**	**8.46**	**0.00**	**46.13**	**0.09**	**5.58**	**3.37**	**3.27**	**0.08**	**133.72**	**3.84**	**0.00**	**20.97**	**0.04**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Chevron	807	OCS-G 31752	NA - DP Drills	AP005, AP001, AP002, AP004, AP008, AP012, AP007		

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	48.90	29.50	28.61	0.71	1171.49	33.68	0.00	183.75	0.34
2022	31.21	18.83	18.26	0.45	747.67	21.50	0.00	117.27	0.22
2023	9.06	5.47	5.30	0.13	217.06	6.24	0.00	34.05	0.06
2024-2031	94.17	56.82	55.11	1.37	2256.31	64.87	0.01	353.90	0.66
Allowable	4195.80			4195.80	4195.80	4195.80		85452.73	

DOCD/DPP - AIR QUALITY

COMPANY	Chevron
AREA	Green Canyon
BLOCK	763
LEASE	OCS - G 25199
FACILITY	Anchor FPU
WELL	
COMPANY CONTACT	Kathy Sharp
TELEPHONE NO.	985-773-6230
REMARKS	

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:

YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2021		
2022	4	92
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		

AIR EMISSIONS COMPUTATION FACTORS

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

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

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

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

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		763	OCS - G 25199	Anchor FPU						Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	66	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	30.41	18.35	17.80	0.44	728.66	20.95	0.00	114.29	0.21
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	66	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	11.03	6.65	6.45	0.16	264.24	7.60	0.00	41.45	0.08
	VESSELS - Light Construction Diesel	TBD	13340	686.2896	16470.95	24	66	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	7.45	4.50	4.36	0.11	178.58	5.13	0.00	28.01	0.05
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler					0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																				
	STORAGE TANK				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	0	0	--	--	--	--	--	#DIV/0!	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00	--	--	0.00	--
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	VESSELS		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2021	Facility Total Emissions							61.74	37.25	36.13	0.90	1,479.16	#DIV/0!	0.00	232.00	0.43	48.90	29.50	28.61	0.71	1,171.49	33.68	0.00	183.75	0.34
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																4,195.80			4,195.80	4,195.80	4,195.80		85,452.73	
	126.0																								
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 - Foundation Piles Barge Tug Diesel	TBD	12000	617.352	14816.45	24	66	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	6.70	4.05	3.92	0.10	160.64	4.62	0.00	25.20	0.05
INSTALLATION	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	66	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	4.47	2.70	2.62	0.07	107.10	3.08	0.00	16.80	0.03
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2021	Non-Facility Total Emissions							14.11	8.51	8.26	0.21	338.05	9.72	0.00	53.02	0.10	11.17	6.74	6.54	0.16	267.74	7.70	0.00	41.99	0.08

AIR EMISSIONS CALCULATIONS - 2ND YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		763	OCS - G 25199	Anchor FPU						Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Export Pipeline Diesel, Laying	TBD	68983	3548.91	85173.83	24	66	48.67	29.36	28.48	0.71	1166.00	33.52	0.00	182.88	0.34	38.54	23.25	22.56	0.56	923.47	26.55	0.00	144.84	0.27
	VESSELS - Light Construction Diesel	TBD	29989	1542.824	37027.79	24	66	21.16	12.76	12.38	0.31	506.90	14.57	0.00	79.51	0.15	16.76	10.11	9.81	0.24	401.46	11.54	0.00	62.97	0.12
	VESSELS - Flowline / Riser Pipeline Diesel, Laying	TBD	55342	2847.125	68330.99	24	26	39.04	23.56	22.85	0.57	935.43	26.90	0.00	146.72	0.27	12.37	7.46	7.24	0.18	296.34	8.52	0.00	46.48	0.09
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Installation Diesel	TBD	54431	2800.257	67206.17	24	30	38.40	23.17	22.47	0.56	920.03	26.45	0.00	144.30	0.27	13.82	8.34	8.09	0.20	331.21	9.52	0.00	51.95	0.10
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	30	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	5.01	3.02	2.93	0.07	120.11	3.45	0.00	18.84	0.04
PRODUCTION	RECIP.<600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Heater/Boiler/Burner		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		BPD	SCF/HR	COUNT																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	VESSELS		kW			HR/D	D/YR																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2022	Facility Total Emissions							161.19	97.25	94.33	2.35	3,862.00	111.04	0.01	605.75	1.13	86.51	52.19	50.63	1.26	2,072.60	59.59	0.01	325.08	0.60
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																4,195.80			4,195.80	4,195.80	4,195.80		85,452.73	
	126.0																								
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 - Pipe Transport Tug 1 Diesel	TBD	10880	559.7325	13433.58	24	24	7.68	4.63	4.49	0.11	183.90	5.29	0.00	28.84	0.05	2.21	1.33	1.29	0.03	52.96	1.52	0.00	8.31	0.02
	VESSELS - Pipe Transport Tug 2 Diesel	TBD	10880	559.7325	13433.58	24	24	7.68	4.63	4.49	0.11	183.90	5.29	0.00	28.84	0.05	2.21	1.33	1.29	0.03	52.96	1.52	0.00	8.31	0.02
	VESSELS - Pipe Transport Tug 3 Diesel	TBD	10880	559.7325	13433.58	24	24	7.68	4.63	4.49	0.11	183.90	5.29	0.00	28.84	0.05	2.21	1.33	1.29	0.03	52.96	1.52	0.00	8.31	0.02
	VESSELS - Crew Diesel	TBD	5000	257.23	6173.52	24	10	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	29	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.96	1.18	1.15	0.03	47.06	1.35	0.00	7.38	0.01
	VESSELS - Pre-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	5	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	2.32	1.40	1.36	0.03	55.58	1.60	0.00	8.72	0.02
	VESSELS - Post-Lay Support Diesel	TBD	57084	2936.743	70481.84	24	2	40.27	24.30	23.57	0.59	964.87	27.74	0.00	151.34	0.28	1.16	0.70	0.68	0.02	27.79	0.80	0.00	4.36	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	4	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.24	0.15	0.14	0.00	5.84	0.17	0.00	0.92	0.00
FACILITY INSTALLATION	VESSELS - Mooring Piles Barge Tug Diesel	TBD	12000	617.352	14816.45	24	24	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Mooring Pre-Lay Barge Tug Diesel	TBD	12000	617.352	14816.45	24	36	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	3.66	2.21	2.14	0.05	87.62	2.52	0.00	13.74	0.03
	VESSELS - Mooring Post-Install Barge Tug Diesel	TBD	12000	617.352	14816.45	24	18	8.47	5.11	4.95	0.12	202.83	5.83	0.00	31.81	0.06	1.83	1.10	1.07	0.03	43.81	1.26	0.00	6.87	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	12	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.81	0.49	0.48	0.01	19.47	0.56	0.00	3.05	0.01
PRODUCTION	VESSELS - Support Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																				
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																						
	VESSELS		kW			HR/D	D/YR																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2022	Non-Facility Total Emissions							149.43	90.15	87.45	2.17	3,580.13	102.94	0.01	561.53	1.04	21.48	12.96	12.57	0.31	514.62	14.80	0.00	80.72	0.15

AIR EMISSIONS CALCULATIONS - 3RD YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		763	OCS - G 25199	Anchor FPU						Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Umbilcal Pipeline Diesel, Laying	TBD	36582	1881.998	45167.94	24	14	25.81	15.57	15.10	0.38	618.33	17.78	0.00	96.98	0.18	4.18	2.52	2.45	0.06	100.17	2.88	0.00	15.71	0.03
	VESSELS - Light Construction 1 Diesel	TBD	13340	686.2896	16470.95	24	14	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	1.63	0.98	0.95	0.02	38.96	1.12	0.00	6.11	0.01
	VESSELS - Light Construction 2 Diesel	TBD	13340	686.2896	16470.95	24	29	9.41	5.68	5.51	0.14	225.48	6.48	0.00	35.37	0.07	3.25	1.96	1.90	0.05	77.93	2.24	0.00	12.22	0.02
FACILITY INSTALLATION	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Installation Diesel	TBD	54400	2798.662	67167.90	24	45	38.38	23.15	22.46	0.56	919.51	26.44	0.00	144.22	0.27	20.72	12.50	12.13	0.30	496.53	14.28	0.00	77.88	0.14
	VESSELS - Installation Support Diesel	TBD	19739	1015.493	24371.82	24	45	13.93	8.40	8.15	0.20	333.64	9.59	0.00	52.33	0.10	7.52	4.54	4.40	0.11	180.17	5.18	0.00	28.26	0.05
	VESSELS - Floatel Main Generators Diesel	TBD	15410	792.7829	19026.79	24	180	10.87	6.56	6.36	0.16	260.47	7.49	0.00	40.85	0.08	23.48	14.17	13.74	0.34	562.62	16.18	0.00	88.25	0.16
	VESSELS - Floatel Emergency Generators Diesel	TBD	5154	265.1527	6363.66	1	26	3.64	2.19	2.13	0.05	87.12	2.50	0.00	13.66	0.03	0.05	0.03	0.03	0.00	1.13	0.03	0.00	0.18	0.00
	VESSELS - Floatel Survival Craft Diesel	TBD	240	12.34704	296.33	1	26	0.17	0.10	0.10	0.00	4.06	0.12	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.01	0.00
	VESSELS - HUC Marine Spread FSV Diesel	TBD	9000	463.014	11112.34	24	180	6.35	3.83	3.72	0.09	152.12	4.37	0.00	23.86	0.04	13.71	8.27	8.03	0.20	328.59	9.45	0.00	51.54	0.10
	VESSELS - HUC Marine Spread 300' Diesel	TBD	6250	321.5375	7716.90	24	180	4.41	2.66	2.58	0.06	105.64	3.04	0.00	16.57	0.03	9.52	5.75	5.57	0.14	228.19	6.56	0.00	35.79	0.07
PRODUCTION	RECIP.<600hp Crane 1 Diesel	TBD	580	29.83868	716.13	12	270	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	2.07	2.07	2.07	0.06	29.21	2.15	--	6.28	--
	RECIP.<600hp Crane 2 Diesel	TBD	580	29.83868	716.13	8	270	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	1.38	1.38	1.38	0.04	19.47	1.44	--	4.18	--
	RECIP.<600hp Temporary / Mobile Equip Diesel**	TBD	1760	90.54496	2173.08	24	365	3.88	3.88	3.88	0.11	54.71	4.04	--	11.76	--	17.00	17.00	17.00	0.47	239.63	17.67	--	51.49	--
	RECIP.>600hp Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	VESSELS - Shuttle Tankers		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Well Stimulation		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Natural Gas Turbine		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	365	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	6.40	2.29	2.29	0.81	469.20	0.22	0.01	1.76	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	120	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	2.10	0.75	0.75	0.27	154.26	0.07	0.00	0.58	--
	Dual Fuel Turbine		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	RECIP. 2 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Lean Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	RECIP. 4 Cycle Rich Natural Gas		0	0	0.00	0	0	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--	--	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			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
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	COLD VENT				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	FUGITIVES				0	0	0	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	GLYCOL DEHYDRATOR				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00		--	0.00	--
DRILLING WELL TEST	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2023	**Facility Total Emissions**							**131.73**	**81.31**	**79.10**	**2.33**	**3,236.87**	**91.09**	**0.01**	**480.16**	**0.86**	**113.02**	**74.22**	**72.70**	**2.87**	**2,926.10**	**79.47**	**0.02**	**380.24**	**0.59**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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 - Supply Diesel	TBD	8000	411.568	9877.63	24	24	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.63	0.98	0.95	0.02	38.94	1.12	0.00	6.11	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	14	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.98	0.59	0.57	0.01	23.37	0.67	0.00	3.66	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	39	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.65	1.00	0.97	0.02	39.55	1.14	0.00	6.20	0.01
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	21	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.42	0.86	0.83	0.02	34.08	0.98	0.00	5.34	0.01
	VESSELS - ROV Support Diesel	TBD	5000	257.23	6173.52	24	24	3.53	2.13	2.06	0.05	84.51	2.43	0.00	13.26	0.02	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
FACILITY INSTALLATION	VESSELS - Wet Tow Tug 1 Diesel	TBD	18000	926.028	22224.67	24	15	12.70	7.66	7.43	0.18	304.25	8.75	0.00	47.72	0.09	2.32	1.40	1.36	0.03	55.49	1.60	0.00	8.70	0.02
	VESSELS - Wet Tow Tug 2 Diesel	TBD	18000	926.028	22224.67	24	20	12.70	7.66	7.43	0.18	304.25	8.75	0.00	47.72	0.09	3.05	1.84	1.78	0.04	73.02	2.10	0.00	11.45	0.02
	VESSELS - Wet Tow Tug 3 Diesel	TBD	18000	926.028	22224.67	24	20	12.70	7.66	7.43	0.18	304.25	8.75	0.00	47.72	0.09	3.05	1.84	1.78	0.04	73.02	2.10	0.00	11.45	0.02
	VESSELS - Wet Tow Tug 4 Diesel	TBD	18000	926.028	22224.67	24	14	12.70	7.66	7.43	0.18	304.25	8.75	0.00	47.72	0.09	2.13	1.29	1.25	0.03	51.11	1.47	0.00	8.02	0.01
	VESSELS - Wet Tow Tug 5 Diesel	TBD	18000	926.028	22224.67	24	22	12.70	7.66	7.43	0.18	304.25	8.75	0.00	47.72	0.09	3.41	2.06	2.00	0.05	81.78	2.35	0.00	12.83	0.02
	VESSELS - Diving Support Diesel	TBD	9648	496.351	11912.42	24	42	6.81	4.11	3.98	0.10	163.08	4.69	0.00	25.58	0.05	3.43	2.07	2.01	0.05	82.19	2.36	0.00	12.89	0.02
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	8	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	0.54	0.33	0.32	0.01	12.98	0.37	0.00	2.04	0.00
	VESSELS - Supply Diesel	TBD	8000	411.568	9877.63	24	26	5.64	3.41	3.30	0.08	135.22	3.89	0.00	21.21	0.04	1.76	1.06	1.03	0.03	42.19	1.21	0.00	6.62	0.01
PRODUCTION	VESSELS - Supply Diesel	TBD	7200	370.4112	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.60	0.36	0.35	0.01	14.40	0.41	0.00	2.26	0.00
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp – Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023	**Non-Facility Total Emissions**							**116.30**	**70.16**	**68.06**	**1.69**	**2,786.38**	**80.11**	**0.01**	**437.04**	**0.81**	**27.96**	**16.87**	**16.36**	**0.41**	**669.83**	**19.26**	**0.00**	**105.06**	**0.20**

AIR EMISSIONS CALCULATIONS - 4TH YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		763	OCS - G 25199	Anchor FPU						Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSELS - Floatel Main Generators Diesel	TBD	15410	792.7829	19026.79	24	180	10.87	6.56	6.36	0.16	260.47	7.49	0.00	40.85	0.08	23.48	14.17	13.74	0.34	562.62	16.18	0.00	88.25	0.16
	VESSELS - Floatel Emergency Generators Diesel	TBD	5154	265.1527	6363.66	1	26	3.64	2.19	2.13	0.05	87.12	2.50	0.00	13.66	0.03	0.05	0.03	0.03	0.00	1.13	0.03	0.00	0.18	0.00
	VESSELS - Floatel Survival Craft Diesel	TBD	240	12.34704	296.33	1	26	0.17	0.10	0.10	0.00	4.06	0.12	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.01	0.00
	VESSELS - HUC Marine Spread FSV Diesel	TBD	9000	463.014	11112.34	24	180	6.35	3.83	3.72	0.09	152.12	4.37	0.00	23.86	0.04	13.71	8.27	8.03	0.20	328.59	9.45	0.00	51.54	0.10
	VESSELS - HUC Marine Spread 300' Diesel	TBD	6250	321.5375	7716.90	24	180	4.41	2.66	2.58	0.06	105.64	3.04	0.00	16.57	0.03	9.52	5.75	5.57	0.14	228.19	6.56	0.00	35.79	0.07
PRODUCTION	RECIP.<600hp Crane 1 Diesel	TBD	580	29.83868	716.13	12	365	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	2.80	2.80	2.80	0.08	39.48	2.91	--	8.48	--
	RECIP.<600hp Crane 2 Diesel	TBD	580	29.83868	716.13	8	365	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	1.87	1.87	1.87	0.05	26.32	1.94	--	5.66	--
	RECIP.>600hp Firewater Pump 1 Diesel	TBD	1500	77.169	1852.06	1	52	1.06	0.60	0.59	0.02	36.05	0.96	--	8.27	--	0.03	0.02	0.02	0.00	0.94	0.02	--	0.21	--
	RECIP.>600hp Firewater Pump 2 Diesel	TBD	1500	77.169	1852.06	1	52	1.06	0.60	0.59	0.02	36.05	0.96	--	8.27	--	0.03	0.02	0.02	0.00	0.94	0.02	--	0.21	--
	RECIP.>600hp Emergency Generator Diesel	TBD	1206	62.04388	1489.05	1	52	0.85	0.48	0.47	0.01	28.98	0.77	--	6.65	--	0.02	0.01	0.01	0.00	0.75	0.02	--	0.17	--
	RECIP.>600hp Essential Generator Diesel	TBD	3017	155.2126	3725.10	24	9	2.13	1.21	1.18	0.04	72.50	1.93	--	16.63	--	0.23	0.13	0.13	0.00	7.97	0.21	--	1.83	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Temporary / Mobile Equip Diesel**	TBD	1760	90.54496	2173.08	24	365	3.88	3.88	3.88	0.11	54.71	4.04	--	11.76	--	17.00	17.00	17.00	0.47	239.63	17.67	--	51.49	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	270	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	4.73	1.70	1.70	0.60	347.08	0.16	0.01	1.30	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	120	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	2.10	0.75	0.75	0.27	154.26	0.07	0.00	0.58	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK - Routed to VRU				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	HP COMBUSTION FLARE - no smoke Continuous	TBD		2083		24	365	0.00	0.00	0.00	0.00	0.15	0.07	--	0.68	--	0.00	0.00	0.00	0.01	0.65	0.33	--	2.97	--
	HP COMBUSTION FLARE - no smoke Upset Cond	TBD		4583333		24	72	0.00	0.00	0.00	2.61	327.25	164.68	--	1491.88	--	0.00	0.00	0.00	2.26	282.74	142.28	--	1288.98	--
	LP COMBUSTION FLARE - no smoke Continuous	TBD		2083		24	365	0.00	0.00	0.00	0.00	0.15	0.07	--	0.68	--	0.00	0.00	0.00	0.01	0.65	0.33	--	2.97	--
	LP COMBUSTION FLARE - no smoke Upset Cond	TBD		166667		24	72	0.00	0.00	0.00	0.10	11.90	5.99	--	54.25	--	0.00	0.00	0.00	0.08	10.28	5.17	--	46.87	--
	COLD VENT - contingency for flare pilot outage	TBD			2	1	1	--	--	--	--	--	########	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES	TBD			9600	24	365	--	--	--	--	--	4.80	--	--	--	--	--	--	--	--	21.02	--	--	--
	GLYCOL DEHYDRATOR - Routed to VRU				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		kW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2024	**Facility Total Emissions**							**40.31**	**27.14**	**26.62**	**4.02**	**1,600.36**	**########**	**0.01**	**1,747.25**	**0.18**	**75.59**	**56.86**	**56.01**	**5.80**	**2,963.65**	**318.71**	**0.01**	**1,774.91**	**0.33**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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	TBD	7200	370.4112	8889.87	24	52	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.17	1.91	1.85	0.05	75.94	2.18	0.00	11.91	0.02
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		kW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	**Non-Facility Total Emissions**							**5.08**	**3.06**	**2.97**	**0.07**	**121.70**	**3.50**	**0.00**	**19.09**	**0.04**	**3.17**	**1.91**	**1.85**	**0.05**	**75.94**	**2.18**	**0.00**	**11.91**	**0.02**

AIR EMISSIONS CALCULATIONS - 4TH YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
Chevron	Green Canyon		763	OCS - G 25199	Anchor FPU						Kathy Sharp		985-773-6230												
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
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS- Drilling - Propulsion Engine - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels - Diesel Boiler		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vessels – Drilling Prime Engine, Auxiliary		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PIPELINE INSTALLATION	VESSELS - Pipeline Laying Vessel - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSELS - Pipeline Burying - Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATI	VESSELS - Heavy Lift Vessel/Derrick Barge Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	RECIP.<600hp Crane 1 Diesel	TBD	580	29.83868	716.13	12	365	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	2.80	2.80	2.80	0.08	39.48	2.91	--	8.48	--
	RECIP.<600hp Crane 2 Diesel	TBD	580	29.83868	716.13	8	365	1.28	1.28	1.28	0.04	18.03	1.33	--	3.87	--	1.87	1.87	1.87	0.05	26.32	1.94	--	5.66	--
	RECIP.>600hp Firewater Pump 1 Diesel	TBD	1500	77.169	1852.06	1	52	1.06	0.60	0.59	0.02	36.05	0.96	--	8.27	--	0.03	0.02	0.02	0.00	0.94	0.02	--	0.21	--
	RECIP.>600hp Firewater Pump 2 Diesel	TBD	1500	77.169	1852.06	1	52	1.06	0.60	0.59	0.02	36.05	0.96	--	8.27	--	0.03	0.02	0.02	0.00	0.94	0.02	--	0.21	--
	RECIP.>600hp Emergency Generator Diesel	TBD	1206	62.04388	1489.05	1	52	0.85	0.48	0.47	0.01	28.98	0.77	--	6.65	--	0.02	0.01	0.01	0.00	0.75	0.02	--	0.17	--
	RECIP.>600hp Essential Generator Diesel	TBD	3017	155.2126	3725.10	24	9	2.13	1.21	1.18	0.04	72.50	1.93	--	16.63	--	0.23	0.13	0.13	0.00	7.97	0.21	--	1.83	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Auxiliary Equip Survival Craft Diese	TBD	48	2.469408	59.27	1	52	0.11	0.11	0.11	0.00	1.49	0.11	--	0.32	--	0.00	0.00	0.00	0.00	0.04	0.00	--	0.01	--
	RECIP.<600hp Temporary / Mobile Equip Diesel**	TBD	1760	90.54496	2173.08	24	365	3.88	3.88	3.88	0.11	54.71	4.04	--	11.76	--	17.00	17.00	17.00	0.47	239.63	17.67	--	51.49	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Natural Gas Turbine	TBD	17390	165619	########	24	365	--	0.33	0.33	0.10	55.65	0.37	--	14.26	--	--	1.45	1.45	0.43	243.74	1.60	--	62.46	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	180	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	3.16	1.13	1.13	0.40	231.38	0.11	0.00	0.87	--
	Diesel Turbine (dual fuel)	TBD	17390	894.6459	21471.50	24	52	1.46	0.52	0.52	0.18	107.12	0.05	0.00	0.40	--	0.91	0.33	0.33	0.12	66.84	0.03	0.00	0.25	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK - Routed to VRU				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	HP COMBUSTION FLARE - no smoke Continuous	TBD		2083		24	365	0.00	0.00	0.00	0.00	0.15	0.07	--	0.68	--	0.00	0.00	0.00	0.01	0.65	0.33	--	2.97	--
	HP COMBUSTION FLARE - no smoke Upset Cond	TBD		4583333		24	72	0.00	0.00	0.00	2.61	327.25	164.68	--	1491.88	--	0.00	0.00	0.00	2.26	282.74	142.28	--	1288.98	--
	LP COMBUSTION FLARE - no smoke Continuous	TBD		2083		24	365	0.00	0.00	0.00	0.00	0.15	0.07	--	0.68	--	0.00	0.00	0.00	0.01	0.65	0.33	--	2.97	--
	LP COMBUSTION FLARE - no smoke Upset Cond	TBD		166667		24	72	0.00	0.00	0.00	0.10	11.90	5.99	--	54.25	--	0.00	0.00	0.00	0.08	10.28	5.17	--	46.87	--
	COLD VENT - contingency for flare pilot outage	TBD			2	1	1	--	--	--	--	--	########	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES	TBD			9600	24	365	--	--	--	--	--	4.80	--	--	--	--	--	--	--	--	21.02	--	--	--
	GLYCOL DEHYDRATOR - Routed to VRU				0	1	1	--	--	--	--	--	0.00	--	--	--	--	--	--	--	--	0.00	--	--	--
	WASTE INCINERATOR		0			0	0	--	0.00	0.00	0.00	0.00	--	--	0.00	--	--	0.00	0.00	0.00	0.00			0.00	
DRILLING	Liquid Flaring		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - light smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - medium smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
	COMBUSTION FLARE - heavy smoke			0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--
ALASKA-SPECIFIC SOURCES	**VESSELS**		KW			**HR/D**	**D/YR**																		
	VESSELS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
2025-2031	**Facility Total Emissions**							**14.88**	**11.80**	**11.73**	**3.65**	**990.95**	**########**	**0.00**	**1,651.66**	**0.00**	**26.05**	**27.65**	**27.65**	**4.77**	**1,639.97**	**286.39**	**0.00**	**1,598.39**	**0.00**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,195.80**			**4,195.80**	**4,195.80**	**4,195.80**		**85,452.73**	
	126.0																								
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	TBD	7200	370.4112	8889.87	24	52	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.17	1.91	1.85	0.05	75.94	2.18	0.00	11.91	0.02
ALASKA-SPECIFIC SOURCES	**On-Ice Equipment**			**GAL/HR**	**GAL/D**																				
	Man Camp - Operation (maximum people per day)		**PEOPLE/DAY**																						
	VESSELS		KW			**HR/D**	**D/YR**																		
	On-Ice – Loader			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Construction Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Other Survey Equipment			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Tractor			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for gravel island)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	On-Ice – Truck (for surveys)			0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	Man Camp - Operation		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	
	VESSELS - Hovercraft Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025-2031	**Non-Facility Total Emissions**							**5.08**	**3.06**	**2.97**	**0.07**	**121.70**	**3.50**	**0.00**	**19.09**	**0.04**	**3.17**	**1.91**	**1.85**	**0.05**	**75.94**	**2.18**	**0.00**	**11.91**	**0.02**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	
Chevron	763	OCS - G 25199	Anchor FPU			

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	48.90	29.50	28.61	0.71	1171.49	33.68	0.00	183.75	0.34
2022	86.51	52.19	50.63	1.13	86.51	52.19	50.63	1.26	2072.60
2023	113.02	74.22	72.70	2.87	2926.10	79.47	0.02	380.24	0.59
2024	75.59	56.86	56.01	5.80	2963.65	318.71	0.01	1774.91	0.33
2025-2031	26.05	27.65	27.65	4.77	1639.97	286.39	0.00	1598.39	0.00
Allowable	4195.80			4195.80	4195.80	4195.80		85452.73	

Appendix E: 2020 Biological Opinion Response

Appendix E: 2020 Biological Opinion Response

Activity Resulting in Potential Stressor	Information Requested by BOEM	Applicability Determination Discussion & Information Requested (If Applicable)
Pile Driving	If applicable, describe pile-driving activities (No.& size of piles, type of hammer, strikes/ft). Will piles be driven sequentially? Approximate amount of time hammering to occur? What will piles be driven into (clay, sand, mud, silt, etc.). If applicable, will operator monitor beyond the 157 m noted in the 2020 Biological Opinion for marine life both before and during the proposed pile-driving operations? If applicable, will the peak sound level during pile-driving be below the limit for temporary and permanent hearing loss noted in Table 72 of the 2020 Biological Opinion? If applicable, will operator utilize soft start techniques when initiating pile-driving?	Not Applicable - Suction embedding techniques will be used to install all subsea equipment on the seabed. No impact or vibratory hammers will be used.
Flexible lines/ropes in the water	If applicable, will proposed operations cause marine life to become entangled or entrapped? If so, will lines extending into the water be minimized? Will operator representative be trained to look for entangled marine life and take appropriate action?	Not Applicable - There will be no “slacklines”, described by the agencies as flexible, small diameter (< 1 in) nylon, plastic, or fiber lines to support operations, used in operations to be approved under this DOCD.
Diver Activities	NOAA (NMFS) is requesting additional information regarding the Diver Activities. Please provide specific information related to the following:	There will be no “slacklines”, described by the agencies as flexible, small diameter (< 1 in) nylon, plastic, or fiber lines used to support diving operations,
	1. Specific activity diver will be involved in.	Installation of tie-in spools between facility riser and riser piping.
	2. How the line will be weighted, moored or attached.	Surface suppied air will be attached directly from platform to diver.
	3. Whether there are separate descent lines that are loose or if the divers free-descending/swimming to the activity area.	There are no loose descent lines in this operation.
	4. Whether divers and/or tenders would be able to monitor lines.	Lines will be attached directly from platform to diver and always monitored
	5. How long lines are expected to be in the water.	Each dive lasts approximately 30 minutes with air supply hose being brought from surface to diving point with each diver on each dive.
	6. How many hours/days the activity will last.	24 hours/day diving operations for ~1 week
Moon Pools	If applicable, will proposed operations utilize a moon pool? a) Approximate size of moon pool? b) DP Semi - Is moon pool in an open area under the rig and not enclosed; therefore, poses no risk to marine life? c) Will moon pool/open areas on MODU for the proposed operations be used for deploying casing and well heads, tools supporting drilling, blow-out preventers, and riser system components? d) Will the moon pool be used to deploy remote-operated vehicles (ROVs)? e) Will flexible lines (drape hoses) utilized to support drilling operations pose a potential entanglement or entrapment threat to listed ESA species? f) Does operator intend to monitor moon pool during operations?	The vessels associated with the operations proposed in this plan will not have moon pools and there is no moonpool on the facility.
Support Base Information (Bryde’s Whale)	Will drilling unit, vessels, crew boats and supply boats associated with this plan transit the Bryde’s whale area?	No vessels associated with operations proposed in this plan will transit the Bryde’s Whale area as described in the 2020 Biological Opinion.
Pipelines Making Landfall	Are any new pipelines expected to make landfall/directly to shore? If yes, describe.	There are no new pipelines that will make landfall to be installed as part of operations proposed in this plan.

Appendix E: 2020 Biological Opinion Response

Activity Resulting in Potential Stressor	Information Requested by BOEM	Applicability Determination Discussion & Information Requested (If Applicable)
New and Unusual Technology	If applicable, describe new or unusual technology.	The Anchor FPU (Anchor) does not include any “new” or “unusual” technology (NUT) in the context of the 2020 Biological Opinion (function and interface with the environment). Anchor will utilize subsea production, riser, and floating production unit systems that are conventionally used in deepwater Gulf of Mexico. As with all equipment, it is designed to the project-specific operating framework and has been reviewed and approved for use in Gulf of Mexico by BOEM and BSEE. These systems will function and interface with the environment in a way that is consistent with technology reviewed and analyzed in the 2020 Biological Opinion, and therefore is not considered “new” or “unusual” in this context.
	1. Has the technology or hardware been used previously or extensively in the Gulf of Mexico OCS Region under operating conditions similar to those anticipated for the activities proposed in this plan (therefore technically not considered NUT)?	Consistent with the description provided above, all Anchor systems are also conventionally used in deepwater GOM operations and have been designed to a project-specific operating framework approved by BOEM and BSEE.
	2. Does the technology function in a manner that potentially causes different impacts to the environment than similar equipment or procedures did in the past?	As described above, the technology functions in a manner consistent with similar equipment and procedures previously used and does not cause different impacts to the environment.
	3. Does the technology have a significantly different interface with the environment than similar equipment or procedures did in the past?	Consistent with the description provided above, the technology will have the same interface with the environment as similar equipment and procedures used in the past.
	4. Does the technology include operating characteristics that are outside the performance parameters established by 30 CFR §550?	Consistent with the description provided above, the technology does not include operating characteristics that are outside the performance parameters established by 30 CFR §550.

Appendix F: Vicinity Map

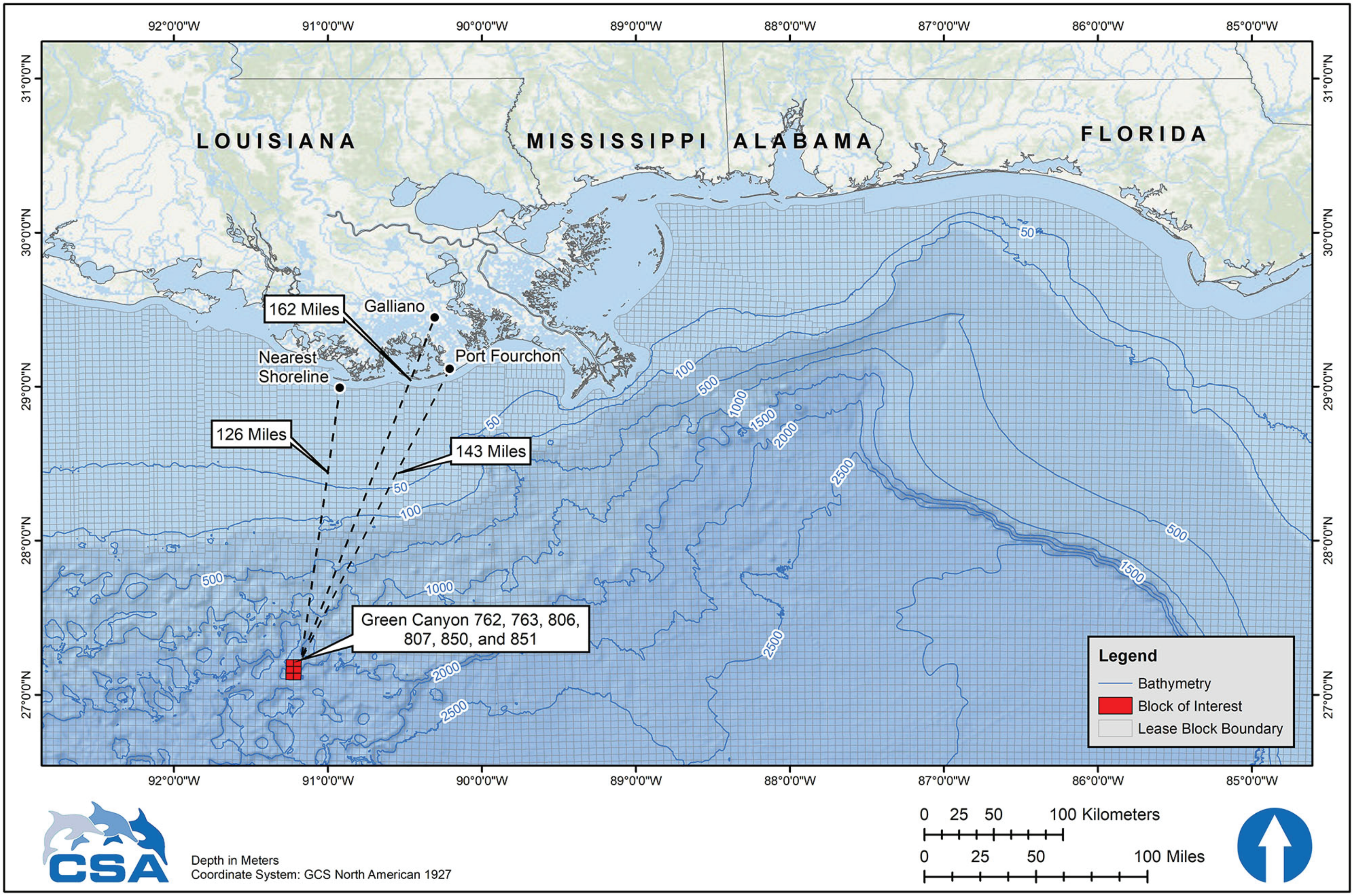


Figure 1. Location of Green Canyon Blocks 762, 763, 806, 807, 850, and 851.

Appendix G: Coastal Zone Management Certification - Louisiana

COASTAL ZONE MANAGEMENT CONSISTENCY CERTIFICATION

DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
Type of OCS Plan

Green Canyon Blocks 763, 762, 806, 807, 850, and 851
Area and Block

OCS-G 25199, 25198, 31751, 31752, 31757, and 31758
Lease Number

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

CHEVRON U.S.A. INC.
Lessee and Operator

Laura Hogge
Certifying Official

September 18, 2020

COASTAL ZONE MANAGEMENT CONSISTENCY CERTIFICATION

DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
Type of OCS Plan

Green Canyon Blocks 763, 762, 806, 807, 850, and 851
Area and Block

OCS-G 25199, 25198, 31751, 31752, 31757, and 31758
Lease Number

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

CHEVRON U.S.A. INC.
Lessee or Operator

Laura Hogge
Certifying Official

October 22, 2020
Date

United States Department of the Interior

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT
Gulf of Mexico Region
1201 Elmwood Park Boulevard
New Orleans, Louisiana 70123-2394

In Reply Refer To: GE 250 October 9, 2019

Mr. Paul Galloway
Chevron Corporation
100 Northpark Boulevard
Covington, Louisiana 70433

Dear Mr. Galloway:

Thank you for the information provided by your letter dated October 4, 2019. We appreciate your efforts in alignment with the intent of 30 CFR 254 to ensure the approved regional Oil Spill Response Plan (OSRP) for Chevron Corporation in our possession contains current and accurate information.

Be reminded, you must review your entire OSRP and submit any resulting modifications to this office no later than March 1, 2021, in accordance with 30 CFR 254.30(a).

The following companies are covered under this OSRP:

Chevron Corporation	02335
Chevron U.S.A. Inc.	00078
Chevron Pipe Line Company	00400
Sabine Pipe Line Company Inc.	00835
Union Oil Company of California	00003
Unocal Pipeline Company	01113
PRS Offshore, L.P.	01767

If you have any questions regarding this letter, contact Dr. Deserié Soliz at (504) 736-2694. Refer to the operator number of 02335and the oil spill response plan number of O-421.

Sincerely,

for, Sara K. Moore
Acting Gulf OSP Section Supervisor
Oil Spill Preparedness Division

United States Department of the Interior

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT

Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

In Reply Refer To: GE 250 July 22, 2019

Mr. Paul Galloway
Chevron Corporation
100 Northpark Boulevard
Covington, Louisiana 70433

Dear Mr. Galloway:

The Oil Spill Preparedness Division (OSPD) received modifications resulting from your review of the approved Oil Spill Response Plan (OSRP) for Chevron Corporation by letter dated March 1, 2019. This OSRP is in compliance with 30 CFR 254.30(a). The consolidated findings of our review under the authority in 30 CFR 254.30(e) are documented in the enclosed Submission Disposition form. Please make these corrections when preparing your next OSRP submittal.

You must review you plan within the next two years and no later than March 1, 2021.

The following companies are covered under this OSRP:

Chevron Corporation	02335
Chevron, U.S.A. Inc.	00078
Chevron Pipe Line Company	00400
Sabine Pipe Line Company Inc.	00835
Union Oil Company of California	00003
Unocal Pipeline Company	01113
PRS Offshore, L.P.	01767

If you have any questions regarding this letter, contact Sara K. Moore at (504) 731-1444. Refer to the operator number of 02335 and the OSRP number of O-421.

Sincerely,

for, Bryan Rogers
Gulf OSP Section Supervisor
Oil Spill Preparedness Division

Enclosure

2017 Oil Spill Response Plan Review: Submission Disposition	OSPD Tracking Number: G.00421-P10.190301	Date: 22 JUL 2019
	OSRP Name: Chevron Corporation	OSRP Review: ■ Complete

Block 1: Plan Review Documentation		Block 2: 30 CFR §254 Submittal		Block 3: Review Error Codes
		Check all that apply to this review:		**Error Types:**
■	Master Review Matrix: Subpart A	☐ Initial	☐ 30(c)	Technical Error (T)
■	Master Review Matrix: Subpart B	■ 30(a) Biennial	■ 30(e)	Regulatory Error (R)
■	Master Review Matrix: Subpart C	☐ 30(b)(1)	☐ Non-Regulatory Update	Preparedness Error (P)
☐	Master Review Matrix: Subpart D	☐ 30(b)(2)	☐ 1(b)Request to Rescind	**Error Qualifiers:**
■	Worst Case Discharge Verification Worksheet	☐ 30(b)(3)	☐ Involuntary Rescission	Missing/Incomplete (MI)
■	Points of Contact Verification Worksheet	☐ 30(b)(4)	☐ 53(a)	Incorrect/False (IF)
☐	Area Contingency Plan Consistency Worksheet			Methodology Unsupported (MU)
☐	Other:			Inconsistent (IX)
				Improper Use (IU)

Block 4: OSRP Review Consolidated Findings

Instructions: If there are no deficiencies, leave block 4 comments section blank. If there are deficiencies, reference them by Review Matrix page number; describe the deficiency utilizing the error codes found in block 4. (Example: Subpart B, Page 14: T-MI Personnel missing key SMT members)

☐ Regulatory Requirements Met: Approved

■ Regulatory Requirements Met: Approved with Revisions: See Comments below

☐ Regulatory Requirements Not Met/ Corrections Needed: See Comments below:

☑ Section 12, Appendix H (30 CFR 254.26): A list of resources of special economic or environmental importance that potentially could be impacted in
☐ the areas identified by your WCD trajectory analysis is missing. Several references to NOAA ESI Maps and GIS data are made throughout the plan;
☐ however, the weblink in Section 12 is incorrect.
☐

☑ Appendix A (30 CFR 254.23(e)): Verify the accuracy of Table 1 - Production Platforms and Satellite Structures in OCS Waters. Our records indicate
☐ that you are the operator of the following facilities: PS008 (BL G17015) and PS007 (G21245)
☐

☑ Appendix A (30 CFR 254.23(e)): Verify the accuracy of Table 2 - ROW Pipelines in OCS Waters. Our records indicate that you are the operator of
☐ the following segments: 12124 (ROW G04648); 17900 (G07561); 17971 (G01855); 19255 (G29375)
☐

☑ Appendix A-2 (30 CFR 254.23(e)): Provide one or more maps at an appropriate scale depicting the relationship of the listed facilities to the shoreline.
☐ Platform structures were depicted; however, pipelines and/or satellite structures do not appear to be included.
☐

☑ Appendix H (30 CFR 254.26): Confirm the accuracy of all response equipment that will be used to contain and recover the discharge. Some MSRC
☐ equipment listed in the tables include out-of-date and/or inaccurate locations.
☐

☑ Section 7 (NTL 2012-N06): Email information listed for Mr. Woodrow is correct in the QI subsection; though, appears to include a typo in the
☐ Safety Officer subsection. Attempts to contact Mr. Nathan Taylor by phone and email were unsuccessful.

Block 5: OSRP Review Compliance Status			Block 6: Subsequent	Block 7: Enforcement
SI: Submittal in Compliance RR: Revision needed with next submittal RFI: Submittal returned for revision or additional information			Indicate next submittal type required:	Enforcement Referral? Y / N
Initial OSRP or WCD Cert.	**Compliance Outcomes for Approved OSRP, Check All that Apply:**			ENF OSPD Tracking No:
☐ Approve	■ 30(a): SI	☐ NRU: RFI	☐ Initial Plan	
☐ Approved, RR	☐ 30(a): RFI	☐ 30(c): SI	☐ 30 (a) Biennial	Comments/Notes:
☐ RFI	☐ 30(b): Approve	☐ 30(c): RFI	☐ 30 (b) Resubmission	In Compliance with Revisions
☐ Cert. Accepted	☐ 30(b): Approved, RR	■ 30(e): SI	☐ 30 (c) Response	
	☐ 30(b): RFI	☐ 30(e): RFI	■ 30 (e) Response	
	☐ 1(b): Rescinded	☐ 53(a): SI	☐ 53 (a) State (AK, CA)	
	☐ 1(b): Rescission Denied, RFI	☐ 53(a): RFI		
	☐ NRU: SI			

Appendix H: Environmental Impact Analysis

Environmental Impact Analysis

for an

INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
for
Green Canyon Block 762 (OCS-G-25198)
Green Canyon Block 763 (OCS-G-25199)
Green Canyon Block 806 (OCS-G-31751)
Green Canyon Block 807 (OCS-G-31752)
Green Canyon Block 850 (OCS-G-31757)
Green Canyon Block 851 (OCS-G-31758)
Offshore Louisiana

September 2020

Prepared for:

Chevron U.S.A. Inc.
1500 Louisiana Street
Houston, Texas 77002

Prepared by:

CSA Ocean Sciences Inc.
8502 SW Kansas Avenue
Stuart, Florida 34997
Telephone: (772) 219-3000

ENVIRONMENTAL IMPACT ANALYSIS FOR AN
INITIAL DEVELOPMENT OPERATIONS COORDINATION DOCUMENT
FOR
GREEN CANYON BLOCK 762 (OCS-G-25198)
GREEN CANYON BLOCK 763 (OCS-G-25199)
GREEN CANYON BLOCK 806 (OCS-G-31751)
GREEN CANYON BLOCK 807 (OCS-G-31752)
GREEN CANYON BLOCK 850 (OCS-G-31757)
GREEN CANYON BLOCK 851 (OCS-G-31758)
OFFSHORE LOUISIANA

DOCUMENT NO. CSA-CHEVRON-FL-20-3583-01-REP-01-FIN

VERSION	DATE	DESCRIPTION	PREPARED BY:	REVIEWED BY:	APPROVED BY:
01	09/08/2020	Initial draft	K. Gifford	J. Tiggelaar	K. Gifford
02	09/14/2020	Revised draft	K. Gifford	K. Metzger	K. Gifford
FIN	09/23/2020	Final	N/A	N/A	N/A

Contents

Contents
(Continued)

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List of Tables

List of Figures

Acronyms and Abbreviations

ac	acre
ADIOS2	Automated Data Inquiry for Oil Spills 2
bbl	barrel
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
bopd	barrels of oil per day
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulations
Chevron	Chevron U.S.A. Inc.
CO	carbon monoxide
dB	decibel
DOCD	Developmental Operations Coordination Document
DP	dynamically positioned
DPS	distinct population segment
EFH	Essential Fish Habitat
EIA	Environmental Impact Analysis
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAD	fish aggregating device
FR	*Federal Register*
FPU	floating production unit
GC	Green Canyon
ha	hectare
HAPC	Habitat Area of Particular Concern
IPF	impact-producing factor
km	kilometer
m	meter
µPa	micropascal
MARPOL	International Convention for the Prevention of Pollution from Ships
MMC	Marine Mammal Commission
MMPA	Marine Mammal Protection Act
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NTL	Notice to Lessees and Operators
NWR	National Wildlife Refuge
OCS	Outer Continental Shelf
OSRA	Oil Spill Risk Analysis
OSRP	Oil Spill Response Plan
PAH	polycyclic aromatic hydrocarbons
PM	particulate matter
re	referenced to
SEL_{cum}	cumulative sound exposure level
SO_x	sulfur oxide
SPL	sound pressure level
SPL_{rms}	root-mean-square sound pressure level
$SPL_{0\text{-}pk}$	zero to peak sound pressure level
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCD	worst case discharge

Introduction

Chevron U.S.A. Inc. (Chevron) is submitting an Initial Developmental Operations Coordination Document (DOCD) for the installation and operation of a semi-submersible floating production unit (FPU) with 12 mooring lines in Green Canyon (GC) Block 763 (GC 763) and the installation of subsea equipment (flowlines, umbilicals, jumpers, etc.) to tie back to three drill centers. The drilling and completion activities for the wells was previously approved in Exploration Plan No. S-07777; therefore, drilling and completion activities are not included in this DOCD. The Environmental Impact Analysis (EIA) provides information on potential environmental impacts of Chevron's proposed activities.

The project area is approximately 126 mi (203 kilometers [km]) from the nearest shoreline (Plaquemines Parish, Louisiana), 143 mi (230 km) from the onshore support base at Port Fourchon, Louisiana, and 162 mi (261 km) from the helicopter base at Galliano, Louisiana (**Figure 1**). The water depth at the project area is approximately 4,750 ft (1,448 m). The proposed activities will be completed using a dynamically positioned (DP) installation vessels. The installation of the proposed FPU and subsea equipment is expected to commence in June 2021 with well production commencing in 2024. There are 12 mooring anchors associated with this plan.

The EIA for this DOCD was prepared for submittal to the Bureau of Ocean Energy Management (BOEM) in accordance with applicable regulations, including Title 30 Code of Federal Regulations (CFR) 550.242(s) and 550.261. The EIA is a project- and site-specific analysis of the potential environmental impacts of Chevron's planned activities. The EIA complies with guidance provided in existing Notices to Lessees and Operators (NTLs) issued by BOEM and its predecessors, Minerals Management Service and Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), including NTLs 2008-G04 (extended by 2015-N02) and 2015-N01. Potential impacts have been analyzed at a broader level in the 2017-2022 Programmatic Environmental Impact Statement (EIS) for the Outer Continental Shelf (OCS) Oil and Gas Leasing Program (BOEM, 2016a) and in multisale EISs for the Western and Central Gulf of Mexico Planning Areas (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a). The most recent multisale EIS contains updated environmental baseline information in light of the Deepwater Horizon incident and addresses potential impacts of a catastrophic spill (BOEM, 2012a,b, 2013, 2014, 2015, 2016b, 2017a,b). Additionally, the NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico assesses impacts and mitigation measures to listed species under the Endangered Species Act (ESA) (NMFS, 2020). The analyses from those documents are incorporated here by reference.

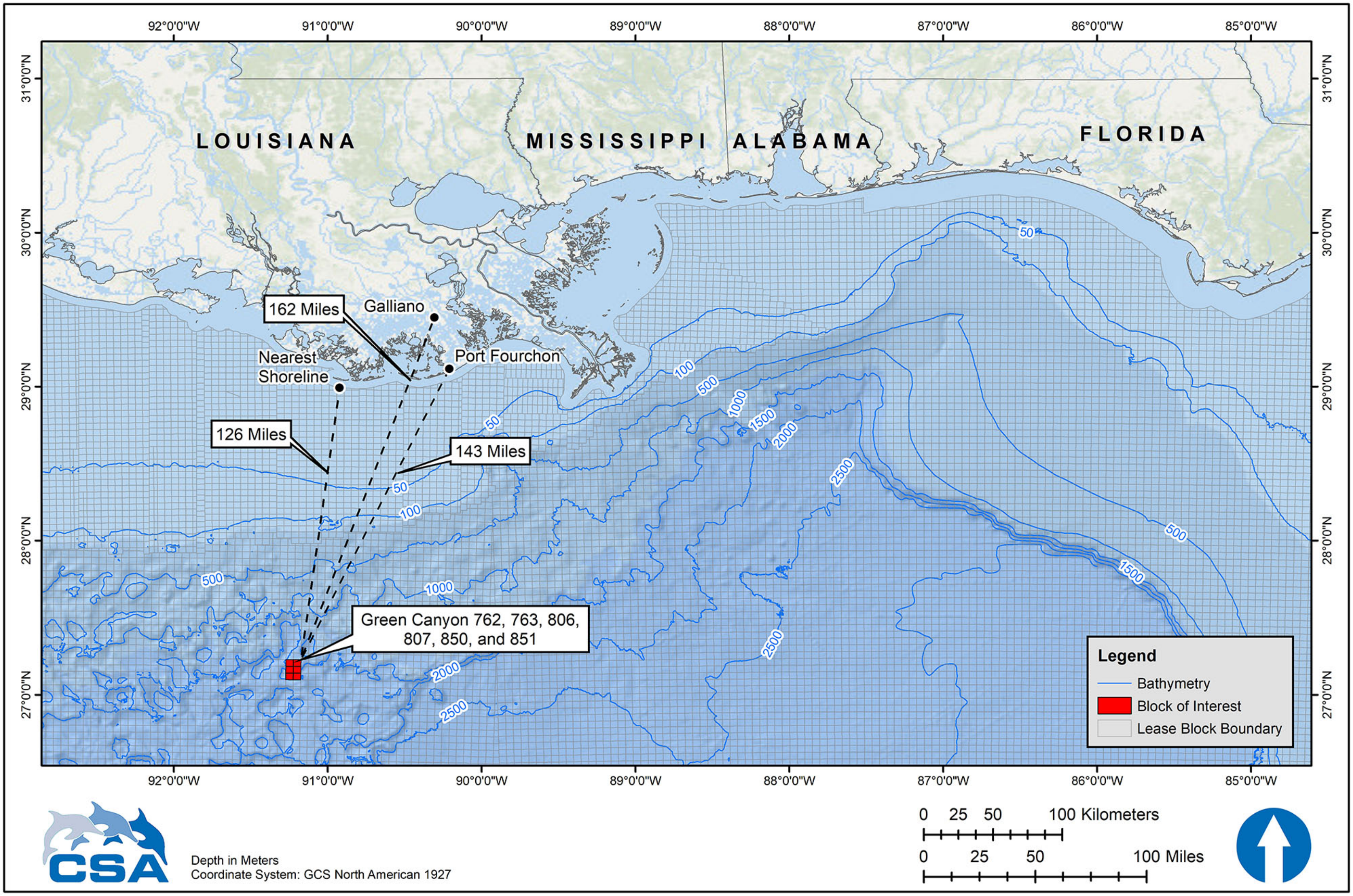

Figure 1. Location of Green Canyon Blocks 762, 763, 806, 807, 850, and 851.

All the proposed activities and facilities in this DOCD are covered by the Chevron's Gulf of Mexico Regional Oil Spill Response Plan (OSRP), filed by Chevron in accordance with 30 CFR 254 and approved by the Bureau of Safety and Environmental Enforcement (BSEE) on March 22, 2016. The biennial review and update to the OSRP was deemed in compliance with BSEE in March 2019. The OSRP details Chevron's plan to rapidly and effectively manage oil spills that may result from drilling and production operations. Chevron has designed its spill response program based on a regional capability of response to spills ranging from small operational spills to a worst-case discharge (WCD) from a well blowout. Chevron's spill response program meets the response planning requirements of the relevant coastal states and applicable federal oil spill planning regulations. The OSRP also includes information regarding Chevron's regional oil spill organization and dedicated response assets, potential spill risks, local environmental team organization, and an overview of actions and notifications that will be taken in the event of a spill.

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

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

NTL	Title	Summary
BOEM-2016-G01	Vessel Strike Avoidance and Injured/Dead Protected Species Reporting	Recommends protected species identification training; recommends that vessel operators and crews maintain a vigilant watch for marine mammals and slow down or stop their vessel movement to avoid striking protected species; and requires operators to report sightings of any injured or dead protected species. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion Appendix C (NMFS, 2020) replaces compliance with this NTL.
BOEM-2016-G02	Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program	Summarizes seismic survey mitigation measures, updates regulatory citations, and provides clarification on how the measures identified in the NTL will be used by Bureau of Ocean Energy Management (BOEM), Bureau of Safety and Environmental Enforcement (BSEE), and operators in order to comply with the Endangered Species Act and the Marine Mammals Protection Act. Reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion Appendix A (NMFS, 2020) replaces compliance with this NTL.
BSEE-2015-G03 (or Appendix B; NMFS 2020)	Marine Trash and Debris Awareness and Elimination	Instructs operators to exercise caution in the handling and disposal of small items and packaging materials; requires the posting of instructional placards at prominent locations on offshore vessels and structures; and mandates a yearly marine trash and debris awareness training and certification process.
BOEM 2015-N02	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BOEM website.

Table 1. (Continued).

NTL	Title	Summary
BOEM 2015-N01	Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge (WCD) and Blowout Scenarios	Provides guidance regarding information required in WCD descriptions and blowout scenarios.
BOEM 2014-G04	Military Warning and Water Test Areas	Provides contact links to individual command headquarters for the military warning and water test areas in the Gulf of Mexico.
BSEE 2014-N01	Elimination of Expiration Dates on Certain Notices to Lessees and Operators Pending Review and Reissuance	Eliminates expiration dates (past or upcoming) of all NTLs currently posted on the BSEE website.
BSEE-2012-N06	Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans	Provides clarification, guidance, and information for preparation of regional Oil Spill Response Plans. Recommends description of response strategy for worst-case discharge scenarios to ensure capability to respond to oil spills is both efficient and effective.
2011-JOINT-G01	Revisions to the List of Outer Continental Shelf (OCS) Blocks Requiring Archaeological Resource Surveys and Reports	Provides new information of which OCS blocks require archaeological surveys and reports; identifies required survey line spacing in each block. This NTL augments NTL 2005-G07.
2010-N10	Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources	Informs operators using subsea blowout preventers (BOPs) or surface BOPs on floating facilities that applications for well permits must include a statement signed by an authorized company official stating that the operator will conduct all activities in compliance with all applicable regulations, including the increased safety measures regulations (75 *Federal Register* [FR] 63346). Informs operators that the BOEM will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy containment resources to respond promptly to a blowout or other loss of well control.
2009-G40	Deepwater Benthic Communities	Provides guidance for avoiding and protecting high-density deepwater benthic communities (including chemosynthetic and deepwater coral communities) from damage caused by OCS oil and gas activities in water depths greater than 984 ft (300 m). Prescribes separation distances of 2,000 ft (610 m) from each mud and cuttings discharge location and 250 ft (76 m) from all other seafloor disturbances.
2009-G39	Biologically Sensitive Underwater Features and Areas	Provides guidance for avoiding and protecting biologically sensitive features and areas (i.e., topographic features, pinnacles, low relief live bottom areas, and other potentially sensitive biological features) when conducting OCS operations in water depths less than 984 ft (300 m) in the Gulf of Mexico.

Table 1. (Continued).

NTL	Title	Summary
2008-G04	Information Requirements for Exploration Plans and Development Operations Coordination Documents	Provides guidance on information requirements for OCS plans, including Environment Impact Assessment requirements and information regarding compliance with the provisions of the Endangered Species Act and Marine Mammal Protection Act.
2008-N05	Guidelines for Oil Spill Financial Responsibility (OSFR) for Covered Facilities	Provides clarification and guidance to operators/lessees on policies for submitting required OSFR documents to the Gulf of Mexico OCS Region as required under 30 CFR Part 253.
2005-G07	Archaeological Resource Surveys and Reports	Provides guidance on regulations regarding archaeological discoveries, specifies requirements for archaeological resource surveys and reports, and outlines options for protecting archaeological resources.

A. Impact-Producing Factors

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

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

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

Environmental Resources	IPFs									
	Floating Production Unit and Vessel Presence (incl. sound & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helo Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Physical/Chemical Environment										
Air quality	--	--	--**X**(9)	--	--	--	--	--	**X**(6)	**X**(6)
Water quality	--	--	--	**X**	--	--	--	--	**X**(6)	**X**(6)
Seafloor Habitats and Biota										
Soft bottom benthic communities	--	**X**	--	**--**	--	--	--	--	--	**X**(6)
High-density deepwater benthic communities	--	--(4)	--	--(4)	--	--	--	--	--	**X**(6)
Designated topographic features	--	--(1)	--	--(1)	--	--	--	--	--	--
Pinnacle trend area live bottoms	--	--(2)	--	--(2)	--	--	--	--	--	--
Eastern Gulf live bottoms	--	--(3)	--	--(3)	--	--	--	--	--	--
Threatened, Endangered, and Protected Species and Critical Habitat										
Sperm whale (Endangered)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Bryde's whale (Endangered)	X(8)	--	--	--	--	--	--	X(8)	X(6,8)	X(6,8)
West Indian manatee (Threatened)	--	--	--	--	--	--	--	**X**(8)	--	**X**(6,8)
Non-endangered marine mammals (protected)	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Sea turtles (Endangered/Threatened)	**X**(8)	--	--	--	--	--	--	**X**(8)	**X**(6,8)	**X**(6,8)
Piping Plover (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Whooping Crane (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Oceanic whitetip shark (Threatened)	**X**	--	--	--	--	--	--	--	--	**X(6)**
Giant manta ray (Threatened)	**X**	--	--	--	--	--	--	--	--	**X**(6)
Gulf sturgeon (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Nassau grouper (Threatened)	--	--	--	--	--	--	--	--	--	**X**(6)
Smalltooth sawfish (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Beach mice (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Florida salt marsh vole (Endangered)	--	--	--	--	--	--	--	--	--	**X**(6)
Threatened coral	--	--	--	--	--	--	--	--	--	**X**(6)
Coastal and Marine Birds										
Marine birds	**X**	--	--	--	--	--	--	**X**	**X**(6)	**X**(6)
Coastal Birds	--	--	--	--	--	--	--	**X**	--	**X**(6)
Fisheries Resources										
Pelagic communities and ichthyoplankton	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Essential Fish Habitat	**X**	--	--	**X**	**X**	--	--	--	**X**(6)	**X**(6)
Archaeological Resources										
Shipwreck sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Prehistoric archaeological sites	--	--(7)	--	--	--	--	--	--	--	**X**(6)
Coastal Habitats and Protected Areas										
Coastal habitats and protected areas	--	--	--	--	--	--	--	**X**	--	**X**(6)

Table 2. (Continued).

Environmental Resources	IPFs									
	Floating Production Unit and Vessel Presence (incl. sound & lights)	Physical Disturbance to Seafloor	Air Pollutant Emissions	Effluent Discharges	Water Intake	Onshore Waste Disposal	Marine Debris	Support Vessel/Helo Traffic	Accidents	
									Small Fuel Spill	Large Oil Spill
Socioeconomic and Other Resources										
Recreational and commercial fishing	**X**	--	--	--	--	--	--	--	**X**(6)	**X**(6)
Public health and safety	--	--	--	--	--	--	--	--	--	**X**(5,6)
Employment and infrastructure	--	--	--	--	--	--	--	--	--	**X**(6)
Recreation and tourism	--	--	--	--	--	--	--	--	--	**X**(6)
Land use	--	--	--	--	--	--	--	--	--	**X**(6)
Other marine uses	--	--	--	--	--	--	--	--	--	**X**(6)

*numbers refer to table footnotes; Helo = helicopter.

Table 2 Footnotes and Applicability to this Program:

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

(1) *Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well, rig site, or any anchors will be on the seafloor within the following:*
   (a) *4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;*
   (b) *1,000-m, 1-mile, or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an Outer Continental Shelf (OCS) lease;*
   (c) *Essential Fish Habitat (EFH) criteria of 500 ft (152 m) from any no-activity zone; or*
   (d) *Proximity of any submarine bank 500 ft [152 m] buffer zone) with relief greater than 7 ft (2 m) that is not protected by the Topographic Features Stipulation attached to an OCS lease.*
   - None of these conditions (a through d) are applicable. The project area is not within or near any marine sanctuary, topographic feature, submarine bank, or no-activity zone.

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

(3) *Activities within any Eastern Gulf OCS block where seafloor habitats are protected by the Live Bottom (Low-Relief) Stipulation attached to an OCS lease.*
   - The Live Bottom (Low-Relief) Stipulation is not applicable to the project area.

(4) *Activities on blocks designated by the BOEM as being in water depths 400 m or greater.*
   - No impacts on high-density deepwater benthic communities are anticipated. There are no features indicative of seafloor hard bottom that could support high-density chemosynthetic communities or coral communities within 250 ft (76 m) of the proposed mooring radius and subsea installation with the exception of a proposed gas export riser and umbilical (Fugro USA Marine, Inc, 2018). The proposed gas export riser and umbilical are within 250 ft (76 m) of a small concentration of pockmarks and hardgrounds that may support high-density deepwater benthic communities. Chevron will either move these subsea installations to be outside of the 250 ft (76 m) radius or use a remotely operated vehicle to inspect the area.

(5) *Exploration or production activities where Hydrogen Sulfide (H_2S) concentrations greater than 500 ppm might be encountered.*
   - The lease block is classified as H_2S absent.

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

(7) *All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which your planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or prehistoric site that no impact would occur, the EIA can note that in a sentence or two.*
   - No impacts to archaeological resources are expected. While GC 762, 763, 806, GC 807, GC 850, and GC 851 are not on the list of high-probability blocks for shipwrecks (BOEM, 2011), the project area is well beyond the 60-m depth contour used by BOEM as the seaward extent for prehistoric archaeological site potential in the Gulf of Mexico. The archaeological survey reported that no archaeologically significant sonar contacts were identified within the project area (Fugro USA Marine, Inc, 2018).

(8) *All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.*
   - IPFs that may affect marine mammals, sea turtles, or their critical habitats include FPU and vessel presence, support vessel and helicopter traffic, and accidents. See **Section C**.

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

A.1 Floating Production Unit and Vessel Presence, Marine Sound, and Lights

The installation of the FPU includes the use of non-anchored vessels for the placement of 12 moorings on the seafloor. Subsea installations will be conducted by a DP installation vessels. DP vessels use a global positioning system, specific computer software, and sensors in conjunction with a series of thrusters to maintain position. Through satellite navigation and position reference sensors, the location of the DP installation vessels is precisely monitored while thrusters, positioned at various locations about the rig pontoons, are activated to maintain position. This allows operations at sea in areas where mooring or anchoring is not feasible. Consequently, there will be no anchoring of the DP vessels during this project; only the 12 FPU mooring lines. The selected installation vessels are expected to be on site for an estimated 360 days to install the FPU and subsea equipment. The FPU and installation vessels will maintain exterior lighting in accordance with applicable federal navigation and aviation safety regulations (International Regulations for Preventing Collisions at Sea, 1972 [72 COLREGS], Part C).

Potential impacts to marine resources from the FPU and installation vessels include the physical presence of the FPU and installation vessels in the ocean, working and safety lighting on the FPU and installation vessels, and underwater sound produced during operations.

The physical presence of the FPU and the installation vessels in the ocean can attract and potentially impact pelagic marine resources, as discussed in **Section C.5.1**. DP vessels maintain exterior lighting for working at night and for navigational and aviation safety in accordance with applicable federal safety regulations. This artificial lighting may also attract and directly or indirectly impact natural resources. Installation operations produce underwater sounds that may impact certain marine resources.

The installation operations of the FPU and subsea equipment can be expected to produce noise associated with propulsion machinery that transmits directly to the water during station keeping and installation operations. Additional sound and vibration are transmitted through the hull to the water from auxiliary machinery, such as generators, pumps, and compressors onboard the FPU (Richardson et al., 1995). The noise levels produced by DP vessels for station-keeping are largely dependent on the level of thruster activity required to keep position and, therefore, vary based on local ocean currents, sea and weather conditions, and operational requirements. Representative source levels (SLs) for vessels in DP activities range from 184 to 190 decibels (dB) referenced to (re) one micropascal (µPa), with a primary amplitude frequency below 600 Hz (Blackwell and Greene Jr., 2003, McKenna et al., 2012; Kyhn et al., 2014). BOEM (2012a) stated that SLs from oil and gas production platforms are low, with a frequency range of 50 to 500 Hz. The response of marine mammals, sea turtles, and fishes to a perceived marine sound depends on a range of factors, including: 1) the sound pressure level, frequency, duration, and novelty of the sound; 2) the physical and behavioral state of the animal at the time of perception; and 3) the ambient acoustic features of the environment (Hildebrand, 2009).

The use of thrusters can elevate SLs from a drillship or semi-submersible to approximately 188 dB re 1 µPa m (Nedwell and Howell, 2004). Nedwell and Edwards (2004) reported sound pressure levels (SPLs) from a semi-submersible drilling rig occurred primarily below 600 Hz. Within the low bandwidths (<600 Hz), measured SPLs were shown to be greatly influenced by the drilling rig for up to (1.2 mi) (2 km); but at distances beyond 3.1 mi (5 km), the drill rig did not contribute significantly to the overall SPLs in that bandwidth.

A.2 Physical Disturbance to the Seafloor

The installation of the FPU includes the use of DP vessels for placement of 12 mooring lines that will anchor the FPU into position. The installation vessels will not use anchors to install the seafloor mooring equipment. There will be minimal disturbance to the seafloor and soft bottom communities during positioning of the subsea equipment. Physical disturbance of the seafloor will be limited to the proximal area where the moorings and subsea equipment are placed on the substrate.

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

A.3 Air Pollutant Emissions

Offshore air pollutant emissions will result from FPU and installation vessels operations as well as support vessel (both supply and crew vessels) and helicopter transits. These emissions occur mainly from combustion of diesel and aviation fuel (Jet-A). The combustion of fuels occurs in diesel-powered generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with emissions from internal combustion engines are suspended particulate matter (PM), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and carbon monoxide (CO).

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

A.4 Effluent Discharges

The discharges will include treated sanitary and domestic wastes, deck drainage, desalination unit brine, uncontaminated ballast and bilge water, noncontact cooling water, fire water, hydrate inhibitor, and produced water. All offshore discharges will be in accordance with requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit No. GMG290006 issued by the U.S. Environmental Protection Agency (USEPA), including permit compliance terms, discharge volumes, discharge rates, and associated monitoring requirements. The support vessels’ discharges are expected to be in accordance with USCG regulations.

A.5 Water Intake

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

A.6 Onshore Waste Disposal

Wastes generated during the proposed activities are tabulated in DOCD Section F. A total of approximately 1,500 cubic ft per well of trash and debris will be generated over the life of the project. Trash will be transported to shore in disposal bags for final disposal by municipal operators in accordance with applicable regulations. Other wastes transported to shore for re-use, recycling, or disposal include chemical product waste (well treatment fluids), and used oil. All wastes will be transported to shore in containers approved by the U.S. Department of Transportation for re-use, recycling, or disposal in accordance with applicable regulations. Compliance with these requirements is expected to result in either no or negligible impacts from this factor.

A.7 Marine Debris

Chevron will comply with all applicable regulations relating to solid waste handling, transportation, and disposal, including the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) Annex V requirements, and USEPA, U.S. Coast Guard (USCG), BSEE, and BOEM regulations. These regulations include prohibitions and compliance requirements regarding the deliberate discharging of containers and other similar materials (i.e., trash and debris) into the marine environment as well as the protective measures to be implemented to prevent the accidental loss of solid material into the marine environment. For example, BSEE regulations 30 CFR 250.300(a) and (b)(6) prohibit operators from deliberately discharging containers and other similar materials (i.e., trash and debris) into the marine environment, and 30 CFR 250.300(c) requires durable identification markings on equipment, tools, containers (especially drums), and other material. The USEPA and USCG regulations require operators to be proactive in avoiding accidental loss of solid materials by developing waste management plans, posting informational placards, manifesting trash sent to shore, and using special precautions such as covering outside trash bins to prevent accidental loss of solid waste. In addition to the regulations in 30 CFR 250, BSEE issued NTL BSEE-2015-G03 which instructs operators to exercise caution in handling and disposal of small items and packaging materials, requires posting of placards at prominent locations on offshore vessels and structures, and mandates a yearly training and certification process for marine trash and debris awareness. Compliance with these requirements is expected to result in either no or negligible impacts from this factor.

A.8 Support Vessel and Helicopter Traffic

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

The project will be supported by onshore crew boats and supply vessels. The crew boat is expected to make approximately one trip per week between the shorebase and the project area. The supply boat is expected to make a trip between the shorebase and the project area every two to three days. The boats typically move to the project area via the most direct route from the shorebase.

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

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

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

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

A.9 Accidents

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

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

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

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

Loss of Well Control. A loss of well control is the uncontrolled flow of a reservoir fluid that may result in the release of gas, condensate, oil, drilling fluids, sand, and/or water. Loss of well control includes incidents from the very minor up to the most serious well control incidents, while blowouts are considered to be a subset of more serious incidents with greater risk of oil spill or human injury (BOEM, 2016a, 2017a). Loss of well control may result in the release of drilling fluid and/or loss of oil. Not all loss of well control events result in blowouts (BOEM, 2012a). In addition to the potential release of gas, condensate, oil, sand, and/or water, the loss of well control can also resuspend and disperse bottom sediments (BOEM, 2012a, 2017a). BOEM (2016a) noted that most OCS blowouts have resulted in the release of gas.

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

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

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

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

H_2S Release. GC 762, 763, GC 806, GC 807, GC 850, and GC 851 are classified as H_2S absent.

A.9.1 Small Fuel Spill

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

Spill Fate. The fate of a small fuel spill in the project area would depend on meteorological and oceanographic conditions at the time as well as the effectiveness of spill response activities. However, given the open ocean location of the project area and response actions, it is expected that impacts from a small spill would be minimal (BOEM, 2016a).

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

Sheens from small fuel spills are expected to persist for relatively short periods of time, ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl), and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a).

For purposes of the EIA, the fate of a small diesel fuel spill was estimated using the National Oceanic and Atmospheric Administration's (NOAA) Automated Data Inquiry for Oil Spills 2 (ADIOS2) model (NOAA, 2016a). This model uses the physical properties of oils in its database to predict the rate of evaporation and dispersion over time as well as changes in the density, viscosity, and water content of the product spilled. It is estimated that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it during this 24-hour period would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

The ADIOS2 results, coupled with spill trajectory information discussed below for a large spill, indicate that a small fuel spill would not impact coastal or shoreline resources. The project area is 126 mi (203 km) from the nearest shoreline (Plaquemines Parish, Louisiana). Slicks from small fuel spills are expected to persist for relatively short periods of time ranging from minutes (<1 bbl) to hours (<10 bbl) to a few days (10 to 1,000 bbl) and rapidly spread out, evaporate, and disperse into the water column (BOEM, 2012a). Because of the distance from shore of these potential spills on the OCS and their lack of persistence, it is unlikely that a spill would make landfall prior to dissipation (BOEM, 2012a).

Spill Response. In the unlikely event the shipboard procedures fail to prevent a fuel spill, response equipment and trained personnel would be activated so that any spill effects would be localized and would result only in short-term environmental consequences. DOCD Section H provides a discussion of Chevron's response efforts if a spill were to occur during operational activities associated with the DOCD.

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

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

A.9.2 Large Oil Spill (Worst Case Discharge)

Spill Size. The WCD scenario for this project is based on GC 807 Anchor 4 well (a representative crestal well). The WCD Scenario initial flow rate is calculated to be 33,679 barrels of oil per day (bopd) by IPM (GAP-Prosper-MBAL) modeling. This rate is expected to decline over time due to reservoir transient effects and depletion. Assuming a 500-acre drainage, the oil rate would decrease to 32,732 bopd in 3 months and 31,815 bopd in 6 months.

Blowout Scenario. Chevron prepared this blowout scenario pursuant to guidance provided in NTL No. 2015-N01. Based on NTL No. 2015-N01 guidance, the total time required to drill the relief well and conduct the kill operation in an uncontrolled blow-out is 177 days. Total Potential

Spill Volume is estimated at 5,926,923 bbls using the constant rate profile resulting from these assumptions explained above.

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

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

The results for the 30-day OSRA model for Launch Area 45 (where GC 762, 763, GC 806, GC 807, GC 850, and GC 851 are located) are presented in **Table 3**. The model predicts up to a 4% chance of shoreline contact within 30 days of a spill ranging from Calhoun County, Texas, to Plaquemines Parish, Louisiana (**Table 3**). Counties with a conditional probability for shoreline contact of < 0.5% for 3, 10, and 30 days are not shown in **Table 3**.

Table 3. Conditional probabilities of a spill in the project area contacting shoreline segments based on the 30-day Oil Spill Risk Analysis (OSRA) (From: Ji et al., 2004). Values are conditional probabilities that a hypothetical spill in OSRA Launch Area 45 could contact shoreline segments within 3, 10, or 30 days.

Shoreline Segment	County or Parish and State	Conditional Probability[1] of Contact (%)		
		3 Days	10 Days	30 Days
C07	Calhoun County, Texas	--	--	1
C08	Matagorda County, Texas	--	--	1
C09	Brazoria County, Texas	--	--	1
C10	Galveston County, Texas	--	--	2
C12	Jefferson County, Texas	--	--	1
C13	Cameron Parish, Louisiana	--	--	4
C14	Vermilion Parish, Louisiana	--	--	2
C15	Iberia Parish, Louisiana	--	--	1
C17	Terrebonne Parish, Louisiana	--	--	2
C18	Lafourche Parish, Louisiana	--	--	1
C20	Plaquemines Parish, Louisiana	--	--	2

[1] Conditional probability refers to the probability of contact within the stated time period, assuming that a spill has occurred (-- indicates <0.5%). Values are conditional probabilities that a hypothetical spill in the project area (represented by OSRA Launch Area 45) could contact shoreline segments within 3, 10, or 30 days.

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

BOEM presented additional OSRA modeling to simulate a spill that continues for 90 consecutive days, with each trajectory tracked for 60 days during four seasons. In this updated OSRA model (herein referred to as the 60-day OSRA model), 60 days was chosen as a conservative estimate of the maximum duration that spilled oil would persist on the sea surface following a spill (BOEM, 2017b). The spatial resolution is limited, with five launch points in the entire Western and Central Planning Areas of the Gulf of Mexico. These launch points were deliberately located in areas identified as having a high possibility of containing large oil reserves. The 60-day OSRA model launch point most appropriate for modeling a spill in the project area is Launch Point 3. The 60-day OSRA results for Launch Point 3 are presented in **Table 4**.

Table 4. Shoreline segments with a 1% or greater conditional probability of contact from a spill starting at Launch Point 3 based on the 60-day Oil Spill Risk Analysis (OSRA). Values are conditional probabilities that a hypothetical spill in the project area could contact shoreline segments within 60 days. Modified from: BOEM (2017a).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
County or Parish	Conditional Probability of Contact[1] (%)															
Cameron, Texas	--	--	--	--	--	--	--	2	--	--	--	1	--	--	--	1
Willacy, Texas	--	--	--	--	--	--	--	1	--	--	--	1	--	--	--	2
Kenedy, Texas	--	--	--	--	--	--	1	5	--	--	--	2	--	--	--	3
Kleberg, Texas	--	--	--	--	--	--	1	3	--	--	1	2	--	--	--	2
Nueces, Texas	--	--	--	--	--	--	--	2	--	--	1	2	--	--	--	3
Aransas, Texas	--	--	--	--	--	--	--	2	--	--	1	2	--	--	--	3
Calhoun, Texas	--	--	--	--	--	--	--	3	--	--	1	2	--	--	1	4
Matagorda, Texas	--	--	3	5	--	--	1	4	--	--	2	5	--	--	3	10
Brazoria, Texas	--	--	3	3	--	--	2	5	--	--	1	2	--	--	3	8
Galveston, Texas	--	--	3	5	--	--	2	3	--	--	1	2	--	--	2	5
Jefferson, Texas	--	--	4	5	--	--	1	1	--	--	--	--	--	--	1	2
Cameron, Louisiana	--	--	9	11	--	--	1	3	--	--	--	2	--	--	1	3
Vermilion, Louisiana	--	1	5	6	--	--	1	1	--	--	--	--	--	--	1	2
Iberia, Louisiana	--	1	3	3	--	--	--	--	--	--	--	--	--	--	--	1
St. Mary, Louisiana	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Terrebonne, Louisiana	--	5	12	13	--	--	1	2	--	--	1	1	–	1	2	2
Lafourche, Louisiana	--	2	5	6	--	--	1	2	--	--	--	--	--	--	1	2
Jefferson, Louisiana	--	--	1	1	--	--	--	1	--	--	--	--	--	--	--	--
Plaquemines, Louisiana	--	3	10	10	--	--	2	3	--	--	--	--	--	--	2	2
St. Bernard, Louisiana	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Baldwin, Alabama	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Escambia, Florida	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Okaloosa, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Bay, Florida	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Miami-Dade, Florida	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--

Table 4. (Continued).

Season	Spring				Summer				Fall				Winter			
Day	3	10	30	60	3	10	30	60	3	10	30	60	3	10	30	60
State Coastline	Conditional Probability of Contact[1] (%)															
Texas	--	--	13	19	--	--	7	30	--	--	7	21	--	--	11	44
Louisiana	--	12	46	52	--	2	6	12	--	1	2	4	–	2	8	12
Mississippi	--	--	1	1	--	--	--	1	--	--	--	--	--	--	--	--
Alabama	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Florida	--	--	2	5	--	--	--	2	--	--	--	--	--	--	--	1

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

From Launch Point 3, potential shorelines with a 1% or greater conditional probability of contact within 60 days range from Cameron County, Texas (summer and fall seasons), to Miami-Dade County, Florida (summer season). Based on statewide contact probabilities within 60 days, Louisiana has the highest likelihood of contact during spring (52% conditional probability), while Texas has the highest probability of contact in summer, fall, and winter (ranging from 21% to 44% conditional probability). The model predicts potential contact with Mississippi shorelines in spring and summer with a 1% conditional probability (within 60 days of a spill). Florida shorelines are predicted to be potentially contacted during spring, summer, and winter, with a probability up to 2%. Based on the 60-day trajectories, counties or parishes with 10% or greater contact probability during any season include Matagorda County in Texas and Cameron, Terrebonne, and Plaquemines parishes in Louisiana (**Table 4**).

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

Weathering. The constituents of diesel fuel are light to intermediate in molecular weight and can be readily degraded by aerobic microbial oxidation. NOAA has reported that diesel fuel is readily and completely degraded by naturally occurring microbes (NOAA, 2006).

Weathering decreases the concentration of oil and produces changes in its chemical composition, physical properties, and toxicity. The more toxic, light aromatic and aliphatic hydrocarbons are lost rapidly by evaporation and dissolution from a slick on the water surface. For example, the light, paraffinic crude oil spilled during the *Deepwater Horizon* incident lost approximately 55 weight % to evaporation during the first 3 to 5 days while floating on the sea surface (Daling et al., 2014). Evaporated hydrocarbons are degraded rapidly by sunlight. Biodegradation of oil on the water surface and in the water column by marine bacteria removes first the n-alkanes and then the light aromatics from the oil. Other petroleum components are biodegraded more slowly. Photo-oxidation attacks mainly the medium and high molecular weight PAHs in the oil on the water surface.

Spill Response. See DOCD Section H for a detailed description of Chevron's site-specific response to the WCD for this DOCD. These sections, along with Chevron's OSRP, also include a description of surface and subsea containment capabilities that could be implemented in the event of the WCD for this DOCD.

All the proposed activities in this DOCD will be covered by Chevron's Gulf of Mexico Regional OSRP, filed by Chevron in accordance with 30 CFR Part 254 and approved by BSEE on March 22, 2016. The biennial review and update to the OSRP was submitted to BSEE and deemed in compliance in March 2019. Chevron has certified that it has the capability to respond to the maximum extent practical to a WCD from all Chevron facilities in the Gulf of Mexico.

B. Affected Environment

The project area is approximately 126 mi (203 km) from the nearest shoreline (Plaquemines Parish, Louisiana), 143 mi (230 km) from the onshore support base at Port Fourchon, Louisiana, and 162 mi (261 km) from the helicopter base at Galliano, Louisiana (**Figure 1**). Water depths at the project area is approximately 4,750 ft (1,448 m). The seafloor in the vicinity of the project area is dominated by highly chaotic and faulted sediments above near-surface salt in central and northern portions (Fugro USA Marine, Inc, 2018).

A detailed description of the regional affected environment, including meteorology, oceanography, geology, air and water quality, benthic communities, threatened and endangered species, biologically sensitive resources, archaeological resources, socioeconomic conditions, and other marine uses is provided in recent EISs (BOEM, 2012a, 2013, 2014, 2015, 2016b, 2017a). These regional descriptions remain valid and are incorporated by reference. General background information is presented in the following sections, and brief descriptions of each potentially affected resource, including site-specific and new information if available, are presented in **Section C**.

C. Impact Analysis

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

C.1 Physical/Chemical Environment

C.1.1 Air Quality

There are no site-specific air quality data for the project area due to the distance from shore. Because of the distance from shore-based pollution sources and the lack of sources offshore, air quality at the project area is expected to be good. The attainment status of federal OCS waters is unclassified because there is no provision in the Clean Air Act for classification of areas outside state waters (BOEM, 2012a).

In general, ambient air quality of coastal counties along the Gulf of Mexico is relatively good (BOEM, 2012a). As of August 2020, Mississippi, Alabama, and Florida Panhandle coastal counties are in attainment of the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants (USEPA, 2020). St. Bernard Parish in Louisiana is a nonattainment area for sulfur dioxide based on the 2010 standard. One coastal metropolitan area in Texas (Houston-Galveston-Brazoria) is a nonattainment area for 8-hour ozone (2015 Standard). One coastal metropolitan area in Florida (Tampa) was reclassified in October 2018 from a nonattainment area to maintenance status for lead based on the 2008 Standard (USEPA, 2020).

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

Impacts of Air Pollutant Emissions

Air pollutant emissions are the only routine IPF likely to affect air quality. Offshore air pollutant emissions result primarily from the FPU operations and subsea installation and service vessels. These emissions occur mainly from combustion or burning of diesel and Jet-A aircraft fuel. The combustion of fuels occurs primarily in generators, pumps, or motors and from lighter fuel motors. Primary air pollutants typically associated with OCS activities are suspended PM, SO_x, NO_x, VOCs, and CO. As demonstrated in the Air Quality Report (see DOCD Section G), emissions from routine activities are projected to have minimal impacts to onshore air quality because of the prevailing atmospheric conditions, anticipated emission rates, anticipated heights of emission sources, and the distance to shore of the proposed activities. The incremental contribution to cumulative impacts from activities similar to Chevron's proposed activities is not significant and is not expected to cause or contribute to a violation of NAAQS. Given the levels of expected emissions and the distance of the project from shore, emissions from the activities described in Chevron's proposed DOCD are not likely to contribute to violations of any NAAQS onshore.

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

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

The Breton Wilderness Area, which is part of the Breton National Wildlife Refuge (NWR), is designated under the Clean Air Act as a Prevention of Significant Deterioration Class I air quality area. BOEM is required to notify the National Park Service and U.S. Fish and Wildlife Service (USFWS) if emissions from proposed projects may affect the Breton Class I area. Additional review and mitigation measures may be required for sources within 186 mi (300 km) of the Breton Class I area that exceed emission limits agreed upon by the administering agencies (National Park Service, 2010). The project area is approximately 195 mi (314 km) from the Breton Wilderness Area. Chevron intends to comply with all BOEM requirements regarding air emissions. No further analysis or control measures are required.

There are three Class I air quality areas on the west coast of Florida: St Mark's Wildlife Refuge in Wakulla County, Florida, Chassahowitzka Wilderness Area in Hernando County, Florida, and Everglades National Park in Monroe, Miami-Dade, and Collier counties, Florida. The project area is approximately 513 mi (826 km) from the closest Florida Class I air quality area (Saint Mark's Wildlife Refuge Class I Air Quality Area). Chevron will comply with emissions requirements as directed by BOEM. No further analysis or control measures are required.

Impacts of a Small Fuel Spill

Potential impacts of a small spill on air quality are expected to be consistent with those analyzed and discussed by (BOEM, 2012a, 2015, 2016b, 2017a). The probability of a small spill would be minimized by Chevron's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to reduce the potential impacts. DOCD Section H includes a detailed discussion of the spill response measures that would be employed. Given the open ocean location of the project area, the extent and duration of air quality impacts from a small spill would not be significant.

A small fuel spill would affect air quality near the spill site by introducing VOCs into the atmosphere through evaporation. The ADIOS2 model (see **Section A.9.1**) indicates that over 90% of a small diesel spill would be evaporated or dispersed within 24 hours (NOAA, 2016a). The area of the sea surface with diesel fuel on it would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions.

A small fuel spill should not affect coastal air quality because the spill would not be expected to make landfall or reach coastal waters prior to dissipating (see **Section A.9.1**).

Impacts of a Large Oil Spill

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

A large oil spill could potentially affect air quality by introducing VOCs into the atmosphere through evaporation from the slick. The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Additional air quality impacts could occur if response measures included *in situ* burning of floating oil. Burning would generate a plume of black smoke and result in emissions of NO_x, SO_x, CO, and PM as well as greenhouse gases. However, *in situ* burning would occur only after authorization from the USCG Federal On-Scene Coordinator. This approval would also be based upon consultation with the regional response team, including USEPA.

Because of the project area's location 126 mi (203 km) from the nearest shoreline, most air quality impacts would occur offshore with minimal chance to affect onshore air quality.

C.1.2 Water Quality

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

A proposed gas export riser and umbilical are located within 250 ft (76 m) of a small concentration of pockmarks and hardgrounds that may support high-density deepwater benthic communities (Fugro USA Marine, Inc., 2018). Chevron will either move these subsea installations to be outside of the 250 ft (76 m) radius or use a remotely operated vehicle to inspect the area.

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

Impacts of Effluent Discharges

Treated sanitary and domestic wastes, including those from support vessels, may have a transient effect on water quality in the immediate vicinity of the discharge. Treated sanitary and domestic wastes may have elevated levels of nutrients, organic matter, and chlorine but should dilute rapidly to undetectable levels within tens to hundreds of meters from the source. All NPDES permit limitations and requirements as well as USCG regulations (as applicable) are expected to be met during proposed activities; therefore, little or no impact on water quality from the overboard releases of treated sanitary and domestic wastes is anticipated.

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

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

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

Impacts of a Small Fuel Spill

Potential impacts of a small spill on water quality are expected to be consistent with those analyzed and discussed by BOEM (2012a, 2015, 2016b, 2017a). The probability of a small spill would be minimized by Chevron's preventative measures during routine operations, including fuel transfer. In the unlikely event of a spill, implementation of Chevron's OSRP is expected to potentially help mitigate and reduce the impacts. DOCD Section H provides details on spill response measures in addition to the summary information provided in the EIA.

The water-soluble fractions of diesel are dominated by two- and three-ringed PAHs, which are moderately volatile (National Research Council, 2003a). The molecular weight of diesel oil constituents is light to intermediate and can be readily degraded by aerobic microbial oxidation. Diesel oil is much lighter than water (specific gravity is between 0.83 and 0.88, compared to 1.03 for seawater). When spilled on water, diesel oil spreads very quickly to a thin film of rainbow and silver sheens, except for marine diesel, which may form a thicker film of dull or dark colors. However, because diesel oil has a very low viscosity, it is readily dispersed into the water column when winds reach 5 to 7 knots or with breaking waves (NOAA, 2017a). It is possible for the diesel oil that is dispersed by wave action to form droplets that are small enough be kept in suspension and moved by the currents.

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

The extent and persistence of water quality impacts from a small diesel fuel spill would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. It is estimated that more than 90% of a small diesel spill would evaporate or disperse within 24 hours (NOAA, 2016a) (see **Section A.9.1**). The sea surface area covered with a very thin layer of diesel fuel would range from 0.5 to 5 ha (1.2 to 12 ac), depending on sea state and weather conditions. In addition to removal by evaporation, constituents of diesel oil are readily and completely degraded by naturally occurring microbes (NOAA, 2006, 2017a). Given the open ocean location of the project area, the extent and duration of water quality impacts from a small spill would not be significant.

Impacts of a Large Oil Spill

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

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

The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time of the release and the effectiveness of spill response measures. Real-time wind and current data from the project area would be available at the time of a spill and would be used to assess the fate and effects of VOCs released. Weathering processes that affect spilled oil on the sea include adsorption (sedimentation), biodegradation, dispersion, dissolution, emulsification, evaporation, and photo oxidation. Most crude oil blends will emulsify quickly when spilled, creating a stable mousse that presents a more persistent cleanup and removal challenge (NOAA, 2017b).

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

Due to the project area being located approximately 126 mi (203 km) from the nearest shoreline (Plaquemines Parish, Louisiana), it is expected that most water quality impacts would occur in offshore waters before low molecular weight alkanes and volatiles are weathered (Operational Science Advisory Team, 2011), especially in the event of a spill lasting less than 30 days. The 30-day OSRA modeling (**Table 3**) indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days ranging from 1% to 4% probability contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential shoreline contacts range from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days).

C.2 Seafloor Habitats and Biota

Water depths at the locations of the project area is approximately 4,750 ft (1,448 m). According to BOEM (2016a), existing information for the deepwater Gulf of Mexico indicates that the seafloor is composed primarily of soft sediments; exposed hard substrate habitats and associated biological communities are rare. The shallow hazards report noted the potential presence of deepwater benthic communities within 250 ft (76 m) of a proposed gas export riser and umbilical (Fugro USA Marine, Inc., 2018). Chevron will either move these subsea installations to be outside of the 250 ft radius or use a remotely operated vehicle to inspect the area.

C.2.1 Soft Bottom Benthic Communities

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

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

Station	Water Depth	Abundance		
		Meiofauna (individuals m^{-2})	Macroinfauna (individuals m^{-2})	Megafauna (individuals ha^{-1})
B1	7,402 ft (2,256 m)	157,417	1,446	252
WC12	4,265 ft (1,300 m)	--	1,787	2,941

Meiofaunal and megafaunal abundances from Rowe and Kennicutt (2009); macroinfaunal abundance from Wei (2006). m = meters; ha = hectares. -- = no data available.

Densities of meiofauna (animals passing through a 0.5-mm sieve but retained on a 0.062-mm sieve) at stations in the vicinity of the project area was approximately 157,000 individuals m^{-2} (**Table 5**) (Rowe and Kennicutt, 2009). Nematodes, nauplii, and harpacticoid copepods were the three dominant meiofaunal groups, accounting for about 90% of total abundance.

The benthic macroinfauna is characterized by small mean individual sizes and low densities, both of which reflect the meager primary production in surface waters of the Gulf of Mexico continental slope (Wei, 2006). Densities decrease exponentially with water depth. Based on an equation presented by Wei (2006), macroinfaunal densities in the water depths of the project area are expected to be approximately 2,325 individuals m^{-2}.

Polychaetes are typically the most abundant macroinfaunal group on the northern Gulf of Mexico continental slope, followed by amphipods, tanaids, bivalves, and isopods. Carvalho et al. (2013) found polychaete abundance to be higher in the central region of the northern Gulf of Mexico when compared to the eastern and western regions. Wei (2006) recognized four depth-dependent faunal zones (1 through 4), two of which are divided horizontally. The project area is in Zone 3W, which ranges in depth from 6,152 to 9,869 ft (1,875 to 3,008 m) including stations on the mid Texas-Louisiana Slope. The most abundant species in this zone were the polychaetes *Levinsenia uncinata*, *Paraonella monilaris*, and *Tachytrypane* spp.; the bivalve *Heterodonta* spp.; and the isopod *Macrostylis* sp. (Wei, 2006).

The megafaunal density at nearby stations in the vicinity of the project area ranged from 252 to 2,941 individuals ha^{-1}. Common megafauna included motile groups such as decapods, ophiuroids, holothurians, and demersal fishes as well as sessile groups such as sponges and anemones (Rowe and Kennicutt, 2009).

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

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

Impacts of Physical Disturbance to the Seafloor

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

There will be impacts from the presence of the FPU mooring anchors, lines, and chains on the seafloor. When the anchors are initially deployed the attached lines and chains will be laid on the seafloor. When the FPU is installed, they will be tensioned, and a small portion of the anchor chain is expected to remain in contact with the seafloor. The total area disturbed by anchors, mooring lines, and chains will depend on the mooring pattern needed to secure the FPU but will affect only a portion of the anchoring radii, even when laid on the seafloor. To avoid any potential impacts, Chevron will lay the anchors for the FPU to ensure that they will be at least 100 ft (30 m) from all sonar targets and 250 ft (76 m) areas of potential chemosynthetic activity.

Anchor or cable scars created during the proposed activities will likely remain on the seafloor for months to years (Shinn et al., 1993). In a study of wellsites on the U.S. Gulf of Mexico continental slope, anchor scars were detected up to 14 years after drilling was completed (Continental Shelf Associates, 2006). However, these features will eventually disappear as sediments are redistributed by currents and reworked by benthic organisms.

The areal extent of these impacts is relatively small compared to the project area itself. Soft bottom communities are ubiquitous along the northern Gulf of Mexico continental slope (Gallaway et al., 2003, Rowe and Kennicutt, 2009). Physical disturbance to the seafloor during this project will have no significant impact on soft bottom benthic communities on a regional basis.

Impacts of a Large Oil Spill

The most likely effects of a subsea blowout on benthic communities would be within a few hundred meters of the wellsite. BOEM (2012a) estimated that a severe subsurface blowout could resuspend and disperse sediments within a 984 ft (300 m) radius. While coarse sediments (sands) would probably settle at a rapid rate within 1,312 ft (400 m) from the blowout site, fine sediments (silts and clays) could be resuspended for more than 30 days and dispersed over a wider area. Based on previous studies, surface sediments at the project area are assumed to largely be silt and clay (Rowe and Kennicutt, 2009).

While impacts from a large oil spill are anticipated to be confined to the immediate vicinity of the wellhead, depending on the specific circumstances of the incident, additional benthic community impacts could extend beyond the immediate vicinity of the wellhead (BOEM, 2017a). During the *Deepwater Horizon* incident, subsurface oil plumes were reported in water depths of approximately 3,600 ft (1,100 m), extending at least 22 mi (35 km) from the wellsite and persisting for more than a month (Camilli et al., 2010). Baguley et al. (2015) noted that while nematode abundance increased with proximity to the Macondo wellhead, copepod abundance, relative species abundance, and diversity decreased in response to the *Deepwater Horizon* incident. Washburn et al. (2017) noted that richness, diversity, and evenness were affected within a radius of 0.62 miles (1 km) of the wellhead. Reuscher et al. (2017) found that meiofauna and macrofauna community diversity was significantly lower in areas that were impacted by Macondo oil. Demopoulos et al. (2016) reported abnormally high variability in meiofaunal and macrofaunal density in areas near the Macondo wellhead, which supports the Valentine et al. (2014) supposition that hydrocarbon deposition and impacts in the vicinity of the Macondo wellhead were patchy. Noirungsee et al. (2020) observed that pressure has a significant influence on deep-sea sediment microbial communities with the addition of dispersant and oil with dispersants being shown to have an inhibitory effect on hydrocarbon degraders. Thus, the dispersant persistence due to hydrostatic pressure could further limit microbial oil biodegradation (Noirungsee et al., 2020). While there are some indications of partial recovery of benthic fauna, as of 2015, full recovery has not occurred (Montagna et al., 2016, Reuscher et al., 2017, Washburn et al., 2017).

C.2.2 High-Density Deepwater Benthic Communities

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

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

The shallow hazards report noted the proposed gas export riser and umbilical are within 250 ft (76 m) of a small concentration of pockmarks and hardgrounds that may support high-density deepwater benthic communities (Fugro USA Marine, Inc., 2018). Chevron will either move these subsea installations to be outside of the 250 ft radius or use a remotely operated vehicle to inspect the area. The nearest known high-density deepwater benthic community is located in GC 233, approximately 34 mi (55 km) from the project area.

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

Impacts of a Large Oil Spill

A large oil spill caused by a seafloor blowout could cause direct impacts (i.e., caused by the physical impacts of a blowout) on benthic communities within approximately 984 ft (300 m) of the wellhead (BOEM, 2012a, 2013).

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

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

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

C.2.3 Designated Topographic Features

The lease block is not within or near a designated topographic feature or a no-activity zone as identified in NTL 2009-G39. The nearest designated Topographic Feature Stipulation Block is located approximately 52 mi (84 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to designated topographic features.

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

C.2.4 Pinnacle Trend Area Live Bottoms

The project area is not covered by the Live Bottom (Pinnacle Trend) Stipulation. As defined by NTL 2009-G39, the nearest Pinnacle Stipulation Block is located approximately 214 mi (344 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to pinnacle trend area live bottoms due to the distance from the project area.

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

C.2.5 Eastern Gulf Live Bottoms

The project area is not covered by the Live Bottom (Low-Relief) Stipulation, which applies to seagrass communities and low-relief hard bottom reef within the Eastern Gulf of Mexico Planning Area leases in water depths of 328 ft (100 m) or less and portions of Pensacola and Destin Dome Area blocks in the Central Gulf of Mexico Planning Area. The nearest block covered by the Live Bottom Stipulation, as defined by NTL 2009-G39, is located approximately 254 mi (409 km) from the project area. There are no IPFs associated with routine operations that could cause impacts to eastern Gulf live bottom areas due to the distance from the project area.

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

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

This section discusses species listed as endangered or threatened under the ESA. In addition, it includes all marine mammal species in the region, which are protected under the Marine Mammal Protection Act (MMPA).

Endangered or Threatened species that may occur in the project area and/or along the northern Gulf Coast are listed in **Table 6**. The table also indicates the location of critical habitat (if designated in the Gulf of Mexico). Critical habitat is defined as (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. The National Marine Fisheries Service (NMFS) has jurisdiction for ESA-listed marine mammals (cetaceans), sea turtles, and fishes in the Gulf of Mexico. The USFWS has jurisdiction for ESA-listed birds, the West Indian manatee (*Trichechus manatus*), and sea turtles while on their nesting beaches.

Table 6. Federally listed Endangered and Threatened species potentially occurring in the project area and along the northern Gulf Coast.

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

E = endangered; T = threatened; X = potentially present; -- = not present.

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

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

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

The sperm whale (*Physeter macrocephalus*), five species of sea turtles, and the oceanic whitetip shark (*Carcharhinus longimanus*) are the only Endangered or Threatened species likely to occur in or near the project area. The listed sea turtles include the leatherback turtle (*Dermochelys coriacea*), Kemp's ridley turtle (*Lepidochelys kempii*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), and green turtle (*Chelonia mydas*) (Pritchard, 1997). Effective August 11, 2014, NMFS has designated certain marine areas as critical habitat for the Northwest Atlantic Distinct Population Segment (DPS) of the loggerhead sea turtle (see **Section C.3.5**). No critical habitat has been designated in the Gulf of Mexico for the leatherback turtle, Kemp's ridley turtle, hawksbill turtle, green turtle, or the sperm whale. Five endangered mysticetes (blue whale [*Balaenoptera musculus*], fin whale [*B. physalus*], humpback whale [*Megaptera novaeangliae*], North Atlantic right whale [*Eubalaena glacialis*], and sei whale [*B. borealis]*) have been reported in the Gulf of Mexico, but are considered rare or extralimital (Würsig et al., 2000). These species are not included in the most recent NMFS stock assessment report (Hayes et al., 2020) nor in the most recent BOEM multisale EIS (BOEM, 2017a); therefore, they are not considered further in the EIA.

The Bryde's whale (*B. edeni*) exists in the Gulf of Mexico as a small, resident population. It is the only baleen whale known to be resident to the Gulf and is federally listed as Endangered. The genetically distinct Northern Gulf of Mexico stock is severely restricted in range, being found only in the northeastern Gulf in the waters of the DeSoto Canyon (Waring et al., 2016) and are therefore not likely to occur within the project area. The Threatened giant manta ray (*Mobula birostris*) is known from the Gulf of Mexico and could occur in the project area but is most commonly observed in the Gulf of Mexico at the Flower Garden Banks. The Nassau grouper (*Epinephelus striatus*) has been observed in the Gulf of Mexico at the Flower Garden Banks but is most commonly observed in shallow tropical reefs of the Caribbean and is not expected to occur in the project area.

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

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

C.3.1 Sperm Whale (Endangered)

The only Endangered marine mammal likely to be present at or near the project area is the sperm whale. Resident populations of sperm whales occur within the Gulf of Mexico; a species description is presented in the recovery plan for this species (NMFS, 2010b). Gulf of Mexico sperm whales are classified as an endangered species and a "strategic stock" (defined as a stock that may have unsustainable human-caused impacts) by NOAA Fisheries (Waring et al., 2016). A "strategic stock" is defined by the MMPA as a marine mammal stock that meets the following criteria:

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

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

In 2013, NMFS conducted a status review to consider designating the Gulf of Mexico population of the sperm whale as a DPS under the ESA but concluded that the designation of a Gulf of Mexico DPS for sperm whales was not warranted (78*FR* 68032).

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

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

IPFs that may potentially affect sperm whales include FPU and vessel presence, marine sound, and lights; support vessel and helicopter traffic; and two types of accidents (a small fuel spill and a large oil spill). Effluent discharges are likely to have negligible impacts on sperm whales due to rapid dilution, the small area of ocean affected, the intermittent nature of the discharges, and the mobility of these marine mammals.

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

NMFS (2016) lists sperm whales in the same functional hearing group (i.e., mid-frequency cetaceans) as most dolphins and other toothed whales, with an estimated hearing sensitivity from 150 Hz to 160 kHz. Therefore, vessel related noise is likely to be heard by sperm whales. Frequencies <150 Hz produced by the drilling operations are not likely to be perceived with any significance by mid-frequency cetaceans. The sperm whale may possess better hearing at lower frequencies than some of the other odontocetes, although not as low as many baleen whale species that primarily produce sounds between 30 Hz and 5 kHz (Wartzok and Ketten, 1999). Generally, most of the acoustic energy produced by sperm whales is present at frequencies below 10 kHz, although diffuse energy up to and past 20 kHz is common, with SLs up to 236 dB re1 µPa m (Møhl et al., 2003).

It is expected that, due to the relatively stationary nature of the proposed drilling operations, sperm whales would avoid the proposed operations area, and noise levels that could cause auditory injury would not be encountered. Noise associated with proposed vessel operations may cause behavioral (disturbance) effects to sperm whales. Observations of behavioral responses of marine mammals to anthropogenic sounds, in general, have been limited to short term behavioral responses, which included the cessation of feeding, resting, or social interactions (NMFS, 2009a). Animals can determine the direction from which a sound arrives based on cues, such as differences in arrival times, sound levels, and phases at the two ears. Thus, an animal's directional hearing capabilities have a bearing on its ability to avoid noise sources (National Research Council, 2003b).

The acoustic criteria (NMFS, 2018a) are based on received sound level accumulations that equate to the onset of marine mammal auditory threshold shifts. For mid-frequency cetaceans exposed to a non-impulsive sources, permanent threshold shifts (PTS) are estimated to occur when the mammal has received a cumulative sound exposure level (SEL_{cum}) of 198 dB re 1 μPa^2 s over a 24-hour period. Similarly, temporary threshold shifts (TTS) are estimated to occur when the mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. Due to the transient nature of sperm whales and the stationary nature of installation activities, it is not expected that any sperm whales will remain within the ensonified area for a full 24-hour period to receive a SEL_{cum} necessary for the onset of PTS or TTS.

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

Though the mooring lines have the potential for entanglement, the lines are anticipated to be rigid; thus, not allowing the lines to encircle/wrap around a sperm whale. As stated previously, it is anticipated that sperm whales will avoid the immediate project area due to the noise associated with project activities. For this reason, NMFS (2020) found the risk of entanglement in oil and gas program equipment so low as to be discountable.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sperm whales, and there is also a risk of vessel strikes, which are identified as a threat in the recovery plan for this species (NMFS, 2010b). To reduce the potential for vessel strikes, BOEM issued BOEM-2016-G01. This NTL was reissued in June 2020 to address instances where guidance in the 2020 NMFS Biological Opinion (NMFS, 2020) replaces compliance with the NTL. This recommends the use of a species guide to identify protected species. Appendix C of NMFS (2020) directs that third-party observers or crew are required to have completed a protected species observer program. Vessel operators are required to maintain a vigilant watch for and report sightings of any injured or dead protected species. When whales are sighted, vessel operators and crews are required to maintain a distance of 328 ft (100 m) or greater from the sighted animal whenever possible (NMFS, 2020). Vessel operators are required to reduce vessel speed to 10 knots or less, if safety permits, when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel. When sperm whales are sighted while a vessel is underway, the vessel should take action (e.g., attempt to remain parallel to the whale’s course, avoid excessive speed or abrupt changes in direction until the whale has left the area) as necessary to avoid violating the relevant separation distance. However, if the sperm whale is sighted within this distance, the vessel should reduce speed and shift the engine to neutral and not re-engage until the whale is outside of the separation area. This does not apply to any vessel towing gear (NMFS [2020] Appendix C). Compliance with these mitigation measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing sperm whales.

NMFS (2020) analyzed the potential for vessel strikes and harassment of sperm whales. With implementation of the mitigation measures in NTL BOEM-2016-G01, NMFS concluded that the observed avoidance of passing vessels by sperm whales is an advantageous response to avoid a potential threat and is not expected to result in any significant effect on migration, breathing, nursing, breeding, feeding, or sheltering to individuals, or have any consequences at the population level. With implementation of the vessel strike avoidance measures requirement to maintain a distance of 328 ft (100 m) from sperm whales, the NMFS (2020) concluded that the potential for harassment of sperm whales would be reduced to insignificant levels.

Helicopter traffic also has the potential to disturb sperm whales. Smultea et al. (2008) documented responses of sperm whales offshore Hawaii to fixed wing aircraft flying at an altitude of 800 ft (245 m). A reaction to the initial pass of the aircraft was observed during

3 (12%) of 24 sightings. All three responses consisted of a hasty dive and occurred at less than 1,180 ft (360 m) lateral distance from the aircraft. Additional reactions were seen when aircraft circled certain whales to make further observations. Based on other studies of cetacean responses to sound, the authors concluded that the observed reactions to brief overflights by the aircraft were short-term and limited to behavioral disturbances.

While flying offshore in the Gulf of Mexico, support helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. In the event that a whale is observed during transit, the helicopter will not approach or circle the animals. In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2016a, 2017a; NMFS, 2020). Although whales may respond to helicopters (Smultea et al., 2008), NMFS (2020) concluded that this altitude would minimize the potential for disturbing sperm whales. Therefore, no significant impacts are expected.

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals, including sperm whales, are discussed by NMFS (2020) and BOEM (2017a). Oil impacts on marine mammals are discussed by Geraci and St. Aubin (1990) and by the Marine Mammal Commission (MMC) (2011) with discussions germane to the Gulf of Mexico populations concerning composition and fate of petroleum and spill-treating agents in the marine environment, aspects of cetacean ecology, and physiological and toxic effects of oil on cetaceans. For this DOCD, there are no unique site-specific issues with respect to spill impacts on these animals that were not analyzed in the previous documents.

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

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

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

Impacts of a Large Oil Spill

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

Impacts of oil spills on sperm whales can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and marine sound of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Waring et al., 2016). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals, including displacement from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sperm whales and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1)** to reduce the potential for striking or disturbing these animals.

C.3.2 Bryde's Whale (Endangered)

The Bryde's whale is the only year-round resident baleen whale in the northern Gulf of Mexico. The Bryde's whale is most frequently sighted in the waters over the DeSoto Canyon between the 328 ft (100 m) and 3,280 ft (400 m) isobaths (Rosel et al., 2016; Hayes et al., 2019). Based on the available data, it is possible that Bryde's whales could occur in the project area.

In 2014, a petition was submitted to designate the northern Gulf of Mexico population as a DPS and list it as Endangered under the ESA (Natural Resources Defense Council, 2014). This petition received a 90-day positive finding by NMFS in 2015 and a proposed rule to list was published in 2016 (Hayes et al., 2019). On April 15, 2019, NMFS issued a final rule to list the Gulf of Mexico DPS of Bryde's whale as Endangered under the ESA. The listing was effective on May 15, 2019.

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

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

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

It is expected that, due to the relatively stationary nature of the drilling operations, Bryde's whales would move away from the proposed operations area, and noise levels that could cause auditory injury would be avoided. Noise associated with proposed vessel operations may cause behavioral (disturbance) effects to individual Bryde's whales. NMFS (2018b) presents criteria that are used in the interim to determine behavioral disturbance thresholds for marine mammals and are applied equally across all hearing groups. Received root-mean-square sound pressure levels (SPL_{rms}) of 120 dB re 1 μPa from non-impulsive sources are considered high enough to elicit a behavioral reaction in some marine mammal species. The 120-dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. However, exposure to a SPL_{rms} of 120 dB re 1 μPa alone does not equate to a behavioral response or a biological consequence; rather it represents the level at which onset of a behavioral response may occur.

For low-frequency cetaceans, specifically the Bryde's whale, PTS and TTS onset from non-impulsive sources is estimated to occur at SEL_{cum} of 199 dB re 1 μPa^2 s and 179 re 1 μPa^2 s, repectively. Due to transient nature of Bryde's whales and the stationary nature of the proposed activities, it is not expected that any sperm whales will remain within the ensonified area for a full 24-hour period to receive a SEL_{cum} necessary for the onset of auditory threshold shifts.

The FPU will be located within a deepwater, open ocean environment. Sounds generated by drilling operations will be generally non-impulsive, with some variability in sound level and frequency, and are not expected to reach TTS or PTS values. This analysis assumes that the continuous nature of sounds produced by the FPU will provide individual whales with cues relative to the direction and relative distance (sound intensity) of the sound source, and the fixed position of the FPU will allow for active avoidance of potential physical impacts. Drilling-related noise associated with this project may contribute to increases in the ambient noise environment of the Gulf of Mexico, but it is not expected to be in amplitudes sufficient enough to cause hearing effects to Bryde's whales and due to the low density of Bryde's whales in the Gulf of Mexico, no significant impacts are expected.

The mooring lines have the potential for entanglement. The mooring lines are anticipated to be rigid; thus, not allowing the lines to encircle/wrap around a Bryde's whale. As stated previously, it is anticipated that the Bryde's whale will avoid the immediate project area due to the noise associated with project activities. For this reason, NMFS (2020) found the risk of entanglement in oil and gas program equipment to be extremely low and the Bryde's whale likely to not be adversely affected.

Impacts of Support Vessel and Helicopter Traffic

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

Helicopter traffic also has the potential to disturb Bryde's whales. Based on studies of cetacean responses to sound, the observed responses to brief overflights by aircraft were short-term and limited to behavioral disturbances (Smultea et al., 2008). Helicopters maintain altitudes above 700 ft (213 m) during transit to and from the offshore working area. In the event that a whale is observed during transit, the helicopter will not approach or circle the animal(s). In addition, guidelines and regulations issued by NMFS under the authority of the MMPA specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (NMFS, 2020).

The current PBR level for the Gulf of Mexico stock of Bryde's whale is 0.03 (Hayes et al., 2019). Mortality of a single Bryde's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Bryde's whales. However, it is very unlikely that Bryde's whale occur within the project area, including the transit corridor for support vessels; consequently, the probability of a vessel collision with this species is extremely low. Compliance with these mitigation measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing Bryde's whales. Due to the brief potential for disturbance the low density of Bryde's whales thought to reside in the Gulf of Mexico, no significant impacts are expected.

Impacts of a Small Fuel Spill

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

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

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

Impacts of a Large Oil Spill

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

Potential impacts of a large oil spill on Bryde's whales could include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, noise, and dispersants) (MMC, 2011). Direct physical and physiological effects could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft. The level of impact of oil exposure depends on the amount, frequency, and duration of exposure; route of exposure; and type or condition of petroleum compounds or chemical dispersants (Waring et al., 2016). Complications of the above may lead to dysfunction of immune and reproductive systems, physiological stress, declining physical condition, and death. Behavioral responses can include displacement of animals from prime habitat, disruption of social structure, changing prey availability and foraging distribution and/or patterns, changing reproductive behavior/productivity, and changing movement patterns or migration (MMC, 2011).

In the event of oil from a large spill contacting Bryde's whales, it is expected that impacts resulting in the injury or death of individual Bryde's whales would be significant based on the current PBR level for the Gulf of Mexico subspecies and stock (0.03). Mortality of a single Bryde's whale would constitute a significant impact to the local (Gulf of Mexico) stock of Bryde's whales. The core distribution area for Bryde's whales is within the eastern Gulf of Mexico OCS Planning Area; therefore, it is very unlikely that Bryde's whale occur within the project area and surrounding waters. Consequently, the probability of spilled oil from a project-related well blowout reaching Bryde's whales is extremely low.

C.3.3 West Indian Manatee (Threatened)

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

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

IPFs that potentially may affect manatees include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect manatees, as the project area is approximately 126 mi (203 km) from the nearest shoreline (Plaquemines Parish, Louisiana). As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with BSEE-NTL 2015-G03 is intended to minimize the potential for marine debris-related impacts on manatees. In certain cases, guidance in Appendix A of NMFS (2020) replaces guidance in the NTL per the June 2020 reissued BSEE-NTL-2015-G03.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb manatees, and there is also a risk of vessel strikes, which are identified as a threat in the recovery plan for this species (USFWS, 2001a). Manatees are expected to be limited to shelf and coastal waters, and impacts are expected to be limited to transits of these vessels and helicopters through these waters. To reduce the potential for vessel strikes, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessel operators and that vessels slow down or stop their vessel to avoid striking protected species. Vessel strike avoidance measures described in NMFS (2020) for the marine mammal species managed by that agency may also provide some additional indirect protections to manatees. The current PBR level for the Florida subspecies of manatee is 14 (USFWS, 2014). In the event of a vessel strike during support vessel transits, the mortality of a single manatee would constitute an adverse but insignificant impact to the subspecies.

Helicopter traffic also has the potential to disturb manatees. Rathbun (1988) reported that manatees were disturbed more by helicopters than by fixed-wing aircraft; however, the helicopter was flown at relatively low altitudes of 66 to 525 ft (20 to 160 m). Helicopters used in support operations maintain a minimum altitude of 700 ft (213 m) while in transit offshore, 1,000 ft (305 m) over unpopulated areas or across coastlines, and 2,000 ft (610 m) over populated areas and sensitive habitats such as wildlife refuges and park properties. In addition, guidelines and regulations specify that helicopters maintain an altitude of 1,000 ft (305 m) within 328 ft (100 m) of marine mammals (BOEM, 2017a; NMFS, 2020). This mitigation measure will minimize the potential for disturbing manatees. No significant impacts are expected.

Impacts of a Large Oil Spill

The potential for significant impacts to manatees from a large oil spill would be most likely associated with coastal oiling in areas of manatee habitats. Based on the 30-day OSRA modeling (**Table 3**), nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun

County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days ranging from 1% to 4% probability contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential shoreline contacts range from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days). This range does not include any areas of manatee critical habitat.

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

In the event that a large spill reached coastal waters where manatees were present, the level of vessel and aircraft activity associated with spill response could disturb manatees and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels would be expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1**) to reduce the potential for striking or disturbing these animals, and therefore no significant impacts are expected.

In the event of oil from a large spill enters areas inhabited by manatees, it is expected that impacts resulting in the injury or death of individual manatees could be significant at the population level. The current PBR level for the Florida subspecies of Antillean manatee is 14 (USFWS, 2014). It is not anticipated that groups of manatees would occur in coastal waters of the north central GOM and therefore large groups are unlikely to be affected by a large spill. Mortality of individual manatees from a large oil spill would constitute an adverse but insignificant impact to the subspecies.

C.3.4 Non-Endangered Marine Mammals (Protected)

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

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

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

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

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

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

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

Noise from routine drilling and well completion operations has the potential to disturb marine mammals. As discussed in **Section A.1,** noise impacts would be expected at greater distances when DP thrusters are in use than with vessel and drilling noise alone and are dependent on variables relating to sea state conditions, thruster type and usage. Three functional hearing groups are represented in the 20 non-endangered cetaceans found in the Gulf of Mexico. Eighteen of the 20 odontocete species are considered to be in the mid-frequency functional hearing group and two species (*Kogia* spp.) are in the high-frequency functional hearing group, (NMFS, 2018a). Thruster and drilling noise will affect each group differently depending on the frequency bandwidths produced by operations. Generally, noise produced by FPUs on DP is dominated by frequencies below 10 kHz. Thus, FPU DP sound sources are out of range for the high-frequency group.

For mid-frequency cetaceans exposed to a non-impulsive source (like installation operations), PTS is estimated to occur when a marine mammal has received a SEL_{cum} of 198 dB re 1 μPa^2 s over a 24-hour period (NMFS, 2018a). Similarly, TTS is estimated to occur when a marine mammal has received a SEL_{cum} of 178 dB re 1 μPa^2 s over a 24-hour period. Due to the transient nature of marine mammals and the stationary nature of drilling activities, it is not expected that any marine mammals will remain within the ensonified area for a full 24-hour period to receive SEL_{cum} necessary for the onset of auditory threshold shifts.

NMFS (2018b) presents criteria that are used in the interim to determine behavioral disturbance thresholds for marine mammals and are applied equally across all functional hearing groups. Received SPL_{rms} of 120 dB re 1 µPa from non-impulsive sources are considered high enough to elicit a behavioral reaction in some marine mammal species. The SPL_{rms} 120 dB isopleth may extend tens to hundreds of kilometers from the source depending on the propagation environment. There are other OCS facilities and activities near the project area, and the region as a whole has a large number of similar sources. Marine mammal species in the northern Gulf of Mexico have been exposed to noise from anthropogenic sources for a long period of time and over large geographic areas and likely do not represent a naïve population with regard to sound (National Research Council, 2003b). Due to the limited scope, timing, and geographic extent of installation activities, this project would represent a small, temporary contribution to the overall noise regime, and any short-term behavioral impacts are not expected to be biologically significant to marine mammal populations. Support vessel lighting and presence are not identified as IPFs for marine mammals by BOEM (2017a). FPU lighting and rig presence are not identified as IPFs for marine mammals by BOEM (2017a).

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb marine mammals, and there is also a risk of vessel strikes. Data concerning the frequency of vessel strikes are presented by BOEM (2012a). To reduce the potential for vessel strikes, BOEM issued NTL 2016-G01, which recommends protected species identification training for vessels operators and that vessels slow down or stop to avoid striking protected species. The NTL also requires that operators and crews maintain a vigilant watch for marine mammals and report sightings of any injured or dead protected species. Vessel operators and crews are required to attempt to maintain a distance of 328 ft (100 m) for toothed whales and 1,640 ft (500 m) for baleen whales or greater when sighted and 164 ft (50 m) when small cetaceans are sighted (NMFS, 2020). When cetaceans are sighted while a vessel is underway, vessels must attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction until the cetacean has left the area. Vessel operators are required to reduce vessel speed to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. Although vessel strike avoidance measures described in NMFS (2020) are only applicable to ESA-listed species, complying with them may provide additional indirect protections to non-listed species as well. Use of these measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing marine mammals, and therefore no significant impacts are expected.

The current PBR level for several non-endangered cetacean species in the Gulf of Mexico are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf and pygmy sperm whales = 0.9) (Hayes et al. 2020). Mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

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

Impacts of a Small Fuel Spill

Potential spill impacts on marine mammals are discussed by BOEM (2012a, 2015, 2016b). Oil impacts on marine mammals in general are discussed by Marine Mammals Commission (2011) and Geraci and St. Aubin (1990). For this DOCD, there are no unique site-specific issues with respect to spill impacts on these animals.

In the unlikely event of a spill, implementation of Chevron's OSRP is expected to lessen the potential for impacts on marine mammals. DOCD Section H provides detail on spill response measures, and those measures are summarized in the EIA. Given the open ocean location of the project area, the limited duration of a small spill, and response efforts, it is expected that any impacts would be brief and minimal.

A small fuel spill in offshore waters would produce a thin slick on the water surface and introduce the concentrations of petroleum hydrocarbons and their degradation products. Direct physical and physiological effects of exposure to diesel fuel could include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil directly or via contaminated prey; and stress from the activities and noise of response vessels and aircraft (MMC, 2011). The extent and persistence of impacts would depend on the meteorological and oceanographic conditions at the time and the effectiveness of spill response measures. A small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (**Section A.9.1**). Therefore, due to the limited areal extent and short duration of water quality impacts from a small fuel spill as well as the mobility of marine mammals, no significant impacts would be expected.

Impacts of a Large Oil Spill

Potential spill impacts on marine mammals are discussed by BOEM (2017a). For this DOCD, there are no unique site-specific issues. Impacts of oil spills on marine mammals can include direct impacts from oil exposure as well as indirect impacts due to response activities and materials (e.g., vessel traffic, marine sound, and dispersants) (MMC, 2011). Direct physical and physiological effects can include skin irritation, inflammation, or necrosis; chemical burns of skin, eyes, and mucous membranes; inhalation of toxic fumes; ingestion of oil (and dispersants) directly or via contaminated prey. Complications of the above may lead to dysfunction of immune and reproductive systems (De Guise et al., 2017), physiological stress, declining physical condition, and death. Indirect impacts could include stress from the activities and noise of response vessels and aircraft. Behavioral responses can include displacement of animals from prime habitat (McDonald et al., 2017), disruption of social structure, change in prey availability and foraging distribution or patterns, change in reproductive behavior/productivity, and change in movement patterns or migration (MMC, 2011).

In the event of a large spill, it is expected that impacts resulting in the injury or death of individual marine mammals could be significant at the population level depending on the level of oiling and the species affected. Based on the current PBR level for several non-endangered cetacean species in the Gulf of Mexico that are less than 3 individuals (e.g., rough-toothed dolphin = 2.5, Clymene dolphin = 0.6, killer whale = 0.1, pygmy killer whale = 0.8, dwarf and pygmy sperm whales = 0.9) (Hayes et al. 2020), mortality of individuals equal to or in excess of their PBR level would constitute a significant impact to the local (Gulf of Mexico) stocks of these species.

In the event of a large spill, response activities that may impact marine mammals include increased vessel traffic and remediation activities (e.g., use of dispersants, controlled burns, skimmers, boom, etc.) (BOEM, 2017a). The increased level of vessel and aircraft activity associated with spill response could disturb marine mammals, potentially resulting in behavioral changes. The large number of response vessels could result in vessel strikes, entanglement or other injury, or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1**) to reduce the potential for striking or disturbing these animals, and therefore no significant impacts are expected. The application of dispersants greatly reduces exposure risks to marine mammals as the dispersants would remove oil from the surface, thereby reducing the risk of contact and rendering it less likely to adhere to skin, baleen plates, or other body surfaces (BOEM, 2017a).

C.3.5 Sea Turtles (Endangered/Threatened)

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

Critical habitat has been designated for the loggerhead turtle in the Gulf of Mexico as shown in **Figure 2**. Loggerhead turtles in the Gulf of Mexico are part of the Northwest Atlantic Ocean DPS (76 *FR* 58868). In July 2014, NMFS and the USFWS designated critical habitat for this DPS (NMFS, 2014b). The USFWS designation (79 *FR* 39756) includes nesting beaches in Jackson County, Mississippi; Baldwin County, Alabama; and Bay, Gulf, and Franklin Counties in the Florida Panhandle as well as several counties in southwest Florida and the Florida Keys (and other areas along the Atlantic coast). The NMFS designation (79 *FR* 39856) includes nearshore reproductive habitat within 0.99 mi (1.6 km) seaward of the mean high-water line along these same nesting beaches. NMFS also designated a large area of shelf and oceanic waters, termed *Sargassum* habitat, in the Gulf of Mexico (and Atlantic Ocean) as critical habitat. *Sargassum* is a brown algae (Class Phaeophyceae) that takes on a planktonic, often pelagic existence after being removed from reefs during rough weather. Rafts of *Sargassum* serve as important foraging and developmental habitat for numerous fishes and young sea turtles, including loggerhead turtles. NMFS designated three other categories of critical habitat; of these, two (migratory habitat and overwintering habitat) are along the Atlantic coast and the third (breeding habitat) is found in the Florida Keys and along the Florida east coast (NMFS, 2014b).

The nearest designated nearshore reproductive critical habitat for loggerhead sea turtles is approximately 252 mi (406 km) northeast of the project area. The project area is located within the designated *Sargassum* critical habitat for loggerhead sea turtles (**Figure 2**).

Leatherback and loggerhead turtles are the most likely species to be present near the project area as adults. Green, hawksbill, and Kemp's ridley turtles are typically inner shelf and nearshore species, unlikely to occur near the project area as adults. Hatchlings or juveniles of any of the sea turtle species may be present in deepwater areas, including the project area, where they may be associated with floating mats of *Sargassum* and other flotsam.

All five sea turtle species in the Gulf of Mexico are migratory and use different marine habitats according to their life stage. These habitats include high-energy beaches for nesting females and emerging hatchlings and pelagic convergence zones for hatchling and juvenile turtles. As adults, green, hawksbill, and loggerhead turtles forage primarily in shallow, benthic habitats. Leatherback turtles are the most pelagic of the sea turtles, feeding primarily on jellyfish.

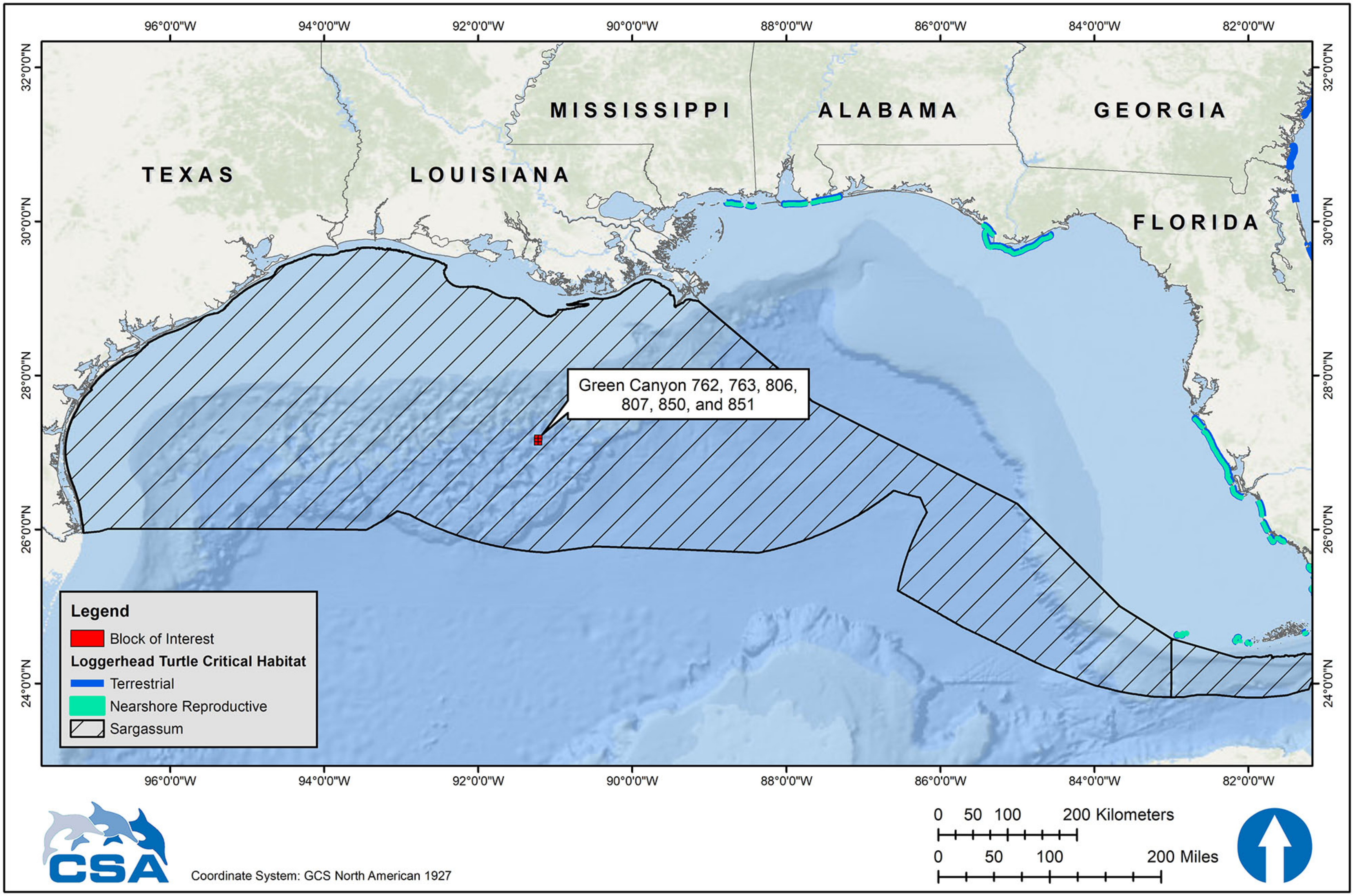

Figure 2. Location of loggerhead turtle designated critical habitat in relation to the project area.

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

- Loggerhead turtles – loggerhead turtles nest in significant numbers along the Florida Panhandle (Florida Fish and Wildlife Conservation Commission, 2018a) and, to a lesser extent, from Texas through Alabama (NMFS and USFWS, 2008).
- Green and leatherback turtles – green and leatherback turtles infrequently nest on Florida Panhandle beaches (Florida Fish and Wildlife Conservation Commission, 2018b,c).
- Kemp's ridley turtles – the critically endangered Kemp's ridley turtle nests almost exclusively on a 16-mile (26-km) stretch of coastline near Rancho Nuevo in the Mexican state of Tamaulipas (NMFS et al., 2011). A much smaller population nests in Padre Island National Seashore, Texas, mostly as a result of reintroduction efforts (NMFS et al., 2011). As of July 2020, a total of 262 Kemp's ridley turtle nests have been counted on Texas beaches for the 2020 nesting season. A total of 190 Kemp's ridley turtle nests were counted on Texas beaches during the 2019 nesting season and a total of 250 Kemp's ridley turtle nests were counted on Texas beaches during the 2018 nesting season. These are a decrease from the 353 Kemp's ridley turtle nests counted in the 2017 nesting season (Turtle Island Restoration Network, 2020). Padre Island National Seashore along the coast of Willacy, Kenedy, and Kleberg Counties in southern Texas, is the most important nesting location for this species in the United States, although there have been occasional reports of Kemp's ridleys nesting in Alabama (Share the Beach, 2016).
- Hawksbill turtles – hawksbill turtles typically do not nest anywhere near the project area, with most nesting in the region located in the Caribbean Sea and on the beaches of the Yucatán Peninsula (USFWS, 2016a).

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

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

Sea turtles can hear low to mid-frequency sounds and they appear to hear best between 200 and 750 Hz; they do not respond well to sounds above 1,000 Hz (Ketten and Bartol, 2005). The currently accepted hearing and response estimates are derived from fish hearing data rather than from marine mammal hearing data in combination with the limited experimental data available (Popper et al., 2014). NMFS Biological Opinion (NMFS, 2020) lists the sea turtle underwater acoustic injury threshold as a zero to peak sound pressure level ($SPL_{0\text{-}pk}$) of

232 dB re 1 µPa and an SEL_{cum} of 204 dB re 1 $µPa^2$ s; Blackstock et al. (2018) identified the sea turtle underwater acoustic SPL_{rms} level injury threshold as 207 dB re 1 µPa. The behavioral threshold used is from Blackstock et al. (2018) which identified the sea turtle underwater acoustic SPL_{rms} behavioral threshold as 175 dB re 1 µPa. No distinction is made between impulsive and non-impulsive sources for these thresholds. Certain sea turtles, especially loggerheads, may be attracted to offshore structures (Lohoefener et al., 1990; Gitschlag et al., 1997) and thus may be more susceptible to impacts from sounds produced during routine drilling activities. However, given the estimated SLs produced by drilling activities (**Section A.2**), and the required 24-hour accumulation period for SEL_{cum} levels to be realized it is unlikely acoustic injury will occur. Any impacts would likely be short-term behavioral changes such as diving and evasive swimming, disruption of activities, or departure from the area. Because of the limited scope and short duration of drilling activities, these short-term impacts are not expected to be biologically significant to sea turtle populations.

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

NMFS (2020) stated sea turtles have the potential to be entangled or entrapped in moon pools, and though many sea turtles could exit the moon pool under their own volition, sublethal effects could occur. Based on the moon pool entrapment cases of sea turtles reported and successful rescues and releases that have occurred, NMFS (2020) estimated approximately about one sea turtle will be sub-lethally entrapped in moon pools every year. Therefore, no significant impacts are expected from entrapment.

Sea turtles have the potential for entanglement with the mooring lines; though, they are anticipated to be rigid and will pose no risk.

Impacts of Support Vessel and Helicopter Traffic

Support vessel traffic has the potential to disturb sea turtles, and there is also a risk of vessel strikes. Data show that vessel traffic is one cause of sea turtle mortality in the Gulf of Mexico (Lutcavage et al., 1997; NMFS, 2020). While adult sea turtles are visible at the surface during the day and in clear weather, they can be difficult to spot from a moving vessel when resting below the water surface, during nighttime, or during periods of inclement weather. To reduce the potential for vessel strikes, BOEM issued NTL BOEM-2016-G01, which recommends protected species identification training and that vessel operators and crews maintain a vigilant watch for sea turtles and slow down or stop their vessel to avoid striking protected species, and requires operators to report sightings of any injured or dead protected species. When sea turtles are sighted, vessel operators and crews are required to maintain a distance of 164 ft (50 m) or greater whenever possible (NMFS, 2020). Compliance with these mitigation measures will minimize the likelihood of vessel strikes as well as reduce the chance for disturbing sea turtles. Therefore, no significant impacts are expected.

Noise generated from support helicopter traffic also has the potential to disturb sea turtles. However, while flying offshore, helicopters maintain altitudes above 700 ft (213 m) during transit to and from the working area. This altitude is intended to minimize the potential for disturbing sea turtles, and no significant impacts are expected (NMFS, 2020; BOEM, 2012a).

Impacts of a Small Fuel Spill

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

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

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

<u>Loggerhead Critical Habitat – Nesting Beaches</u>. A small fuel spill in the project area would be unlikely to affect sea turtle nesting beaches due to the distance from the nearest shoreline. Loggerhead turtle nesting beaches and nearshore reproductive habitat designated as critical habitat are located in Mississippi, Alabama, and the Florida Panhandle, at least 252 mi (406 km) from the project area. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to natural dispersion.

<u>Loggerhead Critical Habitat – *Sargassum*</u>*.* The project area is within the designated *Sargassum* critical habitat for the loggerhead turtles (**Figure 2**). If juvenile sea turtles come into contact with or ingest diesel oil, impacts could include death, injury, or other sublethal effects. Effects of a small spill on *Sargassum* critical habitat for loggerhead turtles would be limited to the small area (0.5 to 5 ha [1.2 to 12 ac]) likely to be impacted by a small spill. An impact area of 5 ha (12 ac) would represent a negligible portion of the approximately 40,662,810 ha (100,480,000 ac) designated *Sargassum* critical habitat for loggerhead turtles in the northern Gulf of Mexico. However, if juvenile sea turtles are present in the area impacted, significant impacts to the regional population could occur.

Impacts of a Large Oil Spill

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

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

Loggerhead Critical Habitat – Nesting Beaches. If spilled oil reaches sea turtle nesting beaches, nesting sea turtles and egg development could be affected (NMFS, 2020). An oiled beach could affect nest site selection or result in no nesting at all (e.g., false crawls). Upon hatching and successfully reaching the water, hatchlings are subject to the same types of oil spill exposure hazards as adults. Hatchlings that contact oil residues while crossing a beach can exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions (NMFS, 2007).

Based on the 30-day OSRA modeling (**Table 3**), indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), potential shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days). The nearest nearshore reproductive critical habitat for the loggerhead turtle is located in Jackson County, Mississippi, approximately 252 mi (406 km) from the project area, and is predicted by the 60-day OSRA model to have up to <0.5% or less conditional probability of contact within 60 days of a spill.

Loggerhead Critical Habitat – *Sargassum*. The project area is within the loggerhead turtle critical habitat designated as *Sargassum* habitat, which includes most of the Western and Central Planning Areas in the Gulf of Mexico and parts of the southern portion of the Eastern Planning Area (**Figure 2**) (NMFS, 2014b). Because of the large area covered by the designated *Sargassum* critical habitat for loggerhead turtles, a large spill could result in a substantial part of the *Sargassum* critical habitat in the northern Gulf of Mexico being oiled. However, the 2010 *Deepwater Horizon* spill affected approximately one-third of the *Sargassum* habitat in the northern Gulf of Mexico (BOEM, 2014). It is unlikely that the entire 40,662,810 ha (100,480,000 ac) of *Sargassum* critical habitat would be affected by a large spill. Because *Sargassum* spp. is a floating, pelagic species, it would only be affected by impacts that occur near the surface.

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

In the event of a large spill, the level of vessel and aircraft activity associated with spill response could disturb sea turtles and potentially result in vessel strikes, entanglement, or other injury or stress. Response vessels are expected to operate in accordance with NTL BOEM-2016-G01 (see **Table 1**) to reduce the potential for striking or disturbing sea turtles.

C.3.6 Piping Plover (Threatened)

The Piping Plover is a migratory shorebird that overwinters along the southeastern U.S. and Gulf of Mexico coasts. This Threatened species experienced declines in population as a result of hunting, habitat loss and modification, predation, and disease (USFWS, 2003). However, as a result of intensive conservation and management, populations of Piping Plover appear to have been increasing since 1991 throughout its range (Bird Life International, 2018). Critical overwintering habitat has been designated, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida (**Figure 3**). Piping Plovers inhabit coastal sandy beaches and mudflats, feeding by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening (USFWS, nd).

A large oil spill is the only IPF that potentially may affect Piping Plovers. There are no IPFs associated with routine project activities that could affect these birds. A small fuel spill in the project area would be unlikely to affect Piping Plovers because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Noise from helicopters would be unlikely to significantly affect piping plover populations, because it is assumed that helicopters will maintain an altitude of 1,000 ft (305 m) over unpopulated areas or across coastlines.

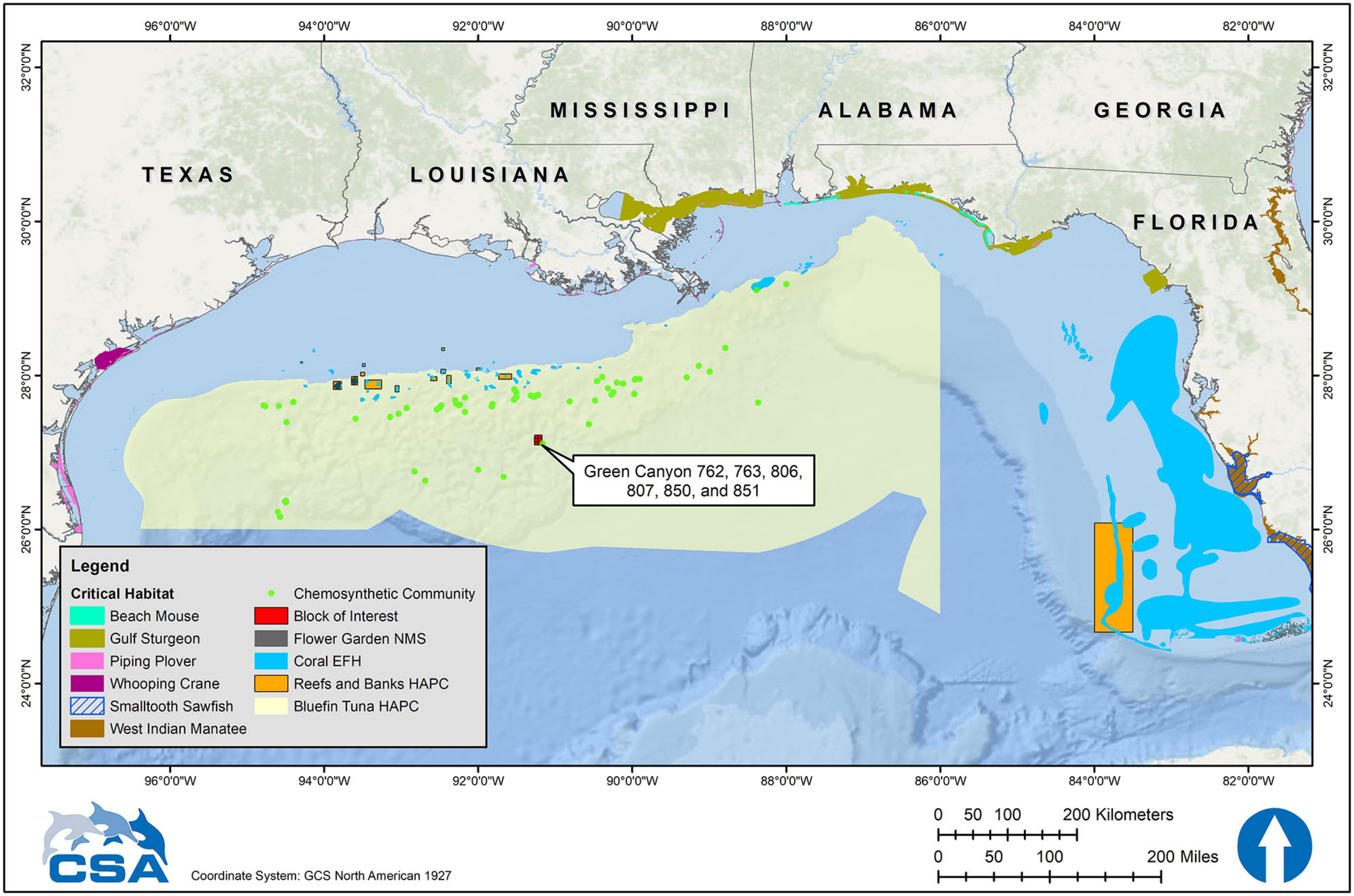

Figure 3. Location of selected environmental features in relation to the project area.

Impacts of a Large Oil Spill

The project area is approximately 126 mi (203 km) from the nearest shorelines designated as critical habitat for the Piping Plover (**Figure 3**). Based on the 30-day OSRA modeling (**Table 3**), indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), predicts a 13% or less probability of shoreline contact within 60 days of a spill between Cameron County, Texas to Miami-Dade County, Florida, a stretch of shoreline that includes numerous areas of Piping Plover critical habitat.

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

C.3.7 Whooping Crane (Endangered)

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

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

Impacts of a Large Oil Spill

A large oil spill is unlikely to affect Whooping Cranes as the project area is approximately 327 mi (526 km) from the Aransas NWR, which is the nearest designated critical habitat. The 30-day OSRA modeling (**Table 3**) predicts a 1% or less chance of oil contacting Whooping Crane critical habitat within 30 days of a spill. The 60-day OSRA model (**Table 4**) predicts that there is up to a 4% chance oil contacting Whooping Crane critical habitat within 60 days of a spill.

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

C.3.8 Oceanic Whitetip Shark (Threatened)

The oceanic whitetip shark was listed as Threatened under the ESA on January 30, 2018 (effective March 30, 2018) by NMFS (83 *FR* 4153). Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude, and historically were one of the most widespread and abundant species of shark (Baum et al., 2015). However, based on reported oceanic whitetip shark catches in several major long-line fisheries, the global population appears to have suffered substantial declines (Camhi et al., 2008) and the species is now only occasionally reported in the Gulf of Mexico (Baum et al., 2015).

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

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

BOEM implemented mitigation measures such as requiring the use of a heavy coated fiber line to prevent coiling or slack lines; therefore, the probability of entanglement in the FPU mooring lines is extremely low for oceanic whitetip sharks (NMFS, 2020). Due to the rare occurrence of oceanic whitetip sharks in the Gulf of Mexico, no population level impacts on oceanic whitetip sharks are expected.

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by sharks, including the threatened oceanic whitetip shark. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013) which includes frequencies exhibited by individual species such as the nurse shark (*Ginglymostoma cirratum*; 300 and 600 Hz) and the lemon shark (*Negaprion brevirostris*; 20 Hz to 1 kHz) (Casper and Mann, 2006). These frequencies overlap with SPLs associated with drilling activities (typically 10 Hz to 10 kHz) (Hildebrand, 2005). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the FPU, impacts would be limited in geographic scope and no population level impacts on oceanic whitetip sharks are expected.

Impacts of a Large Oil Spill

Information regarding the direct effects of oil on elasmobranchs, including the oceanic whitetip shark are largely unknown. However, in the event of a large oil spill, oceanic whitetip sharks could be affected by direct ingestion, ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Because oceanic whitetip sharks may be found in surface waters, they could be more likely to be impacted by floating oil than other species which only reside at depth.

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

C.3.9 Giant Manta Ray (Threatened)

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

Commercial fishing is the primary threat to giant manta rays (NOAA, 2018). The species is targeted and caught as bycatch in several global fisheries throughout its range. Although protected in U.S. waters, protection of populations is difficult as they are highly migratory with sparsely distributed and fragmented populations throughout the world. Some estimated regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NOAA, 2018). Stewart et al. (2018) recently reported that the Flower Garden Banks serves as nursery habitat for aggregations of juvenile manta rays. At least 74 unique individuals have been positively identified at the Flower Garden Banks based on unique underbelly coloration (Flower Garden Banks National Marine Sanctuary, 2018). Genetic and photographic evidence in the Flower Garden Banks over 25 years of monitoring showed that 95% of identified giant manta ray male individuals were smaller than mature size (Stewart et al., 2018).

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

BOEM implemented mitigation measures such as requiring the use of a heavy coated fiber line to prevent coiling or slack lines; therefore, the probability of entanglement in the FPU mooring lines is extremely low for giant manta rays (NMFS, 2020). It is extremely unlikely giant manta rays will be encountered in the project area; it is anticipated no population level impacts are expected.

Offshore drilling activities produce a broad array of sounds at frequencies and intensities that may be detected by elasmobranchs including the threatened giant manta ray. The general frequency range for elasmobranch hearing is approximately between 20 Hz and 1 kHz (Ladich and Fay, 2013). Studies indicate that the most sensitive hearing ranges for individual species were 300 and 600 Hz (yellow stingray [*Urobatis jamaicensis*]) and 100 to 300 Hz (little skate [*Erinacea raja*]) (Casper et al., 2003; Casper and Mann, 2006). These frequencies overlap with SPLs associated with drilling activities (typically 10 Hz to 10 kHz) (Hildebrand, 2005). Impacts from offshore drilling activities (i.e., non-impulsive sound) could include masking or behavioral changes (Popper et al., 2014). However, because of the limited propagation distances of high SPLs from the FPU, impacts would be limited in geographic scope and no population level impacts on giant manta rays are expected.

Impacts of a Large Oil Spill

A large oil spill in the project area could reach coral reefs at the Flower Garden Banks which is the only known location of giant manta ray aggregations in the Gulf of Mexico, although individuals may occur anywhere in the Gulf. In the unlikely event of a large oil spill impacting areas with giant manta rays, individual rays could be affected by direct ingestion of oil which could cover their gill filaments or gill rakers, or by ingestion of oiled plankton. Giant manta rays typically feed in shallow waters of less than 33 ft (10 m) depth (NOAA, 2018). Because of this shallow water feeding behavior, giant manta rays would be more likely to be impacted by floating oil than other species which only reside at depth.

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

C.3.10 Gulf Sturgeon (Threatened)

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

The historic range of the species extended from the Mississippi River to Charlotte Harbor, Florida (Wakeford, 2001). This range has contracted to encompass major rivers and inner shelf waters from the Mississippi River to the Suwannee River, Florida. Populations have been depleted or even extirpated throughout this range by fishing, shoreline development, dam construction, water quality changes, and other factors (Barkuloo, 1988; Wakeford, 2001). These declines prompted the listing of the Gulf sturgeon as a threatened species in 1991. The best-known populations occur in the Apalachicola and Suwannee Rivers in Florida (Carr, 1996; Sulak and Clugston, 1998), the Choctawhatchee River in Alabama (Fox et al., 2000), and the Pearl River in Mississippi/Louisiana (Morrow et al., 1998). Rudd et al. (2014) reconfirmed the spatial distribution and movement patterns of Gulf Sturgeon by surgically implanting acoustic telemetry tags. Critical habitat in the Gulf extends from Lake Borgne, Louisiana (St. Bernard

Parish), to Suwannee Sound, Florida (Levy County) (NMFS, 2014c) (**Figure 3**). A species description is presented by BOEM (2012a) and in the recovery plan for this species (USFWS et al., 1995).

A large oil spill is the only IPF that potentially may affect Gulf sturgeon. There are no IPFs associated with routine project activities that could affect these fish. Entanglement with the FPU mooring lines would be unlikely due to the project being located far from Gulf sturgeon habitat. A small fuel spill in the project area would be unlikely to affect Gulf sturgeon because a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating (see explanation in **Section A.9.1**). Vessel strikes to Gulf sturgeon would be unlikely based on the location of the support vessel base and that NMFS (2020) estimated one non-lethal Gulf sturgeon strike in the 50 years of proposed action.

Impacts of a Large Oil Spill

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

The project area is approximately 239 mi (385 km) from the nearest Gulf sturgeon critical habitat. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has a <0.5% conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has up to a 1% or less conditional probability of contacting any coastal areas containing Gulf sturgeon critical habitat within 60 days of a spill.

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

C.3.11 Nassau Grouper (Threatened)

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

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

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

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 4**), a large hydrocarbon spill would be unlikely (<0.5% probability) to reach Nassau grouper habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks and the difference in water depth between the project area the Banks. While on the surface, hydrocarbons would not be expected to contact subsurface fish.

In the unlikely event that hydrocarbons contact Nassau grouper habitat, hydrocarbon droplets or contaminated sediment particles could come into contact with Nassau grouper present on the reefs. Individual fish could be affected by direct ingestion of hydrocarbons which could cover their gill filaments or gill rakers, result in ingestion of oiled prey, or the absorption of dissolved petroleum products through the gills. Response activities are not expected to impact Nassau grouper due to the very low density of these fish in the northern Gulf of Mexico.

C.3.12 Smalltooth Sawfish (Endangered)

The smalltooth sawfish, named due to their flat, saw-like rostrum, is an elasmobranch ray which lives in shallow coastal tropical seas and estuaries where they feed on fish and invertebrates such as shrimp and crabs (NOAA Fisheries, nd). Once found along most of the northern Gulf of Mexico coast from Texas to Florida, their current range in Gulf of Mexico is restricted to areas primarily in southwest Florida (Brame et al., 2019) where several areas of critical habitat have been designated (**Figure 3**). A species description is presented in the recovery plan for this species (NMFS, 2009b).

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

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

Impacts of a Large Oil Spill

The project area is approximately 616 mi (991 km) from the nearest smalltooth sawfish critical habitat in Charlotte County, Florida. Based on the 30-day OSRA modeling (**Table 3**), coastal areas containing smalltooth sawfish critical habitat are unlikely to be affected within 30 days of a spill (<0.5% conditional probability). The 60-day OSRA modeling (**Table 4**) predicts a <0.5% probability of shoreline contact within 60 days of a spill between the project area to coastal areas containing smalltooth sawfish critical habitat.

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

C.3.13 Beach Mice (Endangered)

Four subspecies of endangered beach mouse occur on the barrier islands of Alabama and the Florida Panhandle. They are the Alabama (*Peromyscus polionotus ammobates*), Choctawhatchee (*P. polionotus allophrys*), Perdido Key (*P. polionotus trissyllepsis*), and St. Andrew beach mouse (*P. polionotus peninsularis*). Critical habitat has been designated for all four subspecies; **Figure 3** shows the critical habitat combined for all four subspecies. One additional species of beach mouse in habiting dunes on the western Florida Panhandle, the Santa Rosa beach mouse (*P. polionotus leucocephalus*), is not listed under the ESA.

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

Impacts of a Large Oil Spill

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

Beach mouse critical habitat in Baldwin County, Alabama, is approximately 281 mi (452 km) from the project area. The 30-day OSRA results (**Table 3**) predicts <0.5% conditional probability of oil contact with beach mouse critical habitat within 30 days of a spill. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has a 1% or less conditional probability of reaching either the Alabama or Florida shorelines inhabited by beach mice within 60 days of a spill.

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

C.3.14 Florida Salt Marsh Vole (Endangered)

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

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

Impacts of a Large Oil Spill

Florida salt marsh vole habitat in Levy and Dixie counties, Florida is approximately 567 mi (912 km) from the project area. The 30-day OSRA modeling (**Table 3**) predicts that a spill in the project area has <0.5% conditional probability of contacting any coastal areas containing Florida salt marsh voles within 30 days. The 60-day OSRA modeling (**Table 4**) predicts that a spill in the project area has <0.5% conditional probability of contacting any coastal areas containing beach mouse critical habitat within 60 days of a spill.

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

C.3.15 Threatened Coral Species

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

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

Impacts of a Large Oil Spill

Based on the 60-day OSRA modeling results (**Table 4**), a large oil spill would be unlikely (<0.5% probability) to reach elkhorn coral critical habitat in the Florida Keys (Monroe County, Florida). A spill would be unlikely to contact the corals of the Flower Garden Banks based on the distance between the project area and the Flower Garden Banks (approximately 170 mi [274 km]), and the difference in water depth between the project area (4,750 ft [1,448 m]) and the Banks (approximately 56 to 476 ft [17 to 145 m]). While on the surface, oil would not be expected to contact corals on the seafloor. Natural or chemical dispersion of oil could cause a subsurface plume which would have the possibility of contacting seafloor corals.

If a subsurface plume were to occur, impacts on the Flower Garden Banks would be unlikely due to the distance between the project area and corals within the Flower Garden Banks (approximately 170 mi [274 km]), and the shallow location of the coral cap of the Banks. Near-bottom currents in the region are predicted to flow along the isobaths (Nowlin et al., 2001) and typically would not carry a plume up onto the continental shelf edge. Valentine et al. (2014) observed the spatial distribution of excess hopane, a crude oil tracer from *Deepwater Horizon* spill sediment core samples, to be in the deeper waters and not transported up the shelf, thus confirming that near-bottom currents flow along the isobaths.

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

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

C.4 Coastal and Marine Birds

C.4.1 Marine Birds

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

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

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

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

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

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

Marine birds that frequent offshore drilling operations may be exposed to contaminants including air pollutants and routine discharges, but significant impacts are unlikely due to rapid dispersion. Birds migrating over water have been known to strike offshore structures, resulting in injury and/or death (Wiese et al., 2001; Russell, 2005; Ronconi et al., 2015). Mortality of migrant birds at tall towers and other land-based structures has been reviewed extensively, and the mechanisms involved in rig collisions appear to be similar. In some cases, migrants simply do not see a part of the rig until it is too late to avoid it. In other cases, navigation may be disrupted by marine sound (Russell, 2005). On the other hand, offshore structures are suitable stopover perches for most trans-Gulf migrant species, and most of the migrants that stop over on rigs probably benefit from their stay, particularly in spring (Russell, 2005). Due to the limited scope and short duration of drilling activities described in this DOCD, any impacts on populations of either seabirds or trans-Gulf migrant birds are not expected to be significant.

A study in the North Sea indicated that rig lighting causes circling behavior in various birds, especially on cloudy nights; apparently the birds' geomagnetic compass is upset by the red part of the spectrum from the lights currently in use (Van de Laar, 2007; Poot et al., 2008). The numbers varied greatly, from none to some tens of thousands of birds per night per rig, with an apparent effect radius of up to 3 mi (5 km) (Poot et al., 2008). A study in the Gulf of Mexico also noted the phenomenon but did not recommend mitigation (Russell, 2005). One factor to consider in evaluating this impact in the Gulf of Mexico would include the lower incidence of cloudy and foggy days in the Gulf of Mexico versus the North Sea. In laboratory experiments, Poot et al. (2008) found the magnetic compass of migratory birds to be wavelength dependent. Migratory birds require light from the blue-green part of the spectrum for magnetic compass orientation, whereas red light (visible long-wavelength) disrupts their magnetic orientation. They designed a field study to test if and how changing light color influenced migrating birds under field conditions. During field studies they found that nocturnally migrating birds were disoriented and attracted by red and white light (containing visible long-wavelength radiation), whereas they were clearly less disoriented by blue and green light (containing less or no visible long-wavelength radiation) (Poot et al., 2008). Overall, potential negative impacts to birds from FPU lighting, collisions, or other adverse effects are highly localized (considering the single structure) and may affect individual birds during migration periods. Therefore, these potential impacts are not expected to affect marine birds at the population or species level and are not significant.

Impacts of Support Vessel and Helicopter Traffic

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

Impacts of a Small Fuel Spill

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

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

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

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

Impacts of a Large Oil Spill

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

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

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

C.4.2 Coastal Birds

Threatened and Endangered bird species (Piping Plover and Whooping Crane) have been discussed previously in **Sections C.3.6** and **C.3.7**. Various species of non-endangered birds are also found along the northern Gulf Coast, including diving birds, shorebirds, marsh birds, wading birds, and waterfowl. Gulf Coast marshes and beaches also provide important feeding and nesting habitats. Species that nest on beaches, flats, dunes, bars, barrier islands, and similar coastal and nearshore habitats include the Sandwich Tern, Wilson's Plover (*Charadrius wilsonia*), Black Skimmer (*Rynchops niger*), Forster's Tern (*Sterna forsteri*), Gull-Billed Tern (*Gelochelidon nilotica*), Laughing Gull, Least Tern, and Royal Tern (USFWS, 2010).

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

The Southern Bald Eagle (*Haliaeetus leucocephalus*) was delisted from its Threatened status in the lower 48 states on 28 June 2007, but still receives protection under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act of 1940. The Bald Eagle is a terrestrial raptor widely distributed across the southern U.S., including coastal habitats along the Gulf of Mexico. The Gulf Coast is inhabited by both wintering migrant and resident Bald Eagles (Johnsgard, 1990; Ehrlich et al., 1992).

IPFs that potentially may affect shorebirds and coastal nesting birds include support vessel and helicopter traffic and a large oil spill. A small fuel spill in the project area would be unlikely to affect shorebirds or coastal nesting birds, as the project area is 126 mi (203 km) from the nearest shoreline. As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. Compliance with NTL BSEE-2015-G03 is expected to minimize the potential for marine debris-related impacts on shorebirds.

Impacts of Support Vessel and Helicopter Traffic

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

Vessel traffic may disturb some foraging and resting birds. Flushing distances vary among species and among individuals (Rodgers and Schwikert, 2002; Schwemmer et al., 2011). The disturbances will be limited to flushing birds away from vessel pathways; known distances are from 65 to 160 ft (20 to 49 m) for personal watercrafts and 75 tp 109 ft (23 to 58 m) for outboard-powered boats (Rodgers and Schwikert, 2002). Support vessels will not approach nesting or breeding areas on the shoreline, so disturbances to nesting birds, eggs, and chicks is not expected. Vessel operators are expected to use designated navigation channels and comply with posted speed and wake restrictions while transiting sensitive inland waterways. Due to the limited scope and short duration of drilling activities, any short-term impacts are not expected to be significant to coastal bird populations.

Helicopter traffic can cause some disturbance to birds onshore and offshore. Responses are highly dependent on the type of aircraft, the bird species, the activities that the animals were previously engaged in, and previous exposures to overflights (Efromyson et al., 2003). Helicopters seem to cause the most intense responses over other human disturbances (Bélanger and Bédard, 1989). The Federal Aviation Administration recommends (Advisory Circular No. 91-36D) that pilots maintain a minimum altitude of 2,000 ft (610 m) when flying over marine sound-sensitive areas such as parks, forest, primitive areas, wilderness areas, National

Seashores, or National Wildlife Refuges, and maintain flight paths to reduce aircraft marine sound in these marine sound-sensitive areas. The 2,000-ft (610-m) altitude minimum is greater than the distance (slant range) at which aircraft overflights have been reported to cause behavioral effects on most species of birds studied by Efroymson et al. (2000). It is assumed that adherence to these guidelines would reduce potential behavioral disturbances (such as temporary displacement or avoidance behavior) of individual birds in coastal and inshore areas. The potential impacts from helicopter traffic are not expected to be significant to coastal bird populations or species in the project area.

Impacts of Large Oil Spill

Based on the 30-day OSRA modeling (**Table 3**), indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), potential shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days).

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

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

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

C.5 Fisheries Resources

C.5.1 Pelagic Communities and Ichthyoplankton

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

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

IPFs that potentially may affect pelagic communities and ichthyoplankton include FPU and vessel presence, marine sound, and lights; effluent discharges; water intake; and two types of accidents (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

Few data exist regarding the impacts of noise on pelagic larvae and eggs. Generally, it is believed that larval fish will have similar hearing sensitivities as adults, but may be more susceptible to barotrauma injuries associated with impulsive noise (Popper et al., 2014). Larval fish were experimentally exposed to simulated impulsive sounds by Bolle et al. (2012). The controlled playbacks produced SEL_{cum} of 206 dB re 1 μPa^2·s but resulted in no increased mortality between the exposure and control groups. Non-impulsive noise sources (such as FPU operations) are expected to be far less injurious than impulsive noise. Because of the periodic and transient nature of ichthyoplankton, they are not expected to remain within the ensonified area for a full 24-hour period to realize SEL_{cum} necessary to result in injury, and no impacts to these life stages are expected.

Impacts of Effluent Discharges

Treated sanitary and domestic wastes may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. These wastes may have elevated levels of nutrients, organic matter, and chlorine, but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Deck drainage may have a slight effect on the pelagic environment in the immediate vicinity of these discharges. Deck drainage from contaminated areas will be passed through an oil-and-water separator prior to release, and discharges will be monitored for visible sheen. The discharges may have slightly elevated levels of hydrocarbons but should be diluted rapidly to undetectable levels within tens to hundreds of meters from the source. Minimal impacts on water quality, plankton, and nekton are anticipated.

Other discharges in accordance with the NPDES permit, such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water, are expected to be diluted rapidly and have little or no impact on water column biota.

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

Impacts of Water Intake

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

Impacts of a Small Fuel Spill

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

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

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

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

Impacts of a Large Oil Spill

Potential spill impacts on pelagic communities and ichthyoplankton are discussed by BOEM (2017a). A large oil spill could affect water column biota including phytoplankton, zooplankton, ichthyoplankton, and nekton. A large spill that persisted for weeks or months would be more likely to affect these communities. While adult and juvenile fishes may actively avoid a large spill, planktonic eggs and larvae would be unable to avoid contact. Eggs and larvae of fishes are especially vulnerable to oiling because they inhabit the upper layers of the water column, and they will die if exposed to certain toxic fractions of spilled oil or dispersants. Impacts potentially would be greater if local-scale currents retained planktonic larval assemblages (and the floating oil slick) within the same water mass. Impacts to ichthyoplankton from a large spill would be greatest during spring and summer when shelf concentrations peak (BOEM, 2016b).

C.5.2 Essential Fish Habitat

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

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

Highly migratory pelagic fishes, which occur as transients in the project area, are the only remaining group for which EFH has been identified in the deepwater Gulf of Mexico. Species in this group, including tunas, swordfishes, billfishes, and sharks, are managed by NMFS. **Table 7** lists the highly migratory fish species and their life stages with EFH at or near the project area.

Table 7. Migratory fish species with designated Essential Fish Habitat (EFH) at or near Green Canyon Blocks 762, 763, 806, 807, 850, and 851, including life stage(s) potentially present within the project area (Adapted from National Marine Fisheries Service [NMFS], 2009b).

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

Research indicates the central and western Gulf of Mexico may be important spawning habitat for Atlantic bluefin tuna (*Thunnus thynnus*), and (NMFS, 2009c) has designated a Habitat Area of Particular Concern (HAPC) for this species. The HAPC covers much of the deepwater Gulf of Mexico, including the project area (**Figure 3**). The areal extent of the HAPC is approximately 115,831 mi^2 (300,000 km^2). Atlantic bluefin tuna follow an annual cycle of foraging in June through March off the eastern U.S. and Canadian coasts, followed by migration to the Gulf of Mexico to spawn in April, May, and June (NMFS, 2009c). The Atlantic bluefin tuna has also been designated as a species of concern (NMFS, 2011). An amendment to the original EFH Generic Amendment was finalized in 2005 (Gulf of Mexico Fishery Management Council, 2005). One of the most significant proposed changes in this amendment reduced the extent of EFH relative to the 1998 Generic Amendment by removing the EFH description and identification from waters between 100 fathoms and the seaward limit of the Exclusive Economic Zone. The Highly Migratory Species Fisheries Management Plan was amended in 2009 to update EFH and HAPC to include the bluefin tuna spawning area (NMFS, 2009c).

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

Other HAPCs have been identified by the Gulf of Mexico Fishery Management Council (2005). These include the Florida Middle Grounds, Madison-Swanson Marine Reserve, Tortugas North and South Ecological Reserves, Pulley Ridge, and several individual reefs and banks of the northwestern Gulf of Mexico (**Figure 3**). Jakkula Bank is the HAPC located nearest to the project area (approximately 53 mi [85 km]).

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

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

FPU and installation vessels noise could potentially cause acoustic masking for fishes, thereby reducing their ability to hear biologically relevant sounds (Radford et al., 2014). Noise may also influence fish behaviors such as predator avoidance, foraging, reproduction, and intraspecific interactions (Picciulin et al., 2010; Bruintjes and Radford, 2013; McLaughlin and Kunc, 2015). The only defined acoustic threshold levels for non-impulsive noise are given by Popper et al. (2014) and apply only to species of fish with swim bladders that provide some hearing (pressure detection) function. Popper et al. (2014) estimated SEL_{cum} threshold levels of 170 dB re 1 μPa^2 s over a 48-hour period for onset of recoverable injury and SEL_{cum} of 158 dB re 1 μPa^2 s over a 12-hour period for onset temporary auditory threshold shifts. No reliable behavioral thresholds for fish have been established. Any impacts on EFH for migratory pelagic fishes are not expected to be significant.

Impacts of Effluent Discharges

Other effluent discharges affecting EFH by diminishing ambient water quality include treated sanitary and domestic wastes, deck drainage, and miscellaneous discharges such as desalination unit brine and uncontaminated cooling water, fire water, and ballast water. Impacts on water quality have been discussed previously. No significant impacts on EFH for managed species are expected from these discharges.

Impacts of Water Intake

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

Impacts of a Small Fuel Spill

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

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

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

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

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

Impacts of a Large Oil Spill

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

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

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

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

The nearest EFH under the corals and coral reefs management plan (Gulf of Mexico Fishery Management Council, 2005) is located 42 mi (68 km) from the project area. An accidental spill would be unlikely to affect this area, since a surface slick would be unlikely to reach these features due to their depth.

C.6 Archaeological Resources

C.6.1 Shipwreck Sites

The project area is not on the list of archaeology survey blocks with a high potential for historic shipwrecks (BOEM, 2011). The archeological assessment identified no archaeologically significant artifacts or shipwrecks within the project area (Fugro USA Marine, Inc, 2018). Chevron will abide by the applicable requirements of NTL 2005-G07 and 30 CFR 550.194(c), which stipulate that work be stopped at the project site if any previously undetected archaeological resource is discovered after work has begun until appropriate surveys and evaluations have been completed.

Impacts of a large oil spill are the only IPFs considered. A small fuel spill would not affect shipwrecks because the oil would float and dissipate on the sea surface. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of a Large Oil Spill

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

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

A spill entering shallow coastal waters could conceivably contaminate an undiscovered or known coastal shipwreck site. Based on the 30-day OSRA modeling (**Table 3**), indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days). BOEM (2012a) stated that if an oil spill contacted a coastal historic site, such as a fort or a lighthouse, the major impact would be a visual impact from oil contact and contamination of the site and its environment.

C.6.2 Prehistoric Archaeological Sites

With water depths at the locations of the proposed FPU and subsea installation is approximately 4,750 ft (1,448 m), the FPU and subsea installation are well beyond the 197-ft (60-m) depth contour used by BOEM as the seaward extent for potential prehistoric archaeological sites in the Gulf of Mexico. Because prehistoric archaeological sites are not found in the project area, the only relevant IPF is a large oil spill. A small fuel spill would not affect prehistoric archaeological resources because the oil would float and dissipate on the sea surface.

Impacts of a Large Oil Spill

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

Along the northern Gulf Coast, prehistoric sites exist along the barrier islands and mainland coast and along the margins of bays and bayous (BOEM, 2017a). Based on the 30-day OSRA modeling (**Table 3**), indicates nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days).

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

C.7 Coastal Habitats and Protected Areas

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

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

Impacts of support vessel traffic and a large oil spill are the only IPFs analyzed for coastal habitats and protected areas. A small fuel spill in the project area would be unlikely to affect coastal habitats, as the project area is 126 mi (203 km) from the nearest shoreline (Plaquemines Parish, Louisiana). As explained in **Section A.9.1**, a small fuel spill would not be expected to make landfall or reach coastal waters prior to dissipating. These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Support Vessel and Helicopter Traffic

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

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

Impacts of a Large Oil Spill

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

Based on the 30-day OSRA modeling (**Table 3**), nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days).

The shorelines within the geographic range predicted by the OSRA modeling (**Tables 3** and **4**) include extensive barrier beaches, wetlands, and oyster reefs with submerged seagrass beds occurring in sheltered areas behind the barrier islands and in estuaries. NWRs and other protected areas along the coast are discussed in BOEM (2017a) and Chevron's OSRP. Coastal and near-coastal wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts based on the 30-day OSRA model (**Table 3**) are presented in **Table 8**.

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

Table 8. Wildlife refuges, wilderness areas, and state and national parks within the geographic range of the potential shoreline contacts after 30 days of a hypothetical spill from Launch Area 45 based on the 30-day OSRA model.

County or Parish, State	Wildlife Refuge, Wilderness Area, or State/National Park
Calhoun, Texas	Aransas National Wildlife Refuge
	Chester Island Bird Sanctuary
	Guadalupe Delta Wildlife Management Area
	Matagorda Island Wildlife Management Area
	Welder Flats Wildlife Management Area
Matagorda, Texas	Big Boggy National Wildlife Refuge
	Matagorda Bay Nature Park
	Oyster Lake Park
	San Bernard National Wildlife Refuge
	West Moring Dock Park
Brazoria, Texas	Brazoria National Wildlife Refuge
	Christmas Bay Coastal Preserve
	Justin Hurst Wildlife Management Area
	San Bernard National Wildlife Refuge
Galveston, Texas	Anahuac National Wildlife Refuge
	Bolivar Flats Shorebird Sanctuary
	Fort Travis Seashore Park
	Galveston Island State Park
	Horseshoe Marsh Bird Sanctuary
	Mundy Marsh Bird Sanctuary
	R.A. Apffel Park
	Seawolf Park
Jefferson, Texas	McFaddin National Wildlife Refuge
	Sea Rim State Park
	Texas Point National Wildlife Refuge
Cameron, Louisiana	Peveto Woods Sanctuary
	Rockefeller State Wildlife Refuge and Game Preserve
	Sabine National Wildlife Refuge
Vermilion, Louisiana	Paul J. Rainey Wildlife Refuge and Game Preserve
	Rockefeller State Wildlife Refuge and Game Preserve
	State Wildlife Refuge
Iberia, Louisiana	Marsh Island Wildlife Refuge
	Shell Key National Wildlife Refuge
Terrebonne, Louisiana	Isles Dernieres Barrier Islands Refuge
	Pointe aux Chenes Wildlife Management Area
Lafourche, Louisiana	East Timbalier Island National Wildlife Refuge
	Pointe aux Chenes Wildlife Management Area
	Wisner WMA (Includes Picciola Tract)
Plaquemines, Louisiana	Breton National Wildlife Refuge
	Delta National Wildlife Refuge
	Pass a Loutre Wildlife Management Area

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

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

C.8 Socioeconomic and Other Resources

C.8.1 Recreational and Commercial Fishing

Potential impacts to recreational and commercial fishing are analyzed by BOEM (2017a). The main commercial fishing activity in deep waters of the northern Gulf of Mexico is pelagic longlining for tunas, swordfishes, and other billfishes (Continental Shelf Associates, 2002; Beerkircher et al., 2009). Pelagic longlining has occurred historically in the project area, primarily during spring and summer. In August 2000, the federal government closed two areas in the northeastern Gulf of Mexico to longline fishing (65*FR* 47214). The lease is outside of the closure areas.

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

It is unlikely that any commercial fishing activity other than longlining occurs at or near the project area. Benthic species targeted by commercial fishers occur on the upper continental slope, well inshore of the project area. Royal red shrimp (*Pleoticus robustus*) are caught by trawlers in water depths of about 820 to 1,804 ft (250 to 550 m) (Stiles et al., 2007). Tilefish (primarily *Lopholatilus chamaeleonticeps*) are caught by bottom longlining in water depths from about 540 to 1,476 ft (165 to 450 m) (Continental Shelf Associates, 2002).

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

The only IPFs associated with routine operations that potentially may affect fisheries is FPU and vessel presence (including marine sound and lights). Two types of potential accidents are also addressed below (a small fuel spill and a large oil spill). These IPFs with potential impacts listed in **Table 2** are discussed below.

Impacts of Floating Production Unit and Vessel Presence, Marine Sound, and Lights

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

Because it is unlikely that any recreational fishing activity is occurring in the project area, no adverse impacts are anticipated. The FPU presence will result in a limited area being unavailable for fishing activity, but this impact is considered inconsequential. Other factors such as effluent discharges are likely to have negligible impacts on commercial or recreational fisheries due to rapid dispersion, the small area of ocean affected, and the intermittent nature of the discharges.

Impacts of a Small Fuel Spill

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

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

Impacts of a Large Oil Spill

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

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

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

C.8.2 Public Health and Safety

There are no IPFs associated with routine operations that are expected to affect public health and safety. Impacts of a small fuel spill and a large oil spill are addressed below. A small fuel spill would be unlikely to cause any impacts on public health and safety because it would affect only a small area of the open ocean. The project area is approximately 126 mi (203 km) from the nearest shoreline, and nearly all of the diesel fuel would evaporate or disperse naturally within 24 hours (see **Section A.9.1**).

Impacts of a Large Oil Spill

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

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

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

C.8.3 Employment and Infrastructure

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

Impacts of a Large Oil Spill

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

C.8.4 Recreation and Tourism

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

Impacts of a Large Oil Spill

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

Impacts on recreation and tourism would vary depending on the duration of the spill and its fate including the effectiveness of response measures. A large spill that reached coastal waters and shorelines could adversely affect recreation and tourism by contaminating beaches and wetlands, resulting in negative publicity that encourages people to stay away.

Based on the 30-day OSRA modeling (**Table 3**), nearshore waters and embayments in Cameron Parish in Louisiana is the coastal area most likely to be affected (4% probability within 30 days). Other shorelines from Calhoun County, Texas to Plaquemines Parish, Louisiana could be affected within 30 days, ranging from 1% to 4% probability of contact. Based on the 60-day OSRA modeling estimates (**Table 4**), the potential for shoreline contact ranges from Cameron County, Texas to Miami-Dade County, Florida (up to 13% conditional probability within 60 days).

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

C.8.5 Land Use

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

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

Impacts of a Large Oil Spill

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

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

C.8.6 Other Marine Uses

The project area is not located within any USCG-designated fairway, shipping lane, or Military Warning Area. Chevron will comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft. The shallow hazards report identified existing seafloor infrastructure in the vicinity of the project area but no impacts on existing infrastructure are expected. The archaeological survey reported no archaeologically significant sonar contacts were identified in the project area (Fugro USA Marine, Inc, 2018).

However, 16 unidentified sonar contacts were noted within the project area but were listed as disturbed sediments or potential modern debris (Fugro USA Marine, Inc, 2018).

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

Impacts of a Large Oil Spill

An accidental spill would be unlikely to significantly affect shipping or other marine uses. In the event of a large spill requiring numerous response vessels, coordination would be required to manage the vessel traffic for safe operations. Chevron will comply with BOEM requirements and lease stipulations to avoid impacts on uses of the area by military vessels and aircraft.

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

C.9 Cumulative Impacts

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

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

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

Cumulative Impacts of Activities in this DOCD. The BOEM (2017a) Final EIS included a discussion of cumulative impacts, which analyzed the incremental environmental and socioeconomic impacts of the 10 proposed lease sales, in addition to all activities (including non-OCS activities) projected to occur from past, proposed, and future lease sales. The EISs considered exploration, delineation, and development wells; FPU and subsea installation;

service vessel trips; and oil spills. The EISs examined the potential cumulative effects on each specific resource for the entire Gulf of Mexico.

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

D. Environmental Hazards

D.1 Geologic Hazards

The shallow hazards report concluded that the proposed the FPU and subsea installation are generally favorable for the proposed activities (Fugro USA Marine, Inc, 2018). See DOCD Section C for supporting geological and geophysical information.

D.2 Severe Weather

Under most circumstances, weather is not expected to have any effect on the proposed activities. Extreme weather, including high winds, strong currents, and large waves, was considered in the design criteria for the FPU under consideration for this project. High winds and limited visibility during a severe storm could disrupt support activities (vessel and helicopter traffic) and make it necessary to suspend some activities for safety reasons until the storm or weather event passes. In the event of a hurricane, procedures as outlined in the Hurricane Evacuation Plan would be adhered to. Evacuation in the event of a hurricane or other severe weather would increase the number and frequency of support vessel and helicopter trips to and from the project area.

D.3 Currents and Waves

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

E. Alternatives

No formal alternatives were evaluated in the EIA for the proposed project. However, various technical and operational options, including the location of the FPU and subsea equipment and the selection of a FPU, potential installation vessels, were considered by Chevron.

F. Mitigation Measures

The proposed action includes numerous mitigation measures required by laws, regulations, and BSEE and BOEM lease stipulations and NTLs (**Table 1**). The project will comply with all applicable federal, state, and local requirements concerning air pollutant emissions, discharges to water, and solid waste disposal. All project activities will be conducted under guidance by Chevron's OSRP and Safety and Environmental Management System. Additional information can be found in DOCD Section H.

G. Consultation

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

H. Preparers

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

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- John M. Tiggelaar II (Project Scientist);
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- Kristen L. Metzger (Library and Information Services Director).

I. References

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

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

Anderson, C.M., M. Mayes, and R. LaBelle. 2012. Update of Occurence Rates for Offshore Oil Spills. U.S. Department of the Interior, Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement. OCS Report BOEM 2012-069, BSEE 2012-069.

Azzara, A.J., W.M. von Zharen, and J.J. Newcomb. 2013. Mixed-methods analytic approach for determining potential impacts of vessel noise on sperm whale click behavior. Journal of the Acoustical Society of America 134(6): 4566-4574.

Baguley, J.G., P.A. Montagna, C. Cooksey, J.L. Hyland, H.W. Bang, C.L. Morrison, A. Kamikawa, P. Bennetts, G. Saiyo, E. Parsons, M. Herdener, and M. Ricci. 2015. Community response of deep-sea soft sediment metazoan meiofauna to the *Deepwater Horizon* blowout and oil Spill. Marine Ecology Progress Series 528: 127-140.

Barkaszi, M.J., M. Butler, R. Compton, A. Unietis, and B. Bennett. 2012. Seismic Survey Mitigation Measures and Marine Mammal ObserverRreports. New Orleans, LA. OCS Study BOEM 2012-015.

Barkaszi, M.J. and C.J. Kelly. 2019. Seismic Survey Mitigation Measures and Protected Species Observer Reports: Synthesis Reports. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study BOEM 2019-012. 141 pp + apps.

Barkuloo, J.M. 1988. Report on the Conservation Status of the Gulf of Mexico Sturgeon, *Acipenser oxyrinchus desotoi*. U.S. Department of the Interior, U.S. Fish and Wildlife Service. Panama City, FL.

Baum, J.K. and R.A. Myers. 2004. Shifting baselines and the decline of pelagic sharks in the Gulf of Mexico. Ecology Letters 7(2): 135-145.

Baum, J.K., E. Medina, J.A. Musick, and M. Smale. 2015. *Carcharhinus longimanus*. The IUCN Red List of Threatened species.

Beazley, M.J., R.J. Martinez, S. Rajan, J. Powell, Y.M. Piceno, L.M. Tom, G.L. Andersen, T.C. Hazen, J.D. Van Nostrand, J. Zhou, B. Mortazavi, and P.A. Sobecky. 2012. Microbial community analysis of a coastal salt marsh affected by the *Deepwater Horizon* oil spill. PLoS One 7(7): e41305.

Beerkircher, L., C.A. Brown, and V. Restrepo. 2009. Pelagic Observer Program Data Summary, Gulf of Mexico Bluefin Tuna (*Thunnus thynnus*) Spawning Season 2007 and 2008; and Analysis of Observer Coverage Levels. NOAA Technical Memorandum NMFS-SEFSC-588. 33 pp.

Bélanger, L. and J. Bédard. 1989. Responses of staging greater snow geese to human disturbance. Journal of Wildlife Management 53(3): 713-719.

Berry, M., D.T. Booth, and C.J. Limpus. 2013. Artificial lighting and disrupted sea-finding behaviour in hatchling loggerhead turtles (*Caretta caretta*) on the Woongarra coast, south-east Queensland, Australia. Australian Journal of Zoology 61(2): 137-145.

Biggs, D.C. and P.H. Ressler. 2000. Water column biology. In: Deepwater Program: Gulf of Mexico Deepwater Information Resources Data Search and Literature Synthesis. Volume I: Narrative Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049.

BirdLife International 2018. *Charadrius melodus*. The IUCN Red List of Threatened Species 2018.

Blackstock, S.A., J.O. Fayton, P.H. Hulton, T.E. Moll, K. Jenkins, S. Kotecki, E. Henderson, V. Bowman, S. Rider, and C. Martin. 2018. Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing. NUWC-NPT Technical Report August 2018. N.U.W.C. Division. Newport, Rhode Island. 109 pp.

Blackwell, S.B. and C.R. Greene Jr. 2003. Acoustic measurements in Cook Inlet, Alaska, during August 2001. Greeneridge Sciences, Inc., for NMFS, Anchorage, AK. 43 pp.

Bolle, L.J., C.A.F. de Jong, S.M. Bierman, P.J.G. Van Beek, O.A. van Keeken, P.W. Wessels, C.J.G. van Damme, H.V. Winter, D. de Haan, and R.P.A. Dekeling. 2012. Ccommon sole larvae survive high levels of pile-driving sound in controlled exposure experiments. PLoS One 7(3): e33052.

Bonde, R.K. and T.J. O'Shea. 1989. Sowerby's beaked whale (*Mesoplodon bidens*) in the Gulf of Mexico. Journal of Mammology 70: 447-449.

Brame, A.B., T.R. Wiley, J.K. Carlson, S.V. Fordham, R.D. Grubbs, J. Osborne, R.M. Scharer, D.M. Bethea, and G.R. Poulakis. 2019. Biology, ecology, and status of the smalltooth sawfish *Pristis pectinata* in the USA. Endangered Species Research 39: 9-23.

Brooke, S. and W.W. Schroeder. 2007. State of deep coral ecosystems in the Gulf of Mexico region: Texas to the Florida Straits, pp 271-306. In: S.E. Lumdsen, T.F. Hourigan, A.W. Bruckner and G. Dorr (Eds.). The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3, Silver Spring, MD.

Brooks, J.M., C. Fisher, H. Roberts, E. Cordes, I. Baums, B. Bernard, R. Church, P. Etnoyer, C. German, E. Goehring, I. McDonald, H. Roberts, T. Shank, D. Warren, S. Welsh, and G. Wolff. 2012. Exploration and Research of Northern Gulf of Mexico Deepwater Natural and Artificial Hard-Bottom Habitats with Emphasis on Coral Communities: Reefs, Rigs, And Wrecks — "Lophelia II" Interim Report. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study BOEM 2012-106.

Bruintjes, R. and A.N. Radford. 2013. Context-dependent impacts of anthropogenic noise on individual and social behaviour in a cooperatively breeding fish. Animal Behaviour 85(6): 1343-1349.

Bureau of Ocean Energy Management. 2011. Archaeology Survey Blocks. https://www.bsee.gov/sites/bsee.gov/files/reports/safety/surveyblocks.pdf

Bureau of Ocean Energy Management. 2012a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2012-2017. Western Planning Area Lease Sales 229, 233, 238, 246, and 248. Central Planning Area Lease Sales 227, 231, 235, 241, and 247. Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2012-019.

Bureau of Ocean Energy Management. 2012b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2012. Central Planning Area Lease Sale 216/222. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2012-058.

Bureau of Ocean Energy Management. 2013. Gulf of Mexico OCS Oil and Gas Lease Sales: 2013-2014. Western Planning Are Lease Sale 233. Central Planning Area 231. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2013-0118.

Bureau of Ocean Energy Management. 2014. Gulf of Mexico OCS Oil and Gas Lease Sales: 2015-2017. Central Planning Area Lease Sales 235, 241, and 247. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2014-655.

Bureau of Ocean Energy Management. 2015. Gulf of Mexico OCS Oil and Gas Lease Sales: 2016 and 2017. Central Planning Area Lease Sales 241 and 247; Eastern Planning Area Lease Sale 226. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2015-033.

Bureau of Ocean Energy Management. 2016a. Outer Continental Shelf Oil and Gas Leasing Program: 2017-2022. Final Programmatic Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EIA BOEM 2016-060.

Bureau of Ocean Energy Management. 2016b. Gulf of Mexico OCS Oil and Gas Lease Sale: 2016. Western Planning Area Lease Sale 248. Final Supplemental Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2016-005.

Bureau of Ocean Energy Management. 2016c. Essential Fish Habitat Assessment for the Gulf of Mexico. U.S. Department of the Interior. New Orleans, LA. OCS Report BOEM 2016-016.

Bureau of Ocean Energy Management. 2017a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022. Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261. Final Multisale Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-009.

Bureau of Ocean Energy Management. 2017b. Catastrophic Spill Event Analysis: High-Volume, Extended Duration Oil Spill Resulting from Loss of Well Control on the Gulf of Mexico Outer Continental Shelf. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report BOEM 2017-007.

Bureau of Safety and Environmental Enforcement. 2018. Offshore Incident Statistics. U.S. Department of the Interior, Bureau of Safety and Environmental Enforcement. https://www.bsee.gov/stats-facts/offshore-incident-statistics

Cada, G. 1990. A review of studies relating to the effects of propeller-type turbine passage on fish early life stages. North American Journal of Fisheries Management 10(4): 418-426.

Camhi, M.D., E.K. Pikitch, and E.A. Babcock, (eds) 2008. Sharks of the Open Ocean: Biology, Fisheries, and Conservation. Blackwell Publishing Ltd. Oxford, UK. 502 pp.

Camilli, R., C.M. Reddy, D.R. Yoerger, B.A. Van Mooy, M.V. Jakuba, J.C. Kinsey, C.P. McIntyre, S.P. Sylva, and J.V. Maloney. 2010. Tracking hydrocarbon plume transport and biodegradation at *Deepwater Horizon*. Science 330(6001): 201-204.

Carlson, J.K., J. Osborne, and T.W. Schmidt. 2007. Monitoring of the recovery of smalltooth sawfish, *Pristis pectinata*, using standardized relative indices of abundance. Biological Conservation 136: 195-202.

Carlson, J.K. and J. Osborne. 2012. Relative Abundance of Smalltooth Sawfish (*Pristis pectinata*) Based on Everglades National Park Creel Survey. NOAA Technical Memorandum NMFS-SEFSC-626. 15 pp.

Carr, A. 1996. Suwanee River sturgeon, pp 73-83. In: M.H. Carr, A Naturalist in Florida a Celebration of Eden. Yale University Press, New Haven, CT.

Carvalho, R., C.-L. Wei, G.T. Rowe, and A. Schulze. 2013. Complex depth-related patterns in taxonomic and functional diversity of polychaetes in the Gulf of Mexico. Deep Sea Research. Part I: Oceanographic Research Papers 80: 66-77.

Casper, B.M., P.S. Lobel, and H.Y. Yan. 2003. The hearing sensitivity of the little skate, *Raja erinacea*: a comparison of two methods. Environmental Biology of Fishes 68: 371-379.

Casper, B.M. and D.A. Mann. 2006. Evoked potential audiograms of the nurse shark (*Ginglymostoma cirratum*) and the yellow stingray (*Urobatis jamaicensis*). Environmental Biology of Fishes 76: 101-108.

Cave, E.J. and S.M. Kajiura. 2018. Effect of *Deepwater Horizon* crude oil water accommodated fraction on olfactory function in the Atlantic stingray, *Hypanus sabinus*. Scientific Reports 8:15786.

Centers for Disease Control and Prevention. 2010. Health Hazard Evaluation of *Deepwater Horizon* Response Workers. HETA 2010-0115. http://www.cdc.gov/niosh/hhe/pdfs/interim_report_6.pdf.

Clapp, R.B., R.C. Banks, D. Morgan-Jacobs, and W.A. Hoffman. 1982a. Marine Birds of the Southeastern United States and Gulf of Mexico. Part I. Gaviiformes through Pelicaniformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. FWS/OBS-82/01.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1982b. Marine Birds of the Southeastern United States and Gulf of Mexico. Part II. Anseriformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington DC. FWS/OBS 82/20.

Clapp, R.B., D. Morgan-Jacobs, and R.C. Banks. 1983. Marine Birds of the Southeastern United States and Gulf of Mexico. Part III. Charadriiformes. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC. FWS/OBS-83/30.

Continental Shelf Associates, Inc,. 1997. Characterization and Trends of Recreational and Commercial Fishing from the Florida Panhandle. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. USGS/BRD/CR 1997 0001 and OCS Study MMS 97-0020.

Continental Shelf Associates, Inc. 2002. Deepwater Program: Bluewater fishing and OCS Activity, Interactions Between the Fishing and Petroleum Industries in Deepwaters of the Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002-078.

Continental Shelf Associates, Inc. 2006. Effects of oil and gas exploration and development at selected continental slope sites in the Gulf of Mexico. Volume II: Technical report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2006-045.

Cruz-Kaegi, M.E. 1998. Latitudinal Variations in Biomass and Metabolism of Benthic Infaunal Communities. Ph.D. Dissertation, Texas A&M University, College Station, TX. 140 pp.

CSA International, Inc. 2007. Characterization of Northern Gulf Of Mexico Deepwater Hard-Bottom Communities with Emphasis on *Lophelia* Coral. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2007-044.

Daling, P.S., F. Leirvik, I.K. Almås, P.J. Brandvik, B.H. Hansen, A. Lewis, and M. Reed. 2014. Surface weathering and dispersability of MC252 crude oil. Marine Pollution Bulletin 15(87): 1-2.

Davis, R.W. and G.S. Fargion (Eds.). 1996. Distribution and Abundance of Cetaceans in The North-Central and Western Gulf of Mexico: Technical report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 96-0026.

Davis, R.W., W.E. Evans, and B. Würsig. 2000. Cetaceans, Sea Turtles, and Seabirds in the Northern Gulf of Mexico: Distribution, Abundance and Habitat Associations. Volume II: Technical Report. U.S. Geological Survey, Biological Resources Division, USGS/BRD/CR 1999 0006 and U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-003.

De Guise, S., M. Levin, E. Gebhard, L. Jasperse, L. Burdett Hart, C.R. Smith, S. Venn-Watson, R. Townsend, R. Wells, B. Balmer, E. Zolman, T. Rowles, and L. Schwacke. 2017. Changes in immune functions in bottlenose dolphins in the northern Gulf of Mexico associated with the *Deepwater Horizon* oil spill. Endangered Species Research 33: 291-303.

Demopoulos, A.W.J., J.R. Bourque, E. Cordes, and K.M. Stamler. 2016. Impacts of the *Deepwater Horizon* oil spill on deep-sea coral-associated sediment communities. Marine Ecology Progress Series 561(51-68).

Ditty, J.G. 1986. Ichthyoplankton in neritic waters of the northern Gulf of Mexico off Louisiana: Composition, relative abundance, and seasonality. Fishery Bulletin 84(4): 935-946.

Ditty, J.G., G.G. Zieske, and R.F. Shaw. 1988. Seasonality and depth distribution of larval fishes in the northern Gulf of Mexico above 26°00’N. Fishery Bulletin 86(4): 811-823.

Du, M. and J.D. Kessler. 2012. Assessment of the spatial and temporal variability of bulk hydrocarbon respiration following the *Deepwater Horizon* oil spill. Environmental Science and Technology 46: 10499-10507.

Dubinsky, E.A., M.E. Conrad, R. Chakraborty, M. Bill, S.E. Borglin, J.T. Hollibaugh, O.U. Mason, Y.M. Piceno, F.C. Reid, W.T. Stringfellow, L.M. Tom, T.C. Hazen, and G.L. Andersen. 2013. Succession of hydrocarbon-degrading bacteria in the aftermath of the *Deepwater Horizon* oil spill in the Gulf of Mexico. Environmental Science and Technology 47(19): 10860-10867.

Efroymson, R.A., J.P. Nicolette, and G.W. Sutter II. 2003. A Framework for Net Environmental Benefit Analysis for Remediation or Restoration of Petroleum-Contaminated Sites. ORNL/TM- 2003/17.

Efroymson, R.A., W.H. Rose, S. Nemeth, and G.W. Sutter II. 2000. Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft. Oak Ridge National Laboratory. Oak Ridge, TN. ORNL/TM-2000/289 ES-5048.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada, including Hawaii and Puerto Rico. Palo Alto, CA, Stanford University Press. 259 pp.

Electric Power Research Institute. 2000. Technical Evaluation of the Utility of Intake Approach Velocity as anIindicator of Potential Adverse Environmental Impact Under Clean Water Act Section 316(b). Technical Report 1000731.

Fertl, D., A.J. Schiro, G.T. Regan, C.A. Beck, and N. Adimey. 2005. Manatee occurence in the northern Gulf of Mexico, west of Florida. Gulf and Caribbean Research 17(1): 69-94.

Florida Fish and Wildlife Conservation Commission. nd. Florida Salt Marsh Vole, *Microtus pennsylvanicus dekecampbelli*. https://myfwc.com/wildlifehabitats/profiles/mammals/land/florida-salt-marsh-vole/

Florida Fish and Wildlife Conservation Commission. 2018a. Loggerhead Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/

Florida Fish and Wildlife Conservation Commission. 2018b. GreenTturtle Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/green-turtle/

Florida Fish and Wildlife Conservation Commission. 2018c. Leatherback Nesting in Florida. http://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/

Florida Fish and Wildlife Conservation Commission. 2018d. Florida's Endangered and Threatened Species. https://myfwc.com/media/1945/threatend-endangered-species.pdf

Flower Garden Banks National Marine Sanctuary. 2018. Manta Catalog. https://flowergarden.noaa.gov/science/mantacatalog.html

Foley, K.A., C. Caldow, and E.L. Hickerson. 2007. First confirmed record of Nassau Grouper *Epinephelus striatus* (Pisces: Serranidae) in the Flower Garden Banks National Marine Sanctuary. Gulf of Mexico Science 25(2): 162-165.

Fonseca, M., G.A. Piniak, and N. Cosentino-Manning. 2017. Susceptibility of seagrass to oil spills: A case study with eelgrass, *Zostera marina*, in San Francisco Bay, USA. Marine Pollution Bulletin 115(1-2): 29-38.

Fox, D.A., J.E. Hightower, and F.M. Parauka. 2000. Gulf Sturgeon Spawning Migration and Habitat in the Choctawhatchee River System, Alabama–Florida. Transactions of the American Fisheries Society 129(3): 811-826.

Fritts, T.H. and R.P. Reynolds. 1981. Pilot Study of the Marine Mammals, Birds, and Turtles In OCS Areas of the Gulf of Mexico. U.S. Department of the Interior, Fish and Wildlife Service, Biological Services Program. FWS/OBS 81/36.

Fugro USA Marine, Inc. 2018. Interim Geophysical Survey Interpretive Report. Anchor project. Fugro Document No. 02.17031201B-Geophys_Anchor.

Gallaway, B.J. and G.S. Lewbel. 1982. The Ecology of Petroleum FPUs in the Northwestern Gulf of Mexico: a Community Profile. U.S. Fish and Wildlife Service, Biological Services Program and U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. FWS/OBS-82/27 and USGS Open File Report 82-03. http://www.nwrc.usgs.gov/techrpt/82-27text.pdf

Gallaway, B.J., J.G. Cole, and R.G. Fechhelm. 2003. Selected Aspects of the Ecology of the Continental Slope Fauna of the Gulf of Mexico: A Synopsis of the Northern Gulf of Mexico Continental Slope Study, 1983-1988. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-072.

Geraci, J.R. and D.J. St. Aubin. 1990. Sea Mammals and Oil: Confronting the Risks. San Diego, CA, Academic Press. 282 pp.

Gitschlag, G., B. Herczeg, and T. Barcack. 1997. Observations of sea turtles and other marine life at the explosive removal of offshore oil and gas structures in the Gulf of Mexico. Gulf Research Reports 9(4): 247-262.

Gomez, C., J.W. Lawson, A.J. Wright, A.D. Buren, D. Tollit, and V. Lesage. 2016. A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. Canadian Journal of Zoology 94: 801-819.

Gulf of Mexico Fishery Management Council. 2005. Generic Amendment Number 3 for addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and adverse effects of fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp fishery of the Gulf of Mexico, United States waters red drum fishery of the Gulf of Mexico, reef fish fishery of the Gulf of Mexico coastal migratory pelagic resources (mackerels) in the Gulf of Mexico and South Atlantic, stone crab fishery of the Gulf of Mexico, spiny lobster in the Gulf of Mexico and South Atlantic, coral and coral reefs of the Gulf of Mexico. Tampa, FL. Gulf of Mexico Fishery Management Council. 104 pp. https://gulfcouncil.org/wp-content/uploads/March-2005-FINAL3-EFH-Amendment.pdf

Hamdan, L.J., J.L. Salerno, A. Reed, S.B. Joye, and M. Damour. 2018. The impact of the *Deepwater Horizon* blowout on historic shipwreck-associated sediment microbiomes in the northern Gulf of Mexico. Scientific Reports 8: 9057.

Haney, C.J., H.J. Geiger, and J.W. Short. 2014. Bird mortality from the *Deepwater Horizon* oil spill. Exposure probability in the Gulf of Mexico. Marine Ecology Progress Series 513: 225-237.

Hawkins, A.D. and A.N. Popper. 2014. Assessing the impact of underwater sounds on fishes and other forms of marine life. Acoustics Today. Spring 2014**:** 30-41.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel, B. Byrd, S. Chavez-Rosales, L.P. Garrison, J. Hatch, A. Henry, S.C. Horstman, J. Litz, M.C. Lyssikatos, K.D. Mullin, C. Orphanides, R.M. Pace, D.L. Palka, J. Powell, and F.W. Wenzel. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2018. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NE-258.

Hazen, T.C., E.A. Dubinsky, T.Z. DeSantis, G.L. Andersen, Y.M. Piceno, N. Singh, J.K. Jansson, A. Probst, S.E. Borglin, J.L. Fortney, W.T. Stringfellow, M. Bill, M.E. Conrad, L.M. Tom, K.L. Chavarria, T.R. Alusi, R. Lamendella, D.C. Joyner, C. Spier, J. Baelum, M. Auer, M.L. Zemla, R. Chakraborty, E.L. Sonnenthal, P. D'Haeseleer, H.Y. Holman, S. Osman, Z. Lu, J.D. Van Nostrand, Y. Deng, J. Zhou, and O.U. Mason. 2010. Deep-sea oil plume enriches indigenous oil-degrading bacteria. Science 330(6001): 204-208.

Higashi, G.R. 1994. Ten years of fish aggregating device (FAD) design development in Hawaii. Bulletin of Marine Science 55(2-3): 651-666.

Hildebrand, J.A. 2005. Impacts of anthropogenic sound, pp 101-124. In: J.E. Reynolds III, W.F. Perrin, R.R. Reeves, S. Montgomery and T.J. Ragen (Eds.). Marine Mammal Research: Conservation Beyond Crisis. Johns Hopkins University Press, Baltimore, MD.

Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395: 5-20.

Hildebrand, J.A., S. Baumann-Pickering, K.E. Frasier, J.S. Trickey, K.P. Merkens, S.M. Wiggins, M.A. McDonald, L.P. Garrison, D. Harris, T.A. Marques, and L. Thomas. 2015. Passive acoustic monitoring of beaked whale densities in the Gulf of Mexico. Scientific Reports 5: 16343.

Hinwood, J. 1994. Environmental Implications of Offshore Oil and Gas Development in Australia. Australian Petroleum Exporation Association, Sydney, Australia.

Holland, K.N. 1990. Horizontal and vertical movements of yellowfin and bigeye tuna associated with fish aggregating devices. Fishery Bulletin 88: 493-507.

Intergovernmental Panel on Climate Change. 2014. Climate Change 2014: Impacts, Adaptation and Vulnerability. http://www.ipcc.ch/report/ar5/wg2/.

International Association of Oil & Gas Producers. 2010. Risk Assessment Data Directory: Blowout Frequencies. OGP Report No. 434 2. 13 pp.

International Tanker Owners Pollution Federation Limited. 2018. Weathering. https://www.itopf.org/knowledge-resources/documents-guides/fate-of-oil-spills/weathering/.

Ji, Z.-G., W.R. Johnson, C.F. Marshall, and E.M. Lear. 2004. Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Report MMS 2004-026.

Jochens, A., D.C. Biggs, D. Benoit-Bird, D. Engelhaupt, J. Gordon, C. Hu, N. Jaquet, M. Johnson, R.R. Leben, B. Mate, P. Miller, J.G. Ortega-Ortiz, A. Thode, P. Tyack, and B. Würsig. 2008. Sperm Whale Seismic Study in The Gulf of Mexico: Synthesis Report. Minerals Management Service, U.S. Department of the Interior, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2008-006.

Johnsgard, P.A. 1990. Hawks, Eagles, and Falcons of North America; Biology and Natural History. Washington, D.C., Smithsonian Institution Press. 403 pp.

Keithly, W.R. and K.J. Roberts. 2017. Commercial and Recreational Fisheries of the Gulf of Mexico., pp 1039-1188. In: C.H. Ward (Ed.), Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill. Volume 2: Fish Resources, Fisheries, Sea Turtles, Avian Resources, Marine Mammals, Diseases and Mortalities. Springer, New York, NY.

Kennicutt, M.C. 2000. Chemical Oceanography, pp. 123-139. In: Continental Shelf Associates, Inc. Deepwater Program: Gulf of Mexico deepwater information resources data search and literature synthesis. Volume I: Narrative report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2000-049.

Kessler, J.D., D.L. Valentine, M.C. Redmond, M. Du, E.W. Chan, S.D. Mendes, E.W. Quiroz, C.J. Villanueva, S.S. Shusta, L.M. Werra, S.A. Yvon-Lewis, and T.C. Weber. 2011. A persistent oxygen anomaly reveals the fate of spilled methane in the deep Gulf of Mexico. Science 331: 312-315.

Ketten, D.R. and S.M. Bartol. 2005. Functional Measures of Sea Turtle Hearing. Woods Hole Oceanographic Institution: ONR Award No: N00014-02-0510.

Kyhn, L.A., S. Sveegaard, and J. Tougaard. 2014. Underwater noise emissions from a drillship in the Arctic. Marine Pollution Bulletin 86: 424-433.

Ladich, F. and R.R. Fay. 2013. Auditory evoked potential audiometry in fish. Reviews in Fish Biology and Fisheries 23(3): 317-364.

Lin, Q. and I.A. Mendelssohn. 2012. Impacts and recovery of the *Deepwater Horizon* oil spill on vegetation structure and function of coastal salt marshes in the northern Gulf of Mexico. Environmental Science and Technology 46(7): 3737-3743.

Liu, J., H.P. Bacosa, and Z. Liu. 2017. Potential environmental factors affecting oil-degrading bacterial populations in deep and surface waters of the northern Gulf of Mexico. Frontiers in Microbiology 7:2131.

Lohoefener, R., W. Hoggard, K.D. Mullin, C. Roden, and C. Rogers. 1990. Association of Sea Turtles with Petroleum FPUs in the North Central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 90-0025.

Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. Archives of Environmental Contamination and Toxicology 28(4): 417-422.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival, pp. 387-409. In: P.L. Lutz and J.A. Musick (Eds.). The Biology of Sea Turtles. CRC Press, Boca Raton, FL.

MacDonald, I.R. 2002. Stability and Change in Gulf of Mexico Chemosynthetic Communities. Volume II: Technical Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2002-036.

Main, C.E., H.A. Ruhl, D.O.B. Jones, A. Yool, B. Thornton, and D.J. Mayor. 2015. Hydrocarbon contamination affects deep-sea benthic oxygen uptake and microbial community composition. Deep Sea Research. Part I: Oceanographic Research Papers 100: 79-87.

Marine Mammal Commission. 2011. Assessing the Long-Term Effects of the BP *Deepwater Horizon* Oil Spill on Marine Mammals in the Gulf of Mexico: A statement of research needs. http://www.mmc.gov/wp-content/uploads/longterm_effects_bp_oilspil.pdf

Marshall, A., M.B. Bennett, G. Kodja, S. Hinojosa-Alvarez, F. Galvan-Magana, M. Harding, G. Stevens, and T. Kashiwagi. 2018. *Mobula birostris* (amended version of 2011 assessment). The IUCN Red List of Threatened Species.

Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig. 2000. A comparative review of entrainment survival studies at power plants in estuarine environments, pp. S295–S302. In: J. Wisniewski (Ed.), Environmental Science & Policy; Power Plants & Aquatic Resources: Issues and Assessment, Vol. 3, Supplement 1. Elsevier Science Ltd., New York, New York.

McDonald, T.L., F.E. Hornsby, T.R. Speakman, E.S. Zolman, K.D. Mullin, C. Sinclair, P.E. Rosel, L. Thomas, and L.H. Schwacke. 2017. Survival, density, and abundance of common bottlenose dolphins in Barataria Bay (USA) following the *Deepwater Horizon* oil spill. Endangered Species Research 33: 193-209.

McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. Journal of the Acoustical Society of America 131: 92-103.

McLaughlin, K.E. and H.P. Kunc. 2015. Changes in the acoustic environment alter the foraging and sheltering behaviour of the cichlid *Amititlania nigrofasciata*. Behavioural Processes 116: 75-79.

Mendelssohn, I.A., G.L. Andersen, D.M. Baltx, R.H. Caffey, K.R. Carman, J.W. Fleeger, S.B. Joyce, Q. Lin, E. Maltby, E.B. Overton, and L.P. Rozas. 2012. Oil impacts on coastal wetlands: Implications for the Mississippi River delta ecosystem after the *Deepwater Horizon* oil spill. BioScience 62(6): 562-574.

Mississippi Natural Heritage Program. 2018. Natural Heritage Program Online Database. Museum of Natural Science, Mississippi Deptartment of Wildlife, Fisheries, and Parks. https://www.mdwfp.com/museum/seek-study/heritage-program/nhp-online-data/

Møhl, B., M. Wahlberg, and P.T. Madsen. 2003. The monopulsed nature of sperm whale clicks. Journal of the Acoustical Society of America 114(2): 1143-1154.

Montagna, P.A., J.G. Baguley, C. Cooksey, and J.L. Hyland. 2016. Persistent impacts to the deep soft bottom benthos one year after the *Deepwater Horizon* event. Integrated Environmental Assessment and Management 13(2): 342-351.

Morrow, J.V.J., J.P. Kirk, K.J. Killgore, H. Rugillio, and C. Knight. 1998. Status and recovery of Gulf sturgeon in the Pearl River system, Louisiana-Mississippi. North American Journal of Fisheries Management 18: 798-808.

Mullin, K.D., W. Hoggard, C. Roden, R. Lohoefener, C. Rogers, and B. Taggart. 1991. Cetaceans on the Upper Continental Slope in the North-central Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 91-0027.

Mullin, K.D. 2007. Abundance of Cetaceans in the Oceanic Gulf of Mexico Based on 2003-2004 Ship Surveys. U.S. Department of Commerce, National Marine Fisheries Service, Southeast Fisheries Science Center. Pascagoula, MS.

National Marine Fisheries Service. 2007. Endangered Species Act, Section 7 Consultation – Biological Opinion. Gulf of Mexico Oil and Gas Activities: Five Year Leasing Plan for Western and Central Planning Areas 2007-2012. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. St. Petersburg, FL.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (*Caretta caretta*), Second Revision. https://repository.library.noaa.gov/view/noaa/3720

National Marine Fisheries Service. 2009a. Sperm Whale (*Physeter macrocephalus*) 5-Year Review: Summary and Evaluation. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Sustainable Fisheries, Highly Migratory Species Management Division. Silver Spring, MD.

National Marine Fisheries Service. 2009b. Smalltooth Sawfish Recovery Plan (*Pristis pectinata*). Prepared by the Smalltooth Sawfish Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 102 pp. https://repository.library.noaa.gov/view/noaa/15983

National Marine Fisheries Service. 2009c. Final Amendment 1 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan Essential Fish Habitat. Highly Migratory Species Management Division, Office of Sustainable Fisheries. Silver Spring, MD. http://pbadupws.nrc.gov/docs/ML1219/ML12195A241.pdf

National Marine Fisheries Service. 2010a. *Deepwater Horizon*/BP Oil Spill: Size and Percent Coverage of Fishing Area Closures Due to BP Oil Spill. http://sero.nmfs.noaa.gov/deepwater_horizon/size_percent_closure/index.html

National Marine Fisheries Service. 2010b. Final Recovery Plan For The Sperm Whale (*Physeter macrocephalus*). Silver Spring, MD. https://repository.library.noaa.gov/view/noaa/15976

National Marine Fisheries Service, U.S. Fish and Wildlife Service and Secretaría de Medio Ambiente y Recursos Naturales. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. https://www.fws.gov/kempsridley/Finals/kempsridley_revision2.pdf

National Marine Fisheries Service. 2011. Species of Concern: Atlantic Bluefin Tuna, *Thunnus thynnus*. https://www.fisheries.noaa.gov/species/western-atlantic-bluefin-tuna

National Marine Fisheries Service. 2014a. Sea Turtles, Dolphins, and Whales and The Gulf Of Mexico Oil Spill. https://www.fisheries.noaa.gov/national/marine-life-distress/deepwater-horizon-oil-spill-2010-sea-turtles-dolphins-and-whales

National Marine Fisheries Service. 2014b. Loggerhead Sea Turtle Critical Habitat in the Northwest Atlantic Ocean. https://www.fisheries.noaa.gov/resource/map/loggerhead-turtle-northwest-atlantic-ocean-dps-critical-habitat-map

National Marine Fisheries Service. 2014c. Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). https://www.fisheries.noaa.gov/species/gulf-sturgeon

National Marine Fisheries Service. 2015. Recovery Plan for Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*A. cervicornis*). Protected Resources Division, Southeast Regional Office,National Marine Fisheries Service. Saint Petersburg, FL. https://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/2160/final_acropora_recovery_plan.pdf

National Marine Fisheries Service. 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. NOAA Technical Memorandum NMFS-OPR-55.

National Marine Fisheries Service. 2018a. Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. NOAA Technical Memorandum NMFS-OPR-59.

National Marine Fisheries Service. 2018b. Oceanic Whitetip Shark. https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark

National Marine Fisheries Service. 2018c. Smalltooth Sawfish (*Pristis pectinata*) 5-Year Review: Summary and Evaluation of United States Distinct Population Segment of Smalltooth Sawfish. Southeast Regional Office, St. Petersburg, Florida. 63 pp. https://repository.library.noaa.gov/view/noaa/19253/Print

National Marine Fisheries Service. 2020. Endangered Species Act, Section 7 Consultation – Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. St. Petersburg, FL. https://www.fisheries.noaa.gov/resource/document/biological-opinion-federally-regulated-oil-and-gas-program-activities-gulf-mexico

National Oceanic and Atmospheric Administration. 2006. Fact Sheet: Small Diesel Spills (500-5,000 gallons). NOAA Scientific Support Team, Hazardous Materials Response and Assessment Division. Seattle, WA. http://rpitt.eng.ua.edu/Class/EffectsandFates/Module7/diesel%20fact%20sheet.pdf

National Oceanic and Atmospheric Administration. 2010. Oil and Sea Turtles. Biology, Planning, and Response. U.S. Department of Commerce, National Ocean Service, Office of Response and Restoration. 111 pp. http://response.restoration.noaa.gov/sites/default/files/Oil_Sea_Turtles.pdf

National Oceanic and Atmospheric Administration. 2011a. Joint Analysis Group. *Deepwater Horizon* oil spill: Review of preliminary data to examine subsurface oil in the vicinity of MC252#1, May 19 to June 19, 2010. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 25. http://service.ncddc.noaa.gov/rdn/www/media/documents/activities/jag-reports/NTR-NOS-ORR-25-082011.pdf

National Oceanic and Atmospheric Administration. 2011b. Joint Analysis Group, *Deepwater Horizon* oil spill: Review of R/V Brooks McCall data to examine subsurface oil. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 24. http://service.ncddc.noaa.gov/rdn/www/media/documents/activities/jag-reports/NTR-NOS-ORR-24-062011.pdf

National Oceanic and Atmospheric Administration. 2011c. Joint Analysis Group, *Deepwater Horizon* oil spill: Review of preliminary data to examine oxygen levels in the vicinity of MC252#1 May 8 to August 9, 2010. U.S. Department of Commerce, National Ocean Service. Silver Spring, MD. NOAA Technical Report NOS OR&R 26. http://service.ncddc.noaa.gov/rdn/www/media/documents/activities/jag-reports/NTR-NOS-ORR-26-082011.pdf

National Oceanic and Atmospheric Administration. 2014. Flower Garden Banks National Marine Sanctuary. http://flowergarden.noaa.gov/about/cnidarianlist.html

National Oceanic and Atmospheric Administration. 2016a. ADIOS 2 (Automated Data Inquiry for Oil Spills). http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/downloading-installing-and-running-adios.html

National Oceanic and Atmospheric Administration. 2016b. *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement. http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/

National Oceanic and Atmospheric Administration. 2017a. Small Diesel Spills (500 - 5,000 gallons). U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration. https://response.restoration.noaa.gov/sites/default/files/Small-Diesel-Spills.pdf

National Oceanic and Atmospheric Administration. 2017b. Oil Types. Office of Response and Restoration. http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/oil-types.html

National Oceanic and Atmospheric Administration. 2018. Giant Manta Ray. https://www.fisheries.noaa.gov/species/giant-manta-ray

National Oceanic and Atmospheric Administration. nd. Nassau Grouper. https://www.fisheries.noaa.gov/species/nassau-grouper

National Park Service. 2010. Breton Wilderness 300 km Radius. https://www.fws.gov/refuges/airquality/docs/Breton_WA300km.pdf

National Research Council. 2003a. Oil in the Sea III: Inputs, Fates, and Effects. Washington, DC. National Academy Press. 182 pp. + app.

National Research Council. 2003b. Ocean Noise and Marine Mammals. Washington, DC. National Academy Press. 204 pp.

National Wildlife Federation. 2016. Wildlife Library: Whooping Crane. http://www.nwf.org/wildlife/wildlife-library/birds/whooping-crane.aspx

Natural Resources Defense Council. 2014. A petition to list the Gulf of Mexico Bryde's whale (*Balaenoptera edeni*) as endangered under the Endangered Species Act. https://www.nrdc.org/sites/default/files/wil_14091701a.pdf

Nedwell, J.R. and B. Edwards. 2004. A Review of Measurements of Underwater Man-Made Noise carried out by Subacoustech Ltd, 1993 - 2003. Prepared by Subacoustech Report Reference: 565R00109, September 2004; prepared for ChevronTexaco Ltd, Total Final Elf Exploration UK PLC, DSTL, DTI, Shell UK.

Nedwell, J.R. and D. Howell. 2004. A Review of Offshore Windfarm Related Underwater Noise Sources. Report No. 544 R 0308. Subacoustech Ltd., Southampton, UK. 63 pp.

NOAA Fisheries (National Marine Fisheries Service). nd. Smalltooth Sawfish. https://www.fisheries.noaa.gov/species/smalltooth-sawfish.

Noirungsee, N., S. Hackbush, J. Viamonte, P. Bubenheim, A. Liese, and R. Muller. 2020. Influence of oil, dispersant, and pressure on microbial communities from the Gulf of Mexico. Nature Research: Scientific Reports. 10: 7079. https://doi.org/10.1038/s41598-020-63190-6.

Nowlin, W.D.J., A.E. Jochens, S.F. DiMarco, R.O. Reid, and M.K. Howard. 2001. Deepwater Physical Oceanography Reanalysis and Synthesis of Historical Data: Synthesis Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2001-064.

Operational Science Advisory Team, 2011. Summary Report for Fate and Effects of Remnant Oil Remaining in the Beach Environment. Prepared for Lincoln D. Stroh, Capt., U.S. Coast Guard, Federal On-Scene Coordinator, *Deepwater Horizon* MC252.

Pabody, C.M., R.H. Carmichael, L. Rice, and M. Ross. 2009. A new sighting network adds to 20 years of historical data on fringe West Indian Manatee (*Trichechus manatus*) populations in Alabama waters. Gulf of Mexico Science 1:52-61.

Picciulin, M., L. Sebastianutto, A. Codarin, A. Farina, and E.A. Ferrero. 2010. In situ behavioural responses to boat noise exposure of *Gobius cruentatus* (Gmelin, 1789; fam. Gobiidae) and *Chromis chromis* (Linnaeus, 1758; fam. Pomacentridae) living in a Marine Protected Area. Journal of Experimental Marine Biology and Ecology 386(1): 125-132.

Poot, H., B.J. Ens, H. de Vries, M.A. Donners, M.R. Wernand, and J.M. Marquenie. 2008. Green light for nocturnally migrating birds. Ecology and Society 13(2): 47.

Popper, A.N., A.D. Hawkins, R.R. Fay, D. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D. Zeddies, and W.N. Tavolga. 2014. Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report. ASA S3/SC1.4 TR-2014 prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. ASA Press, Springer.

Powers, S.P., F.J. Hernandez, R.H. Condon, J.M. Drymon, and C.M. Free. 2013. Novel pathways for injury from offshore oil spills: Direct, sublethal and indirect effects of the *Deepwater Horizon* oil spill on pelagic *Sargassum* communities. PLoS One 8(9): e74802.

Pritchard, P.C.H. 1997. Evolution, phylogeny, and current status, pp. 1-28. In: P.L. Lutz and J.A. Musick (Eds.), The Biology of Sea Turtles. CFC Press, Boca Raton, FL.

Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? Behavioral Ecology 25(5):1,022 - 021,030.

Ramseur, J.L. 2010. *Deepwater Horizon* Oil Spill: The Fate of the Oil. Congressional Research Service Report prepared for Members and COmmittees of Congress. http://cwc.lumcon.edu/wp-content/uploads/2012/09/BP-Oil-Spill-Fate-of-the-Oil.pdf

Rathbun, G.B. 1988. Fixed-wing airplane versus helicopter surveys of manatees. Marine Mammal Science 4(1): 71-75.

Reddy, C.M., J.S. Arey, J.S. Seewald, S.P. Sylva, K.L. Lemkau, R.K. Nelson, C.A. Carmichael, C.P. McIntyre, J. Fenwick, G.T. Ventura, A.S. Van Mooy, and R. Camilli. 2012. Composition and fate of gas and oil released to the water column during the *Deepwater Horizon* oil spill. Proceedings of the National Academy of Sciences of the United States of America 109(50):20229-20234.

Relini, M., L.R. Orsi, and G. Relini. 1994. An offshore buoy as a FAD in the Mediterranean. Bulletin of Marine Science 55(2-3): 1099-1105.

Reuscher, M.G., J.G. Baguley, N. Conrad-Forrest, C. Cooksey, J.L. Hyland, C. Lewis, P.A. Montagna, R.W. Ricker, M. Rohal, and T. Washburn. 2017. Temporal patterns of *Deepwater Horizon* impacts on the benthic infauna of the northern Gulf of Mexico continental slope. PLoS One 12(6): e0179923.

Richards, W.J., T. Leming, M.F. McGowan, J.T. Lamkin, and S. Kelley-Farga. 1989. Distribution of fish larvae in relation to hydrographic features of the Loop Current boundary in the Gulf of Mexico. ICES Marine Science Symposia 191: 169-176.

Richards, W.J., M.F. McGowan, T. Leming, J.T. Lamkin, and S. Kelley-Farga. 1993. Larval fish assemblages at the Loop Current boundary in the Gulf of Mexico. Bulletin of Marine Science 53(2): 475-537.

Richardson, W.J., C.R. Greene Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. San Diego, CA, Academic Press. 576 pp.

Rodgers, J.A. and S.T. Schwikert. 2002. Buffer-Zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft and Outboard-Powered Boats. Conservation Biology 16(1): 216-224.

Ronconi, R.A., K.A. Allard, and P.D. Taylor. 2015. Bird interactions with offshore oil and gas FPUs: Review of impacts and monitoring techniques. Journal of Environmental Management 147: 34-45.

Rosel, P.E., P. Corkeron, L. Engleby, D. Epperson, K.D. Mullin, M.S. Soldevilla, and B.L. Taylor. 2016. Status Review of Bryde's Whales (*Balaenoptera edeni*) in the Gulf of Mexico under the Endangered Species Act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center. NOAA Technical Memorandum NMFS-SEFSC-692. 133 pp.

Ross, S.W., A.W.J. Demopoulos, C.A. Kellogg, C.L. Morrison, M.S. Nizinski, C.L. Ames, T.L. Casazza, D. Gualtieri, K. Kovacs, J.P. McClain, A.M. Quattrini, A.Y. Roa-Varón, and A.D. Thaler. 2012. Deepwater Program: Studies of Gulf of Mexico Lower Continental Slope Communities Related to Chemosynthetic and Hard Substrate Habitats. U.S. Department of the Interior, U.S. Geological Survey. U.S. Geological Survey Open-File Report 2012-1032.

Rowe, G.T. and M.C. Kennicutt. 2009. Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology Study. Final Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2009-039.

Rudd, M.B., R.N.M. Ahrens, W.E. Pine III, and S.K. Bolden. 2014. Empirical spatially explicit natural mortality and movement rate estimates for the threatened Gulf Sturgeon (*Acipenser oxyrinchus desotoi*). Canadian Journal of Fisheries and Aquatic Sciences 71: 1407-1417.

Russell, R.W. 2005. Interactions Between Migrating Birds and Offshore Oil and Gas FPUs in the Northern Gulf of Mexico: Final Report. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2005-009.

Sadovy, Y. 1997. The case of the disappearing grouper; *Epinephelus striatus*, the Nassau grouper in the Caribbean and western Atlantic. Proceedings of the Gulf and Caribbean Fisheries Institute 45: 5-22.

Salmon, M. and J. Wyneken. 1990. Do swimming loggerhead sea turtles (*Caretta caretta L.*) use light cues for offshore orientation? Marine and Freshwater Behaviour and Physiology 17(4): 233-246.

Samuel, Y., S.J. Morreale, C.W. Clark, C.H. Greene, and M.E. Richmond. 2005. Underwater, low-frequency noise in a coastal sea turtle habitat. Journal of the Acoustical Society of America 117(3): 1465-1472.

Schwemmer, P., B. Mendel, N. Sonntag, V. Dierschke, and S. Garthe. 2011. Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning. Ecological Applications 21(5): 1851-1860.

Seitz, J.C. and G.R. Poulakis. 2006. Anthropogenic effects on the smalltooth sawfish (*Pristis pectinata*) in the United States. Marine Pollution Bulletin 52(11): 1533-1540.

Share the Beach. 2016. Nesting Season Statistics. http://www.alabamaseaturtles.com/nesting-season-statistics/

Shinn, E.A., B.H. Lidz, and C.D. Reich. 1993. Habitat impacts of offshore drilling: Eastern Gulf of Mexico. New Orleans, LA, U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. 73 pp.

Simões, T.N., A. Candido de Silva, and C. Carneiro de Melo Moura. 2017. Influence of artificial lights on the orientation of hatchlings of *Eretmochelys imbricata* in Pernambuco, Brazil. Zoologia 34: e13727.

Smultea, M.A., J.R. Mobley Jr., D. Fertl, and G.L. Fulling. 2008. An unusual reaction and other observations of sperm whales near fixed wing aircraft. Gulf and Caribbean Research 20: 75-80.

Stewart, J.D., M. Nuttall, E.L. Hickerson, and M.A. Johnson. 2018. Important juvenile manta ray habitat at Flower Garden Banks National Marine Sanctuary in the northwestern Gulf of Mexico. Marine Biology 165(111).

Stiles, M.L., E. Harrould-Kolieb, R. Faure, H. Tlitalo-Ward, and M.F. Hirschfield. 2007. Deep sea trawl fisheries of the southeast U.S. and Gulf of Mexico: rock shrimp, royal red shrimp, calico scallops. Oceana. New York, NY. 13 pp.

Sulak, K.J. and J.P. Clugston. 1998. Early life history stages of Gulf sturgeon in the Suwanee River, Florida. Transactions of the American Fisheries Society 127: 758-771.

Todd, V.L.G., W.D. Pearse, N.C. Tegenza, P.A. Lepper, and I.B. Todd. 2009. Diel echolocation activity of harbour porpoises (*Phocoena phocoena*) around North Sea offshore gas installations. ICES Journal of Marine Science 66: 734-745.

Turtle Island Restoration Network. 2020. Kemp's Ridley Sea Turtle Count on the Texas Coast. https://seaturtles.org/turtle-count-texas-coast/

Tuxbury, S.M. and M. Salmon. 2005. Competitive interactions between artificial lighting and natural cues during seafinding by hatchling marine turtles. Biological Conservation 121: 311-316.

U.S. Department of Homeland Security. 2014. U.S. Coast Guard Incident Management Handbook. COMDTPUB P3120.17B. S.o.D.p. U.S. Government Printing Office. Washington, D.C.

U.S. Environmental Protection Agency. 2016. Questions and answers about the BP oil spill in the Gulf Coast. https://archive.epa.gov/emergency/bpspill/web/html/qanda.html

U.S. Environmental Protection Agency. 2020. The Green Book Nonattainment Areas for Criteria Pollutants. https://www.epa.gov/green-book

U.S. Fish and Wildlife Service, Gulf States Marine Fisheries Commission and National Marine Fisheries Service. 1995. Gulf Sturgeon Recovery/Management Plan. U.S. Department of Interior, U.S. Fish and Wildlife Service, Southeast Region. Atlanta, GA. https://www.gsmfc.org/publications/WB-Sport%20Fish/Gulf%20Sturgeon%20Plan.PDF

U.S. Fish and Wildlife Service. 2001a. Florida Manatee Recovery Plan (*Trichechus manatus latirostris*), Third Revision. U.S. Department of the Interior, Southeast Region. Atlanta, GA. https://www.fws.gov/northflorida/Manatee/Recovery%20Plan/2001_FWS_Florida_Manatee_Recovery_Plan.pdf

U.S. Fish and Wildlife Service. 2001b. Endangered and threatened wildlife and plants; Endangered status for the Florida salt marsh vole. *Federal Register* 56(9):1457-1459.

U.S. Fish and Wildlife Service. 2003. Recovery plan for the Great Lakes Piping Plover (*Charadrius melodus*). U.S. Department of the Interior. Fort Snelling, MN. https://www.fws.gov/northeast/pafo/pdf/endspecies/PipingPlover_RecoveryPlan.pdf

U.S. Fish and Wildlife Service. 2007. International Recovery Plan: Whooping Crane (*Grus americana*), Third Revision. U.S. Department of the Interior. Albequerque, NM. https://digitalcommons.unl.edu/endangeredspeciesbull/45/

U.S. Fish and Wildlife Service. 2010. Beach-nesting birds of the Gulf. http://www.fws.gov/home/dhoilspill/pdfs/DHBirdsOfTheGulf.pdf

U.S. Fish and Wildlife Service. 2011. FWS *Deepwater Horizon* Oil Spill Response. Bird Impact Data and Consolidated Wildlife Reports. *Deepwater Horizon* Bird Impact Data from the DOI-ERDC NRDA Database 12 May 2011. http://www.fws.gov/home/dhoilspill/pdfs/Bird%20Data%20Species%20Spreadsheet%2005122011.pdf

U.S. Fish and Wildlife Service. 2016a. Hawksbill Sea Turtle (*Eretmochelys imbricata*). http://www.fws.gov/northflorida/SeaTurtles/Turtle%20Factsheets/hawksbill-sea-turtle.htm

U.S. Fish and Wildlife Service. 2016b. Find Endangered Species. http://www.fws.gov/endangered/

U.S. Fish and Wildlife Service. 2014. West Indian Manatee (Trichechus manatus) Florida Stock (Florida subspecies, *Trichechus manatus latirostris*). Jacksonville, Florida.

U.S. Fish and Wildlife Service. 2020. Whooping Crane Survey Results: Winter 2019-2020. https://www.fws.gov/uploadedFiles/WHCR%20Update%20Winter%202019-2020b.pdf

U.S. Fish and Wildlife Service. nd. All About Piping Plovers. http://www.fws.gov/plover/facts.html

Valentine, D.L., G.B. Fisher, S.C. Bagby, R.K. Nelson, C.M. Reddy, S.P. Sylva, and M.A. Woo. 2014. Fallout plume of submerged oil from *Deepwater Horizon*. Proceedings of the National Academy of Sciences USA 111(45): 906-915.

Van de Laar, F.J.T. 2007. Green Lights to Birds: Investigations into the Effect of Bird Friendly Lighting. NAM bv/Assen (NDL), NAM LOCATIE L15-FA-1, S: 22.

Wakeford, A. 2001. State of Florida Conservation Plan for Gulf sturgeon (*Acipencer oxyrinchus desotoi*). Florida Marine Research Institute Technical Report TR-8.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E.e. Rosel. 2016. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2015. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS NE 238.

Wartzok, D. and D.R. Ketten. 1999. Marine mammal sensory systems, pp 117-175. In: J.E. Reynolds III and S. Rommel (Eds.). Biology of Marine Mammals. Smithsonian Institution Press, Washington, DC.

Washburn, T.W., M.G. Reuscher, P.A. Montagna, and C. Cooksey. 2017. Macrobenthic community structure in the deep Gulf of Mexico one year after the *Deepwater Horizon* blowout. Deep-Sea Research Part I: Oceanographic Research Papers 127:21-30.

Wei, C.-L. 2006. The Bathymetric Zonation and Community Structure of Deep-Sea Macrobenthos in The Northern Gulf of Mexico. M.S. Thesis, Texas A&M University. http://repository.tamu.edu/handle/1969.1/4927

Wei, C.-L., G.T. Rowe, G.F. Hubbard, A.H. Scheltema, G.D.F. Wilson, I. Petrescu, J.M. Foster, M.K. Wickstein, M. Chen, R. Davenport, Y. Soliman, and Y. Wang. 2010. Bathymetric zonation of deep-sea macrofauna in relation to export of surface phytoplankton production. Marine Ecology Progress Series 39: 1-14.

Wiese, F.K., W.A. Montevecchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil FPUs in the north-west Atlantic. Marine Pollution Bulletin 42(12): 1285-1290.

Wilson, C.A., A. Pierce, and M.W. Miller. 2003. Rigs and Reefs: A Comparison of the Fish Communities at Two Artificial Reefs, a Production FPU, and a Natural Reef in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2003-009.

Wilson, C.A., M.W. Miller, Y.C. Allen, K.M. Boswell, and D.L. Nieland. 2006. Effects of Depth, Location, and Habitat Type on Relative Abundance and Species Composition of Fishes Associated with Petroleum FPUs and Sonnier Bank in the Northern Gulf of Mexico. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. OCS Study MMS 2006-037.

Wilson, J. 2003. Manatees in Louisiana. Louisiana Conservationist July/August 2003: 7 pp.

Würsig, B., S.K. Lynn, T.A. Jefferson, and K.D. Mullin. 1998. Behaviour of cetaceans in the northern Gulf of Mexico relative to survey ships and aircraft. Aquatic Mammals 24(1): 41-50.

Würsig, B., T.A. Jefferson, and D.J. Schmidly. 2000. The Marine Mammals of the Gulf of Mexico. College Station, TX, Texas A&M University Press. 232 pp.

Young, C.N. and J.K. Carlson. 2020. The biology and conservation status of the oceanic whitetip shark (*Carcharhinus longimanus*) and future directions for recovery. Reviews in Fish Biology and Fisheries. 30:293-321.