

UNITED STATES GOVERNMENT
MEMORANDUM

January 24, 2024

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

Subject: Public Information copy of plan
Control # - N-10231
Type - Initial Exploration Plan
Lease(s) - OCS-G36021 Block - 198 Green Canyon Area
Operator - QuarterNorth Energy LLC
Description - Subsea Wells A, B, C
Rig Type - Not Found

Attached is a copy of the subject plan.

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

Nawaz Khasraw
Plan Coordinator

Site Type/Name	Botm Lse/Area/Blk	Surface Location	Surf Lse/Area/Blk
WELL/A	G36021/GC/198	7736 FSL, 2866 FEL	G36021/GC/198
WELL/B	G36021/GC/198	558 FSL, 7736 FEL	G36021/GC/198
WELL/C	G36021/GC/198	5418 FSL, 5458 FEL	G36021/GC/198

INITIAL EXPLORATION PLAN

LEASE OCS-G 36021 GREEN CANYON BLOCK 198

Substantive changes to the Initial Exploration Plan are noted in the table below.

Record of Change:

Date	Summary of Change
11/01/23	Section A – Updated proposed spud date to 02/01/24
11/30/23	Section A – Updated Oil Storage Tanks/Production Vessels w/ 25 bbls of more Section N – Added Diesel Oil Supply Vessels Section P – Updated CZM Consistency Certification

Submitted by:

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**SECTION A
PLAN CONTENTS**

(a) Description, objectives, and schedule

QuarterNorth Energy LLC (QNE) submits this Initial Exploration Plan for the Drilling, Testing and Temporary Abandonment for Well Locations A, B & C, in Lease OCS-G 36021, Green Canyon Block 198. An OCS Plan Information Form, “Form BOEM-0137” is included under this section with further activity descriptions as **Attachment A-1**.

QuarterNorth Energy LLC acquired Lease OCS-G 36021 on June 1, 2017. Lease OCS-G 36021 has an expiration date of May 31, 2024 and has not been drilled nor developed to date; therefore there are no existing approved permits.

The anticipated spud date is February 1, 2024. If commercial quantities of hydrocarbons are discovered, a Development Operations Coordination Document will be submitted for approval.

(b) Location

A Well Location Map showing the proposed surface location of each well is included in this plan as **Attachment A-2**. The vessel types planned for the drilling of this well are dynamically positioned, therefore no anchors.

(c) Drilling unit

QuarterNorth will use a DP Drillship or DP Semisubmersible with subsea BOP’s, and will comply with all of the regulations of the ABS, IMO and USCG. All drilling operations will be conducted under the provisions of 30 CFR, Part 250, Subpart D, and other applicable regulations and notice to lessees, including those regarding the avoidance of potential drilling hazards and safety and pollution prevention control. Such measures as inflow detection and well control, monitoring for loss of circulation and seepage loss, and casing design will be our primary safety measures.

Pollution prevention measures include installation of curbs, gutters, drip pans, and drains on drilling deck areas to collect all contaminants and debris. All discharges will be in accordance with applicable EPA NPDES permits.

Oil Storage Tanks and/or Production Vessels with 25 bbls or more – Drillship

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel	Drillship	5570 bbls	7	38990 bbls	33°

Oil Storage Tanks and/or Production Vessels with 25 bbls or more – DP Semisubmersible

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel	Semi	5000 bbls	6	30000 bbls	33°

(d) Service fee

A Pay.gov receipt in the amount of \$13,044.00 is enclosed as **Attachment A-3** to cover the cost and processing fee for the proposed operations being conducted under this plan.

ATTACHMENTS:

- 1) Attachment A-1 - Form BOEM-137
- 2) Attachment A-2 – Location Plat (Well Locations A, B & C)
- 3) Attachment A-3 – Pay.gov Receipt

OCS PLAN INFORMATION FORM

General Information										
Type of OCS Plan:	<input checked="" type="checkbox"/>	Exploration Plan (EP)	Development Operations Coordination Document (DOCD)							
Company Name: QuarterNorth Energy LLC			BOEM Operator Number: 03672							
Address:			Contact Person: Melissa Guidry							
3737 Buffalo Speedway, Suite 800			Phone Number: 713-969-1310							
Houston, Texas 77098			E-Mail Address: melissa.guidry@qenergy.com							
If a service fee is required under 30 CFR 550.125(a), provide the				Amount paid	\$13,044.00	Receipt No.	278PV3KP			
Project and Worst Case Discharge (WCD) Information										
Lease(s): OCS-G 36021		Area: GC		Block: 998		Project Name (If Applicable): Talon				
Objective(s)		<input checked="" type="checkbox"/>	Oil	<input checked="" type="checkbox"/>	Gas	<input type="checkbox"/>	Sulphur	<input type="checkbox"/>	Salt	Onshore Support Base(s): QNE DW SB OSS Dock, Port Fourchon, LA
Platform/Well Name: Well Loc A, B or C		Total Volume of WCD: 556,500				API Gravity: 34.3°				
Distance to Closest Land (Miles): 89				Volume from uncontrolled blowout: 556,500						
Have you previously provided information to verify the calculations and assumptions for your WCD?							Yes	<input checked="" type="checkbox"/>	No	
If so, provide the Control Number of the EP or DOCD with which this information was provided										
Do you propose to use new or unusual technology to conduct your activities?							Yes	<input checked="" type="checkbox"/>	No	
Do you propose to use a vessel with anchors to install or modify a structure?							Yes	<input checked="" type="checkbox"/>	No	
Do you propose any facility that will serve as a host facility for deepwater subsea development?							Yes	<input checked="" type="checkbox"/>	No	
Description of Proposed Activities and Tentative Schedule (Mark all that apply)										
Proposed Activity				Start Date		End Date		No. of Days		
Exploration Drill, Well Test & Temporary Abandonment				02/01/24		04/16/24		75		
Description of Drilling Rig					Description of Structure					
<input type="checkbox"/>	Jackup	<input checked="" type="checkbox"/>	Drillship		<input type="checkbox"/>	Caisson	<input type="checkbox"/>	Tension leg platform		
<input type="checkbox"/>	Gorilla Jackup	<input type="checkbox"/>	Platform rig		<input type="checkbox"/>	Fixed platform	<input type="checkbox"/>	Compliant tower		
<input type="checkbox"/>	Semisubmersible	<input type="checkbox"/>	Submersible		<input type="checkbox"/>	Spar	<input type="checkbox"/>	Guyed tower		
<input checked="" type="checkbox"/>	DP Semisubmersible	<input type="checkbox"/>	Other (Attach Description)		<input type="checkbox"/>	Floating production system	<input type="checkbox"/>	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)		

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

Proposed Well/Structure Location										
Well or Structure Name/Number (If renaming well or structure, reference previous name): Well Loc A				Previously reviewed under an approved EP or DOCD?			Yes	<input checked="" type="checkbox"/>	No	
Is this an existing well or structure?		Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	If this is an existing well or structure, list the Complex ID or API No.			N/A	
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?							<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 556,500 bbls/day			For structures, volume of all storage and pipelines (Bbls): 0			API Gravity of fluid			
Surface Location				Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS OCS-G 36021			OCS			OCS OCS			
Area Name	Green Canyon									
Block No.	198									
Blockline Departures (in feet)	N/S Departure: F <u> </u> L			N/S Departure: F <u> </u> L			N/S Departure: F <u> </u> L		F <u> </u> L	
	7736'						N/S Departure: F <u> </u> L		F <u> </u> L	
	E/W Departure: F <u> </u> L			E/W Departure: F <u> </u> L			E/W Departure: F <u> </u> L		F <u> </u> L	
	2866'						E/W Departure: F <u> </u> L		F <u> </u> L	
Lambert X-Y coordinates	X: 2,331,346			X:			X:			
	Y: 10,081,374			Y:			Y:			
Latitude/ Longitude	Latitude 27° 45' 53.3118"			Latitude			Latitude		Latitude	
	Longitude -90° 51' 47.0124"			Longitude			Longitude		Longitude	
Water Depth (Feet):				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet:								MD (Feet):		TVD (Feet):
Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)										
Anchor Name or No.	Area	Block	X Coordinate	Y Coordinate	Length of Anchor Chain on Seafloor					
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						

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

Proposed Well/Structure Location										
Well or Structure Name/Number (If renaming well or structure, reference previous name): Well Loc B					Previously reviewed under an approved EP or DOCD?			Yes	No	X
Is this an existing well or structure?		Yes	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): 556,500 bbls/day			For structures, volume of all storage and pipelines (Bbls): 0			API Gravity of fluid			
Surface Location				Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS OCS-G 36021			OCS			OCS OCS			
Area Name	Green Canyon									
Block No.	198									
Blockline Departures (in feet)	N/S Departure: F <u> </u> L 558'			N/S Departure: F <u> </u> L			N/S Departure: F <u> </u> L N/S Departure: F <u> </u> L N/S Departure: F <u> </u> L			
	E/W Departure: F <u> </u> L 7736'			E/W Departure: F <u> </u> L			E/W Departure: F <u> </u> L E/W Departure: F <u> </u> L E/W Departure: F <u> </u> L			
Lambert X-Y coordinates	X: 2,336,216			X:			X: X: X:			
	Y: 10,074,798			Y:			Y: Y: Y:			
Latitude/ Longitude	Latitude 27° 44' 47.3748"			Latitude			Latitude Latitude Latitude			
	Longitude -90° 50' 54.099"			Longitude			Longitude Longitude Longitude			
Water Depth (Feet):				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet:							MD (Feet):		TVD (Feet):	
Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)										
Anchor Name or No.	Area	Block	X Coordinate	Y Coordinate	Length of Anchor Chain on Seafloor					
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						

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

Proposed Well/Structure Location										
Well or Structure Name/Number (If renaming well or structure, reference previous name): Well Loc C					Previously reviewed under an approved EP or DOCD?			Yes	No	X
Is this an existing well or structure?		Yes	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): 556,500 bbls/day			For structures, volume of all storage and pipelines (Bbls): 0			API Gravity of fluid			
Surface Location				Bottom-Hole Location (For Wells)			Completion (For multiple completions, enter separate lines)			
Lease No.	OCS OCS-G 36021			OCS			OCS OCS			
Area Name	Green Canyon									
Block No.	198									
Blockline Departures (in feet)	N/S Departure: F <u> </u> L			N/S Departure: F <u> </u> L			N/S Departure: F <u> </u> L		N/S Departure: F <u> </u> L	
	5418'						N/S Departure: F <u> </u> L		N/S Departure: F <u> </u> L	
	E/W Departure: F <u> </u> L			E/W Departure: F <u> </u> L			E/W Departure: F <u> </u> L		E/W Departure: F <u> </u> L	
	5458'						E/W Departure: F <u> </u> L		E/W Departure: F <u> </u> L	
Lambert X-Y coordinates	X: 2,333,938			X:			X:		X:	
	Y: 10,079,658			Y:			Y:		Y:	
Latitude/ Longitude	Latitude 27° 45' 35.8806"			Latitude			Latitude		Latitude	
	Longitude -90° 51' 18.4998"			Longitude			Longitude		Longitude	
Water Depth (Feet):				MD (Feet):		TVD (Feet):		MD (Feet):		TVD (Feet):
Anchor Radius (if applicable) in feet:								MD (Feet):		TVD (Feet):
Anchor Locations for Drilling Rig or Construction Barge (If anchor radius supplied above, not necessary)										
Anchor Name or No.	Area	Block	X Coordinate	Y Coordinate	Length of Anchor Chain on Seafloor					
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						
			X =	Y =						

90°52'0"W

90°50'0"W

Y = 10,090,080

27°46'0"N

X = 2,328,480

X = 2,344,320

PSLA
 X = 2,331,346
 Y = 10,081,374
 Lat. = 27.76480946°N
 Long. = 90.86305890°W
 W.D. = 2,599 ft

PSL C
 X = 2,333,938
 Y = 10,079,658
 Lat. = 27.75996669°N
 Long. = 90.85513933°W
 W.D. = 2,656 ft

PSL B
 X = 2,336,216
 Y = 10,074,798
 Lat. = 27.74649329°N
 Long. = 90.84836099°W
 W.D. = 2,811 ft

198
G36021

2,866 ft

PSLA

5,458 ft

PSL C

7,134 ft

5,418 ft

7,736 ft

558 ft

Y = 10,074,240



2330000

2335000

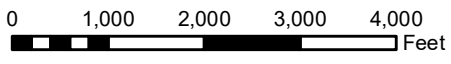
2340000

QUARTER NORTH
ENERGY

GC198 'Talon' Prospect
Gulf of Mexico

**PSLs FOR A, B, AND C
PUBLIC PLAT**

Coordinate System: NAD 1927 BLM Zone 15N
 Projection: Transverse Mercator
 Datum: North American 1927
 False Easting: 1,640,416.6667
 False Northing: 0.0000
 Central Meridian: -93.0000
 Scale Factor: 0.9996
 Latitude Of Origin: 0.0000
 Units: Foot US



Date: 10/16/2023

Author: Kevin Gallatin

Document Name: GC198_Talon_EP_Public_Plat_20231011_KDG

Pay.gov Payment Confirmation: BOEM Exploration Plan - BF

notification@pay.gov <notification@pay.gov>

Wed 10/25/2023 8:06 AM

To:Melissa Guidry <melissa.guidry@qenergy.com>

External: This Email is from an external sender. Be alert for Phishing. Do not click links if you do not know the sender.



An official email of the United States government

Your payment has been submitted to Pay.gov and the details are below. If you have any questions regarding this payment, please contact Brenda Dickerson at (703) 787-1617 or BseeFinanceAccountsReceivable@bsee.gov.

Application Name: BOEM Exploration Plan - BF
Pay.gov Tracking ID: 278PV3KP
Agency Tracking ID: 76531516187
Transaction Type: Sale
Transaction Date: 10/25/2023 09:06:39 AM EDT
Account Holder Name: Brenda Montalvo
Transaction Amount: \$13,044.00
Card Type: MasterCard
Card Number: *****9382

Region: Gulf of Mexico
Contact: Melissa Guidry (713) 969-1310
Company Name/No: QuarterNorth Energy LLC, 03672
Lease Number(s): 36021
Area-Block: Green Canyon GC,198
Surface Locations: 3

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**SECTION B
GENERAL INFORMATION**

(a) Applications and permits

No additional applications or permits from other agencies are required to be submitted and/or approved at this time. An Application for Permit to Drill (APD) will be submitted to the Bureau of Safety and Environmental Enforcement (BSEE's) Houma District Office for approval.

(b) Drilling fluids

The drilling fluids for the proposed operations being conducted under this plan are described in Table 1 under Section F of this plan.

(c) Chemical products

Chemical product information is not required for this Initial EP per NTL No. 2008-G04.

(d) New or unusual technology

New or unusual will not be used for the proposed drilling operations.

(e) Bonds, oil spill financial responsibility, and well control statements -

The bond requirements for the activities and facilities proposed in this EP are satisfied by a \$3,000,000.00 area-wide bond, furnished and maintained according to 30 CFR 556.901; NTL No. 2015-BOEM-N04 "General Financial Assurance;" and additional security under 30 CFR 556.901 (d) - (f) and NTL No. 2016-BOEM N01, "Requiring Additional Security."

QuarterNorth Energy LLC (BOEM company number 03672) has demonstrated oil spill financial responsibility for the facilities proposed in this Initial EP according to 30 CFR Part 553; and NTL No. 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities."

(f) Suspension of operations

QuarterNorth has not filed and does not anticipate filing a request for Suspension of Production for Lease OCS-G 36021.

(g) Blowout scenario

Proprietary Information.

SECTION C
GEOLOGICAL AND GEOPHYSICAL INFORMATION

(a) Geological description

Proprietary Information.

(b) Structure contour maps

Proprietary Information.

(c) Two dimensional (2-D) or three-dimensional (3-D) seismic lines

Proprietary Information.

(d) Geological cross-sections

Proprietary Information.

(e) Shallow hazards report

An Archaeological Assessment was prepared by Fugro Geoservices, Inc., Report No. 2408-5004 for Green Canyon Block 198 by and is enclosed as **Attachment C-9**.

(f) Shallow hazards assessment

A shallow hazards assessment was prepared by Geoscience Earth & Marine Services, Inc., Project No. 0408-1483 for the proposed surface locations and is included as **Attachment C-10**.

(g) High resolution seismic lines

Proprietary Information.

(h) Stratigraphic column

Proprietary Information.

(i) Time-versus depth chart

Sufficient well control data for the target areas proposed in this EP exists; therefore, seismic time versus depth tables for the proposed well locations are not required.

(j) Geochemical information.

Geochemical information is not required for this Initial EP per NTL No. 2008-G04.

(k) Future G&G activities -

Future G&G information is not required for this Initial EP per NTL No. 2008-G04.

ATTACHMENTS:

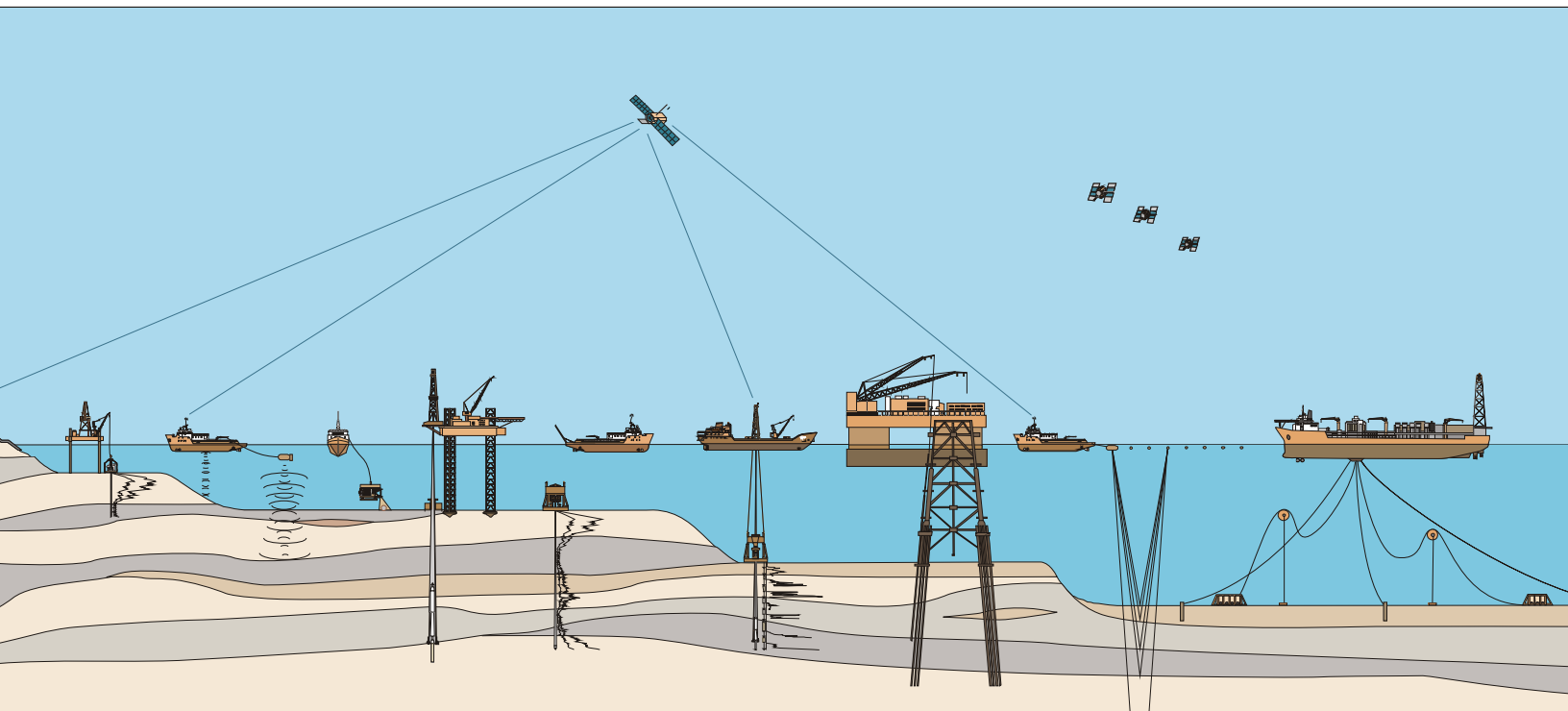
- 1) Attachments C-1 through C-2 - Structure Contour Maps (Proprietary)
- 1) Attachments C-3 through C-5 - Seismic Lines (Proprietary)
- 2) Attachments C-6 through C-8 – Geological Cross Section (Proprietary)
- 3) Attachment C-9 – Shallow Hazards Report
- 4) Attachment C-10 – Shallow Hazards Assessment Report
- 5) Attachment C-11 – High Resolution Seismic Lines (Proprietary)
- 6) Attachment C-12 – Stratigraphic Column (Proprietary)



DAVIS OFFSHORE

**ARCHAEOLOGICAL ASSESSMENT
BLOCK 198 & VICINITY
GREEN CANYON AREA
GULF OF MEXICO**

**REPORT No. 2408-5004
JULY 2008**



**ARCHAEOLOGICAL ASSESSMENT
BLOCK 198 & VICINITY
GREEN CANYON AREA
GULF OF MEXICO**

Report No.: 2408-5004

Client:

Davis Offshore
1360 Post Oak Blvd.
Suite 2400
Houston, Texas 77056

Date of Survey:

June 8-12, 2008

Date of Report:

July 3, 2008

Report No. 2408-5004
July 3, 2008

Davis Offshore
1360 Post Oak Blvd.
Suite 2400
Houston, TX 77056

Attention: Mark Gillespie

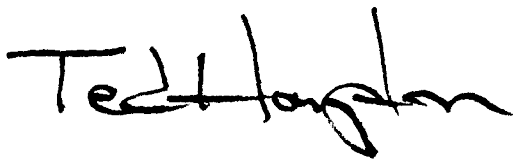
**Archaeological Assessment
Block 198 & Vicinity
Green Canyon Area
Gulf of Mexico**

We are pleased to present this final report detailing the Archaeological Assessment for Block 198 and vicinity, Green Canyon Area. This report complies with the latest guidelines established by the Minerals Management Service (MMS). An archaeological assessment of the geophysical data was prepared since the study area lies within the recently designated high probability zones for the occurrence of historic shipwrecks requiring 300-meter line spacing. Findings submitted in this archaeological assessment are based on the interpretation of side scan sonar, analog subbottom profiler, and multibeam bathymetry data sets.

We appreciate the opportunity to work with you on this project and look forward to continuing as your geohazard consultants. Please contact us (337-268-3357) if you have any questions or if we can be of further assistance.



[Ray Blackmon](#)
Staff Archaeologist



[Ted Hampton](#)
Marine Archaeologist

FUGRO GEOSERVICES, INC.

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Figure No. 1 Sonar Record (seafloor / wells / linear debris / drill splay)	
Figure No. 2 Sonar Record (seafloor / linear debris / drag scars)	
APPENDIX B: Sonar Contact Table	
APPENDIX C: Water Column Velocity Data	
APPENDIX D: Instrument Settings & Personnel	
Boat Setback Diagram	
Equipment Descriptions	
<i>R/V Fugro Enterprise</i>	
FUGRO STARFIX® Differential Global Positioning System	
FUGRO STARFIX® Positioning and Navigation Software	
Kongsberg Hugin 3000 AUV	
Kongsberg EM2000 multibeam bathymetry	
EdgeTech Full Spectrum side scan sonar	
EdgeTech Full Spectrum chirp subbottom profiler	
Kongsberg HiPAP 500 Acoustic Positioning System	
Seacat SBE-19-01 Velocimeter	
SonarWiz Side Scan Sonar Recording System	
SonarWiz Subbottom Profiler Recording System	
Geophysical Job Logs	
STUDY MAPS	
Map 1 Archaeological & Bathymetry Map.....	1" = 1,000'
Map 2 Sonar Mosaic Map.....	1" = 1,000'

ARCHAEOLOGICAL ASSESSMENT

Introduction

This report presents the evaluation of the high-resolution geophysical survey data collected within Block 198 and vicinity (Blocks 153, 154, 155, 197, 199, 241, 242, and 243), Green Canyon Area, offshore Louisiana. The data have been assessed for evidence of shipwrecks. The entire survey falls within the newly designated high probability zone for the occurrence of shipwrecks within Green Canyon Area requiring 300-meter line spacing ([U.S. Department of the Interior, Mineral Management Service \[USDI MMS\] 2005](#)).

NTL-2007-G01 and NTL-2005-G07 stipulate that analysis of potential hazards and cultural resources may be made from available geophysical and geological data. This archaeological assessment is based on a 2008 Fugro GeoServices, Inc. survey as well as a 2007 C & C Technologies survey. Findings submitted in this report are based on the interpretation of side scan sonar, magnetometer, subbottom profiler, and bathymetric data sets. The final report for the 2007 C & C Technologies survey was prepared in February of 2007 by Kimberly Eslinger (Marine Archaeologist).

Fugro GeoServices, Inc. was contracted by Davis Offshore to conduct a deepwater survey and Archaeological Assessment within Block 198 and vicinity, Green Canyon Area. Fugro GeoServices, Inc. was also contracted by Noble Energy to conduct a deepwater survey and Archaeological Assessment within Block 154 and vicinity, Green Canyon Area. Due to the close proximity of the two surveys, both the Davis Offshore survey and the Noble Energy survey were acquired as one comprehensive survey.

Fugro GeoServices, Inc. (FGSI) acquired the high-resolution geophysical survey data utilizing FGSI's Autonomous Underwater Vehicle (AUV) aboard the *R/V Fugro Enterprise* from June 8-12, 2008. Sea conditions during data acquisition were variable with winds from 5 to 25 knots and seas from 2 to 7 feet. The quality of the collected geophysical data was good, and the data were suitable for interpretation. Data collected during the survey included the AUV side scan sonar, subbottom profiler, and multibeam bathymetry. Horizontal positioning of the survey vessel was accomplished with the FUGRO STARFIX® Differential Global Positioning System, which has a field accuracy of ± 3 meters. The AUV navigates using GPS while on the surface and an inertial navigation system (INS) coupled with a Doppler velocity logger when submerged. In addition, the AUV is tracked with a USBL system and sent position updates via an acoustic modem to continually augment the INS navigation. The AUV performed pre-programmed survey missions collecting 200 kHz multibeam bathymetry, 120 and 410 kHz chirp side scan sonar, and 2-12 kHz chirp subbottom profiler data.

The comprehensive 2008 FGSI survey grid consists of forty-eight (48) primary east-west tracklines (Lines 100-147) spaced 300 meters apart, and two (2) north-south tie lines (Lines 200 and 201). Data quality was good and no reruns were necessary. Navigational fixes (shot points) were recorded at 410-foot (125 meter) intervals and annotated on all digital data. The comprehensive survey covered all of Block 154 and Block 198, Green Canyon Area, with tracklines extending into surrounding blocks. The survey grid provides complete coverage of the seafloor by the sonar and a representative sampling with the other systems.

The portion of the comprehensive 2008 FGSI survey used for this Archaeological Assessment for Davis Offshore (Block 198 and Vicinity) consists of twenty-nine (29) primary east-west tracklines (Lines 119-147) spaced 300 meters apart, and portions of the two (2) north-south tie lines (Lines 200 and 201).

The 2008 FGSI survey lines have been plotted in black on the enclosed study maps ([Maps 1 and 2](#)).

C & C Technologies was contracted by Noble Energy to conduct a deepwater survey and Archaeological Assessment of eight proposed anchor locations within Block 199, Green Canyon Area. The survey's deep-

water multi-sensor data was acquired using C & C Technologies' C-Surveyor II Autonomous Underwater Vehicle (AUV). The survey was conducted on February 15, 2007. Sea conditions during data acquisition were variable with winds from 5 to 20 knots and seas from 3 to 7 feet. The quality of the collected geophysical data was good, and the data were suitable for interpretation. The C-Surveyor II's remote-sensing payload included a Simrad EM2000 Swath Bathymetric Mapping System, and EdgeTech High-Resolution Dual-Frequency Side Scan Sonar (120 and 410 kHz), and a Chirp Subbottom Profiling System (2-8 kHz).

The grid for the 2007 C & C Technologies survey consisted of twenty-one (21) east-west tracklines that crossed Well No. 1, Well No. 2, proposed surface location for Well "L-3", and the proposed anchor pattern for Well "L-3". These primary east-west lines were run at 300-meter intervals. Two (2) north-south tie lines (Lines 122 and 123) were run at the outer edges of the proposed anchor locations. Navigation fixes were plotted at 150-meter intervals on all survey lines. The survey grid provided complete coverage of the seafloor by the sonar and a representative sampling with the other systems. The 2007 C & C Technologies' survey covered almost all of Block 199, Green Canyon Area with tracklines extending into surrounding blocks.

The portion of the 2007 C & C Technologies survey used for this Archaeological Assessment for Davis Offshore (Block 198 and Vicinity) consists of portions of twenty-one (21) primary east-west tracklines (Lines 101-121) spaced 300 meters apart and a portion of a north-south tie line (Line 122).

The 2007 C & C Technologies survey lines have been plotted in orange on the enclosed maps ([Maps 1 and 2](#)).

Data reproductions of characteristic features encountered in the area during the 2008 FGSI survey are included in [Appendix A](#) of the report. A side scan sonar contact table has been included in [Appendix B](#). The water column velocity data and velocity profile are enclosed in [Appendix C](#). [Appendix D](#) contains the instrument settings, vessel personnel list, the diagram illustrating the FGSI survey vessel with the sensor configurations, descriptions of the geophysical equipment and the navigation system, as well as a copy of the daily operations log, which includes information on the sea state, weather conditions, and other commentary by the operators. The AUV calibration report can also be found in Appendix D. The interpretive [maps](#) (scale: 1" = 1,000') are included in a pocket behind Appendix D.

For further details concerning the 2007 C & C Technologies survey, please refer to C & C Project #072350 delivered to Noble Energy in February of 2007.

Historic Cultural Resources Evaluation

The regional probability for shipwrecks in this area is considered to be moderate; preservation of a wreck would be moderate to good ([Pearson et al. 2003](#)). Analyses of available shipwreck sources, as well as the FUGRO CHANCE database, indicate that no shipwrecks have been reported within the current survey area. The information for the nearest reported shipwrecks are listed below:

NAME	DATE	SOURCE	Latitude	Longitude	Location Reliability	AREA	BLOCK
Unknown Vessel	N/A	MMS	27.723330	-90.715874	1	GC	245
American Eagle	1984	USCG	27.816669	-90.750000	3	GC	156
Charles K. Schull	1917	MVUS	27.719999	-90.459999	4	GC	250
America La Reseda	1779	CEI	27.719999	-90.459999	4	GC	250
Ardilla	1808	CEI	27.719999	-90.459999	4	GC	250
Holly Ann Visier	1986	USCG	27.683331	-90.339996	3	GC	296

J.O Ellison	1914	MVUS	27.719999	-90.459999	4	GC	250
Kodiak II	1998	USCG	27.583330	-90.750000	3	GC	376
Unknown Vessel	N/A	NIMA	27.631670	-90.677498	4	GC	334

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.: Automated Wreck and Obstruction Information System (AWOIS), Hangs and Obstructions (HO), Coastal Environments Inc. baseline study, etc.), many of these lists are primarily based on secondary sources of information, shipwreck location coordinates are often inaccurate, and many only contain information concerning large, twentieth century commercial craft. It is therefore possible for earlier commercial craft and/or private vessels to be located within the survey area.

The degree to which a shipwreck is preserved is dependant upon the interaction of multiple factors. Hull composition, sediment type, water depth, wave energy, depth of burial, and biological activity all play a vital role in determining how much of the original vessel and its associated cargo is preserved once on bottom.

Studies conducted by [Garrison et al. \(1989a\)](#), [Muckelroy \(1998\)](#), and others suggest that shipwrecks which are 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.

Hull composition is also an important factor in determining how much of a vessel will be preserved. 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 encrustation can have detrimental affects to the structural integrity of the ships 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. \(1989b\)](#) 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 as follows: multiple peak anomalies, anomalies with spatial frequency, differential amplitude anomalies, anomalies spread over a 10,000 m² 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.

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

Bathymetric and subbottom 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 rising above the surrounding ambient seafloor.

Bathymetry

The [AUV Kongsberg EM2000 Multibeam Bathymetric System](#) was utilized to collect accurate water depths across the survey area. The multibeam bathymetric system was run at an operating frequency of 200 kHz, generating swath coverage of 150°. Two (2) Sea-Bird velocimeter drops were taken within the survey area during the project. The velocity readings were applied to the calculated record times to determine accurate water depths below sea level. The resulting water depths were contoured at a 20-foot interval as displayed on the enclosed [Archaeological and Bathymetry Map](#). The listings of the velocimeter recordings and calculated harmonic mean velocities are provided in [Appendix C](#) of this report. The multibeam bathymetric data was processed using Fugro Starfix PROC processing suite.

Water depths within the survey area range from -1,400 to -3,140 feet Below Sea Level (BSL). A large topographic high, likely associated with diapiric uplift, is located in the northern portion of the survey area. The water depth in the northern portion of the survey area is -1,400 feet BSL and the seafloor slopes to the south-southwest displaying a gradient of up to 700 feet per mile (7.55°) along the downslope of the topographic uplift. In the southern and western portions of the survey area, the seafloor slopes to the south-southwest displaying a gradient of approximately 200 feet per mile (2.17°). Other minor topographic highs were noted in the northeastern portion of the survey area. Zero datum is equal to sea level.

There were no irregular seafloor features identified on the multibeam bathymetry data that could represent unidentified shipwreck remains.

Side Scan Sonar Analysis

The sonar was run at 120 and 410 kHz; data quality was good ([Appendix A, Figure Nos. 1-2](#)). The side scan sonar records exhibit a seafloor of light to moderate reflectivity in the areas outside of the centrally located topographic high feature, which is commonly indicative of finer-grained sediments such as silt or clay ([Appendix A, Figure Nos. 1-2](#)).

Irregular seafloor areas and dark sonar reflectivity were noted along the topographic highs ([Map 2](#)) in the northern and northeastern portions of the survey area. This can be attributed to diapiric uplift within the area. Within this topographic feature and in the northeastern portion of the survey area, seafloor outcrops were noted ([Map 2](#)). Areas of linear reflectivity change were also noted on sonar records. These may represent surface expressions of faults or seafloor furrows.

Due to soft sediments, the majority of pipelines within the survey area have self-buried. All pipeline positions have been plotted from database as-built information.

Drag scars were noted on the sonar records throughout the survey area. The majority of these scars correspond to previous anchor patterns. Some of the seafloor drag scars have sediment mounding associated with them.

There were no unusual depressions, scours, sediment changes, or unidentified seafloor targets observed during the comprehensive 2008 FGSI survey that could represent unidentified shipwreck remains.

Six (6) sonar contacts were noted within the survey area during the comprehensive 2008 FGSI survey. Sonar Contact Nos. 1-3 fall within the portion of the comprehensive survey used for the current Archaeological Assessment and are plotted on [Map 1](#). A [Sonar Contact Table](#) containing the location, description, and image of each sonar contact is located in [Appendix B](#). The X – Y coordinates with corresponding index

number is also included in a table on the [Archaeological and Bathymetry Map](#), where the target is plotted, with its position corrected for sensor offset.

Sonar Contact No. 1, located in southwestern portion of GC242, is a piece of linear debris approximately 635 feet in length and approximately 4.5 feet wide ([Appendix A, Figure No. 2](#)). This contact is interpreted as a piece of pipeline or cable. Sonar Contact Nos. 2 and 3 are located within close proximity to Wells No. 1 and 2 in GC242 ([Appendix A, Figure No. 1](#)). Both contacts appear as linear debris targets and are interpreted as possible drill pipe from prior construction.

Sonar Contacts Nos. 1-3 are believed to be associated with prior construction and shipping operations and are not deemed archaeologically significant.

Eleven (11) unidentified side scan sonar contacts were noted during the 2007 C & C Technologies survey. The sonar contacts ranged from 7 to 66 feet long; 3 to 7 feet wide, and had no measurable height. All of the sonar contacts were interpreted as being related to modern lease block activities. Nine (9) sonar contacts (Nos. 1-7, 10, and 11) fall within the portion of the 2007 C & C Technologies survey used for the current Archaeological Assessment and are plotted on [Map 1](#). The X – Y coordinates with corresponding index number and a brief description of the contact size has been included in a table on the [Archaeological and Bathymetry Map](#).

Contact Nos. 5-7 were interpreted as linear debris or possible pipe related to construction activities. There were no sonar contacts deemed archaeologically significant. There were no unusual depressions, scours, sediment changes, or unidentified seafloor targets observed within the 2007 C & C Technologies survey area that could represent unidentified shipwreck remains.

For further details concerning the 2007 C & C Technologies survey, please refer to C & C Project #072350 delivered to Noble Energy in February of 2007.

CONCLUSIONS AND RECOMMENDATIONS

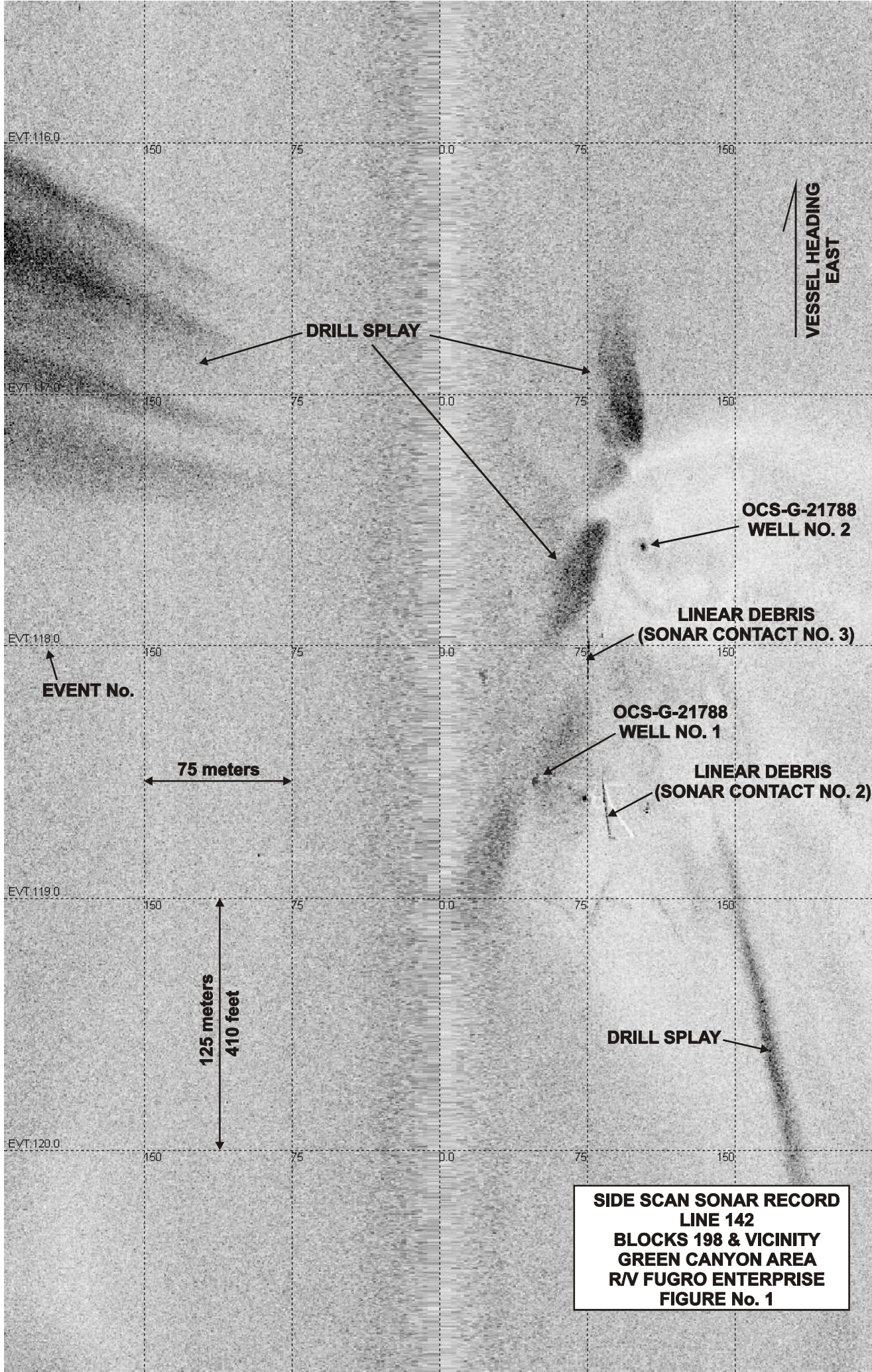
The evaluation of the high-resolution geophysical survey data collected within the survey area indicates that there were no unusual depressions, scours, sediment changes, or unidentified seafloor targets observed within the survey area that could represent unidentified shipwreck remains.

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 are encountered, the USDI MMS archaeologists should be contacted to provide an assessment of these artifacts.

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APPENDIX A
GEOPHYSICAL DATA REPRODUCTIONS



EVENT No.

75 meters

**125 meters
410 feet**

**VESSEL HEADING
EAST**

DRILL SPLAY

**OCS-G-21788
WELL NO. 2**

**LINEAR DEBRIS
(SONAR CONTACT NO. 3)**

**OCS-G-21788
WELL NO. 1**

**LINEAR DEBRIS
(SONAR CONTACT NO. 2)**

DRILL SPLAY

**SIDE SCAN SONAR RECORD
LINE 142
BLOCKS 198 & VICINITY
GREEN CANYON AREA
R/V FUGRO ENTERPRISE
FIGURE No. 1**

EVT:116.0

150

75

0.0

75

150

EVT:117.0

150

75

0.0

75

150

EVT:118.0

150

75

0.0

75

150

EVT:119.0

150

75

0.0

75

150

EVT:120.0

150

75

0.0

75

150

**SIDE SCAN SONAR RECORD
LINE 142
BLOCKS 198 & VICINITY
GREEN CANYON AREA
R/V FUGRO ENTERPRISE
FIGURE No. 1A**

EVT:133.0

150

75

0.0

75

150

**DRAG
SCARS**

**VESSEL HEADING
EAST**

EVT:134.0

150

75

0.0

75

150

EVT:135.0

EVENT No.

150

75

0.0

75

150

75 meters

**LINEAR DEBRIS
(SONAR CONTACT NO. 1)**

EVT:136.0

150

75

0.0

75

150

**125 meters
410 feet**

EVT:137.0

150

75

0.0

75

150

**SIDE SCAN SONAR RECORD
LINE 146
BLOCKS 198 & VICINITY
GREEN CANYON AREA
R/V FUGRO ENTERPRISE
FIGURE No. 2**

EVT:138.0

150

75

0.0

75

150

EVT:133.0

150

75

0.0

75

150

EVT:134.0

150

75

0.0

75

150

EVT:135.0

150

75

0.0

75

150

EVT:136.0

150

75

0.0

75

150

EVT:137.0

150

75

0.0

75

150

EVT:138.0

150

75

0.0

75

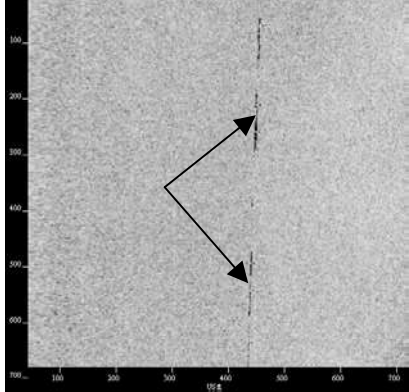
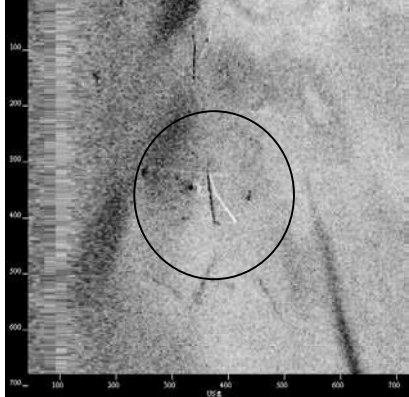
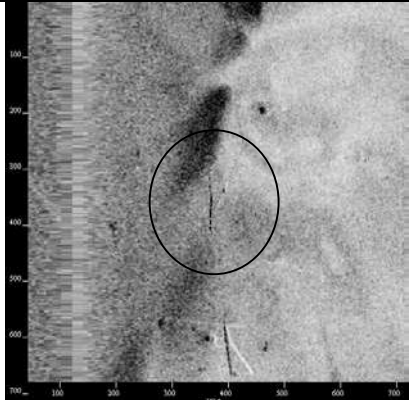
150

**SIDE SCAN SONAR RECORD
LINE 146
BLOCKS 198 & VICINITY
GREEN CANYON AREA
R/V FUGRO ENTERPRISE
FIGURE No. 2A**

APPENDIX B

SONAR CONTACT TABLE

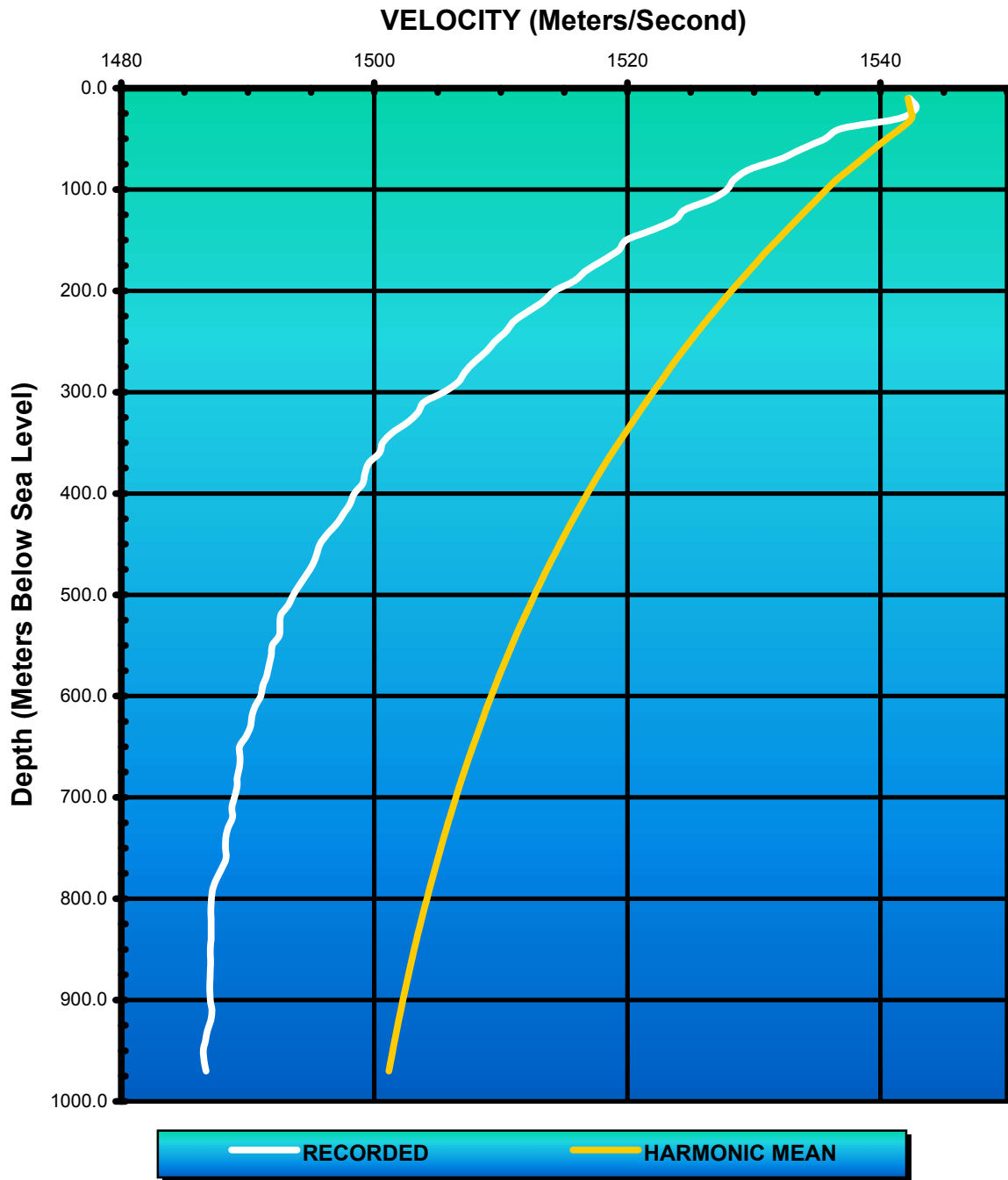
Sonar Contact Table

Target Image	Target Info	User Entered Info
	<p>Contact 1</p> <ul style="list-style-type: none"> • Sonar Time at Target: 06/09/2008 04:02:12 • Click Position (Lat WGS84): 27.724204276 • Click Position (Lon WGS84): -90.869114305 • Click Position (Lat NAD27): 27.723942010 • Click Position (Lon NAD27): -90.869043896 • Map Proj: NAD27 UTM, Zone 15 North, US Foot • Click Position (X): 2,329,667.74 • Click Position (Y): 10,066,483.03 • Acoustic Source File: K:\CT085004\XTF\146.XTF • Ping Number: 722 • Range to Target: 433.61 US Feet • Fish Height: 144.02 US Feet • Event Number: 135 • Line Name: 146 • Area: GC Block: 242 	<p>Dimensions</p> <p>Target Height = 0.00 US Feet Target Length: 635.07 US Feet Target Shadow: 0.00 US Feet Target Width: 4.36 US Feet Mag Anomaly:</p> <p>N/A</p> <p>Avoidance Area:</p> <p>N/A</p> <p>Classification 1: debris Classification 2: Description: linear debris</p>
	<p>Contact 2</p> <ul style="list-style-type: none"> • Sonar Time at Target: 06/09/2008 08:03:18 • Click Position (Lat WGS84): 27.734989668 • Click Position (Lon WGS84): -90.837336357 • Click Position (Lat NAD27): 27.734727613 • Click Position (Lon NAD27): -90.837266517 • Map Proj: NAD27 UTM, Zone 15 North, US Foot • Click Position (X): 2,339,879.90 • Click Position (Y): 10,070,583.47 • Acoustic Source File: K:\CT085004\XTF\142.XTF • Ping Number: 6168 • Range to Target: 269.28 US Feet • Fish Height: 144.02 US Feet • Event Number: 118 • Line Name: 142 • Area: GC Block: 242 	<p>Dimensions</p> <p>Target Height = 18.56 US Feet Target Length: 99.17 US Feet Target Shadow: 44.68 US Feet Target Width: 3.82 US Feet Mag Anomaly:</p> <p>N/A</p> <p>Avoidance Area:</p> <p>N/A</p> <p>Classification 1: debris Classification 2: Description: linear debris. possible drill pipe</p>
	<p>Contact 3</p> <ul style="list-style-type: none"> • Sonar Time at Target: 06/09/2008 08:03:58 • Click Position (Lat WGS84): 27.735058705 • Click Position (Lon WGS84): -90.836542751 • Click Position (Lat NAD27): 27.734796651 • Click Position (Lon NAD27): -90.836472931 • Map Proj: NAD27 UTM, Zone 15 North, US Foot • Click Position (X): 2,340,136.19 • Click Position (Y): 10,070,613.08 • Acoustic Source File: K:\CT085004\XTF\142.XTF • Ping Number: 6285 • Range to Target: 240.28 US Feet • Fish Height: 144.02 US Feet • Event Number: 118 • Line Name: 142 • Area: GC Block: 242 	<p>Dimensions</p> <p>Target Height = 11.01 US Feet Target Length: 111.88 US Feet Target Shadow: 22.96 US Feet Target Width: 3.83 US Feet Mag Anomaly:</p> <p>N/A</p> <p>Avoidance Area:</p> <p>N/A</p> <p>Classification 1: debris Classification 2: Description: linear debris. possible drill pipe</p>

APPENDIX C

WATER COLUMN VELOCITY DATA

**WATER COLUMN VELOCITY PROFILES
NOBLE ENERGY
BLOCK 154, GREEN CANYON AREA**



WATER COLUMN VELOCITY PROFILE DATA

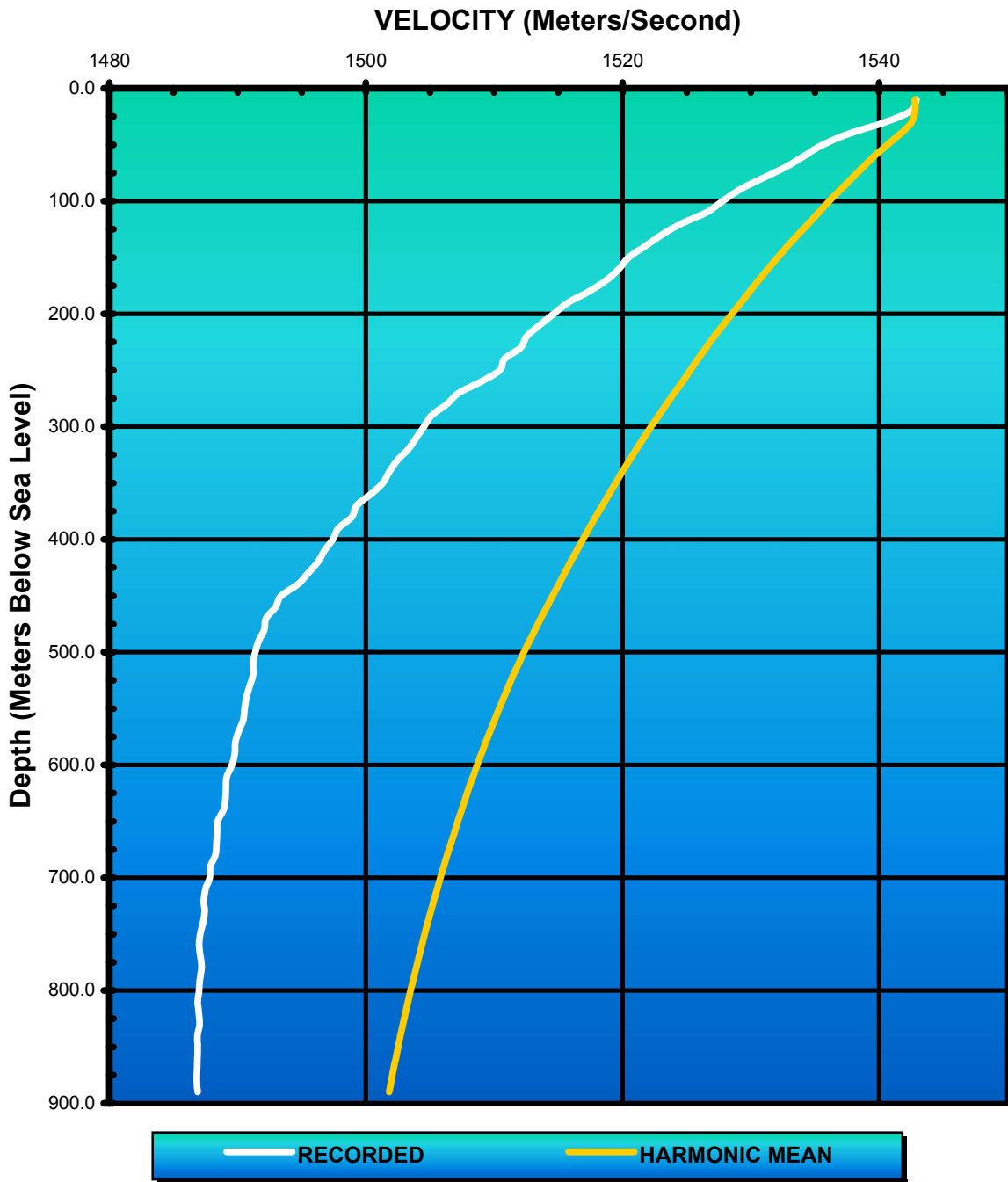
Block 154, Green Canyon Area
LOCATION: X = 710,059.33' Y = 3,067,863.73'
8-Jun-08

PTS.	DEPTH (Feet)	DEPTH (Msec)	DEPTH (Meters)	INT. VELOCITY (M/Sec)	HARM. MEAN (M/Sec)	HARM. MEAN (Ft/Sec)	FEET/MSEC (2-Way)
1	32.81	12.97	10	1542.27	1542.16	5059.56	2.529782
2	65.62	25.93	20	1542.81	1542.34	5060.17	2.530083
3	98.42	38.90	30	1541.49	1542.46	5060.55	2.530276
4	131.23	51.90	40	1536.88	1541.56	5057.59	2.528795
5	164.04	64.91	50	1535.63	1540.50	5054.11	2.527057
6	196.85	77.95	60	1533.76	1539.48	5050.77	2.525383
7	229.66	91.00	70	1532.08	1538.54	5047.71	2.523853
8	262.47	104.06	80	1529.67	1537.56	5044.48	2.522239
9	295.27	117.14	90	1528.44	1536.56	5041.20	2.520599
10	328.08	130.23	100	1527.88	1535.74	5038.49	2.519246
11	360.89	143.33	110	1526.60	1534.96	5035.95	2.517976
12	393.70	156.44	120	1524.55	1534.16	5033.33	2.516667
13	426.51	169.56	130	1523.77	1533.38	5030.78	2.515390
14	459.32	182.69	140	1521.97	1532.61	5028.25	2.514125
15	492.12	195.84	150	1519.92	1531.84	5025.70	2.512852
16	524.93	209.00	160	1519.32	1531.08	5023.20	2.511602
17	557.74	222.17	170	1518.06	1530.35	5020.82	2.510411
18	590.55	235.35	180	1516.74	1529.63	5018.44	2.509222
19	623.36	248.54	190	1515.84	1528.92	5016.13	2.508064
20	656.17	261.74	200	1514.26	1528.22	5013.83	2.506917
21	688.97	274.95	210	1513.39	1527.54	5011.60	2.505802
22	721.78	288.17	220	1512.20	1526.88	5009.42	2.504711
23	754.59	301.40	230	1511.03	1526.21	5007.25	2.503626
24	787.40	314.64	240	1510.41	1525.57	5005.13	2.502564
25	820.21	327.88	250	1509.52	1524.94	5003.08	2.501540
26	853.02	341.13	260	1508.84	1524.33	5001.08	2.500541
27	885.82	354.39	270	1507.94	1523.74	4999.13	2.499565
28	918.63	367.66	280	1507.15	1523.16	4997.23	2.498613
29	951.44	380.93	290	1506.62	1522.59	4995.36	2.497682
30	984.25	394.21	300	1505.46	1522.03	4993.51	2.496757
31	1017.06	407.50	310	1503.92	1521.47	4991.69	2.495844
32	1049.87	420.80	320	1503.46	1520.92	4989.87	2.494936
33	1082.67	434.10	330	1502.60	1520.38	4988.11	2.494053
34	1115.48	447.41	340	1501.43	1519.84	4986.36	2.493178
35	1148.29	460.74	350	1500.65	1519.31	4984.60	2.492302
36	1181.10	474.06	360	1500.41	1518.79	4982.90	2.491448
37	1213.91	487.40	370	1499.58	1518.28	4981.21	2.490604
38	1246.72	500.73	380	1499.25	1517.78	4979.58	2.489789
39	1279.52	514.07	390	1499.07	1517.30	4978.00	2.489002
40	1312.33	527.41	400	1498.41	1516.83	4976.48	2.488241
41	1345.14	540.76	410	1498.09	1516.38	4974.99	2.487497
42	1377.95	554.11	420	1497.56	1515.94	4973.55	2.486776

PTS.	DEPTH (Feet)	DEPTH (Msec)	DEPTH (Meters)	INT. VELOCITY (M/Sec)	HARM. MEAN (M/Sec)	HARM. MEAN (Ft/Sec)	FEET/MSEC (2-Way)
43	1410.76	567.47	430	1497.01	1515.51	4972.13	2.486066
44	1443.57	580.83	440	1496.29	1515.08	4970.73	2.485366
45	1476.37	594.19	450	1495.71	1514.66	4969.35	2.484674
46	1509.18	607.56	460	1495.45	1514.25	4967.99	2.483996
47	1541.99	620.94	470	1495.13	1513.84	4966.66	2.483330
48	1574.80	634.31	480	1494.64	1513.44	4965.36	2.482679
49	1607.61	647.70	490	1494.11	1513.06	4964.08	2.482042
50	1640.42	661.08	500	1493.61	1512.67	4962.82	2.481412
51	1673.22	674.47	510	1493.20	1512.30	4961.59	2.480796
52	1706.03	687.87	520	1492.60	1511.92	4960.37	2.480184
53	1738.84	701.26	530	1492.53	1511.56	4959.17	2.479584
54	1771.65	714.66	540	1492.49	1511.20	4958.01	2.479004
55	1804.46	728.06	550	1491.93	1510.86	4956.87	2.478437
56	1837.27	741.47	560	1491.85	1510.52	4955.76	2.477880
57	1870.07	754.87	570	1491.66	1510.19	4954.68	2.477340
58	1902.88	768.28	580	1491.50	1509.87	4953.62	2.476812
59	1935.69	781.69	590	1491.19	1509.55	4952.58	2.476292
60	1968.50	795.10	600	1491.02	1509.24	4951.57	2.475786
61	2001.31	808.52	610	1490.59	1508.94	4950.58	2.475288
62	2034.12	821.93	620	1490.32	1508.64	4949.60	2.474798
63	2066.92	835.35	630	1490.20	1508.35	4948.64	2.474319
64	2099.73	848.77	640	1489.84	1508.06	4947.70	2.473848
65	2132.54	862.20	650	1489.35	1507.78	4946.77	2.473384
66	2165.35	875.62	660	1489.39	1507.50	4945.85	2.472926
67	2198.16	889.05	670	1489.33	1507.23	4944.96	2.472479
68	2230.97	902.48	680	1489.17	1506.96	4944.09	2.472043
69	2263.77	915.91	690	1489.14	1506.70	4943.24	2.471618
70	2296.58	929.34	700	1488.94	1506.45	4942.40	2.471202
71	2329.39	942.77	710	1488.74	1506.20	4941.59	2.470794
72	2362.20	956.20	720	1488.79	1505.96	4940.79	2.470395
73	2395.01	969.64	730	1488.43	1505.72	4940.01	2.470003
74	2427.82	983.07	740	1488.26	1505.48	4939.23	2.469616
75	2460.62	996.51	750	1488.24	1505.25	4938.48	2.469239
76	2493.43	1009.95	760	1488.27	1505.03	4937.74	2.468871
77	2526.24	1023.39	770	1487.94	1504.81	4937.02	2.468510
78	2559.05	1036.83	780	1487.54	1504.59	4936.30	2.468150
79	2591.86	1050.27	790	1487.23	1504.37	4935.59	2.467794
80	2624.67	1063.72	800	1487.12	1504.16	4934.88	2.467442
81	2657.47	1077.17	810	1487.08	1503.95	4934.19	2.467097
82	2690.28	1090.61	820	1487.10	1503.74	4933.52	2.466759
83	2723.09	1104.06	830	1487.11	1503.54	4932.86	2.466430
84	2755.90	1117.51	840	1487.10	1503.34	4932.22	2.466109
85	2788.71	1130.96	850	1487.04	1503.15	4931.59	2.465796
86	2821.52	1144.40	860	1487.06	1502.96	4930.98	2.465489
87	2854.32	1157.85	870	1487.03	1502.78	4930.38	2.465188
88	2887.13	1171.30	880	1487.02	1502.60	4929.79	2.464893
89	2919.94	1184.75	890	1486.99	1502.43	4929.21	2.464605

PTS.	DEPTH (Feet)	DEPTH (Msec)	DEPTH (Meters)	INT. VELOCITY (M/Sec)	HARM. MEAN (M/Sec)	HARM. MEAN (Ft/Sec)	FEET/MSEC (2-Way)
90	2952.75	1198.20	900	1487.03	1502.26	4928.65	2.464324
91	2985.56	1211.65	910	1487.16	1502.09	4928.10	2.464051
92	3018.37	1225.09	920	1487.08	1501.93	4927.57	2.463784
93	3051.17	1238.54	930	1486.81	1501.76	4927.04	2.463519
94	3083.98	1251.99	940	1486.65	1501.60	4926.51	2.463257
95	3116.79	1265.45	950	1486.47	1501.45	4925.99	2.462996
96	3149.60	1278.90	960	1486.55	1501.29	4925.48	2.462740
97	3182.41	1292.35	970	1486.69	1501.14	4924.98	2.462491

**WATER COLUMN VELOCITY PROFILES
NOBLE ENERGY
BLOCK 198, GREEN CANYON AREA**



WATER COLUMN VELOCITY PROFILE DATA

Block 198, Green Canyon Area
LOCATION: X = 714,782.05' Y = 3,068,682.95'
12-Jun-08

PTS.	DEPTH (Feet)	DEPTH (Msec)	DEPTH (Meters)	INT. VELOCITY (M/Sec)	HARM. MEAN (M/Sec)	HARM. MEAN (Ft/Sec)	FEET/MSEC (2-Way)
1	32.81	12.96	10	1542.91	1542.78	5061.61	2.530803
2	65.62	25.93	20	1542.50	1542.82	5061.74	2.530871
3	98.42	38.90	30	1540.50	1542.55	5060.86	2.530429
4	131.23	51.89	40	1537.75	1541.72	5058.13	2.529066
5	164.04	64.91	50	1535.60	1540.63	5054.57	2.527283
6	196.85	77.94	60	1534.16	1539.63	5051.25	2.525627
7	229.66	90.98	70	1532.69	1538.73	5048.32	2.524160
8	262.47	104.04	80	1530.87	1537.86	5045.45	2.522723
9	295.27	117.11	90	1529.11	1536.98	5042.57	2.521284
10	328.08	130.20	100	1527.82	1536.13	5039.79	2.519893
11	360.89	143.29	110	1526.56	1535.31	5037.10	2.518551
12	393.70	156.40	120	1524.59	1534.49	5034.41	2.517207
13	426.51	169.53	130	1523.06	1533.67	5031.71	2.515857
14	459.32	182.66	140	1521.78	1532.86	5029.07	2.514535
15	492.12	195.81	150	1520.47	1532.09	5026.54	2.513269
16	524.93	208.97	160	1519.73	1531.34	5024.07	2.512035
17	557.74	222.13	170	1518.75	1530.63	5021.74	2.510870
18	590.55	235.31	180	1517.41	1529.92	5019.42	2.509712
19	623.36	248.49	190	1515.75	1529.23	5017.15	2.508573
20	656.17	261.69	200	1514.63	1528.53	5014.84	2.507421
21	688.97	274.90	210	1513.54	1527.83	5012.56	2.506281
22	721.78	288.12	220	1512.54	1527.16	5010.37	2.505186
23	754.59	301.34	230	1512.07	1526.51	5008.22	2.504112
24	787.40	314.57	240	1510.81	1525.89	5006.19	2.503095
25	820.21	327.81	250	1510.42	1525.28	5004.18	2.502088
26	853.02	341.06	260	1508.98	1524.68	5002.21	2.501107
27	885.82	354.32	270	1507.25	1524.05	5000.17	2.500085
28	918.63	367.59	280	1506.31	1523.44	4998.14	2.499070
29	951.44	380.87	290	1505.13	1522.83	4996.14	2.498069
30	984.25	394.16	300	1504.54	1522.22	4994.17	2.497083
31	1017.06	407.45	310	1503.91	1521.65	4992.27	2.496133
32	1049.87	420.75	320	1503.31	1521.08	4990.41	2.495205
33	1082.67	434.06	330	1502.46	1520.53	4988.60	2.494300
34	1115.48	447.37	340	1501.83	1519.99	4986.82	2.493411
35	1148.29	460.69	350	1501.32	1519.46	4985.09	2.492543
36	1181.10	474.01	360	1500.36	1518.94	4983.39	2.491696
37	1213.91	487.35	370	1499.27	1518.42	4981.69	2.490847
38	1246.72	500.69	380	1498.91	1517.91	4980.02	2.490008
39	1279.52	514.03	390	1497.87	1517.41	4978.38	2.489192
40	1312.33	527.38	400	1497.42	1516.92	4976.76	2.488379
41	1345.14	540.74	410	1496.78	1516.44	4975.17	2.487586
42	1377.95	554.10	420	1496.27	1515.96	4973.62	2.486809

PTS.	DEPTH (Feet)	DEPTH (Msec)	DEPTH (Meters)	INT. VELOCITY (M/Sec)	HARM. MEAN (M/Sec)	HARM. MEAN (Ft/Sec)	FEET/MSEC (2-Way)
43	1410.76	567.47	430	1495.51	1515.49	4972.08	2.486042
44	1443.57	580.85	440	1494.68	1515.03	4970.57	2.485283
45	1476.37	594.23	450	1493.38	1514.56	4969.02	2.484509
46	1509.18	607.62	460	1492.95	1514.09	4967.49	2.483744
47	1541.99	621.02	470	1492.22	1513.63	4965.98	2.482991
48	1574.80	634.42	480	1492.09	1513.19	4964.51	2.482255
49	1607.61	647.83	490	1491.64	1512.75	4963.08	2.481540
50	1640.42	661.23	500	1491.37	1512.32	4961.68	2.480842
51	1673.22	674.64	510	1491.21	1511.91	4960.33	2.480165
52	1706.03	688.05	520	1491.20	1511.51	4959.02	2.479511
53	1738.84	701.46	530	1490.94	1511.13	4957.75	2.478876
54	1771.65	714.88	540	1490.68	1510.75	4956.52	2.478258
55	1804.46	728.29	550	1490.55	1510.38	4955.31	2.477657
56	1837.27	741.71	560	1490.43	1510.03	4954.15	2.477073
57	1870.07	755.13	570	1490.08	1509.68	4953.01	2.476503
58	1902.88	768.55	580	1489.83	1509.34	4951.89	2.475943
59	1935.69	781.97	590	1489.78	1509.01	4950.80	2.475399
60	1968.50	795.40	600	1489.55	1508.68	4949.74	2.474870
61	2001.31	808.82	610	1489.17	1508.37	4948.70	2.474348
62	2034.12	822.25	620	1489.10	1508.05	4947.68	2.473838
63	2066.92	835.68	630	1489.05	1507.75	4946.68	2.473342
64	2099.73	849.11	640	1488.89	1507.46	4945.72	2.472861
65	2132.54	862.54	650	1488.45	1507.17	4944.77	2.472385
66	2165.35	875.98	660	1488.39	1506.89	4943.84	2.471920
67	2198.16	889.41	670	1488.36	1506.61	4942.93	2.471467
68	2230.97	902.85	680	1488.26	1506.34	4942.05	2.471025
69	2263.77	916.29	690	1487.88	1506.07	4941.18	2.470588
70	2296.58	929.73	700	1487.82	1505.81	4940.32	2.470160
71	2329.39	943.17	710	1487.49	1505.56	4939.48	2.469741
72	2362.20	956.62	720	1487.37	1505.30	4938.65	2.469327
73	2395.01	970.06	730	1487.43	1505.06	4937.85	2.468924
74	2427.82	983.51	740	1487.31	1504.82	4937.06	2.468531
75	2460.62	996.95	750	1487.09	1504.58	4936.29	2.468145
76	2493.43	1010.40	760	1486.99	1504.35	4935.53	2.467766
77	2526.24	1023.85	770	1487.10	1504.13	4934.79	2.467396
78	2559.05	1037.30	780	1487.18	1503.91	4934.08	2.467039
79	2591.86	1050.74	790	1487.05	1503.70	4933.38	2.466690
80	2624.67	1064.19	800	1487.00	1503.49	4932.69	2.466347
81	2657.47	1077.64	810	1486.88	1503.28	4932.02	2.466012
82	2690.28	1091.09	820	1486.98	1503.08	4931.37	2.465684
83	2723.09	1104.54	830	1487.03	1502.89	4930.73	2.465365
84	2755.90	1117.99	840	1486.86	1502.70	4930.11	2.465054
85	2788.71	1131.44	850	1486.88	1502.51	4929.50	2.464749
86	2821.52	1144.89	860	1486.86	1502.33	4928.90	2.464450
87	2854.32	1158.34	870	1486.84	1502.15	4928.31	2.464157
88	2887.13	1171.79	880	1486.81	1501.98	4927.74	2.463872
89	2919.94	1185.24	890	1486.89	1501.81	4927.18	2.463592

APPENDIX D

**INSTRUMENT SETTINGS
BOAT SETBACK DIAGRAM
EQUIPMENT DESCRIPTIONS
GEOPHYSICAL JOB LOGS**

Client: Davis Offshore
Job#: 2408-5004 **Date:** June 8-12, 2008
Area: Green Canyon 198 & Vicinity

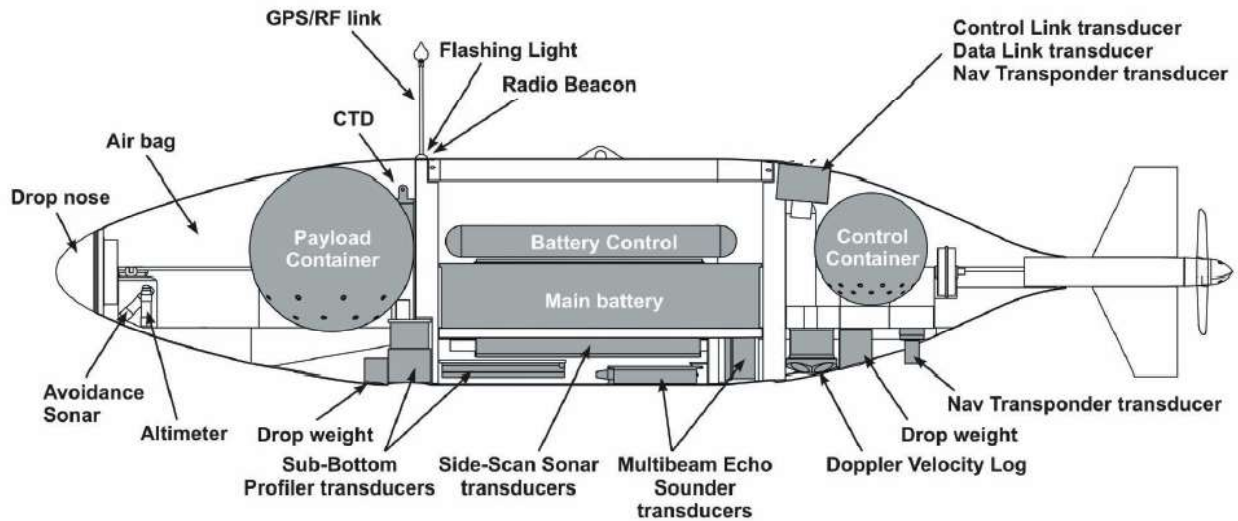
VESSEL: *Fugro Enterprise*

PERSONNEL

Geophysical Party Chief:	Marc Harris
Technical Coordinator:	John Boudreaux
Lead Processor:	Matt Bridges
Processor:	Darrell Smith
AUV Shift Supervisor:	Arvin Wright
AUV Shift Supervisor:	Wyatt Smith
AUV Technician:	Lane Wootan
AUV Technician:	Derrick Jackson
AUV Technician:	Will Williams
Navigation Party Chief:	Brad Chaumont
Navigation Party Chief:	Travis Groefsema
1 st Captain:	John Halton
2 nd Captain:	Joe Naquin

Fugro Echo Surveyor II/HUGIN 3000

Depth rating: 3000 m
 Length: 5.35 m
 Maximum diameter: 1 m
 Volume: 2.4m³
 Weight in air: 1400 kg
 Weight in water: neutral buoyant
 Nominal speed: 3.7 knots
 Total energy content of battery: 45 kWh
 Endurance: 50-60 hours, depending upon speed and payload configuration



Payload

Multi Beam Echosounder

Manufacture: Kongsberg EM 2000
Frequency: 200khz
Motion Sensor: Ixsea IMU 90
Beam Geometry: 150° 1.5°X3.5°, 111 Beams
Ping Rate: 2.9hz
Ping Time: Coupled to SSS Low Freq.

Integrated Side Scan Sonar and Sub Bottom Profiler

Manufacture & Model: EdgeTech 2200 Full Spectrum Chirp SSS/SBP
Side Scan Sonar Frequency: Low 120khz , High 410khz
Side Scan Sonar Range: 200m
Sub Bottom Profiler Frequency: 2-12khz
Sub Bottom Profiler Record Length: 290ms
Sub Bottom Profiler Ping Times: Coupled to SSS Low Freq.

Doppler Velocity Log

Manufacturer & Model: RDI WHN 300
Frequency: 307khz

Acoustic Command Link

Frequency: 24-28khz, 55 bits/sec.

Acoustic Data Link

Frequency: 22.5khz, 4250 bits/sec

HiPap 500 SSBL

Frequency (Primary) B24: Int1 21.5khz Int2 22.5khz Reply 30.0khz
Frequency (Emergency) B14: Int1 21.0khz Int2 22.5khz Reply 30.25khz

Navigation Equipment

HiPAP 500 Super Short Baseline Acoustic System

Operating range: 1- 4000 m
Position Accuracy in % of Range: 0.2%
Angle Accuracy: 0db S/N: 0.30 °
10db S/N: 0.18 °
20db S/N: 0.12 °
Range Detection: <20cm
Operating Beam from Vertical: +/- 100 °
Number of Active Elements: 241
Number of Transponder Channels: 56

Motion Sensor:

Kongsberg Motion Reference Unit: #5
Number of Accelerometers: 3
Angular Rate Sensors: 3
Roll/Pitch Precision: 0.02 °
Heave Precision: 5cm
Acceleration: 0.01 m/s²

GPS Receivers:

2-Trimble SPS551H

Frequency:

L1 & L2

Corrections:

XP & HP

Accuracy:

XP -Hz 0.2m

Vt 0.3m

HP- Hz 0.1

Vt 0.15m

Heading Accuracy:

0.05 ° (10m Separation)

Heading Sensors:

RG Brown Gyro Compass

Navigation Software:

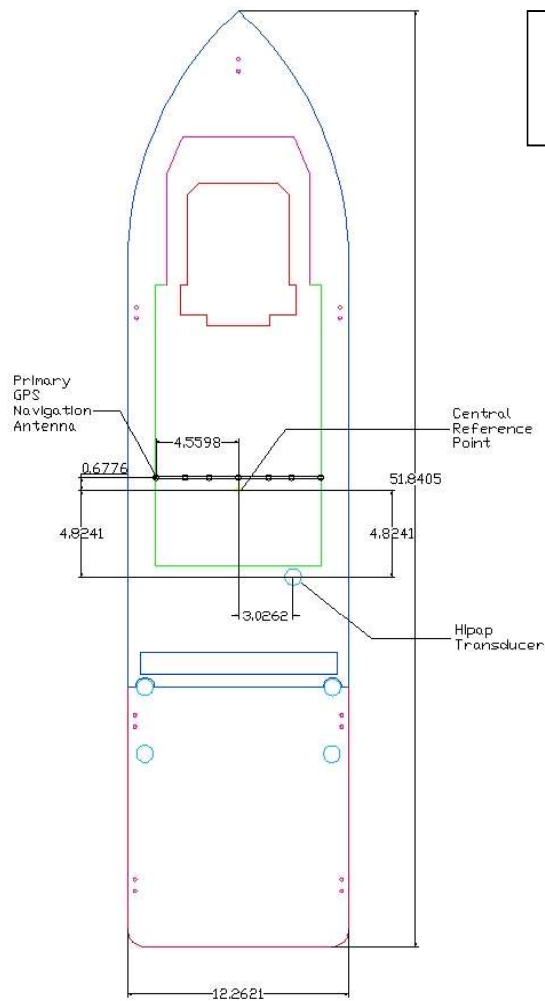
Fugro Starfix Nav

Hugin Operators Station

Interfacing:

Fugro IOWIN Serial & Ethernet interface Software

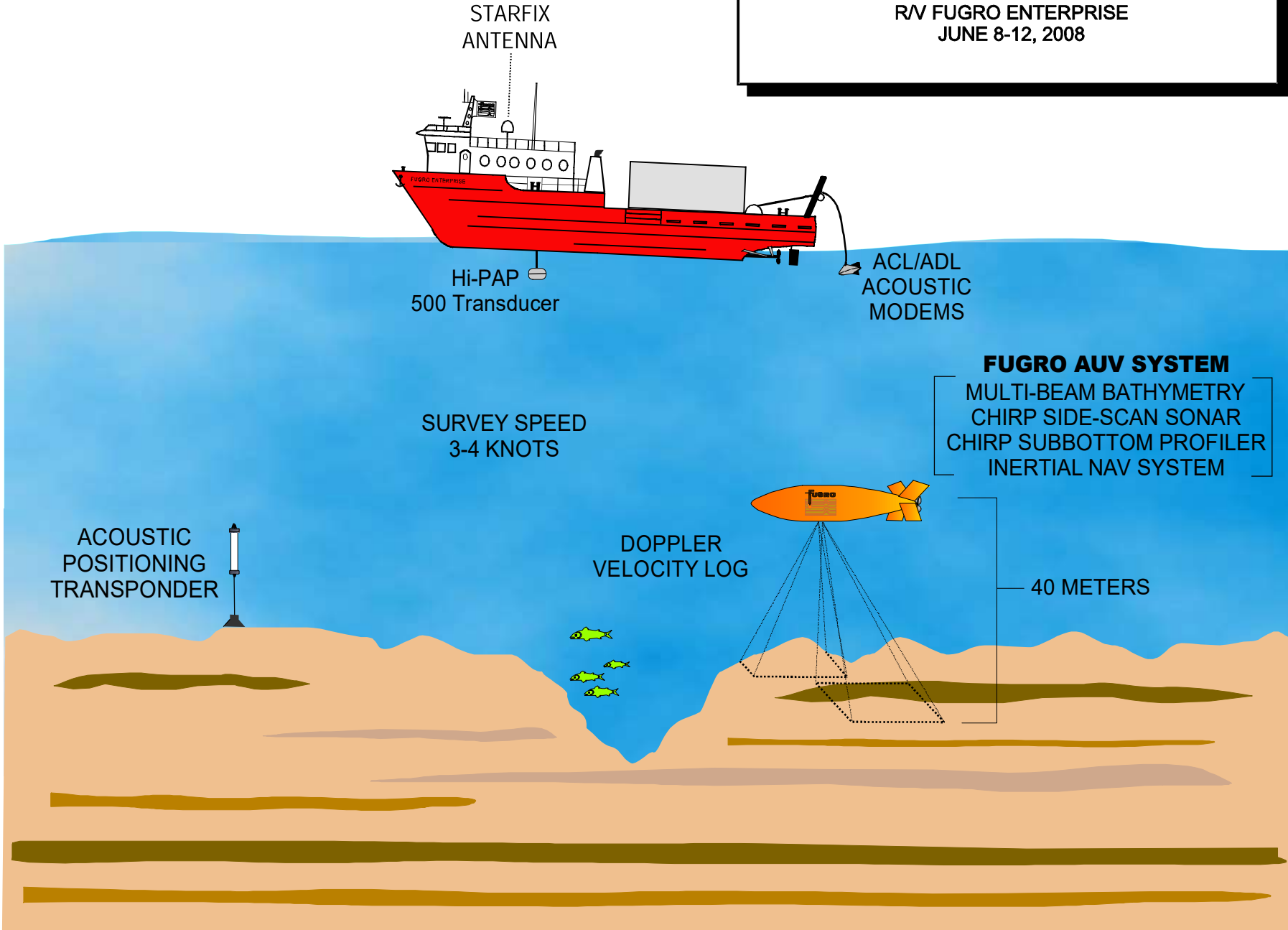
1 gb/s Lab Network



**Fugro Enterprise
Offsets
Plan View**

FUGRO AUV SYSTEM

DAVIS OFFSHORE
BLOCKS 198 & VICINITY
GREEN CANYON AREA
R/V FUGRO ENTERPRISE
JUNE 8-12, 2008



Fugro Enterprise



HIGH-RESOLUTION GEOPHYSICAL SURVEY VESSEL

Fugro GeoServices, Inc. (FGSI) of Houston, TX and Lafayette, LA has a newbuild survey vessel named the *Fugro Enterprise*. Designed specifically as a high-resolution seismic and remote sensing platform with a suite of survey equipment including AUV, the vessel will be permanently mobilized for domestic and international deployment.

The STARFIX® System provides state-of-the-art differential GPS positioning of the survey vessel. The vessel wheelhouse, navigation station, and remote sensing instrument room are located adjacent to one another to ensure the seamless integration of all survey activities.

Clients within the energy industries, governmental agencies, engineering firms, and universities can utilize the *Fugro Enterprise* to collect high resolution remote sensing information for permitting, planning, and design activities, oil and gas exploration, and academic research.

A leader in supplying equipment and services on a global basis, FGSI is a member of the multi-national Fugro group of companies with 200 offices in 45 countries. Clients of FGSI can benefit from the individual and collective experience of hundreds of survey professionals at Fugro companies worldwide.

Vessel Capabilities

- Minerals Management Services
- Hazard Surveys
- Cultural Resource Evaluations
- 2-D/3-D Seismic Surveys
- Platform Siting Feasibility Studies
- Shipwreck and Aircraft Searches
- Academic Research
- Tow Route Clearances
- Platform and Pipeline Damage Assessments
- Pipeline/Cable Clearance Surveys
- Bare Boat Leasing

Technical Information

REGISTRATION:

Owner: Fugro Leasing, Inc.
Operator: Fugro Geoservices, Inc.
Official Number: 1204438
Certification: SUBCHAPTER L; ABS L/L /ORV
Builder: Boconco Shippbuilding, INC.
Port of Registry: Morgan City, LA
Maximum Deck Tonnage Capacity: 54 LONG TONNES
@ CG OF 12' ABOVE DECK

Number in Crew: 5
Gross/Net Tonnage: <67
Class: Research Vessel
Hull Number: 127
Year Built: 2007

DIMENSIONS:

Length: 170'
Beam: 40'
Molded Depth: 13'
Clear Deck Space: Length: 48' Width: 38'

Light Draft: 11'
Maximum Draft: 11'

PROPULSION:

Main Engines (No.): 2
Model: Caterpillar 3508 (Tier 2)
Reduction Gear: ZF w/Trolling Gears
Steering: HYDRAULIC
Shafts: 6"

Make: CAT
Total Horsepower: 2,000
Ratio: 4.5:1
Propellers: 78" x 62"
Vessel Speed: 11.5

KNOTS

Fuel Consumption: 100 GALLONS PER HOUR / 120 GPH IN TRANSIT
Range: 6000 NAUTICAL MILES
Endurance: 24 CONTINUOUS DAYS TRANSIT – 28 AUV

TANK CAPACITIES:

Fuel: 54,000 GALLONS
GALLONS
Hydraulic Oil: 2400 GALLONS
Portable Water: 60,000 GALLONS Village Marine PW-1600 Water Maker

Lube Oil: 2500
Waste: 2500 GALLONS

GENERATORS:

Generators (No.): 3
Model: 3306 (Tier 2)
Volts: 440

Make: Caterpillar
kiloWatts: 2-250/1-75

This vessel is equipped with a full parallel board capable of delivering 500KW when required Ship has 75kw emergency generator that meets ABS/SOLAS standards.

MOORING EQUIPMENT:

Ship's Windlass: Coastal Marine Hydraulic
2000#
Rode: 2 X Chains of 7 and 5 shots

Ship's Anchors: 2 -

ELECTRONICS: (all electronics IMO-SOLAS)

GMDSS: Furuno A3, SSB, Immarisat B, VHF, NAV TEX (SOLAS complete)
Radar: 1. Furuno FR 2117
2. Furuno FR 8122
AIS: Furuno FA 150
Auto Pilot: AP 50 Simrad
Fathometer: Furuno FE 700
GPS: 2 Furuno GP 150
VHF: 2 Icom M-504
Speed log: Furuno DS 80
Gyro: Simrad GC80 Expanded
Chart Plotter: Garim 3210
Sound Surveillance: Zenithal VSS-111
Loud Hailer: Furuno RD 30
Intercom: Sound powered phones, Intercom, Panasonic 24 Station phone system
Weather: Furuno RD 30 Weather Station
Sat. Phone: Orbit AL7103 Ku-8 Buc, 8 watts, 2 lines
Internet: Orbit AL7103 Ku-8 Buc, 8 watts, 256/256 kb
Cellular: Petrocom
Fire Det. System and sensors as per SOLAS and ABS regulation
EPIRB: ARC 2774
SART: 2 ARC 2714
SAT TV: Sea Coastal 24

ACCOMMODATIONS & EQUIPMENT:

FOCSLE DECK:

4-2-BERTH STATEROOMS
3 COMPLETE HEAD

SPECIAL FEATURES:

10' x 36' Forecastle available winch deck area

MAIN DECK:

12-2-BERTH STATEROOMS
1-4-BERTH STATEROOM
5 COMPLETE HEAD - TOILET, SHOWER & LAVATORY
1 LOUNGE AREA – SatTV system
FULL COMPLIMENT OF GALLEY APPLIANCES/MESS
WALK-IN COOLER/FREEZER
TRASH COMPACTOR
ICE MAKER

SPECIAL FEATURES:

10 x 30' STORAGE ROOM (A/C)
10' x 30' INSTRUMENT ROOM
2 – 17KVA UPS SYSTEMS
ALL AREAS NETWORKED AND PHONE LINES
20' A-FRAME w/ 9' INTERNAL OPENING, 15,000 SWL
ALASKA CRANE 3,000 LBS @ 30'
500mm GATE VALVE FOR HiPAP
(WT COMPARTMENT)
4 – 36" MOON POOLS
COMMERCIAL TRASH COMPACTOR
TRASH BIN - REMOVABLE DUMPSTER
6' X 8' X 8'
COMPRESSOR ROOM 15' X 25'

LIFE SAVING EQUIPMENT:

2-20 MAN AND 2-17 MAN LIFE RAFTS
40 LIFE JACKETS
8 LIFE RINGS 4 WITH LIGHTS
2 QUICK RELEASE LIFE RINGS WITH
LIGHTS AND SMOKE
RESCUE BOAT SOLAS 25HP GAS, SOLAS
DAVIT
ALDIS LAMP
FIRE AND SAFETY STATION PLAN
FIRST AID KIT
EMERGENCY LIGHTING
GENERAL ALARMS
HIGH LEVEL BILGE ALARMS
WINDOW DEFROSTER
BILGE PUMPS
BALLAST/FIRE PUMP
EMERGENCY FIRE PUMP @ EMERGENCY
GENERATOR
CG APPROVED FIRE STATIONS
FOAM HOSE SYSTEM
PORTABLE FOAM SYSTEM
FIRE AXE
FIRST RESPONDER KIT
AED
1 COMPLETE FIREMAN'S STATION 1
FOCSLE, 1 INSTR. AREA

STARFIX® SATELLITE POSITIONING SYSTEM

DESCRIPTION

The fundamental idea of Long-Range or Wide Area Multi-Site DGPS is to extend the range of operation of typical stand-alone DGPS systems from 300 km to 1000 km and beyond. The degradation of accuracy with distances longer than 300 km occurs due to the spatial decorrelation of ionosphere, troposphere, orbit and other errors. The ionospheric and tropospheric errors are computed for user and reference sites and removed. Other errors do not cancel out in the differencing process. However, they tend to be a linear function of the distance and frequently tend to affect the individual DGPS position solutions with opposite signs depending on relative location of DGPS stations with respect to satellite passes. Therefore the combined solution of several DGPS baselines has an advantage of canceling out most of the systematic errors that are present in individual stand-alone DGPS solutions. An additional important advantage of Multi-Site DGPS is a redundancy necessary for monitoring the integrity of pseudo-range corrections from DGPS stations.

The FUGRO Multi-Reference DGPS was the first in the industry to implement the concept of Wide Area DGPS. The FUGRO system uses the latest GPS receiver technology and robust differential corrections from the OMNISTAR DGPS network that is transmitted via STARFIX®. The current FUGRO DGPS network covers the continental United States, parts of Canada, Mexico, as well as other service areas in South America, Africa, Europe and South East Asia. Another first, has been the development and deployment of the STARFIX Plus Dual Frequency DGPS for ionospherically disturbed regions, such as Africa and South America.

The FUGRO Multiple Reference Differential GPS (MRDGPS) software package computes the individual stand-alone solutions from user-selected DGPS stations, checks for outliers and combines into a composite solution; with weights assigned according to distance and geometric dilution of precision (DGOP) of individual solutions. A sequential least-squares filter is used to process carrier smoothed pseudo-range data. It can simultaneously compute a Virtual Base Station (VBS) solution by combining the individual corrections into a single set, depending on client requirements. The MRDGPS system provides robust Quality Control (QC) for system performance, adhering to UKOOA requirements for DGPS systems.

STARFIX DGPS North and South America Service Infrastructure

Operated by OMNISTAR®, Inc. in Houston, TX the Fugro STARFIX DGPS network that serves the US West Coast, Gulf of Mexico, and the North and South Atlantic region is a robust, reliable and redundant DGPS correction service.

Each reference station in the network is configured with either a Single or Dual frequency Trimble GPS receiver, power and communication controllers; all operating on a battery backup UPS systems. There is a primary lease line and dial backup connection from each, to the primary network hub in Houston, TX. It is possible to receive data on the primary lease line and simultaneously control the GPS receiver on the dial up line. It is also possible to receive data from the remote site on the lease line and dial up line. Each reference site is located at or near a technical facility for ease of equipment maintenance.

A secondary hub in Lafayette, LA is configured to take over in case of catastrophic or partial failure of the Houston hub. Both hubs can be up and operational at the same time using the combination of lease and dial backup facilities. It is also possible to use cell phone backup at the reference sites in case of cable infrastructure failure (backhoe fade).

There are four different satellite correction delivery systems available in this service area:

- C band
- AMSC L band regional spot beam
- AM-SAT L band global beam
- INMARSAT (AORW) global beam

The C band and AMSC service have basically the same 11 reference stations, (10 US plus Carmen, Mexico), AM-SAT and AORW include 13 stations; 7 South American stations, along with specific US and Canadian stations. Uplink facilities are at three different locations: The C band uplink is in Houston while AMSC is in Virginia with AORW and AM-SAT in Connecticut. AMSC, AMSAT and C band services all support omnidirectional antennas while AORW requires a high gain directional antenna.

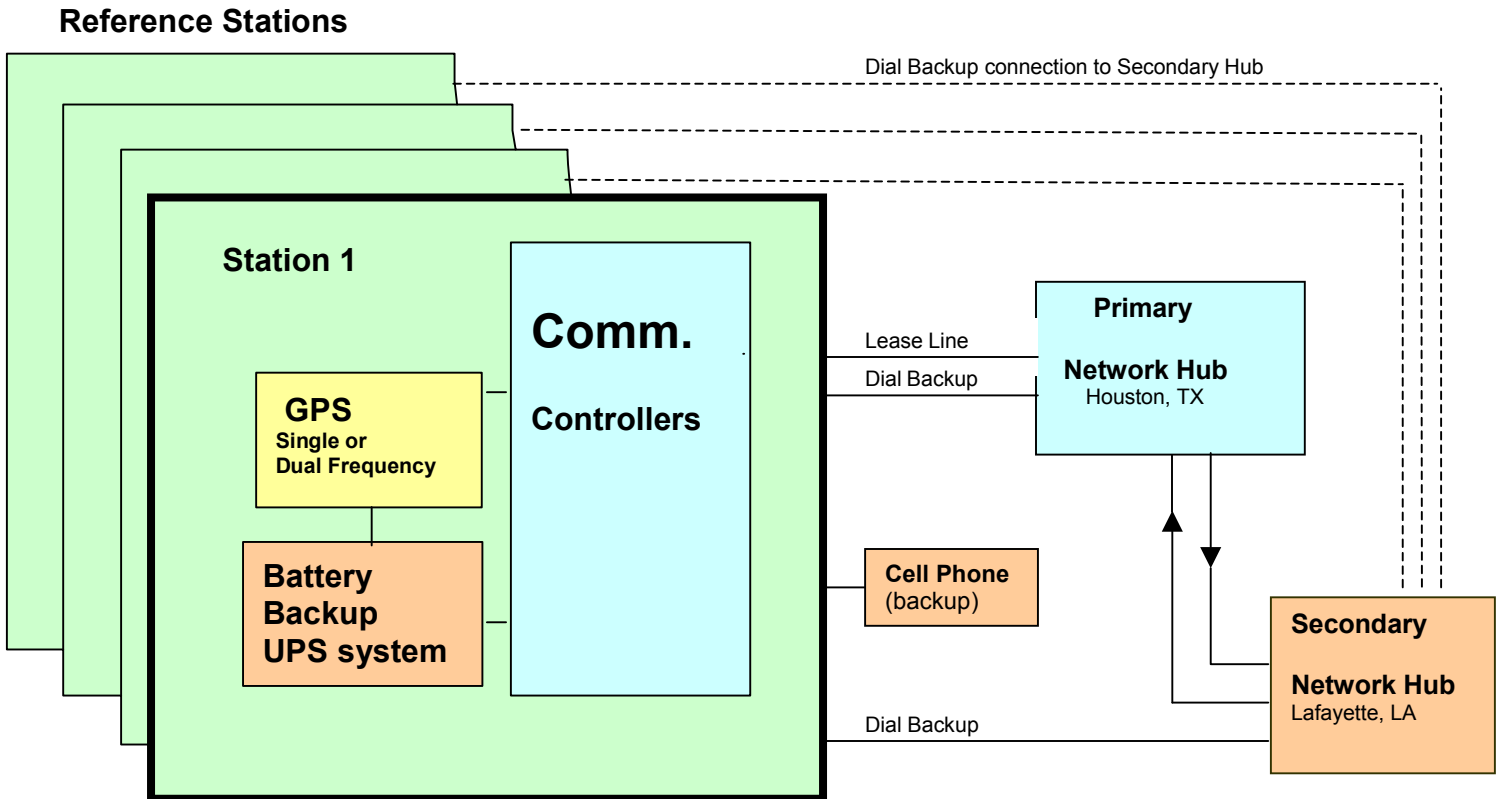
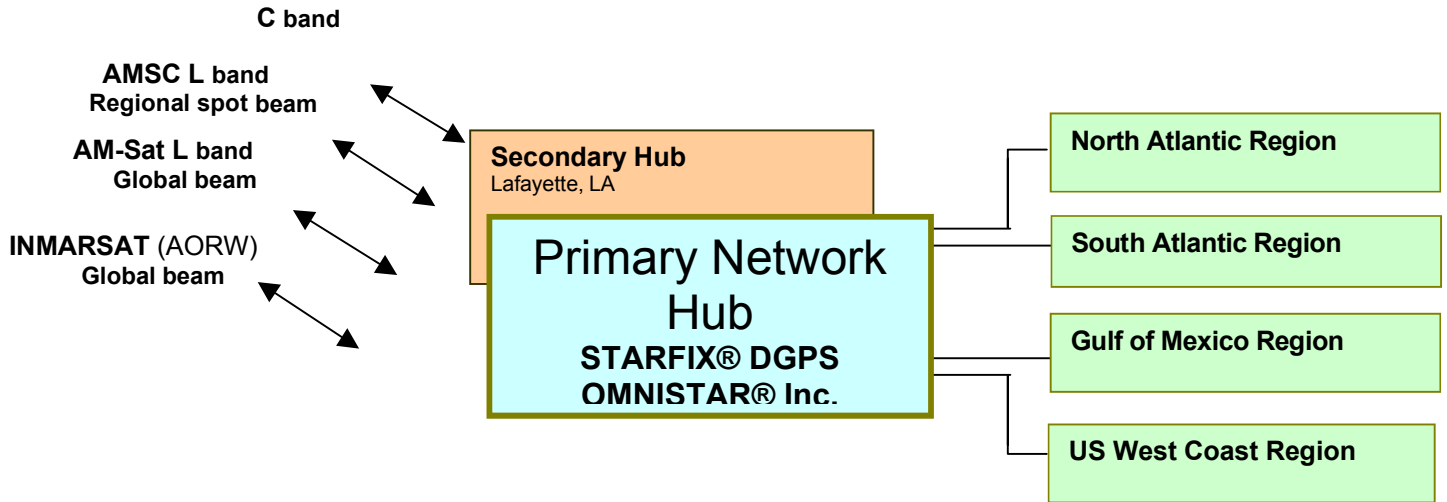
The balance of user software and reference station site selection allows for continued service even with the loss of one or more individual reference stations. Reference stations can be taken down for maintenance and upgrading without impacting user operations. Increased service availability is possible if multiple satellite delivery systems are configured at the user. It is also possible to configure the US Coast Guard GPS Beacon system into most of the systems provided by Fugro as an additional, independent backup.

This combination of user software reference station, communications infrastructure, control and satellite delivery service provides an average uptime reliability of 99.978% for 1999.

The Fugro STARFIX DGPS network is designed to provide the highest level of availability and accuracy for offshore navigation and positioning.

STARFIX® DGPS North and South America Service Infrastructure

A robust, reliable, and redundant DGPS correction service



Each reference station has a separate primary lease line and backup.

South American Reference Stations use the Fugro Data Network for Communication Links



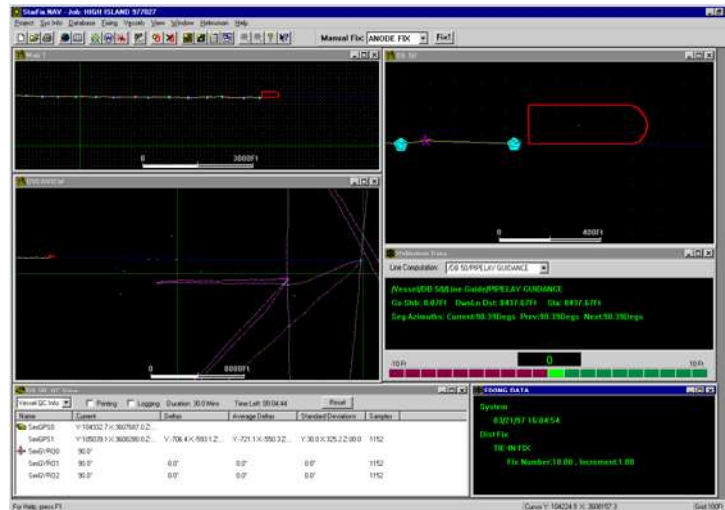
STARFIX•NAV

POSITIONING & NAVIGATION SOFTWARE

The rapidly changing technology of the offshore industry demands precise, comprehensive navigation and positioning service. To meet this demand, Fugro-Chance, Inc. has developed Starfix.Nav™.

A product of Fugro's Global Survey Division, Starfix.Nav is a component of an integrated surveying software system used by Fugro surveyors worldwide. Starfix.Nav, the general navigation program, has a wide range of functionality to meet the requirements of diverse markets and clients. Offshore applications for Starfix.Nav include rig moves, barge management, anchor vessel management, template placement, and pipelay/cablelay; however, Starfix.Nav is not confined to these operations.

The core features of Starfix.Nav are the intelligent user interface and data display, comprehensive data processing and logging, hardware interfacing capability, and extensive geodetic and survey computations. Real-time positioning and true GIS functionality are just some of the advantages of using Starfix.Nav. The features list below provides an overview of Starfix.Nav functionality, but best way to learn about Starfix.Nav is to attend a demonstration.



GEODETIC FUNCTIONALITY

STARFIX.NAV supports all existing geodetic options and all local computational algorithms. The coordinate system standards project settings include reference spheroid, datum, map projection, and operating unit. The user may select the project coordinate system standards from the comprehensive lists provided or define standards by entering parameter values. All project coordinate system standards may be changed and changes are reflected throughout the project.

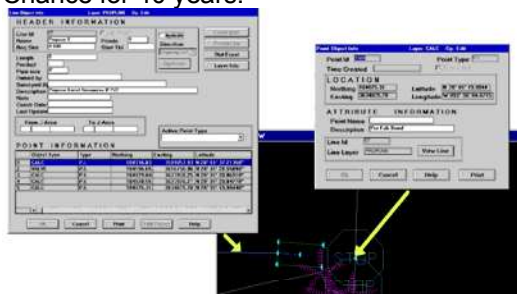
DEVICE INTERFACE FEATURES

Starfix.Nav supports multiple instances of positioning devices (GPS, remote, and pre-calculated), heading devices, bathymetry sensors, pitch-and-roll sensors, sounders, heave sensors, and speed sensors. Data from the "primary" device for each device type is used in all Starfix.Nav calculations and data displays. Secondary devices are used for QC. Datum shifts are applied to all positioning devices using the selected datum shift method. The **Peripheral**

Status window displays the details and status of peripheral devices.

DATA ACCESS & ACQUISITION

Data Access. True GIS functionality, enabling fast access to reliable data, is now available with Starfix.Nav. All map objects can be identified by visual inspection of color, symbol, or line type. Starfix.Nav map objects are linked to database information, enabling online query and edit of survey data, such as pipeline owner and size. The survey operator may query any map object and gain instantaneous access the proprietary information that has been maintained by Fugro-Chance for 40 years.



Data Acquisition. Starfix.Nav has a flexible and dynamic data architecture. Data can be acquired and modified and new data categories can be added at any time while the project is open. Data for a specific Starfix.Nav map object can be entered or changed online, for fast data updating. Attributes can be added for any map object, without code changes or interruption to the running Starfix.Nav project.

VESSEL TRACKING

Starfix.Nav allows simultaneous tracking of an unlimited number of vessels. Once defined, the vessel is displayed on all **Map** windows and is positioned by the data from its primary position device. Each vessel can be independently configured for the following:

Description. A general record may be entered for each vessel.

Vessel shape outline. Each vessel may be represented on the map with a dimensionally accurate shape. A drawing utility is provided in Starfix.Nav for creating and editing vessel shapes.

Survey sensors. An unlimited number of devices of each device type may be assigned to a vessel. An auto-switching option is available for each device type to automatically select the primary device based on a user-prioritized device order and device status.

Offsets. An unlimited number of offsets may be defined from the central reference point (CRP) of a vessel for each offset type. Four categories of offsets are defined in Starfix.Nav, based on their function. Antenna offsets define the location of positioning device antennas on a vessel. Static offsets define fixed locations on or off the vessel for which the user wants a calculated position and can be used as reference points in position and navigation computations. Anchor fairlead offsets define the anchors on a vessel by defining the position of the vessel's anchor fairleads. Sensor offsets define the location of sensor antennas.

Vessel QC output. QC data for a vessel may be printed, logged, and displayed in the **QC** window. QC data includes comparisons between multiple devices of the same device type and results of any average fix configured for the vessel.

DATA PROCESSING AND CALCULATIONS

Starfix.Nav has extensive mathematical calculation and conversion capabilities. Distances, angles, directions, locations, elevations, areas, and volumes are thus determined from raw survey data and user-defined parameters. Starfix.Nav handles the following calculations:

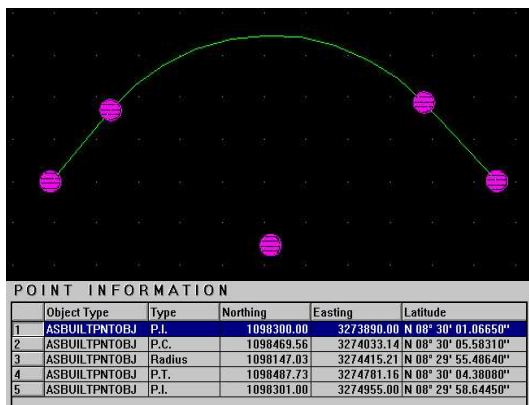
Position Computations. Starfix.Nav performs multiple simultaneous positioning computations, including for vessels with multiple positioning systems. Positioning and heading filters are provided, including Kalman Filtering.

QA Computations. Comparisons between multiple sensors for average fixing and quality assurance are calculated.

Navigation Computations. An unlimited number of line guidance computations and range/azimuth computations can be defined for any vessel and displayed simultaneously in real time in the Helmsman window. Line guidance computations are defined from any vessel offset

to any critical line, including any Starfix.Nav line object, active barge route, approach azimuth line, or proposed anchor line. Line guidance computations can be calculated along curved survey routes. Range azimuth computations are defined from any vessel offset to any critical point, including any Starfix.Nav map point, the proposed position, any proposed anchor, and any offset on another vessel.

Curves. Starfix.Nav can calculate and display circular curves on any Starfix.Nav map line.



Barge route calculations. A barge route can be calculated along any Starfix.Nav line object, including curved lines. The touch-down distance can be entered for curved segments. The following barge route values can be computed and displayed in real time in the Helmsman window: kilometer post (KP), station, pipe laid, proposed barge heading, and distance to go.

Parallel lines. An unlimited number of parallel lines can be generated from any Starfix.Nav line object, including curved lines.

GRAPHIC DATA DISPLAY

The Map window graphically displays the physical survey site and the real-time progress of survey and navigation operations. The survey operator can create an unlimited number of map windows, each of which can be configured with a different view. Starfix.Nav uses TERRAMODEL® Plus 3 Toolpak™ as its graphics engine, with a layer system for managing map objects.

The following Map Window functionality is available:

Multiple plan views. All Map windows can be individually scaled, including auto-centering on any vessel or the proposed position.

Mapping. All Map windows are updated with changes to project coordinate system standards and can be printed.

Coordinate display. The pointer position in the map is displayed in grid coordinates in the status bar.

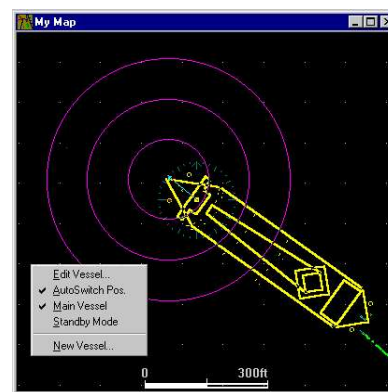
Some Starfix.Nav procedures allow mouse click coordinate entry.

Measurement. Navigation computations provide continuous measurements between a vessel offset and a map object. A measuring tool enables quick distance measurements between any two positions on the map.

The following items may be displayed on the map window:

Points and lines. Survey entities are represented by point and line objects in the map window. Point and line objects of the same type, such as well or existing pipeline, have identical visual attributes—symbol, color, line type—for quick visual identification.

Vessel outline. Each vessel in Starfix.Nav is represented on the map by a user-specified vessel shape and moves in synchronization with the primary position device allocated to it. The display of the vessel shape may be suppressed.

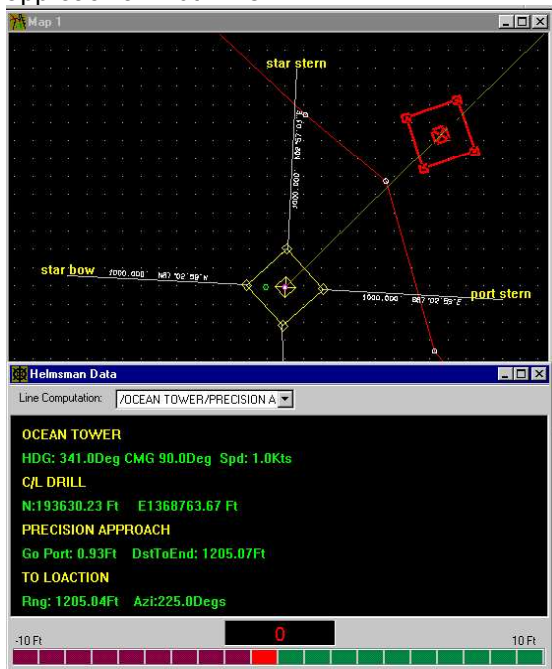


Vessel display options. Options are provided to display up to five graduated, tolerance circles radiating from a selected offset, a snail trail

generated from a selected offset, a compass rose, and a CMG (course made good) indicator for any vessel. The color for these items is selectable.

Images and Drawings. Electronic charts and digital mosaics may be imposed on the map. Map files in .dxf or .dwg format can be displayed on the map. A utility to convert drawing file objects to Starfix.Nav map objects is provided.

Graphical positioning options. A proposed position, heading, and approach azimuth may be defined for any vessel. A proposed anchor pattern may be entered for any vessel that has a proposed position. Graphical display options include displaying a vessel outline over the proposed position as a positioning template, displaying markers at the proposed anchor locations, displaying the imaginary anchor lines extending from the proposed anchor locations to the corresponding anchor fairleads of the proposed position, and displaying a navigable approach azimuth line.



Anchors. Any vessel can have anchors associated with it. Anchor lines are displayed from the anchor position to the anchor fairlead.

Barge routes. Active barge routes are displayed.

Text and labeling. User-defined text may be displayed at a user-defined coordinate and lines may be labeled with stationing and segment distance/azimuth, including along curved segments. Text and label attributes can be user-specified. Proposed anchor lines are automatically labeled with range/bearing.

Grid and scale bar. A user-defined grid and a scale bar can be displayed, optionally.

TEXT DATA DISPLAY

The counterpart of the graphical Map window is the textual display of survey data, provided by the **Helmsman** window. The survey operator can create an unlimited number of Helmsman windows, each configured with a customized set of survey data. System parameters, calculated positions for vessels offsets, heading, velocity, line guidance computations, range/azimuth computations, and barge route parameters are some of the data items that may be selected. A graphical left/right indicator may be displayed in any Helmsman window to facilitate navigation during line guidance operations.

DATA COMMUNICATION

Starfix.Nav supports up to 16 remote monitors. The survey operator can configure each remote monitor with a customized display, providing the client representative, helmsman, and anyone else requiring project data with the specific information to satisfy their job requirements. Starfix.Nav is equipped with extensive printing and logging functionality. Logging and printing may be enabled for such functions as data QC, fixing, and snail trails. Demand print can be activated to instantaneously print critical operation data. Any window and many dialog boxes can be printed.

ANCHOR HANDLING

Starfix.Nav provides comprehensive anchor management. A customized **Anchor** window may be displayed for each vessel to track the status of the anchors defined for that vessel. The Anchor window displays the anchor name; anchor state; the vessel on which an anchor is laid (when applicable); the current position; the proposed position; and the following

range/azimuth computations: fairlead to current, fairlead to proposed, current to proposed, and anchor boat to current.

The Anchor window contains all of the functionality to record anchor events and anchor events are logged for as-laid anchor reports. Anchor lines are displayed on the map. When the proposed position is moved, proposed anchors can be either kept in position or the proposed anchor pattern can be transposed.

QUALITY ASSURANCE

A text window showing the following survey QA results can be displayed for each vessel: raw receiver data, device comparisons, computed data, device status and warning messages.

FIXING

Starfix.Nav is capable of initiating events for any vessel, based on the following non-mutually exclusive fixing modes: time, **distance**, **average**, and **manual**. The specifications for each fix type are user-defined. Time, average, and manual fixes can be taken from any vessel offset. Distance fixes are controlled by a line guidance computation. Average and manual fixes have an optional hotkey function. Time and distance fixes have a fix number and fix counter. Fixes are recorded with Starfix.Nav point object and may have data attributed to them. Lines can be mapped in real-time using a sequence of fixes in any combination of fix modes.

INTEGRATION WITH OTHER STARFIX APPLICATIONS

Starfix.Nav is capable of sending and receiving data messages to and from the following STARFIX applications:

Starfix.IOWIN IOWIN provides centralized control of all serial input and output operations, including messaging, serial protocol, and low-level communications for output.

Starfix.MM Message Manager (MM) is the data distribution application for the Starfix suite—the heart of the system.

Starfix.Probe Interfacing to USBL or Range/Azimuth systems, this program provides accurate positioning for both the simple ROV navigation projects and the complex multi-transponder structure installations.

Starfix.Acoustics Used with Starfix.Nav, this program will provide the highest quality LBL acoustics positioning available in the survey industry.

Starfix.ADV Software for CHANCE's proprietary DWADV system, a high-precision, high-accuracy system for determining the depth of submerged features and an accurate bathymetry system on ROV's.

WINDOWS FUNCTIONALITY

Starfix.Nav runs on the Microsoft® Windows 95™ and Windows NT™ operating systems and has the following standard MS Windows features:

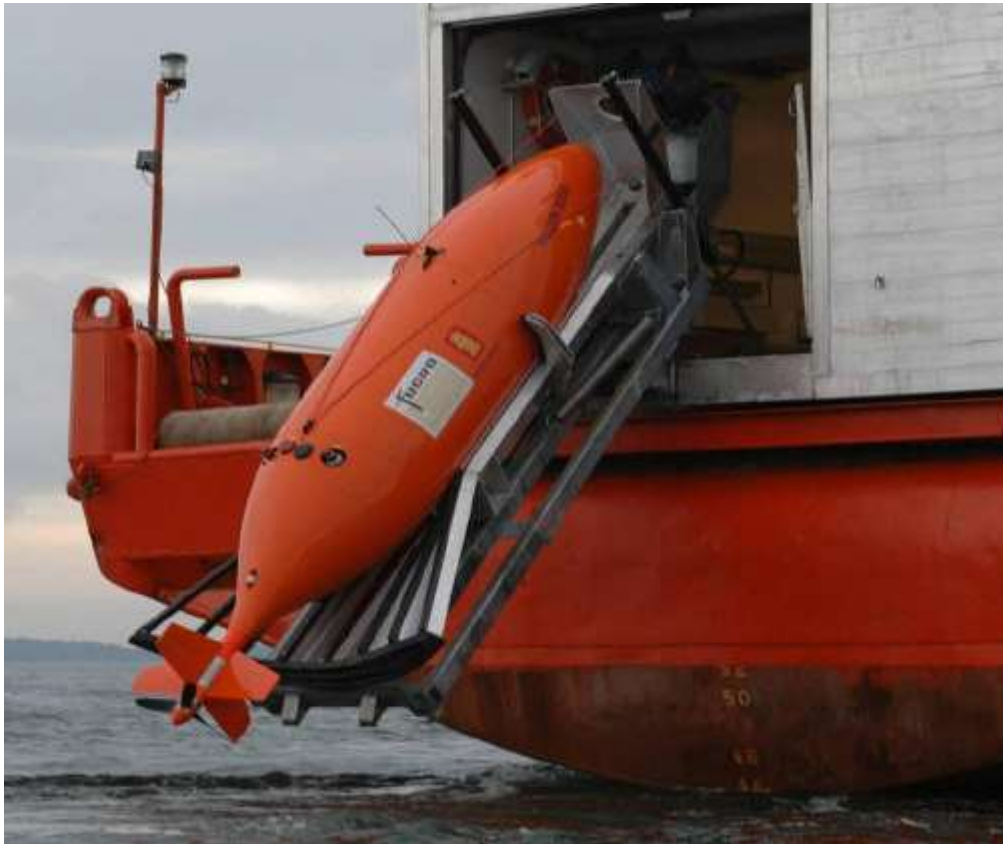
- Multi-tasking, i.e., system parameters may be changed on-line
- Windows 95/NT graphical user interface (GUI)
- Faster data processing and command response
- Uses any hardware—video graphics board, multiport RS-232 serial board, etc.—that has an MS Windows driver

SUPPORT

CHANCE provides comprehensive technical support for Starfix.Nav, including trained operations personnel, context-sensitive help, a comprehensive user's guide, and 24-hour technical support world-wide.



Echo Surveyor



Autonomous Underwater Vehicle (AUV)

Echo Surveyor is a “state of the art” autonomous underwater vehicle (AUV), specifically designed for efficient survey operations in water depths down to 3000 metres.

AUV's are the ultimate choice of instrument platform for deep sea and remote surveys. Placing survey sensors onboard an AUV means the geophysical measurements take place close to the seafloor, dramatically improving data resolution and accuracy.

The AUV is based on a Kongsberg Maritime manufactured Hugin 3000 body with a payload selected by Fugro to meet the demands of the offshore survey industry.

In comparison to towed systems, the tight turning circle enormously reduces the time to change between survey lines. The Inertial Navigation System (INS) adds rigour to the positioning of hazards and features. Compared to an ROV, the AUV operates without an umbilical and is able to move both faster and more quietly, collecting data with a very high signal-to-noise ratio. The survey is completed sooner and the results are more accurate. Clients within the oil and gas industry,

the utilities sector and government agencies utilise Fugro's AUV's to obtain engineering grade of high resolution data for deep sea field development and seabed mapping. Design is optimised and risk is reduced.

Fugro own and operate two Echo Surveyor class AUVs which are mobilised either from one of Fugro's dedicated fleet of international survey vessels or from 3rd party charter ship's. The AUV container system is ready for rapid deployment to survey locations worldwide.

Echo Surveyor has the following capabilities:

- Efficient semi-fuel cell battery
- 60 to 70 hour dive endurance
- Nominal survey speed 4 knots
- Inertial Navigation System
- Standard payload comprises:
 - Multibeam echosounder
 - Sidescan sonar
 - Sub-bottom profiler
 - CTD profiler
- Typically survey operations:
 - Deep water field developments
 - Site surveys
 - Pipeline and cable routes
 - Regional mapping

- Angola
- Argentina
- Australia
- Azerbaijan
- Belgium
- Bermuda
- Brazil
- Brunei
- Canada
- China
- Congo
- Denmark
- Egypt
- France
- Gabon
- Germany
- Ghana
- Hong Kong
- India
- Indonesia
- Ireland
- Italy
- Japan
- Kazakhstan
- Kuwait
- Lebanon
- Luxembourg
- Malaysia
- Mexico
- Netherlands
- Netherlands Antilles
- Norway
- Nigeria
- Oman
- Pakistan
- Philippines
- Poland
- Qatar
- Russia
- Saudi Arabia
- Singapore
- South Africa
- Spain
- Switzerland
- Thailand
- Trinidad & Tobago
- Turkmenistan
- United Arab Emirates
- United Kingdom
- United States
- Venezuela

Echo Surveyor

Autonomous Underwater Vehicle

PHYSICAL DATA

Length 5.35 meters
Weight (air) 1450 kg
Weight (water) Neutral
Diameter 1.0 meter
Volume 2.4 m³
Hull material: Carbon fibre reinforced epoxy, titanium and syntactic foam

POWER SYSTEM

Battery: Aluminium / Hydrogen peroxide semi fuel Cell
Battery capacity – 45kWh
Propulsion – SmartMotor, rudders and propeller

ACOUSTIC NAVIGATION SYSTEM

Aided Inertial Navigation System
Simrad HiPAP 500 USBL
Inertial measurement unit (IMU) – iXSEA IMU 90
Depth pressure sensor - Parascientific Digiquartz
Doppler Velocity Log (DVL) – RDI Workhorse Navigator WHN-300, 307 kHz

ACOUSTIC COMMUNICATION

Command link – Kongsberg 24 to 28 kHz, 55bps
ACL transducers – TP324, TP331
Data link – LinkQuest 13.5 to 22.5 kHz, 4250bps
DCL transducers – UWM4010
Emergency link – Kongsberg 25 to 25.6 kHz, 10bps

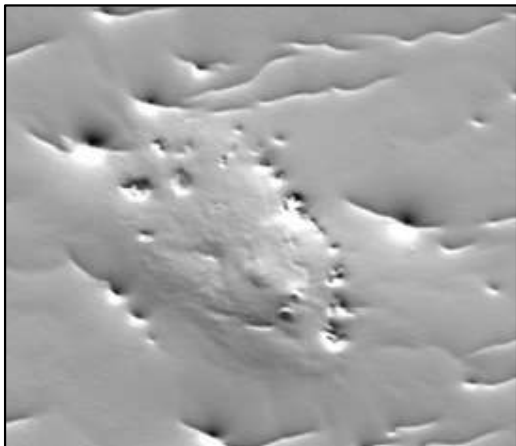
SURFACE COMMUNICATION

Radio Frequency Link – Wood & Douglas M971, UHF SX450, 458 MHz
Jupiter 12 channel DGPS receiver

PAYLOAD SENSORS

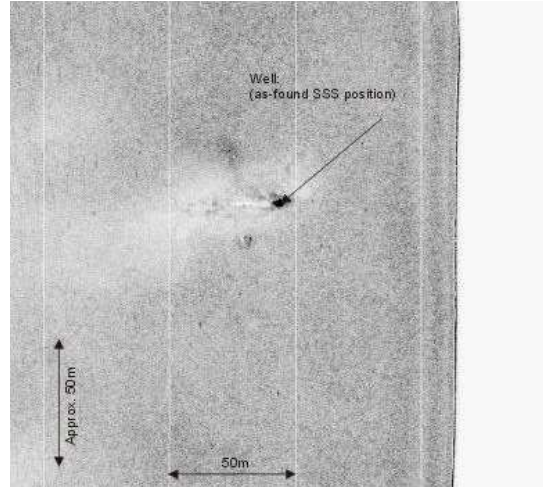
MULTIBEAM ECHO SOUNDER

Kongsberg EM2000, 150 degrees coverage
Frequency 200 kHz



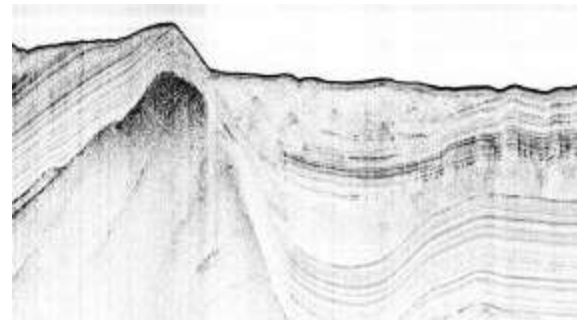
SIDE SCAN SONAR

Edgetech Full Spectrum sidescan sonar
Simultaneous Frequency 120 kHz and 410 kHz



SUB BOTTOM PROFILER

Edgetech Full Spectrum chirp subbottom profiler
Frequency 2 to 16 kHz



ADDITIONAL SENSORS

CTD – Falmouth FSI Micro
Altimeter avoidance – Mesotech 1007, 675 kHz
Altimeter height – Trittech LPA200

HIPAP® 500 HIGH PRECISION ACOUSTIC POSITIONING AND UNDERWATER NAVIGATION SYSTEM

One hull mounted transducer

HiPAP 500 SSBL principle has the obvious advantage that it only requires installation of one hull mounted transducer and one subsea transponder to establish a three-dimensional position of the transponder. An SSBL system is measuring the horizontal and vertical angles together with the range to the transponder. An error in the angle measurement causes the position error to be a function of the range to the transponder. To obtain better position accuracy in deep water with an SSBL system it is necessary to increase the angle measurement accuracy.

Typical configuration

The HiPAP 500 High Precision Acoustic underwater Positioning and navigation system operates with the transducer mounted on a hull unit to allow the transducer to be lowered some meters below the hull of the vessel. A Transceiver Unit containing transmitter, preamplifiers and beam forming electronics is mounted close to the hull unit. The system can be configured with one or two hull mounted transducers. With the use of two transducers, accuracy and redundancy will be improved.

HiPAP 500 transducer

The HiPAP 500 High Precision Acoustic Positioning system has a spherical transducer with several hundred elements covering the whole sphere under the vessel.

Beam control

The system will dynamically control the beam so it is always pointing towards the transponder. The transponder may be moving, and roll, pitch and yaw affect the vessel itself. Data from roll/pitch sensors are used to roll and pitch compensate the position.



SEACAT SBE 19-01 SOUND VELOCITY PROFILER

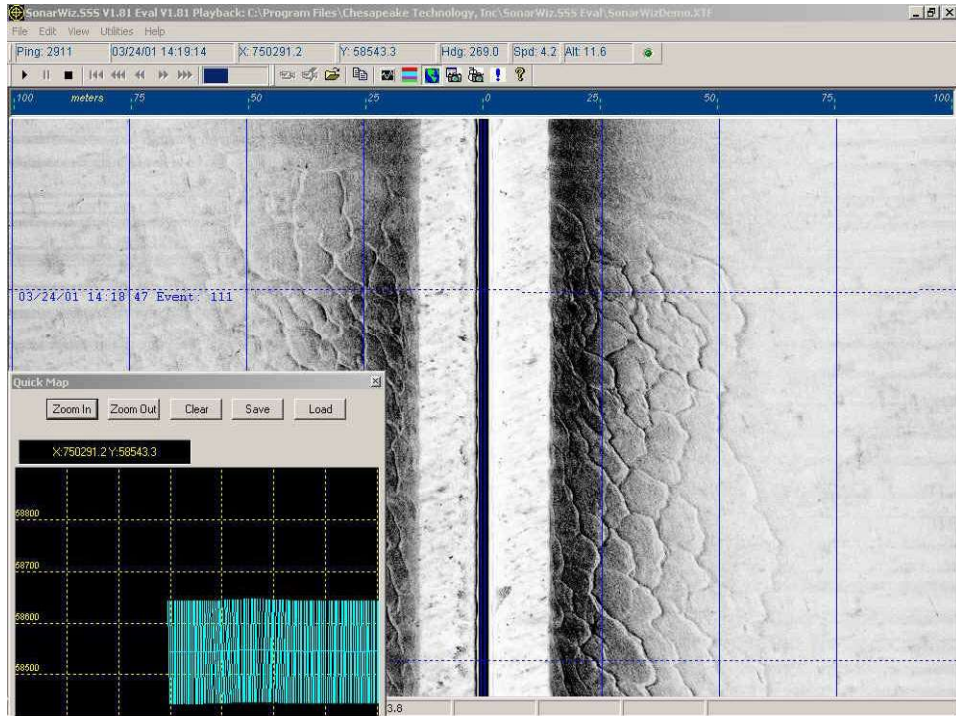
DESCRIPTION

The Seacat SBE 19-01 Profiler, from Sea-Bird Electronics, Inc., measures electrical conductivity and temperature versus pressure (depth) in marine environments to depths up to 6,800 meters (22,309 feet). The maximum sampling rate is 2 scans per second. Self-powered and self-contained, the SBE 19 features proven Sea-Bird conductivity and temperature sensors and a precision semiconductor strain gauge pressure transducer. A 64-kilobyte solid-state memory allows 1.5 hours of recording (6 hours with optional 256 kilobyte memory) while sampling at two scans per second. Set-up, checkout, and data extraction are performed without opening the housing. Simultaneous real time monitoring is possible using the Seacat Profiler's two wire RS-232C transmit capability. Sea-Bird's powerful Seasoft CTD software derives salinity, density, sound velocity, and other ocean parameters from stored CTD (conductivity, temperature, depth) and may be used for data analysis, plotting and archival. Small external sensors may be powered and their frequency or voltage outputs acquired by the SBE 19.

Seacat Profiler options include 1) aluminum housings for use to 3,400 or 6,800 meters; 2) 256 kilobyte memory; 3) an extra bulkhead connector for auxiliary inputs; 4) SBE 5 submersible pump for pumped conductivity; 5) an opto-isolated junction box for supplying power and interconnecting Seacat Profiler and a companion computer which is necessary when using the Profiler in real-time mode.

Use of conductivity, temperature, and depth measurement for determination of sound velocity is appealing because these instruments are simpler and more rugged and because resolution, accuracy, and stability lead to better precision than can be obtained with direct sound velocity measuring devices. Three equations are widely used for deriving sound velocity from CTD data (Wilson, 1959; Del Grosso, 1972; Millero and Chen, 1977). Absolute sound velocities derived from these equations differ on the order of .5 meter/second for various combinations of water temperature, salinity, and pressure. The work of Millero and Chen is the most modern and builds upon and attempts to incorporate the work of the earlier investigators. Millero and Chen's 1977 equation is used in the Sea-Bird Seasoft software, and is the one which is endorsed by the Unesco/SCOR/ICES/IASPO Joint Panel on Oceanographic Tables and Standards which comprises the internationally recognized authority for measurements of ocean parameters.

SONARWIZ SIDE SCAN SONAR



SonarWiz SSS offers 2-4 channel side-scanning sonar data acquisition for analog side scan sonars

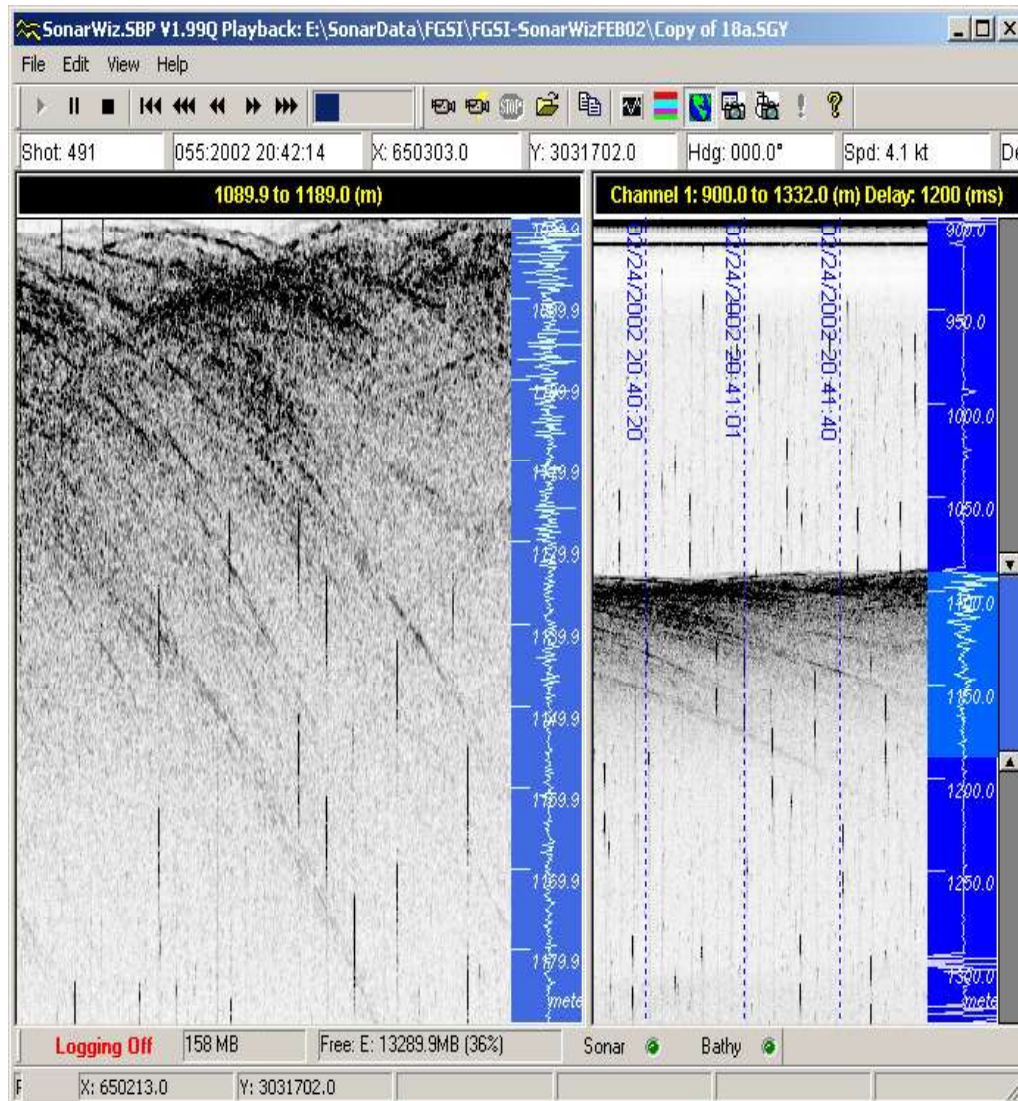
SonarWiz SSS Features

- 64 kHz sampling rate with 8 or 16-bit resolution.
- Real-time sidescan data display and playback with QC tools.
- Playback logic supports VCR style fast-forward, reverse, pause and stop options.
- Amplitude scope trace monitor.
- Non-linear per-channel TVG .
- Digital recording in 8 or 16-bit XTF format
- Compatible with any analog sub-bottom sidescan sonar and some digital sonars
- Flexible triggering options allowing either internal or external trigger source.
- Flexible internal or external event generation.
- Text annotation support stored in XTF Annotation record for subsequent playback.
- Redundant data recording option.
- Contact marking.
- Color and contrast controls
- Work in meters, feet or milliseconds. Local or UTC time.
- Compatible with most sidescan post processing systems and SonarWeb
- Interfaces with Hypack, NMEA-0183 (RMC, GGA, GLL, VTG, HDT and VHW) and custom navigation interfaces.
- Support for EPC-1086, 980x, HSP-100, ODEC TDU-850, TDU-1200 and TDU-2000 in real-time and playback.
- Laptop/PCMCIA configurations available.
- Full online HTML help system.

SONARWIZ SUBBOTTOM PROFILER

DESCRIPTION

SonarWiz.SBP offers single channel sub-bottom profiler data acquisition for most analog sub-bottom profilers. Features include built-in deep water delay, SEG-Y recording, NMEA and custom navigation interfaces.



16-bit SEG-Y sub-bottom data acquisition

SONARWIZ SUBBOTTOM PROFILER

SONARWIZ SBP FEATURES

- 64 kHz sampling rate with 16-bit resolution.
- Real-time seismic data display and playback with QC tools.
- Playback logic supports VCR style fast-forward, reverse, pause and stop options.
- Amplitude scope trace monitor.
- Spectrum display and band-cut filter.
- TVG and Stacking.
- Digital recording in 16-bit SEG-Y format.
- Compatible with any analog sub-bottom profiler.
- Flexible triggering options allowing either internal or external trigger source.
- Flexible internal or external event generation.
- Text annotation support stored in user-defined area of SEG-Y trace header for subsequent playback.
- Redundant data recording option.
- Contact marking.
- Color and contrast controls.
- Built-in deep water delay.
- Work in meters, feet or milliseconds. Local or UTC time.
- Multi-ping support for high resolution coverage in deep water.
- Compatible with most SEG-Y post processing systems and SonarWeb.
- Interfaces with Hypack, NMEA-0183 (RMC, GGA, GLL, VTG, HDT and VHW) and custom navigation interfaces.
- Built-in support for TSS-320 heave compensator.
- Support for EPC-1086, 980x, HSP-100, ODEC TDU-850, TDU-1200 and TDU-2000 in real-time and playback.
- Laptop/PCMCIA configurations available.

FUGRO GEOSERVICES, INC.

GEOPHYSICAL JOBLOG

ver 2.27.2007-HSE-2-E

DATE: 09-Jun-2008 Mon Julian Day: 161

PROSPECT / SITE:

NAV. SYSTEM: Starfix

FGSI JOB #: 2408-5004

JOB DAY #: Day: 4

CRP TO STERN: 0.00 N/A

CLIENT: Davis Offshore

JOB DESCRIPTION: AUV Archeological Survey

AREA & BLOCK: Green Canyon 198 & Vicinity

Select Vessel Type: M/V Enterprise

No. of SURVEY LINES: 50 452.37 Kilometers
42.5% Complete

VESSEL MANAGER(S)

Party Manager:	Marc Harris
Technical Coordinator:	John Boudreaux

CLIENT REPRESENTATIVE(S)

Client Rep #1:	
Client Rep #2(HSE):	
Client Rep #3:	
Client Rep #4:	

GEOPHYSICAL EQUIPMENT EQUIP #

Kongsberg EM200 MBE 200kHz	
00 Side Scan120kHz Low & 4	
Edgtec SBP 2-12kHz	
ESE	
c Command Link 24-28kHz 55	
stic Data Link 22.5kHz 4250bit	

GEOPHYSICAL CREW

AUV Shift Supervisor:	Arvin Wright
AUV Shift Supervisor:	Wyatt Smith
AUV Tech:	Lane Wootan
"	Derrick Jackson
"	Daniel McDowell
"	Will Williams
"	0
FGSI Navigator:	Travis Groefsema
FGSI Navigator:	Brad Chaumont
FGSI Geologist:	
FGSI Geologist:	

VESSEL CREW

1st Captain:	John Halton
2nd Captain:	Joe Naquin
Captain:	Bruce Grimball
Engineer:	Joe Smallwood
Cook:	Tim Christopher
Cook:	Ronnie Weston
Deckhand:	Willie Odom
Asst. Engineer	Rick Bodner

WEATHER REPORT

Time	Sea State	Wind Speed	Dir.
Wx - 0600:	2-4	10-15	SE
Wx - 1200:	2-4	10-15	SE
Wx - 1800:	2-4	10-15	SSE
Wx - 2400:	2-4	5-10	SSE

DATA PROCESSORS

Lead Processor:	Matt Bridges
Ass't Processor:	Darrell Smith

HSE Reporting (Place an "x" in the box, with brief description)

HSE OFFICER: Marc Harris

Toolbox:

Shift Change: Yes Marine Debris video

Safety:

Pre/Post Job:

TIME		OP CODE	LINE INFORMATION							DNP
FROM	TO		LINE NUMBER	HEADING	BSP	ESP			SSS Fish (m)	
0000	0029	OLC	145	271.0°	122	139			40.0	
0029	0033	LT								
0033	0115	OL	144	091.0°	139	100			40.0	
0115	0126	LT								
0126	0224	OL	143	271.0°	100	151			40.0	
0224	0228	LT								
0228	0324	OL	142	091.0°	151	100			40.0	
0324	0327	LT								
0327	0425	OL	141	271.0°	100	151			40.0	
0425	0429	LT								
0429	0531	OL	140	091.0°	156	100			40.0	
0531	0534	LT								
0534	0649	OL	139	271.0°	100	167			40.0	
0649	0653	LT								
0653	0802	OL	138	091.0°	162	100			40.0	
0802	0808	LT								
0808	0913	OL	137	271.0°	100	158			40.0	
0913	0916	LT								
0916	1019	OL	136	091.0°	156	100			40.0	
1019	1025	LT								
1025	1123	OL	135	271.0°	100	153			40.0	
1123	1127	LT								
1127	1225	OL	134	091.0°	152	100			40.0	
1225	1231	LT								
1231	1337	OL	133	271.0°	100	159			40.0	
1337	1340	LT								
1340	1446	OL	132	091.0°	159	100			40.0	
1446	1449	LT								
1449	1555	OL	131	271.0°	100	159			40.0	
1555	1558	LT								
1558	1705	OL	130	091.0°	159	100			40.0	
1705	1709	LT								
1709	1813	OL	129	271.0°	100	159			40.0	

DETAILED SURVEY INFORMATION

FUGRO GEOSERVICES, INC.

GEOPHYSICAL JOBLOG

ver 2.27.2007-HSE-2-E

DATE: 10-Jun-2008 Tue Julian Day: 162

PROSPECT / SITE:

NAV. SYSTEM: Starfix

FGSI JOB #: 2408-5004

JOB DAY #: Day: 5

CRP TO STERN: 0.00 N/A

CLIENT: Davis Offshore

JOB DESCRIPTION: AUV Archeological Survey

AREA & BLOCK: Green Canyon 198 & Vicinity

Select Vessel Type: M/V Enterprise

No. of SURVEY LINES: 50 452.37 Kilometers
73.3% Complete

VESSEL MANAGER(S)

Party Manager:	Marc Harris
Technical Coordinator:	John Boudreaux

CLIENT REPRESENTATIVE(S)

Client Rep #1:	0
Client Rep #2(HSE):	0
Client Rep #3:	0
Client Rep #4:	

GEOPHYSICAL EQUIPMENT EQUIP #

Kongsberg EM200 MBE 200kh	
00 Side Scan120khz Low & 4	
Edgtec SBP 2-12khz	
ESE	
c Command Link 24-28khz 55	
stic Data Link 22.5khz 4250bit	

GEOPHYSICAL CREW

AUV Shift Supervisor:	Arvin Wright
AUV Shift Supervisor:	Wyatt Smith
AUV Tech:	Lane Wootan
"	Derrick Jackson
"	Daniel McDowell
"	Will Williams
"	0
FGSI Navigator:	Travis Groefsema
FGSI Navigator:	Brad Chaumont
FGSI Geologist:	
FGSI Geologist:	

VESSEL CREW

1st Captain:	John Halton
2nd Captain:	Joe Naquin
Captain:	Bruce Grimbball
Engineer:	Joe Smallwood
Cook:	Tim Christopher
Cook:	Ronnie Weston
Deckhand:	Willie Odom
Asst. Engineer	Rick Bodner

DATA PROCESSORS

Lead Processor:	Matt Bridges
Ass't Processor:	Darrell Smith

WEATHER REPORT

Time	Sea State	Wind Speed	Dir.
Wx - 0600:			
Wx - 1200:			
Wx - 1800:			
Wx - 2400:			

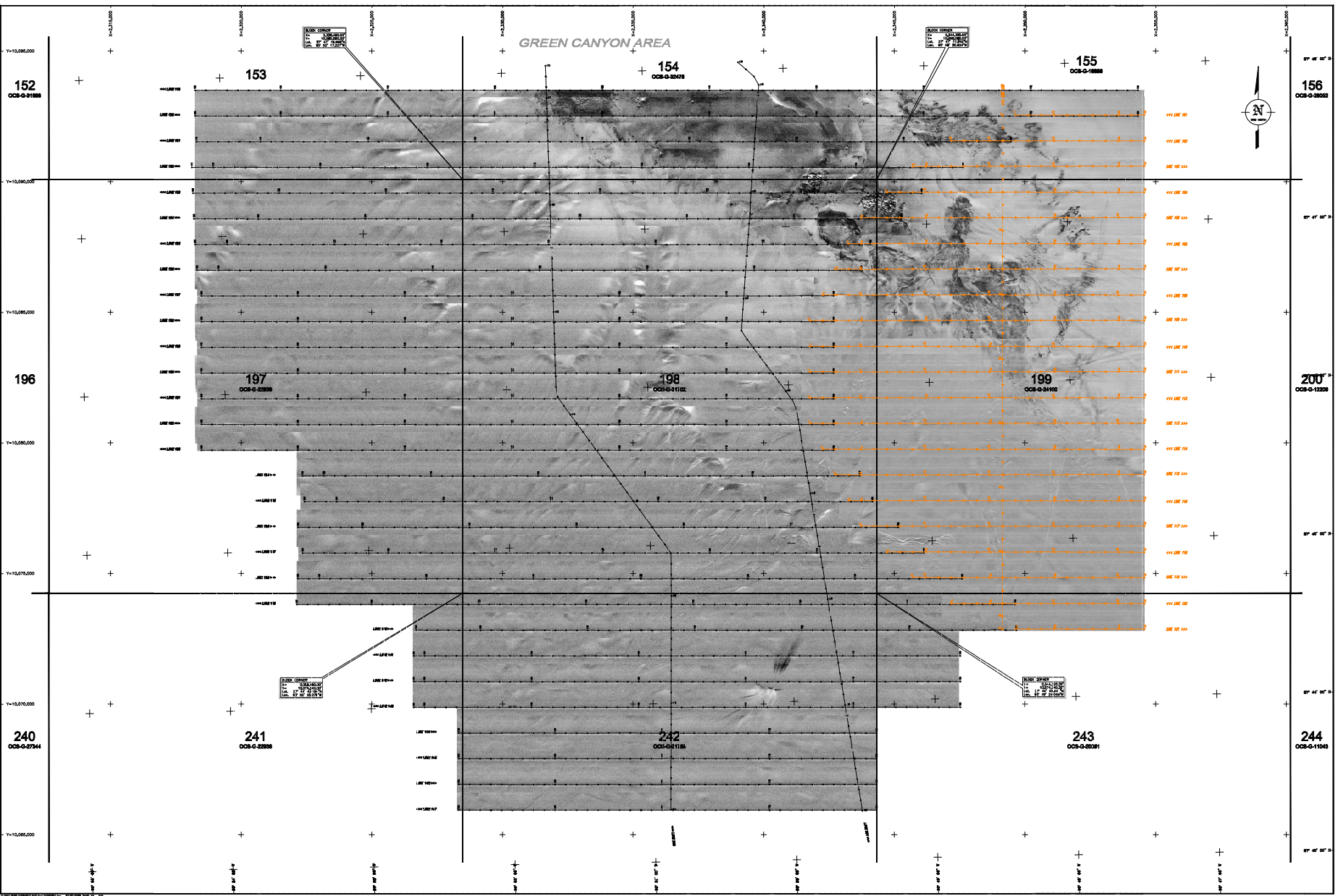
ISE Reporting (Place an "x" in the box, with brief description)

HSE OFFICER:	Marc Harris
Toolbox:	
Shift Change:	
Safety:	
Pre/Post Job:	

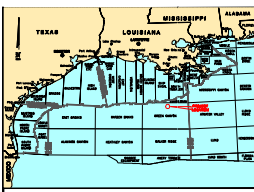
TIME		OP CODE	LINE INFORMATION							DNP
FROM	TO		LINE NUMBER	HEADING	BSP	ESP			SSS Fish (m)	
0000	0018	OLC	124	091.0°	116	100				
0018	0023	LT								
0023	0137	OL	123	271.0°	100	168				
0137	0141	LT								
0141	0303	OL	122	091.0°	172	100				
0303	0311	LT								
0311	0433	OL	121	271.0°	100	176				
0433	0436	LT								
0436	0618	OL	120	091.0°	188	100				
0618	0621	LT								
0621	0755	OL	119	271.0°	100	188				
0755	0759	LT								
0759	0939	OL	118	091.0°	188	100				
0939	0942	LT								
0942	1118	OL	117	271.0°	100	188				
1118	1123	LT								
1123	1300	OL	116	091.0°	188	100				
1300	1303	LT								
1303	1441	OL	115	271.0°	100	188				
1441	1445	LT								
1445	1621	OL	114	091.0°	188	100				
1621	1625	LT								
1625	1802	OL	113	271.0°	100	188				
1802	1806	LT								
1806	1944	OL	112	091.0°	188	100				
1944	1948	LT								
1948	2124	OL	111	271.0°	100	188				
2124	2155	OW								
2155	2220	OW								
2220	2400	OW								

DETAILED SURVEY INFORMATION

Begin recovery to surface
Recovering the AUV to deck
Downloading data and preparing AUV for re-deployment



GREEN CANYON AREA



LEGEND

- SYMBOL: SHOT POINT & SHOT POINT NO. (POSITIVE SURFACE)
- SYMBOL: SHOT POINT & SHOT POINT NO. (C & C BEDROCKS OFFSHORE)



SCALE = 1:11250
 0 1000 2000 3000 4000 5000
 FEET
 0 1000 2000
 METERS

DAVIS OFFSHORE

SIDE SCAN SONAR MOSAIC MAP

BLOCK 198 & VICINITY

GREEN CANYON AREA

Project Name: 2004-11-10	Scale: 1:11250
Client: Shell Offshore Services	Location: Block 198 & Vicinity
Contract No: 04-11-10	Order No: 04-11-10
Contractor: GEBCO	Checked by: M. B. BROWN
Prepared by: M. B. BROWN	Checked by: M. B. BROWN
Date: 04-11-10	Sheet No: 04-11-10
Job No: 04-11-10	Sheet No: 04-11-10

MAP 2 OF 2

Figro Geoservices, Inc.
 10000 Westchase Drive, Houston, TX 77036



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RAY BLACKMON
Staff Archaeologist



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TED HAMPTON
Vice President

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(713) 468-1410 phone
(713) 468-1438 fax
gems@gemsinc.com

Geologic and Stratigraphic Assessment of
Block 198 (OCS G-31702)
Green Canyon Area, Gulf of Mexico

Report submitted to

Davis Offshore L.P.

Houston, Texas

by

Geoscience Earth & Marine Services, Inc.®

Houston, Texas

Project No. 0408-1483



10615 SHADOW WOOD DRIVE
SUITE 200
HOUSTON, TEXAS 77043
Phone: (713) 468-1410
Fax: (713) 468-1438
E-mail: gems@gemsinc.com

August 25, 2008

Project 0408-1483

Davis Offshore, L.P.
1360 Post Oak Blvd.
Suite 2400
Houston, Texas, 77056

Attention: Mr. Mark Gillespie

**Geologic and Stratigraphic Assessment
Block 198 (OCS G-31702)
Green Canyon Area, Gulf of Mexico**

Geoscience Earth & Marine Services, Inc.[®], (GEMS) is pleased to provide Davis Offshore L.P., the following report describing the geologic and stratigraphic conditions within Federal lease block 198 in the Green Canyon area in Gulf of Mexico.

The Minerals Management Service (MMS) has issued a number of Notice to Lessees (NTL) that outline the requirements for the documentation needed for Exploration and Development Plans, geohazard assessments, and the delineation of potential areas of chemosynthetic communities. This report complies with the following MMS guidelines:

- NTL 2008-G04 (MMS, 2008a)
- NTL 2008-G05 (MMS, 2008b), and,
- NTL 2000-G20 (MMS, 2000)

In addition to this geohazard report, an archaeological assessment was completed over the prospect area in order to comply with MMS NTL 2005-G07 (MMS, 2005) and NTL 2006-G07 (MMS, 2006). The archaeological assessment was based on a high resolution geophysical survey conducted using an autonomous underwater vehicle (AUV). The AUV data were also incorporated into the geohazard assessment to define near-surface geologic hazards and delineate possible areas of high-density chemosynthetic communities. Fugro GeoServices, Inc., collected the AUV data and compiled an archaeological assessment report. Their report was submitted to Davis under separate cover.

We appreciate the opportunity to be of service to Davis Offshore L.P., on this project and look forward to working closely with you on other projects.

Sincerely,

**GEOSCIENCE EARTH & MARINE
SERVICES, INC.[®]**

Thomas W. Neurauter Ph. D
Senior Marine Geologist

Michael J. Kaluza
President/Marine Geologist

Distribution:
Mr. Mark Gillespie, Davis Offshore, Houston, TX 5 copies.

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- Appendix A: Proposed Wellsite Assessment Letters
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SUMMARY

Geoscience Earth & Marine Services, Inc.[®], (GEMS) conducted a shallow geologic assessment for Federal lease block 198 in the Green Canyon (GC) area, for Davis Offshore L.P. This study involved assessing the seafloor and subsurface conditions relative to potential hazards or constraints that may affect exploration drilling activities in the area. The area of investigation was of sufficient coverage to assess wellsite and potential anchoring conditions.

GEMS used 3-D exploration seismic data along with high resolution data collected with an AUV for the geohazard assessment. The AUV collected multibeam echosounder, side-scan sonar, and subbottom profiler data in order to comply with the archaeological assessment requirements in MMS NTL 2005-G07. The exploration 3-D seismic data focused on the geologic conditions and stratigraphy between the seafloor and ~3,500 ft bml. We believe these data are of sufficient quality to allow a thorough analysis of potential drilling hazards. This study conforms to guidelines established by the Minerals Management Service in their most recent Notice-to-Lessees.

The following information pertains to the location and shallow geologic conditions in the Study Area as derived from analysis of the 3-D and AUV data.

- The GC 198-study area is located along the upper continental slope in the northeast quadrant of the Green Canyon protraction area. The blocks of interest are approximately 143 miles southwest of New Orleans, Louisiana.
- Oil field infrastructure in the 9 blocks examined for this investigation includes several exploration wells, pipelines, umbilicals and production facilities. No sites exist within GC 198.
- Fugro GeoServices, Inc., prepared an archaeological assessment of the area using the sonar data. The archaeological assessment reported 14 unidentified sonar targets. The sonar targets were interpreted as modern debris from the oil field and shipping activity in the area. No special avoidance was recommended for any of the unidentified targets.
- Water depth in GC 198 ranges from -1,590 ft to -2,976 ft. The seafloor gradient ranges from near flat to approximately 32°. The average seafloor gradient in the study area is 5.45°. The highest seafloor gradients occur along seafloor escarpments. In the area surrounding GC 198, water depths shallow to -1,296 ft along a topographic high in GC 154 and deepen to -3,549 ft along the axis of a trough in GC 241.
- Possible expulsion features and areas of hydrocarbon seepage were identified by the 3-D and high-resolution datasets. The side-scan sonar defined extensive areas of hard bottom associated with the eroded top of a salt dome covering portions of GC 154-155 and GC 198-199. The hard bottom will include carbonate pinnacles, boulders, and pavements. Submersible investigations of similar areas show varying densities of chemosynthetic communities within such carbonate build ups. Chemosynthetic communities are likely within these carbonates, but the sonar data cannot define population densities. Therefore, the hard grounds defined in the area must be considered as having a high potential for high density chemosynthetic communities and should be avoided.
- Surface renderings and the high-resolution geophysical data define a network of channels, gullies, and furrows. Some of these channels can be traced for several miles and originate outside of the 9 blocks assessed for this investigation. These features, and a number of escarpments, are the seafloor expressions of ancient mass wasting events. However, in places, near-surface mass-transport deposits lack a well-defined pelagic drape suggesting activity in relatively recent times. Mudflow-like pressure ridges in some areas also suggest the possibility of local seafloor instability.
- Hemipelagic and mud-rich mass-transport deposits dominate the near-surface stratigraphy. These fine-grained units drape over the sand-prone, intraslope fan sequence that is part of the “Red Unit”. Overpressured sands within the Red Unit have been responsible for shallow water flow incidents in the general region. The average depth to the top of the Red Unit (Horizon 13) is 875 ft in GC 198. The average thickness of this unit (Unit 3) is 385 ft.

- Shallow gas will be an issue in some areas. Numerous, high-amplitude “bright spots”, indicative of shallow gas, occur in the study area. The most prolific and extensive zones are within sequences that are part of the Red Unit complex. The majority of anomalies are stratigraphic traps indicating accumulations of biogenic gas.

Recommendations Regarding Future Wellsite Plans

Specified wellsite locations are addressed in Appendix A of this report. If additional drilling locations are selected, or the locations detailed in Appendix A of this report are moved, we recommend reviewing the text, maps, and seismic examples presented in this report to determine the feasibility of the new locations

SECTION I: INTRODUCTION

Davis Offshore L.P., (Davis) contracted Geoscience Earth & Marine Services, Inc.[®], (GEMS) to provide a geologic and stratigraphic assessment for Block 198 in the Green Canyon area, Gulf of Mexico (Figure 1). The United States Minerals Management Service (MMS) designates this block as OCS G-31702.

This report is the geologic and stratigraphic analysis which integrates 3-D and high resolution geophysical data. The archaeological assessment report compiled by Fugro GeoServices, Inc., was submitted to Davis under separate cover.

Purpose

The purpose of this report is to provide a shallow geologic and hazards assessment for the seafloor and upper 3,500 ft of sediment below the seabed. This report complies with requirements set forth by the MMS in the following Notice-to-Lessees (NTL):

- NTL 2000-G20: Deepwater Chemosynthetic Communities (MMS, 2000),
- NTL 2005-G07 (MMS, 2005) Archaeological Resource Surveys and Reports,
- NTL 2006-G07 (MMS, 2006) Revisions to the List of OCS Lease Blocks
- NTL 2008-G04: Information Requirements for Exploration Plans (MMS, 2008a).
- NTL 2008-G05: Shallow Hazards Program (MMS, 2008b).

The GC-198 Study Area is designated by the MMS as having the potential for archaeological significance. The guidelines established in NTL 2005-G07 (MMS, 2005) and NTL 2006-G07 (MMS, 2006) are satisfied by the side-scan sonar data collected with an autonomous underwater vehicle (AUV) and the archaeological assessment provided by Fugro GeoServices, Inc. The high-resolution data collected for the archaeological assessment were also used by GEMS to satisfy NTL 2000-G20 to define possible areas of high density chemosynthetic communities.

Available Data

Our geohazard assessment results from the analysis of both proprietary data specific to the project area and publicly available data and publications.

Proprietary 3-D Data. Davis provided several types of geophysical data for this assessment, comprising a digital 3-D seismic amplitude volume covering the area of interest and time-depth information for generating a subsurface velocity profile.

The 3-D seismic amplitude volume was part of the CGG Green Canyon Phase 1-3 survey. These data were collected in 1997. The dataset was provided to GEMS on DVD in a standard SEG-Y format. Details on the seismic data parameters and resolution are provided in Appendix B.

The entire 3-D data volume covers approximately 81 square miles and includes 9 Federal Lease blocks (Figure 1 and Map 1). Subsurface interpretation using the 3-D data volume was limited to the 9-square mile area comprising GC 198.

Davis provided time-depth information from a checkshot survey from a well in a nearby block. The checkshot data, to approximately 3,500 ft below the mudline (bml), was used to create the time to depth function used in generation of the isopach and structure maps. Details on the velocities used in this assessment are provided in Appendix B.

Proprietary AUV Data. Fugro GeoServices, Inc., compiled an archaeological assessment of GC 198 and the surrounding area in order to satisfy current MMS NTL requirements. The assessment utilized existing data from a 2007 survey conducted for Noble Energy in 2007 (C & C Technologies, 2007) and newly acquired data in 2008 (Fugro, 2008). Both surveys collected side-scan sonar, multibeam echosounder, and subbottom profiler data using similar autonomous underwater vehicles (AUV) built by Kongsberg Simrad. These AUV's are owned and operated by C&C Technologies and Fugro, respectively. Davis supplied

GEMS with the archaeological reports produced by Fugro and C&C. SEG-Y and xtf data files from the Fugro 2008 survey were provided along with x, y, z ASCII file of the multibeam data. The sonar mosaics from both surveys were included in the archaeological reports.

The subbottom profiler data and sonar mosaics were loaded into the SMT project file with the 3-D data volume. Map 1 includes the navigation post plot of the AUV lines in the study area. The high-resolution data were used in order to interpret seafloor features within the study area.

Public Data. The regional framework for this study was established by referencing public sources such as the MMS and various published technical papers (MMS, 2007a). References are included in Appendix C. GEMS has compiled a database of information including Federal lease blocks of reported chemosynthetic communities, shallow water flow, shipwrecks, obstructions, and infrastructure. Regional bathymetry data is from the National Oceanic and Atmospheric Administration (NOAA) swath bathymetry with additional data from the Texas A&M Sea Grant program.

Project Responsibilities

The interpretations, assessments, and preparation of this report were a team effort by GEMS personnel. Dr. Thomas Neurauter was the lead geoscientist responsible for the interpretation and preparation of the text portion of this report. Geoscience assistants, under the direction of Mr. Brandon Cooley, set up and annotated the accompanying figures. Ms. Dixie Spurling and Mr. Zach Metz drafted the maps included in this report. Mr. Michael J. Kaluza reviewed the final report text, maps, and figures.

Report Format

The remainder of the report is divided into the following sections:

Section 2:	Regional Geologic Setting	Page 3
Section 3:	Bathymetry and Seafloor Conditions	Page 8
Section 4:	Subsurface Conditions of the Study Area	Page 13
Section 5:	Results and Recommendations	Page 18

The main text of the geohazard report is followed by the illustrative figures referenced in the text. Following these figures are the appendices. Appendix A contains descriptions of proposed well sites within the study area. Each well site description includes a tophole prognosis diagram and illustrations of the subbottom profiler record, 3-D inline, and 3-D crossline closest to the proposed well site. Appendix B is a description of the mapping and interpretive procedures followed for this assessment. Appendix B also includes equipment specifications and survey parameters. Appendix C is a list of the reference publications used for developing this report. Following all text portions of the report are 1:24,000 and 12,000 scale maps (in pockets) referenced in the text of the report.

Under separate cover, Fugro GeoServices, Inc., produced an "Archaeological Assessment Report". Included in their report are the detailed equipment specifications for the AUV system and navigation. In addition, all the Daily Progress Reports (dpr's) are included for the survey that took place on the R/V *Fugro Enterprise* from June 8-12, 2008.

SECTION 2: REGIONAL GEOLOGIC SETTING

The study area is located on the upper continental slope along the north-central portion of the Green Canyon protraction area, approximately 143 miles southwest of New Orleans, Louisiana (Figure 1). The continental slope of the northern Gulf of Mexico contains thick, rapidly deposited, Tertiary sediments. These sediments have built out over a ductile, Jurassic salt layer that has deformed due to the weight of the clastic sediments. Salt diapirs, sills, and sheets along with associated normal and growth faults create an irregular seafloor morphology. The steep faces of prograding wedges of sediment have, in the past, become unstable and formed large channel and canyon features. These erosional features were conduits for the transport of coarse-grained sediments out across the slope. Thermogenic hydrocarbons generated at depth, and biogenic gas formed in the near surface, migrate up faults and fractures to the seabed creating a wide range of sedimentary volcanic features. The hydrocarbons also provide the nutrients for chemosynthetic based communities and create authigenic carbonates. Locating wells, platforms, and pipelines is further complicated by the ever-growing oil field infrastructure and the locations of old explosive and toxic waste dumpsites.

This section of the report defines the study area within the context of the regional geologic conditions in the Green Canyon area. The regional geologic structures and conditions are derived from various published references and previous investigations in the area.

Location/Regional Morphology

The study area is located on the upper continental slope approximately 15 miles downslope of the shelf/slope break (Figure 2). This area is within the tabular salt-minibasin province defined by Diegel et al., (1995). In general, this province consists of extensive salt sheets with intervening deepwater sediment filled minibasins. The central Louisiana slope is characterized by deep minibasins surrounded by interconnected shallow salt bodies with extensive systems of arcuate growth faults (Diegel et al., 1995). The topography in the eastern third of the Green Canyon area is subdued relative to the western two-thirds, due to greater amounts and higher rates of sedimentation during the Pleistocene.

A salt dome occurs near the center of the study area (Figure 2). West of the salt dome is an elongated trough that is situated between two salt-cored highs. The narrow valley in the study area trends north-south and opens up into a larger minibasin structure (Thibodaux Basin). The trough probably represents a former sediment pathway through which sediments were transported from the shelf-edge to the deep basin. The flanks of the valley, the salt stocks, and the fault escarpments have gradients that in places exceed 30%.

The eastern-half of the study area is a southerly sloping ramp. The slope is dissected by a number of ridges and gullies creating an irregular topography.

Sediments

The near-surface sediments on the continental slope are predominantly very soft, high-water content silty clays that have been found to be slightly underconsolidated (Booth and Dunlap, 1977). Hooper and Dunlap (1989) report that, in places on the continental slope, near-surface sediments can be classified as “sensitive” soils. The stability of these units depends on the *in situ* strength and the existing slope of the seabed. A generic slope soil profile shows a gradual increase in strength with depth along with a corresponding decrease in water content. Actual geotechnical properties, however, can differ greatly from the generic profile, due to the presence of mass-transport complexes, turbidity flow deposits, faulting, and the possible presence of gas hydrates.

Soil boring data in the region show the upper few hundred feet of sediment to consist of alternating hemipelagic clays and carbonate-rich shell hashes. These “hash” layers are actually foraminifera-rich hemipelagic clays with a minimum of coarse clastic debris (Coleman and Roberts, 1988a and b). The carbonate-rich, “condensed” or high-stand deposits are highly bioturbated and had slow rates of deposition. The thicker low stand or “expanded” sections consist of laminated clays and silts with a minimal degree of bioturbation. Thin zones of contorted bedding indicative of mass transport are found within the expanded

sections. Coleman and Roberts (1988a) showed the upper 450-ft of sediment cored in Green Canyon, Block 184, to include oxygen isotope stages 1 through 7, or roughly the last 200,000 years of sedimentation.

Between the salt-cored, topographic highs are deep valleys. The bathymetric valleys represent pathways along which sediments were transported from shelf and shelf-edge depocenters to the deep water (Swanson and Bryant, 1992). Typical valley sections consist of alternating sequences of thin, parallel-bedded reflectors separated by relatively thick sequences of discontinuous to chaotic reflections (Swanson and Bryant, 1992; Seni, 1994). The parallel-bedded sequences are clay-rich, condensed zones representing deposition during times of higher sea level. The chaotic sequences consist of mass-transport complexes and lowstand slope-fan systems. The sediments vary from silty and mud-rich debris flows to sand-rich, non-channelized turbidity flows (Swanson and Bryant, 1992). A stratigraphic boring approximately 20 miles southeast of the study area encountered displaced faunas and terrigenous sands within a chaotic sequence roughly 1,500 ft beneath the of seafloor (Woodbury et al., 1978). Normal, bathyal type faunas were found in the pelagic sediments overlying the chaotic units.

Swanson and Bryant (1992) detected few, well-developed channel cut and fill structures within the poorly stratified to chaotic slope-fan sequences. The channels that were identified were not laterally continuous. This was attributed to the channels being of a thin braided nature, and that the continuity of the channels was eroded or obscured by the abundance of mass transport deposits. Faulting and slumping along the sides of the valleys was common due to the steepness of the slopes and the active growth of the salt domes.

Geologic Structure and Stratigraphy

The ridges that bound the submarine valley in this region and the isolated, circular topographic highs are the result of shallow allochthonous salt structures sourced directly from the autochthonous Louann Salt and injected within younger strata. The sediments above the salt are Pleistocene and younger in age. Stratigraphic borings drilled on the crest of topographic highs in the eastern Green Canyon area (GC 293, GC 424, and GC 521), encountered 500 ft to 800 ft of Holocene and Pleistocene deepwater clays overlying Jurassic salt (Lehner, 1969). No anhydrite or carbonate caprock was encountered in any of these borings. The thin and relatively young overburden suggests that the salt domes in this area are still actively growing (Lehner, 1969).

The Plio-Pleistocene stratigraphy in this portion of the northern Green Canyon area is described as deep-water turbidite systems deposited in intraslope minibasins (Weimer et al., 1998b). Turbidity systems were deposited primarily during relative sea level low stands. During transgressive and highstand deposition, sediment was trapped on the continental shelf and condensed sections developed on the slope. The repetition of these systems tracts resulted in cyclic deposition. Turbidity systems are defined as mass-flow and turbidity-current facies. Elements within these systems include erosional features (slides), channels, overbank deposits, and depositional lobes (slope fans). Well log analyses in the area show thicker, more sand-rich turbidity systems deeper in the section (Weimer et al., 1998a).

Figure 3 shows the major depocenters of the Pleistocene Mississippi River Province. The major sand-bearing units within the depocenters include intraslope fans, canyons and channels on the slope, fluvio-deltaic deposits on the shelf, and submarine fans on the abyssal plain (Ostermeier et al., 2000; Winker and Booth, 2000). Within the eastern Green Canyon area a sand-bearing late Pleistocene intraslope fan occurs and is labeled the GC Red Unit or the “Red Sand Unit” (Figure 3). The Red Unit occurs within the study area.

Shallow Over-Pressured Sands

Shallow overpressured sands or “flowing water sands” generally occur while drilling shallow overpressured formations at deepwater sites (Ostermeier et al., 2000). Encountering overpressured sands in the shallow section is a problem because of the low formation strengths and fracture gradients. These flows are a particular problem when encountered in an open hole prior to the 20-inch casing, usually about 2,000 ft to 2,500 ft beneath the mudline (Alberty et al., 1997). The water flows originating from these over-pressured

zones can cause large and long lasting uncontrolled flows, well damage and foundation failure, formation compaction, damaged casing and re-entry and control problems (Ostermeier et al., 2000).

Overpressured sands are generally isolated layers of varying thickness, encased in low permeability shales and clays. The sand-rich units are then rapidly buried, increasing the existing pressure, or in some cases inducing pressure, within the underlying sand bodies. The higher the sedimentation rate above the sand, the higher the pore water pressures. Thomson et al., (1999) found areas experiencing the most severe water flow problems have late Pleistocene deposition rates above 1,500 ft per million years (Ma). Areas with moderate deposition rates (500-1,500 ft/Ma) have had only a few water flow problems while areas with regional deposition rates of less than 500 ft/Ma have not experienced shallow water flow.

Water flow units in the Green Canyon and Mississippi Canyon areas are generally associated with seismic facies representing intraslope fan complexes and in some cases channel or canyon sequences (Ostermeier et al., 2000). Overpressured sands can also occur within salt withdrawal basins where sheet or turbidite sands can become ponded behind structure and subsequently buried.

The present study area is located in a region of the Green Canyon area that has experienced a number of shallow water flows (MMS, 2007). Over-pressured zones in this area correlate with a multiple of sand-bearing layers that are part of a late Pleistocene depocenter (Ostermeier et al., 2000). The authors label the sand-prone unit the “Red Sand Unit” (Figure 3). This depocenter is slightly older than the Blue Unit sands that are the source of water flow incidents to the east in the Mississippi Canyon area.

The MMS (2007b) lists the following blocks in the vicinity of the present study area that have had shallow water flow problems:

Wells in the General Area Reporting Shallow Water Flow (MMS, 2007b)

Surface Area/Block	Well Name	Operator	Severity	Depth (ft, BML)
GC 31	002	EP operating	unknown	1,239 ft
GC 32	001	BP	low	1,132 ft
GC 72	001	Shell	unknown	1,782 ft
GC 113	001	Shell	low	175 ft*
GC 158	001	Shell	low	2,056 ft
GC 161	001	Chevron	moderate	1,142 ft
GC 165	002	BP	low	1,199 ft
GC 165	001	BP	low	1,859
GC 200	TA005	BP	low	1,266
GC 200	001	BP	low	1,266
GC 205	003	Chevron	low	848
GC 205	002	Chevron	moderate	983
GC212	001	Total	moderate	1,045
GC 237	003	Chevron	low	720
GC 243	002	Nexen	unknown	1,123
GC 243	001	Nexen	unknown	1,015
GC 254	001	Ensearch	unknown	1,657
GC 282	001	BHP	moderate	2,121
GC 286	001	ExxonMobil	unknown	1,142
GC 296	001	Shell	moderate	638
GC 338	001	Shell	low	918
GC 341	001	Newfield	unknown	1,063
GC 429	001	Exxon	unknown	922
GC 435	001	Conoco	moderate	1,400
GC 461	001	BP	low	664
GC 463	001	BP	low	456
GC 472	001	ENI	low	539
GC 473	002	ENI	unknown	2,048

Red Color indicates wells drilled in the 9-block 3-D dataset area.

* The 175 depth listed in the MMS data base is an error according to Shell drilling reports (Long Ma, Shell, personal communication)

Overall the drilling history in this area, suggests that any sand-prone slope fan sequences in the shallow section will have potential for overpressure. However, localized features and conditions such as depth of burial, the presence of slumps or landslides, and faulting may influence the pressure regime at any given spot. Therefore, the water flow potential within a given sequence may vary from well to well across the study area.

Hydrocarbon Vents, Chemosynthetic Communities, and Shallow Gas

Gas and other hydrocarbons in the shallow sediments can influence exploration well location and field development in several ways. First, hydrocarbons provide a nutrient source for chemosynthetic communities. The formation of tubeworms, mussels, clams, and assorted organisms are considered unique occurrences in the deepwater environment and are protected under NTL-2000 G20 (MMS, 2000). Drilling locations must remain at least 1,500 ft from any seafloor anomaly having the potential for hydrocarbon seepage unless the site is determined to be clear of significant communities by remote sensing surveys or visual inspection. This large avoidance area is to prevent the potential community from being covered by drill muds or cuttings expelled from the well. Anchors supporting drilling vessels must be placed at least 500 ft from areas of potential hydrocarbon seepage unless precise positioning of the anchor is undertaken. With precision placement, anchors can be placed within 250 ft of the potential community.

Hydrocarbon vents are also geologic hazards. Sediments within and around the vents will vary in strength and lithology. Reaction of the gas with sediments can produce authigenic carbonates that form a variety of substrates such as scattered nodules or boulders, lithified slabs or pavements, and even large mounds (Roberts et al., 1990). These lithified surfaces can pose problems for casing penetration, anchor holding, and provide a substrate for biological communities. In addition, pressure and temperature conditions in deepwater cause near-surface gas to go into the hydrate phase. Large accumulations of hydrates can form pingo-like mounds and in some cases, are possibly responsible for the formation of large seafloor depressions (Prior et al., 1989; Paull et al., 1995). Drilling into hydrates could alter the temperature regime in the shallow sediments thus causing the hydrates to disassociate and create uncontrolled gas releases, collapsed casing, and well control problems (Collett, et al., 2000; Szczepanski et al., 1998). Depending on the scale of disassociation, the instability may reduce the bearing capacity of the sediments and become the triggering mechanism for a slope failure (Max and Chandra, 1998).

Active seepage to the seabed is a possible indication of over-pressured sediments in the subsurface. Small reservoirs in the near-surface may be difficult to control during the initial stages of drilling operations. Therefore, it is important to delineate such accumulations so that they can be avoided, or casing/mud programs can be designed to mitigate their impact.

The MMS designates a number of confirmed “high density” chemosynthetic communities in the Green Canyon area in general (MMS, 2000). GC 287, to the south of GC 243, is the closest designated high-density community to the study area.

Exploration Activity and Man-Made Structures

No wells or pipelines occur within GC 198, the main block of interest for this geohazard assessment. However, numerous exploration wells exist within the surrounding 9-block area (Map 1). In addition, production facilities with associated pipelines exist in GC 155, GC 199, and GC 243. Several pipelines and umbilicals cross the 9-block survey area.

The following table provides a summary of the existing exploration wells in the 9-block survey area: of (Figure 2 and Map 1):

Surface Area/Block	Well Name	Operator	Spud Date*	Reported Water Depth (ft)
GC 153	001	Marathon	02/18/1984	1,590

Surface Area/Block	Well Name	Operator	Spud Date*	Reported Water Depth (ft)
GC 153	001	Kerr McGee	04/20/1999	1,923
GC 154	001/002	Marathon	11/04/1987	1,452
GC 155	MA001	Shell	04/28/1988	1,939
GC155	MA002	Shell	11/07/2001	1,939
GC 197	001	Shell	09/07/1989	2,100
GC 199	001	Noble	02/14/2003	2,182
GC 199	001	Noble	05/02/2005	2,200
GC 199	001	Placid	09/20/1984	2,315
GC 242	001	Nexen Petroleum U.S.A.	08/31/2004	2,846
GC 242	002	Nexen Petroleum U.S.A.	09/10/2004	2,845
GC 243	SS001	Nexen Petroleum U.S.A.	12/17/2000	3,065
GC 243	SS002	Nexen Petroleum U.S.A.	06/19/2002	3,048
GC 243	003	Nexen Petroleum U.S.A.	11/10/2003	3,006
GC 243	SS004	Nexen Petroleum U.S.A.	03/09/2004	3,058
GC 243	005	Nexen Petroleum U.S.A.	07/26/2006	2,980

The following table lists the pipelines within the 9-block survey area:

Surface Area/Block	Pipeline Name	Pipeline Size and Product	Location in Block
GC 153	Deep Gulf	12-inch Gas Pipeline and Umbilical	NW corner
GC 154	Noble Energy	6-inch Oil (Proposed)	NE quadrant
GC 154	Nexen	2, 7-inch oil pipelines and umbilical	NE corner
GC 155	Shell/BP	2, 10-inch oil pipelines, 3 umbilicals	NE half
GC155	Noble	6-inch oil pipeline	SW half
GC 155	Nexen	7-inch oil pipeline and umbilical	SW half
GC 155	Shell	2, 6-inch oil pipeline and umbilical	NE quadrant
GC 199	Noble	6-inch oil pipeline (Proposed)	North half
GC 199	Nexen	2, 7-inch oil pipeline	East half
GC 241	Enterprise	20-inch gas pipeline	South half
GC 241	Enterprise	14-inch gas pipeline	SW corner
GC 242	Enterprise	20-inch gas pipeline	South half
GC 243	Nexen	2, 5-inch oil pipeline (Proposed)	East half

SECTION 3: BATHYMETRY AND SEAFLOOR CONDITIONS

This section defines the range in water depth and seafloor gradients within the study area. These parameters are then related to the morphological fabric of the sea bottom. Results of the sonar and subbottom profiler data are discussed in terms of the potential for seabed seeps and vents. The likelihood of hydrocarbons at the seabed determines the potential for chemosynthetic communities in the area.

Bathymetry and Seafloor Gradient

The water depth in the 9-block survey area ranges from -1,296 ft to -3,549 ft (Map 2a). The average water depth is -2,371 ft. The shallowest water depths occur near the center of GC 154. This area is a topographic high created by an underlying salt dome. The deepest depths encountered in the survey area are along the southern block boundary of GC 241 near the intersection with GC 242. The seafloor gradient throughout the survey area ranges from nearly flat to 32° (Figure 4). The average gradient is approximately 3.4°. Gradients above 10° are associated with fault and erosional escarpments.

The water depth in the GC 198-study area varies from -1,590 ft to -2,976 ft. The shallowest water depths are in the northeast corner of GC 198 while the deepest depths are in the southwest corner of GC 198.

Slopes in the GC 198 vary from nearly flat to approximately 32° (Figure 4). The average slope for the area is 5.45°. Steep slopes (10° to 32°) are associated with fault and erosional escarpments (Map 2a and Figure 4).

General Seafloor Morphology

A topographic high is centered in GC 154 (Maps 2a and 3a). The high is the seafloor expression of a shallow salt diapir. Faulting along the surface of the high creates an irregular seafloor along the crest of the high. The southern and western flanks have been eroded by massive slope failures. The failure features range from amphitheater-like hollows to steep-walled, v-shaped valleys. Channels or gullies are common and trend downslope from the heads of the valleys. Some of the channels can be traced several miles to the south into Thibodaux Basin (Figure 2). Most of the failure surfaces and channels are covered by thick drapes of hemipelagic and pelagic sediments indicating the failures are late Pleistocene (>12,000 yrs) events. However, there are some examples where the presumably Holocene-aged drape is distorted or absent suggesting movement or emplacement in the last several thousand years.

Seafloor Features

A complex seafloor exists throughout the survey area. Seafloor renderings depict a rough topography associated with the topographic high centered in GC 154 (Maps 3a and 3b). Subbottom profiler and side-scan sonar records show the surface of the high to be eroded and containing numerous patches of “rocky” or reef-like surfaces. Some of these surfaces correspond to subsurface zones of gassy sediments, hence have the possibility of chemosynthetic communities. Downslope from the topographic high is a rugged seafloor with numerous erosional escarpments generally representing buried or draped failure surfaces. The arcuate valleys along the upper flanks of the topographic high trend downslope into a network of channels and gullies. Some of these channels contain near-surface mass-transport deposits with poorly defined or missing pelagic drapes, which suggest fairly recent activity. This section discusses and illustrates the seafloor features defined in GC 198 and the surrounding area.

Seafloor Erosion Surface and Erosional Escarpments. Subbottom profiler records show truncated reflections at the seafloor over the topographic high centered in GC 154 (Figures 5 and 6). The truncations indicate that the surface of the salt diapir is an erosion surface. Away from the dome the stratigraphy consists of a thin, acoustically transparent reflection unit at the seafloor followed by layers of parallel and continuous reflections (Figure 7). The transparent layer is common throughout the northern Gulf of Mexico and generally represents a drape of Holocene-age (i.e., <12,000 years) pelagic sediments that are very soft and have very high water contents. Beneath the drape the sediments will gradually increase in

strength and decrease in water content with depth. A different soil profile will be encountered within the “erosion surface” area over the salt dome (Maps 2b and 5). Over much of the erosion surface the surficial drape is not defined. It is either absent or extremely thin (< 1 ft thick). Therefore, sediments at the seabed will be overconsolidated. Depending on the amount of erosion the soils will range from soft to very stiff.

Toward the center of the topographic high various amounts of section have been removed. The growth of the underlying salt diapir created numerous fractures in the overburden and eventually failure of section. In addition to the erosion surface itself, evidence of these failures include the numerous escarpments, arcuate valleys, and channels which trend downslope from the topographic high (Figure 7 and Map 3a). The seafloor expression of these features is abrupt breaks-in-slope with relief of a few feet to tens of feet (Figure 7). Slopes of 10° to 32° are common along these scarps (Figure 4). The walls of the valleys and channels are defined by subsurface truncations of reflections. The 3-D data show these truncations are erosion (i.e., slope failure) and are not deep-seated faults. The most likely cause of the mass wasting was the oversteepening of the slope caused by the growth of the salt dome, resulting in the failure of the very soft high water content soils. Subbottom profiler data show continuous reflections draping over the escarpments and into the valleys below. Therefore, the escarpments are ancient events that have been buried by recent hemipelagic sedimentation.

The major episodes of mass wasting that formed the erosion surface and the erosional escarpments occurred in the Pleistocene during the maximum growth rates of the salt diapir. These were times of lowered sea level when sedimentary loading occurred along the nearby shelf edge, which in turn, squeezed the underlying salt masses up into the overlying sedimentary section. As the shelf edge deltas retreated, the upward movement of salt slowed considerably or ceased. Some residual movement is possible considering the number of seafloor faults in the area (Figure 5).

As stated, the majority of mass wasting events took place in the late Pleistocene (>12,000 yrs before present (B.P.)). Since that time pelagic and hemipelagic drapes have been laid down over the escarpments and fill the valleys and channels formed by the failures. The drape is seen over most of the features downslope of the diapir (Figure 7). The lack of a pelagic drape over the topographic high suggests that the dome now experiences strong bottom currents that is preventing the deposition of pelagic sediments. Such a phenomenon is noted along shelf edge and upper slope banks in the northern Gulf of Mexico (Rezak et al., 1983; Roberts, 1995). Currents strong enough to transport sand-sized material and erode the seafloor have been measured on some shelf edge banks in the Gulf of Mexico (Roberts, 1995). No bedforms are observed in the GC 198 study area, but the lack of a pelagic drape indicates currents are at least strong enough at present to prevent the accumulation of pelagic material.

Hard Bottom Areas and Chemosynthetic Communities. The side-scan sonar records across the erosion surface show a general increase in the overall backscatter of the seabed and also define extensive areas of hard bottom (Figure 6 and Map 4). The increase in backscatter corresponds to the pinch-out of the soft pelagic drape, the exposure of overconsolidated sediments at the seabed and the presence of coarse-grained lag deposits. The increase in the seabed backscatter was used to define the boundaries of the erosion surface along the top of the diapir where subbottom profiler data were not available (Maps 2b and 5).

The hard bottom areas are features of extremely high backscatter and generally show rough or rocky surfaces (Figure 6). In places, the rocky terrain corresponds to pinnacle fields as defined by the subbottom profiler records (Figure 6). The pinnacles are up to 20 ft high and 300 ft across. The high backscatter, “hard bottom” areas are lithified carbonates and consist of small banks, pinnacles, boulders, and pavements.

Studies of topographic mounds along the shelf edge show that hard bottom features in water depths less than 200 m (656 ft) are dominated by biogenic carbonates (Roberts and Aharon, 1994). Carbonates secreted by organisms within the photic zone form both reefs and bioherms. Reefs are built by framework-type organisms such as typical Caribbean corals while bioherms are mound-like buildups of the skeletal remains of calcareous organisms and coralline algae. Hard grounds deeper than the photic zone (>200 m) consist of authigenic carbonates that are by-products of the bacterial metabolism of hydrocarbon that have reached the seafloor (Roberts and Aharon, 1994). Carbonate hardgrounds occur in GC 140 in similar water depths and geologic setting as those seen in the present study area. The GC 140 hard grounds consisted of

randomly orientated blocks that were cemented together, lithified pavements, and pinnacles some of which were 60 ft high (Roberts et al., 1992). In some places in GC 140, carbonate buildups appeared to be orientated around a central zone of slow venting hydrocarbons. Even though the carbonate structures were very extensive and the carbonates are by-products of hydrocarbon degradation, it was the observation of Roberts and Aharon (1994) that “occurrences of chemosynthetic communities in association of these features were generally sparse”. It is believed by the authors that much of the hard grounds seen in GC 140 were formed in the subsurface and were subsequently exposed by the erosion of the soft sediment overburden. In addition, even though the carbonates were formed by the degradation of hydrocarbons, the rate of seepage was extremely slow and “insufficient to sustain viable communities of diverse chemosynthetic organisms” (Roberts and Aharon, 1994).

The hard grounds in the GC 154, GC 155, GC 198 and GC 199 appear to be very similar in seismic character to those described in GC 140. The majority of the hard grounds occur on an eroded seafloor with little or no association with seafloor vents or areas of gaseous sediments. However, there are areas of seepage and expulsion features in the area indicating the amount and rates of seepage are highly variable in the area. Even though it is likely the majority of carbonate hard grounds in the present study area do not have high density chemosynthetic communities, it cannot be ascertained with data on hand which hard grounds have communities and which do not. Therefore the hard grounds delineated in the study area (Maps 2b and 5) need to be avoided by drilling locations (1,500 ft) and any associated anchors (250 ft).

Acoustically Amorphous Zones, Mud Mounds, and Active Vents. Zones of acoustically amorphous sediments were defined in the near-surface section (Figure 6). This seismic character was defined by the subbottom profiler data. The abrupt lateral termination of stratified reflections being replaced with high-amplitude, hazy or amorphous, incoherent reflections is a signature of gassy sediments. The amorphous zones occur within the area of the seafloor erosion surface around the salt dome centered in GC 154. The most well-developed amorphous zones occur in the northeast corner of GC 198 and the northwest corner of GC 199 (Maps 2a and 5), and are associated with well-defined mud mounds (Figure 6). The GC 198 mound is approximately 1,800 ft by 1,200 ft, and 80 ft high. The GC 199 mound is slightly larger in areal extent and is 2,000 ft by 1,200 ft, and is 80 ft high. The subbottom profiler data define a third mound in the southwest quadrant of GC 154. This mound is 1,200 by 900 ft, and is ~30 ft high. These mounds are generally flat-topped and show little or no subsurface stratification. There is a slight increase in seafloor and near-surface amplitudes on the 3-D data, but the amplitude values are much lower than anomalously high seafloor returns in other parts of the survey area (Map 3b). The mounds have the typical mud mound profile suggestive of expulsion features and they occur just upslope of several seafloor channel features. This feature also has a distinct response on the 3-D data (Figure 6).

Other mounds occur to the southeast of the large features in GC 198 and 199, but subbottom profiler data were not available to confirm the amorphous subsurface character. It is likely that most of the mounded features in the northeast corner of GC 198 and the northwest corner of GC 199 are active expulsion features, either mud diapirs or mud volcanoes. An active vent possibly occurs in the northwest corner of GC 199 (Map 2b). The sonar mosaic in this area showed possible mudflows radiating outward from a central circular depression on top of a small mound.

Seafloor Gullies/Channels and Recent Mass-Transport Deposits. Numerous, long, slightly meandering channels or gullies occur on the seafloor downslope of the topographic highs (Figures 5-9 and Map 3a). The channels are 500 ft to 1,200 ft wide, a few thousand feet to several miles long, and 10 ft to 80 ft deep (Figures 7-9). These features are the seafloor expressions of debris and mudflow channels and gullies formed by slope failures along the flank of the salt dome. The chaotic, mass-transport deposits, which are the remnants of the slope failures, are generally draped with thick deposits of undeformed pelagic and hemipelagic sediments. However, in places, the chaotic mass-transport deposits occur at or just beneath the seafloor (Figure 8 and Maps 2a and 5). The most extensive of these areas is associated with a channel that trends north-south down the eastern boundary of GC 198 then curves southwestward through GC 242. The channel begins in the northeast corner of GC 198 just south of the two expulsion mounds (Figure 8 and Map 5). The mass-transport deposits filling the channel cut varies from 40 ft to 100 ft thick. High-amplitude reflections within the channel fill indicate several episodes of cut and fill. The pelagic drape that

defines sedimentation for the last several thousand years is visible on top of the mass-transport deposits, but it is not always continuous especially where large blocks of material occur along the seafloor. The presence of the drape indicates the majority of the fill is late Pleistocene but the lack of, or deformation of the drape, suggests that relatively recent flows or failures have occurred.

Relatively recent soil instability may be indicated by a series of closely-spaced ridges along the seafloor in the southwest quadrant of GC 198 (Figure 8 and Maps 2b and 5). These ridges resemble pressure ridges along the edges of mudflows. Ridges occur within the near surface drape but are not well defined on the subbottom profiler records. The ridges may indicate shallow slab slides within the near-surface sediments similar to features described in the Mississippi Canyon area (Doyle et al., 1992).

The fill of the channel that trends down the eastern boundary of GC 198 appears to have soil properties that will differ from the surrounding slope sediments. In addition to the chaotic nature of the fill as defined by the subbottom profiler data (Figure 8), a high-amplitude response is seen on 3-D profiles across this channel near its southern extent in GC 242 (Figure 9). Along the length of the channel the fill will be dewatered mudflow sediments, possibly with higher than normal shear strengths. Toward the mouth of the channel in GC 242 there may be ponded sands within the channel fill.

Evidence of Hydrocarbon Seepage and Chemosynthetic Communities

The most definitive evidence for possible gas or fluid seepage comes from the sonar and subbottom profiler data provided by the AUV survey (Figure 6 and Maps 2b and 5). The potential for seepage outside of the area of AUV coverage is seen on the side-scan sonar mosaic of the seabed constructed for the archaeological assessment of the GC 198 and GC 199 areas (Map 4).

AUV Seepage-Related Anomalies. Acoustically amorphous zones, or areas of hazy or distorted reflectors on the subbottom profiler data suggest areas of fluid or hydrocarbon seepage (Figure 6). The total wipe-out of reflections and the presence of prolonged high-amplitude returns at the seabed are indicators of gas in the near-surface sediments. These areas occur above the salt dome that is centered in GC 154. This is the same area where the seabed is an erosion surface as indicated by the lack of a pelagic drape and the truncation of reflections at the seafloor. The near-surface section is also faulted.

Seepage-related seabed anomalies shown on the sonar data include; areas of increased backscatter, increased bottom roughness, and very rough or “rocky” seabed texture (Figure 6). The association of sonar and subsurface anomalies are the most likely areas of prolific gas and fluid seepage, such as the mud mound area displayed in Figure 6. Such features are likely to have a high flux of gas and/or oil to the seabed and the rocky terrain suggest the presence of authigenic carbonates and possibly abundant shell material (i.e., mussel and clam beds).

Chemosynthetic Communities. The salt dome in the survey area is typical for topographic highs along the upper slope of the northern Gulf of Mexico. The crest of the dome is an erosion surface that has been stripped by mass wasting during uplift and subsequently swept clean by periodic strong bottom currents. Also, the surface has extensive authigenic carbonate accumulations. The carbonates formed as the result of degradation of hydrocarbons by microbial activity. Carbonate pinnacles, blocks, and pavements were found at similar water depths above a salt dome in GC 140. Submersible investigations showed occasional seepage into the water column, but only sparse chemosynthetic communities (Roberts and Aharon, 1994). A similar situation is likely in the GC 198 survey area. The majority of hard bottom features in the area are probably devoid of, or have low-density chemosynthetic communities. The most likely areas of high-density communities will be on the southeast part of the topographic high. In this area two large mud mounds were defined. These mounds indicate a high flux of gas and fluids into the near-surface sediments. Roberts and Aharon (1994) believe the lack of chemosynthetic communities was because the flux of hydrocarbons was insufficient to support viable communities. If this is correct, the area of high flux would be more likely to have high density communities.

However, the density of chemosynthetic communities in this geologic setting cannot be ascertained by the sonar data. Therefore, all the hard grounds delineated by the sonar should be considered as having the potential for high-density chemosynthetic communities.

Man-Made Structures and Debris

Several exploration wells, production facilities, and pipelines occur within the 9-block study area (Maps 2 through 5). None of these features occur within GC 198. However, anchors extending outside of the GC 198 borders will need to avoid these features.

The sonar mosaic shows the distribution of the exploration wells and the production facilities. Extending out from most of the wells are distinct anchor scars and splays of drill muds and cuttings (Map 4). Pipelines are delineated by the sonar data. However, most of the small diameter umbilical lines are not resolved on the sonar data.

The archaeological analysis of the side-scan sonar data detected 14 unidentified sonar targets within the AUV survey area (Maps 2b and 5). The location and images of these targets are documented in the Archaeological Assessment Report prepared by C&C Technologies (C&C Technologies, 2007) and Fugro GeoServices (2008). The targets are interpreted as relatively small, irregular objects that are likely associated with lease development, modern maritime activities, or hurricanes.

SECTION 4: SUBSURFACE CONDITIONS OF THE STUDY AREA

This section discusses the shallow structure, stratigraphy, and geologic features as defined by the 3-D seismic data set. The stratigraphic interpretation emphasizes the prediction of sand-prone sequences in the shallow section. This is of prime concern during the initial stages of drilling because of shallow water flow and shallow gas issues. Also discussed in this section are the geologic structures such as faulting and amplitude events that may influence the shallow drilling and casing operations.

Stratigraphy

Several prominent reflecting horizons serve to classify the stratigraphy above the salt sheet within the study area (Figures 10 and 11). These horizons define depositional units or sequences with similar seismic characteristics or “facies”. The variations in facies provide clues to possible depositional environments, lithologies, and other rock properties.

The horizons mapped within the study area are labeled 05, 10, 13, 15, 17, 20, and 30 (Figures 10 and 11). These horizons are sequence boundaries. The sequences or “units” define the depositional processes within the area.

Various isopach and structure maps are included in this report to display the depths and attitudes of significant horizons within the study area.

The following table gives detailed depth information for each of the marker horizons within the study area.

Horizon Designation	Range				Increasing Thickness Direction	Dip Direction
	ft bml	Avg.	Ft, ssd (sub-sea depth)	Avg. Depth		
Horizon 05	130 to 362	252	-1,839 to -3237	-2,841	Variable	Southwest
Horizon 10	129 to 667	380	-1,905 to -3,383	-2,910	Southeast	South-Southwest
Horizon 13	211 to 1,124	827	-2,140 to -3,857	-3,275	Southeast	South-Southwest
Horizon 15	311 to 1,799	1,232	-2,352 to -4,416	-3,739	Southeast	South
Horizon 17	433 to 2,676	1,974	-2,096 to -5,350	-4,432	Southwest	Southwest
Horizon 20	246 to 3,015	2,136	-1,966 to -5,687	-4,510	Southwest	South-Southwest
Horizon 30	621 to 4,195	3,040	-2,257 to -6,948	-5,422	Variable	Southwest

These horizons separate the section into distinct units or sequences. Figure 10 illustrates the designated units within the study area. The statistics for the various units are listed in the following table:

Unit Number	Horizons	Thickness (ft)	Average (ft)	Direction of Increasing Thickness
Unit 1	Seafloor to Horizon 10	129 – 667	380	Variable
Unit 2	Horizon 10 to Horizon 13	240 – 727	464	Variable
Unit 3 “Red Unit”	Horizon 13 to Horizon 15	11 – 701	385	Southwest, Southeast
Unit 4	Horizon 15 to Horizon 17	177 – 1,026	822	Southeast
Unit 5	Horizon 17 to Horizon 20	203 – 555	343	Variable
Unit 6	Horizon 20 to Horizon 30	44 – 1,455	904	Southwest

In general, the horizons dip to the south or southwest and unit thickness increases in the same direction. Faulting and extensive erosion surfaces cause variations in dip and unit thickness within the study area, hence the “variable” designation.

Unit 1, Seafloor to Horizon 10. Unit 1 is defined by the seafloor and Horizon 10 (Figure 10). Horizon 10 is a high-amplitude reflector that can be traced throughout much of the 9-block study area. Within much of GC 198 the sequence above Horizon 10 is fairly simple. Beneath the seabed is a thin interval of stratified reflections overlying a thin, nearly transparent interval which in turn overlies a low-amplitude bedded interval just above the high-amplitude reflector Horizon 10. The low-amplitude bedded intervals are hemipelagic sediments while the near-transparent interval, represents mass-transport deposits. The entire unit is clay-rich with very little or no sand.

The stratigraphy of Unit 1 is more complicated to the east. Horizon 10 is truncated by a relatively thick mass-transport complex (MTC). Reflections within the MTC vary in amplitude. Discontinuous to chaotic intervals generally exhibit low amplitudes. Intervals of high-amplitude reflections possibly represent boundaries of individual flows, blocks of intact sediment, or areas of sandy sediments. The top of the MTC, in many places, is a distinct reflector (Horizon 05).

The thickness of Unit 1 varies from 129 ft to 667 ft (Map 6). The average thickness of Unit 1 is 380 ft. Unit 1 is defined by the presence of Horizon 10. Horizon 10 is eroded by a major MTC deposit which covers much of the northeastern half of GC 198. Unit 1 over the southwestern half of GC 198 varies in thickness. The thinnest areas correspond to slide zones that have eroded much of Unit 1. These slide zones correspond to the northeast-southwest trending channel or gully features that can be seen on the seafloor (Map 3a). The slides probably occurred during the late Pleistocene and are not indicative of present-day instability.

Unit 1 thickens to over 600 ft in the southeast corner of GC 198 (Map 6). Here the major MTC occurs above Horizon 10 (Figure 10). The failure event that created the MTC eroded deeper than Horizon 10 over much of the block, but near the southern border of the block the sediments were piled on top of Horizon 10.

Unit 2, Horizon 10 to Horizon 13. Unit 2, (Horizon 10 to Horizon 13) consists of generally low-amplitude reflections that are fairly continuous over most of GC 198 (Figure 10). Reflection continuity, in general, degrades into chaotic intervals upslope where the section thins and is affected by faults and failure surfaces.

The thickness of Unit 2 varies from 240 ft to 727 ft. The average thickness is 464 ft. The thickest portions of Unit 2 occur just west of the center of GC 198. In this area the unit is relatively intact, whereas to the north, east, and west the unit is thinned by erosional events.

The sediments within Unit 2 are primarily the result of hemipelagic and turbidite deposition. Thin intervals of transparent or chaotic reflections indicate some mass-transport deposition. Unit 2 will be a mud-dominated section consisting primarily of clay and silty-clay layers and seams. However, scattered amplitude events within this unit indicate that thin sand layers are possible (Figure 11).

Unit 3, Horizon 13 to Horizon 15 (Red Unit). Unit 3 is possibly part of the “Red Unit” slope fan sequence described by Winker and Booth (2000). The Red Unit is a sand-rich sequence and the source for shallow water flow events in the area (Figures 2 and 3).

Horizon 13 is the top of Unit 3 and represents a transition from low-amplitude, semi-continuous reflections to moderate to high-amplitude reflections with variable continuity (Figures 10 and 11). A channelized section within Unit 3 occurs through the center of GC 198 (Figure 10 and Maps 7 and 8). East and west of the channelized zone are intervals of parallel and continuous reflections of moderate to high-amplitudes. These bedded sections are abruptly truncated. Within the channelized zone reflections are discontinuous to chaotic but still have relatively high amplitudes.

The well-stratified intervals within Unit 3 probably are turbidites and levee/overbank deposits. The sediments will consist of alternating layers of clay, silt, and sand. Channelized intervals will be a mixture of channel lag, levee/overbank, and mass-transport deposits. Sediments will be sand-rich, but the sands

will be in pockets and discontinuous layers. Sand-layers throughout Unit 3 are possibly overpressured. Water flow from nearby GC 242 wells appears to have originated within sections of discontinuous reflections within Unit 3.

The thickness of Unit 3 varies from 11 ft to 701 ft. The average thickness is 464 ft. The unit is thickest in the southeast and southwest corners of GC 198 (Map 8). The unit thins and pinches out up slope along the flank of the salt diapir which occupies the northeastern quadrant of the block. The channelized central portion of the unit is highlighted by undulating “thicks” and “thins” along the axis of the feature.

Horizon 13 defines the top of Unit 3, the Red Unit. The total thickness of sediment from the seafloor to Horizon 13 varies from 211 ft to 1,124 ft (Map 7). The average thickness of the overburden above Horizon 13 is 827 ft.

Horizon 15, the base of Unit 3, varies from 311 ft to 1,799 ft bml. The average thickness of the overburden above Horizon 15 is 1,232 ft.

Unit 4, Horizon 15 to Horizon 17. Reflection amplitude noticeably decreases within the Unit 4 (Horizon 15 to Horizon 17) sequence (Figures 10 and 11). Reflection continuity is variable. The top half of the unit consist of fairly well-stratified reflections. With depth the reflection continuity decreases and scattered channels and mass-transport intervals occur. The base of Unit 4, Horizon 17, is a distinct transition from chaotic mass-transport deposits to well-stratified reflections.

The thickness of Unit 4 varies from 177 ft to 1,026 ft. The average thickness is 822 ft. The unit pinches out upslope along the salt structure in the northeastern half of GC 198. Toward the southeast the unit thickens corresponding to a general thickening of mass-transport intervals within the unit.

The base of Unit 4 is represented by a sequence boundary, Horizon 17 (Figure 10). The total thickness of sediment from the seafloor to Horizon 17 varies from 433 ft to 2,676 ft bml. The average thickness of the overburden above Horizon 17 is 1,974 ft.

Unit 5, Horizon 17 to Horizon 20. The Unit 5, Horizon 17 to Horizon 20, is a relatively thin sequence of numerous, closely-spaced, parallel and continuous reflections (Figures 10 and 11). This sequence possibly indicates predominantly hemipelagic sedimentation as opposed to the poorly-stratified, mass-transport deposits within the lower portion of Unit 4. The Horizon 17 to Horizon 20 interval possibly represents a condensed sequence representing sedimentation during times of relatively high sea level. Unit 5 is likely to be predominantly clay. Similar units have been described by drillers as “gumbo” or very sticky clays. Drill reports from wells in the study area should provide details on whether or not this unit has similar properties.

The thickness of Unit 5 varies from 203 ft to 555 ft. The average thickness is 343 ft. In general, the unit shows a relatively uniform thickness. Areas where the unit thins correspond to where the unit was eroded by mass-transport deposits in Unit 4. The consistent thickness of the unit is additional evidence that this is a condensed sequence formed at a period of high sea level.

The base of Unit 5 is represented by a sequence boundary, Horizon 20 (Figure 10). Horizon 20 is continuous throughout GC 198. The shallower horizons either pinchout or are eroded along the flank of the salt structure in the northeastern half of GC 198. The total thickness of sediment from the seafloor to Horizon 20 varies from 246 ft to 3,015 ft bml. The average thickness of the overburden above Horizon 20 is 2,136 ft.

Unit 6, Horizon 20 to Horizon 30. Unit 6, Horizon 20 to Horizon 30, is similar to Unit 3 the Red Unit. Reflection amplitudes generally increase within Unit 6 and there are channelized and turbidite intervals (Figure 10). Unit 6 appears to be a slope-fan sequence and likely has sand-rich intervals.

The thickness of Unit 6 varies from a 44 ft to 1,455 ft. The unit thickens to the southwest toward Thibodaux Basin.

The base of Unit 6 is represented by a sequence boundary, Horizon 30 (Figure 10). The total thickness of sediment from the seafloor to Horizon 30 varies from 621 ft to 4,195 ft bml. The average thickness of the overburden above Horizon 30 is 3,040 ft.

Horizon 30 varies from -2,257 ft to -6,948 ft ssd (Map 9). The average depth to the top of Horizon 30 is 5,422 ft ssd. The structure of Horizon 30, like the other horizons, shows a southwest or southward dipping horizon. The horizon dips away from the flank of the salt structure in the northeast corner of GC 198 and toward the intraslope basin to the south-southwest.

High-Amplitude Events

The Geologic Features Map (Map 5) shows the distribution of high-amplitude or “bright spot” events in the shallow section (Figures 11 and 12). The events are grouped according to the unit in which they appear. Representative depths in feet beneath the mudline are included for selected events within each sequence. The following discussion pertains to the various sequences scanned for amplitude events.

Unit 1 (Seafloor to Horizon 10). Unit 1 is believed to consist primarily of pelagic and hemipelagic clays. However, a few small amplitude events occur within the area (Map 5). These majority of events within Unit 1 are associated with channel-fill deposits. The increase in amplitude may reflect sand-rich sediments or possibly partially pavement-like areas. The cements may be precipitation from brine flows or authigenic carbonates. A few amplitude events along the eastern border of the block are possibly gas-related anomalies. The mapped events range in depths from 75 ft to 650 ft bml.

Units 2, 3, 4, and 5 (Horizon 10 to Horizon 20). Erosion and poor definition of horizons made amplitude scans of individual units difficult. Various methods were used to scan this section and events were labeled into the overall Horizon 10 to Horizon 20 sequence. Most of the events occur within Unit 3 (the Red Unit) as would be expected from a sand-rich, slope fan unit (Figures 11 and 12). Scattered anomalies were mapped in Units 2 and 4 indicating that possible gas-charged sand layers are present. No events were mapped in Unit 5 the condensed or “gumbo” sequence.

The amplitude anomalies within the Horizon 10 to Horizon 20 sequence range from approximately 690 ft to 1,555 ft bml.

Unit 6 (Horizon 20 to Horizon 30). Unit 6 is possibly a deeper, sand-rich, slope fan sequence. A number of amplitude events occur within this unit (Map 5). These events are probably sand layers charged with biogenic gas. No events are related to deep-seated faulting.

Events within Unit 6 are mapped between 2,250 ft to 4,050 ft bml. The majority of events are in the 2,900 ft to 3,200 ft range bml.

Horizon 30 to Horizon 30 + 0.25 seconds. A scan for amplitude events was made beneath the deepest mapped horizon (Horizon 30). The events within this interval are some of the largest in areal extent and thickest intervals, thereby representing the greatest accumulations of shallow gas in the area (Figure 12 and Map 5).

Events in this interval are mapped between 1,150 ft to 4,120 ft bml.

Shallow Water Flow

In this portion of the Green Canyon area, the Red Unit Sand Complex is the source for overpressured, shallow sands. Within the study area, the Unit 3 (Horizon 13 to 15) sequence consists of bedded moderate to high-amplitude reflectors and chaotic channel or valley-fill deposits. The bedded sections are probably sand-rich turbidites and intraslope fan deposits. These bedded deposits have scattered high-amplitude events (Map 5). The channelized areas through the center of GC 198 consist of discontinuous reflections. Scattered amplitude events also occur in the channelized intervals. Sands in the channels will be pockets and lenses and generally not as continuous as within the bedded turbidites or sheet sands of the slope fan.

Deeper in the section Unit 6 appears to be a sand-rich, slope fan sequence. The top of Unit 6 averages over 2,100 ft bml. Sand-rich intervals within these units will probably be at a point where the 20-inch casing and the riser are installed. Over-pressure zones encountered at these depths usually can be mitigated with adjustments in mud weights.

SECTION 5: RESULTS AND RECOMMENDATIONS

Examination of the 3-D and AUV seismic datasets shows that geologic conditions are generally favorable for exploration drilling within most parts of the GC 198 Study Area. The following results and recommendations pertain to the geologic conditions of the GC 198 Study Area and the surrounding area that may be impacted by anchors.

- The water depth in GC 198 ranges from -1,590 ft to -2,976 ft. The shallowest water depths occur in the northeast corner of GC 198, while the deepest depths are in the southwest corner.
- The seafloor slope varies from nearly flat to $\sim 32^\circ$. The average slope for the entire study area is 5.45° . The steepest slopes are associated with escarpments representing ancient failure surfaces and seafloor faults.
- No exploration or production wells occur in GC 198. However, several exploration wells and facilities occur in the surrounding blocks. In addition, pipelines occur in all adjacent blocks except GC 197 to the west.
- An archaeological assessment of the area was completed by Fugro GeoServices. Analysis of the side-scan sonar data detected 14 unidentified targets. These targets were deemed to be debris from modern shipping traffic and oil field operations and no special avoidance was assigned.
- Areas of possible hydrocarbon or fluid seepage were mapped using the seafloor rendering, and the AUV data. Possible expulsion features include mud mounds and one vent-like feature. Two mud mounds occur in the northeast corner of GC 198. One extends to the east into GC 198. Another relatively low-relief mound occurs in the southwest quadrant of GC 154. These features have typical seismic characteristics of expulsion features and may represent high flux of hydrocarbons to the seabed.
- The side-scan sonar mosaic shows extensive hard bottom areas across the top of the salt dome in the survey area. These hard bottom areas are pinnacles, blocks, boulders, and pavements. Unlike shallow water bioherms composed of reef-building carbonates or biogenic skeletal debris the carbonates in GC 198 survey area are authigenic carbonates formed as a by-product of the microbial degradation of hydrocarbons. Investigations of similar areas showed varying densities of chemosynthetic communities among such carbonates. However, the sonar cannot define chemosynthetic communities within such carbonate outcrops. Therefore, without further information, the hard grounds in the area have a high potential for high density chemosynthetic communities and will need to be avoided.
- The crest of the topographic high shows a lack of pelagic drape and truncated reflections at the seabed. This area is an erosion surface. Soils in this area will be overconsolidated and have higher than normal shear strengths. Also, the lack of drape suggests the area is affected by periodic strong bottom currents.
- Surface renderings define an extensive drainage-like pattern of downslope-trending channels, gullies, and furrows. Many of these features can be traced for several miles. Most of these channels are remnants from slope failures along the flanks of the salt dome in GC 154 and other steep slopes outside of the 9-block area of this investigation. However, some of the channel-like features have mass-transport sediments at or very near the seabed. These areas should be considered as having a potential for seafloor instability or area of potential flows. Geotechnical sampling and analysis is recommended if production facilities are planned in their vicinity.
- Areas of closely-spaced, low-relief seafloor ridges resemble pressure ridges within mud flows. These areas may indicate soil creep or some other type of instability. Geotechnical sampling and analysis is recommended if production facilities are planned in their vicinity.
- The upper $\sim 5,000$ ft of section was analyzed for this geohazard investigation. Six depositional sequences have been defined within this section. The sequences include bedded hemipelagic clays,

chaotic mass-transport complexes, sand-prone slope fan deposits, and turbidites. Unit 3 (Horizon 13 to Horizon 15) is interpreted to be the sand-rich, intraslope fan section known as the Red Unit.

- Shallow water flow incidents have been reported for some of the wells in the area. The zones of overpressured sands are believed to originate from various intervals within the Red Unit (identified as Unit 3 in this investigation). In GC 198 this unit is defined by Horizon 13 and Horizon 15. Horizon 13, the top of Unit 3, varies from 211 ft to 1,124 ft bml. Horizon 15, the base of the unit, is 311 ft to 1,799 ft bml. The average thickness of the Red Unit in GC 198 is 385 ft.
- The shallow gas potential varies from negligible to high. Amplitude anomalies have been mapped within each unit. In general, most of the anomalies are stratigraphic traps and are likely limited accumulations of biogenic gas.
- If, in the future, additional drilling locations are selected, we recommend reviewing the text, maps, and seismic examples presented in this report, coupled with the 3-D seismic data set, to determine the geologic conditions at the locations.

FIGURES

APPENDIX A: PROPOSED WELLSITE ASSESSMENT LETTERS



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INTRODUCTION

Davis Offshore has designated three (3) proposed wellsites within the study area. These sites, labeled “A, B, and D”, are addressed in the wellsite assessment letters in this Appendix. All of the surface locations are located in Green Canyon Block 198 (OCS G-31702). The coordinates of these proposed locations are listed in the following table:

Table A-1: Davis Proposed Wellsites Green Canyon Block 198

Block	EP Well Name	X*	Y*	Lat	Long	Inline	Xline	Block Call	
GC 198-1	A	2,332,064	10,081,806	27.765963047	-90.860816247	4089	2263	7566 FSL	3584 FWL
GC 198-2	B	2,336,459	10,075,771	27.749157142	-90.847557359	3997	2370	1531 FSL	7861 FWL
GC 198-4	D	2,341,228	10,081,469	27.764594978	-90.832507845	4083	2487	7229 FSL	3092 FEL

*The geographic coordinates are in the Clarke 1866 Spheroid, NAD 27 Projection, Zone 15 North, US Survey Feet



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August 25, 2008

Project No. 0408-1483

Davis Offshore L.P.
1360 Post Oak Blvd. Suit 2400
Houston, Texas 77056

Attention: Mr. Mark Gillespie

**Site Clearance Letter
Proposed Wellsite A
Block 198 (OCS-G-31702)
Green Canyon Area
Gulf of Mexico**

The Proposed Wellsite A location in Green Canyon area (GC) Block 198 appears favorable for exploration drilling operations relevant to the shallow geologic and stratigraphic conditions. The geohazard and archaeological reports and this letter comply with the Minerals Management Service (MMS) Notice-to-Lessees (NTL's) 2000-G20, 2005-G07, 2008-G04 and 2008-G05 (MMS, 2000, 2005, and 2008a,b, respectively).

Introduction

Davis Offshore L.P., (Davis), contracted Geoscience Earth & Marine Services, Inc[®], (GEMS) to prepare a geohazard analysis of Blocks 198 of the Green Canyon area, Gulf of Mexico. The geohazard analysis was submitted to Davis in August, 2008, (GEMS, 2008). The geohazard analysis discusses the seafloor and subsurface conditions within GC 198 and surrounding blocks and was based on processed 3-D seismic data and high-resolution geophysical data (i.e., side-scan sonar, subbottom profiler, and multibeam data) collected with an autonomous underwater vehicle (AUV). The archaeological assessment, prepared by Fugro GeoServices, Inc., used the side-scan sonar data collected with the AUV (Fugro, 2008). The archaeological assessment was submitted to Davis in July, 2008.

Davis has designated several possible drilling locations within the study area. This Site Clearance Letter addresses the specific conditions at Proposed Wellsite GC 198-A (OCS-G-31702). The figures included with this letter are taken from both the 3-D data volume and the 2-D AUV survey used for the geohazard assessment of Green Canyon Block 198.

The Proposed Wellsite GC 198-A surface location is located in the southwestern quadrant of Block 198, Green Canyon area, Gulf of Mexico. Davis provided the following coordinates:

Proposed Wellsite GC 198-A			
Spheroid & Datum: Clarke 1866, NAD27		Line Reference	Block Calls
Projection: UTM Zone 15 North			
X: 2,332,064 ft	Latitude: 27.765963047° N	Inline 4089	7,566 ft FSL
Y: 10,081,806 ft	Longitude: -90.860816247° W	Crossline 2263	3584 ft FWL

Attachments

The figures accompanying this letter were extracted from the 3-D and AUV data volumes. The figures (listed below) are centered on the proposed well location.

Figure A-1: Tophole Prognosis Chart, Proposed Wellsite A, Green Canyon Block 198

Figure A-2: Inline 4089 and Crossline 2263 Showing Conditions Beneath Proposed Wellsite A, Green Canyon Block 198

Figure A-3: Subbottom Profiler Line 200 Showing Near-Surface Conditions in the Vicinity of Proposed Wellsite A, Green Canyon Block 198

Figure A-4: Power Spectrum in the Vicinity of Proposed Wellsite GC 198-A.

The page-sized plat maps are taken from the full-scale (1:12,000) maps included in the report. The plat maps are centered on the proposed GC 198-A location. The maps included in this letter are as follows:

Map A-1: Bathymetry Map, Proposed Wellsite A, Green Canyon Block 198

Map A-2: Enhanced Seafloor Rendering, Wellsite A, Green Canyon Block 198

Map A-3: Side-Scan Sonar Mosaic, Wellsite A, Green Canyon Block 198

Map A-4 Geologic Features Map, Wellsite A, Green Canyon Block 198

Water Depth and Seafloor Conditions

The water depth at the proposed location is -2,537 ft (Figures A-1 and A-2). The seafloor slopes to the southwest with a gradient of 5° (1.9%).

Overall, the seafloor at the proposed wellsite is a southwesterly sloping ramp (Figure A-3 and Map A-1). Subtle undulations of the seabed appear as downslope furrows on the seafloor rendering (Map A-1). These furrows are the seafloor expression of buried channels and gullies (Figure A-3). These features are late Pleistocene events and not indications of recent instability.

Major seafloor escarpments occur 1,200 ft north and 2,250 ft east-southeast of the site (Maps A-1 through A-4). The seafloor gradients along these escarpments are up to 20°. The escarpments are the result of ancient failure surfaces and are not deep-seated faults. The erosional escarpments are draped by thick sequences of undeformed hemipelagic sediments.

Subbottom profiler records across the site show a ~200 ft thick section of numerous, closely-spaced parallel and continuous reflections representing pelagic and hemipelagic clay-rich sediments (Figure A-3). Seafloor sediments at the location are likely to consist of a Holocene-aged drape approximately 8 ft thick (Figure A-3). The drape will consist of very soft, high water content, silty clays. The soils will gradually increase in strength and decrease in water content with depth. A thin layer of mass-transport deposits occurs at ~63 ft below the mudline (bml). This layer marks the erosional episode that formed many of the channels and gullies in the area that are still reflected in the seafloor topography.

Chemosynthetic Communities

The Side-Scan Sonar Mosaic (Map A-3) shows normal or ambient backscatter along the seabed within a 1,500 ft radius of the proposed wellsite. No indications of hydrocarbon seepage appear on the side-scan sonar, subbottom profiler, or 3-D lines within 1,500 ft of the proposed GC 198-A location (Map A-4). Therefore, the potential for high-density chemosynthetic communities within 1,500 ft of the proposed location is negligible.

Hard bottom areas, likely representing seepage-related carbonate features, occur to the north and northeast of the location (Map A-4). These features are associated with the topographic high centered in GC 154 to the north. The seafloor across this high is an erosion surface. In addition to extensive hard grounds the area is highly faulted and there are areas of gassy sediments and expulsion-related mud mounds. Chemosynthetic communities are likely dispersed throughout the hard grounds, but it cannot be ascertained

which outcrop has high-density communities. Therefore, any anchors extending out from the proposed location will need to avoid, by at least 250 ft, any of the hard grounds mapped on top of the topographic high. The nearest features to the site are approximately 8,950 ft to the north-northeast.

Man-Made Features

The closest unidentified side-scan sonar target is approximately 11,700 ft to the southeast (Map A-4). No special avoidance was designated for this target (Target #11) by the archaeologist (Fugro GeoServices, 2008).

Existing wellsites occur to the east in GC 199 and to the southeast in GC 242 (Maps A-4). The closest exploration well is approximately 2.6 miles from the proposed location. The nearest pipeline to the site is 3.1 miles to the south of the proposed location.

Stratigraphy

The subbottom profiler defined approximately 200 ft of stratified sediments beneath the seafloor at proposed location GC 198-A (Figure A-3). The stratified sequence likely represents pelagic and hemipelagic sediments primarily consisting of clay. The soils at the seafloor will have high water contents and low shear strengths. The water contents will gradually decrease with depth accompanied by a gradual increase in soil strength. A thin mass-transport deposit occurs at 63 ft bml (Figure A-3). The mass-transport deposits will likely have higher than normal strengths.

Inline 4089 and Crossline 2263 are the closest lines to the proposed Wellsite 198-A location (Figure A-2). The Tophole Prognosis Chart (Figure A-1) shows the crossline annotated with calculated depths to the various horizons and predicted lithology of the sequences, along with their potential for shallow water flow and shallow gas.

The sediment column from the mudline to approximately 3,500 ft was analyzed for shallow geohazards (Figures A-1 and A-2). The shallow section is divided into approximately six units or sequences. The sequences represent a variety of depositional environments and lithologies, including hemipelagic muds, mass-transport deposits, layered channel-levee deposits, and sand-rich turbidites.

The surficial unit (Unit 1), to approximately 117 ft bml, will consist of pelagic and hemipelagic silty clays. Beneath this drape-like unit is a mass-transport interval approximately 141 ft thick. These mass-transport deposits appear to be related to the buried erosional escarpment to the north (Figure A-1 and A-2). The mass-transport deposits are mud-rich sediments with little or no sand.

Unit 2 (Horizon 10 to Horizon 13) is a low-amplitude, weakly-stratified sequence. The sequence will consist of turbidites interlayered with thin mass-transport deposits. Unit 2 will be mud-rich with only thin sand seams likely. It has a low potential for overpressured sand layers.

Unit 3 (Horizon 13 to Horizon 15), at 892 ft bml, is interpreted as the top of the “Red Unit” a regional slope fan sequence. The Red Unit has been the source of overpressured sand layers in the region. Beneath the proposed wellsite Unit 3 consists of closely-spaced, parallel and continuous reflections (Figure A-1). This is a turbidite interval consisting of alternating layers of clay, silt, and sand. Some of the sands within the unit could be overpressured. Unit 3 is approximately 308 ft thick beneath proposed location GC 198-A.

Unit 4 (Horizon 15 to Horizon 17) consists of intervals of stratified reflections (turbidites) interlayered with discontinuous reflections (mass-transport deposits). The amplitudes of reflections within Unit 4 are relatively low compared with those in the overlying Red Unit (Unit 3). The sand content of Unit 4 will be lower than Unit 3, and also, there is a reduced potential for overpressures.

Unit 5 (Horizon 17 to 20) consists of relatively low-amplitude reflections that are stratified and continuous. It is bounded by high-amplitude reflections Horizons 17 and 20 (Figures A-1 and A-2). Unit 5 possibly

consists of pelagic and hemipelagic clays. Similar units in the area have been described as “gumbo” clays by drillers.

Unit 6 (Horizon 20 to Horizon 30) consists of weakly-stratified, low-amplitude intervals of mud-rich turbidites and mass transport deposits (Figure A-1 and A-2). In the middle of the unit is an interval of relatively high-amplitude reflections that are part of a slope-fan interval. This mid-unit interval is possibly sand-rich and has potential for containing overpressures.

Faults

There are no seafloor faults within 3,400 ft of the proposed wellsite. In addition, no faults are defined at depth beneath the proposed GC 198-A location (Figures A-1 and A-2).

Shallow Water Flow

Shallow water flow has been reported at wells drilled in GC 243 within the survey area (MMS, 2007). The severity of the flows in these blocks is not listed. However, the initial well was drilled only to 6,090 ft, total vertical depth (tvd). Subsequent wells drilled to 24,398 ft tvd and 17,250 ft tvd. The reported depths to the shallow water flows were 1,015 ft bml and 1,123 ft bml for the GC 243-1 and GC 243-2 wells, respectively. This interval correlates with Unit 3 in the study area.

The potential for overpressured sands within sequences beneath proposed Wellsite GC 198-A varies from negligible to high. The lowest potential is associated with the mud-rich drape units in the shallow section (Units 1 and 2, Figures A-1 and A-2). The highest potential is associated with the various sequences associated with the Red Unit slope fan complex (Unit 3,) and from a deeper fan interval in Unit 6.

The likely sand-rich intervals with high potential for overpressure within the shallow section at proposed Wellsite A are as follows:

Bounding Horizons	Unit Location	Depth BML	Depth BSL	Thickness
Horizon 13 to Horizon 15	Unit 3, “Red Unit”	892 ft to 1,200 ft	-3,428 ft to -3,737 ft	308 ft
Horizon 20 to Horizon 30	Mid-Unit 6	2,696 ft to 2,994 ft	-5,233 ft to -5,530 ft	298 ft

Unit 4 (Horizon 15 to Horizon 17) is a predominantly turbidite sequence with alternating clay, silt, and sand layers. This unit has a moderate potential for overpressured sands. Unit 4 occurs between 1,200 ft to 2,150 ft bml.

Shallow Gas

The well path will not penetrate any high-amplitude events in the upper ~3,500 ft beneath the seafloor (Figure A-1). Amplitude events occur within the area, but these events are deep within the section and are several hundred feet from the well path (Map A-4).

Power Spectrum

In accordance with NTL 2008-G04 and NTL 2008-G05 (MMS 2008a,b), we have extracted the power spectrum diagram (Figure A-4) from the 3-D seismic data cube. The extraction was generated within a 500-ft radius of the intersection of the inlines and crosslines at the proposed wellsite. We converted the amplitude vs. frequency spectrum, generated by the SMT software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978.

Closing

The seafloor at Proposed Wellsite A, Green Canyon Block 198 (OCS-G-31702), appears suitable for exploration drilling operations. Anchors supporting a drilling vessel at the proposed location should avoid the areas of potential chemosynthetic communities occurring to the north and to the northeast of the site.

At depth, engineers should be aware of the potential for overpressured sand layers.

The proposed well will be required to follow NTL 2008-G06 (MMS, 2008c) with respect to pre- and post-spud ROV visual inspection surveys.

We appreciate the opportunity to be of service to Davis Offshore, L.P., and look forward to working closely with you on other projects.

Sincerely,

**GEOSCIENCE EARTH & MARINE
SERVICES, INC.[®]**

Thomas W. Neurauter Ph. D.
Senior Marine Geologist

Michael J. Kaluza
President/Marine Geologist

Attachments (4 Figures, 4 Maps)

Distribution:

Mr. Mark Gillespie, Davis Offshore, L.P., Houston, TX (5)

References:

Coffeen, J. A., 1978, Seismic Exploration Fundamentals: Tulsa, the Petroleum Publishing Co., p. 125.

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GEMS, 2008, Geologic, Stratigraphic, and Archaeological Assessment of Block 198 (OCS G-31702), Green Canyon Area Gulf of Mexico. Report No. 0408-1483 submitted to Davis August, 2008.

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Minerals Management Service, 2007, Safety performance review-Shallow Waterflows Can Pose Significant hazards to deepwater drilling, <http://www.gomr/mms.gov/homepg/offshore/sftey/watrflow.html> website accessed April, 2008.

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August 25, 2008

Project No. 0408-1483

Davis Offshore L.P.
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Attention: Mr. Mark Gillespie

**Site Clearance Letter
Proposed Wellsite B
Block 198 (OCS-G-31702)
Green Canyon Area
Gulf of Mexico**

The Proposed Wellsite B location in Green Canyon area (GC) Block 198 appears favorable for exploration drilling operations relevant to the shallow geologic and stratigraphic conditions. The geohazard and archaeological reports and this letter comply with the Minerals Management Service (MMS) Notice-to-Lessees (NTL's) 2000-G20, 2005-G07, 2008-G04 and 2008-G05 (MMS, 2000, 2005, and 2008a,b, respectively).

Introduction

Davis Offshore L.P. (Davis), contracted Geoscience Earth & Marine Services, Inc.[®], (GEMS) to prepare a geohazard analysis of Blocks 198 of the Green Canyon area, Gulf of Mexico. The geohazard analysis was submitted to Davis in August, 2008, (GEMS, 2008). The geohazard analysis discusses the seafloor and subsurface conditions within GC 198 and surrounding blocks and was based on processed 3-D seismic data and high-resolution geophysical data (i.e., side-scan sonar, subbottom profiler, and multibeam data) collected with an autonomous underwater vehicle (AUV). The archaeological assessment, prepared by Fugro GeoServices, Inc., used the side-scan sonar data collected with the AUV (Fugro, 2008). The archaeological assessment was submitted to Davis in July, 2008.

Davis has designated several possible drilling locations within the study area. This Site Clearance Letter addresses the specific conditions at Proposed Wellsite GC 198-B (OCS-G-31702). The figures included with this letter are taken from both the 3-D data volume and the 2-D AUV survey used for the geohazard assessment of Green Canyon Block 198.

The Proposed Wellsite GC 198-B surface location is located in the southeastern quadrant of Block 198, Green Canyon area, Gulf of Mexico. Davis provided the following coordinates:

Proposed Wellsite GC 198-B			
Spheroid & Datum: Clarke 1866, NAD27		Line Reference	Block Calls
Projection: UTM Zone 15 North			
X: 2,336,459 ft	Latitude: 27.749157142° N	Inline 3997	1,531 ft FSL
Y: 10,075,771 ft	Longitude: -90.847557359° W	Crossline 2370	7,861 ft FEL

Attachments

The figures accompanying this letter were extracted from the 3-D and AUV data volumes. The figures (listed below) are centered on the proposed well location.

Figure B-1: Tophole Prognosis Chart, Proposed Wellsite B, Green Canyon Block 198

Figure B-2: Inline 3997 and Crossline 2370 Showing Conditions Beneath Proposed Wellsite B, Green Canyon Block 198

Figure B-3: Subbottom Profiler Line 200 Showing Near-Surface Conditions in the Vicinity of Proposed Wellsite B, Green Canyon Block 198

Figure B-4: Power Spectrum in the Vicinity of Proposed Wellsite GC 198-B.

The page-sized plat maps are taken from the full-scale (1:12,000) maps included in the report. The plat maps are centered on the proposed GC 198-B location. The maps included in this letter are as follows:

Map B-1: Bathymetry Map, Proposed Wellsite B, Green Canyon Block 198

Map B-2: Enhanced Seafloor Rendering, Wellsite B, Green Canyon Block 198

Map B-3: Side-Scan Sonar Mosaic, Wellsite B, Green Canyon Block 198

Map B-4 Geologic Features Map, Wellsite B, Green Canyon Block 198

Water Depth and Seafloor Conditions

The water depth at the proposed location is -2,784 ft (Figures B-1 and B-2). The seafloor slopes to the southwest with a gradient of 1.8° (3.1%).

The proposed location is within a subtle seafloor trough that trends to the south-southwest (Figure B-3 and Map B-1). The trough is approximately 2,500 ft wide and the proposed location is near the middle of the feature. This trough is the seafloor expression of ancient, buried features that were created by mass-wasting events off the flanks of the salt diapir to the north. A more recent mass-transport channel occurs approximately 1,050 ft to the southeast (Maps B-1 through B-4). The chaotic fill within this channel extends to near the seabed. The Holocene drape, in places, is distorted or absent suggesting either additional flows or deformation by soil creep. In addition, along the western flank of the channel sonar records depict a series of closely-spaced ridges that may be indicative of soil movement near or at the seabed. The zone of pressure ridge-like structures is approximately 450 ft from the proposed location.

Additional seafloor escarpments occur 950 ft to 1,200 ft to the northeast of the site (Maps B-1 through B-4). The seafloor gradients along the escarpments in this area are only 5° to 8° . The escarpments are the result of ancient failure surfaces and are not deep-seated faults. The erosional escarpments are draped by varying thicknesses of undeformed hemipelagic sediments. However, there are locations where the near-surface drape is distorted (Map B-4).

Subbottom profiler records across the site show a ~200 ft thick section that generally consists of numerous closely-spaced, parallel and continuous reflections representing pelagic and hemipelagic clay-rich sediments (Figure B-3). Seafloor sediments at the location are likely to consist of a Holocene-aged drape approximately 5 ft thick (Figure B-3). The drape will consist of very soft, high water content, silty clays. Beneath the drape is a thin layer of mass-transport deposits. This layer is roughly 8 ft thick. The mass-transport deposits will be clays but could have shear strengths higher than normal because of dewatering during transport.

Chemosynthetic Communities

The Side-Scan Sonar Mosaic (Map B-3) shows normal or ambient backscatter along the seabed within a 1,500 ft radius of the proposed wellsite. No indications of hydrocarbon seepage appear on the side-scan sonar, subbottom profiler, or 3-D lines within 1,500 ft of the proposed GC 198-B location (Map B-4). Therefore, the potential for high-density chemosynthetic communities within 1,500 ft of the proposed location is negligible.

Hard bottom areas, likely representing seepage-related carbonate features, occur to the north and northeast of the location (Map B-4). These features are associated with the topographic high centered in GC 154 to the north. The seafloor across this high is an erosion surface. In addition to extensive hard grounds the area is highly faulted and there are areas of gassy sediments and expulsion-related mud mounds. Chemosynthetic communities are likely dispersed throughout the hard grounds, but it cannot be ascertained which outcrop has high-density communities. Therefore, any anchors extending out from the proposed location will need to avoid, by at least 250 ft, any of the hard grounds mapped on top of the topographic high. The nearest features to the site are approximately 10,800 ft to the north-northeast.

Man-Made Features

The closest unidentified side-scan sonar target is approximately 6,230 ft to the southeast (Map B-4). No special avoidance was designated for this target (Target #2) by the archaeologist (Fugro GeoServices, 2008). The site is very close to exploration wells GC 242-1 and GC 242-2.

Existing wellsites occur to the east-northeast in GC 199 and to the southeast in GC 242 (Maps B-4). The closest exploration well is approximately 6,500 ft from the proposed location. The nearest pipeline to the site is 2.2 miles to the south of the proposed location.

Stratigraphy

The subbottom profiler defined approximately 200 ft of stratified sediments beneath the seafloor at proposed location GC 198-B (Figure B-3). The stratified sequence likely represents pelagic and hemipelagic sediments, primarily consisting of clay. The soils at the seafloor will have high water contents and low shear strengths. This Holocene-aged drape is approximately 5 ft thick at the location. Normally the water contents will gradually decrease with depth accompanied by a gradual increase in soil strength. However, a ~10 ft of mass-transport deposits occurs just beneath the drape (Figure B-3). The mass-transport deposits will likely have higher than normal shear strengths and lower than normal water contents.

Inline 3997 and Crossline 2370 are the closest lines to the proposed Wellsite 198-B location (Figure B-2). The Tophole Prognosis Chart (Figure B-1) shows the crossline annotated with calculated depths to the various horizons and predicted lithology of the sequences, along with their potential for shallow water flow and shallow gas.

The sediment column from the mudline to approximately 3,900 ft was analyzed for shallow geohazards (Figures B-1 and B-2). The shallow section is divided into approximately six units or sequences. The sequences represent a variety of depositional environments, and lithologies, including hemipelagic muds, mass-transport deposits, layered channel-levee deposits, and sand-rich turbidites.

The surficial unit (Unit 1) in this area is subdivided into two intervals (Figures B-1 and B-2). The upper interval from the seafloor to Horizon 5 is approximately 265 ft thick and generally consists of pelagic and hemipelagic silty clays. Thin, mud-rich, mass transport deposits will also occur within this drape-like unit. The remaining 146 ft of Unit 1, from Horizon 5 to Horizon 10, consists of a thin layer of mass-transport deposits overlying stratified reflections representing a hard clay interval.

Unit 2 (Horizon 10 to Horizon 13) is a low-amplitude, weakly-stratified sequence. The sequence will consist of turbidites interlayered with thin mass-transport deposits. Unit 2 will be mud-rich with only thin sand seams likely. It has a low potential for overpressured sand layers. Unit 2 is approximately 443 ft thick.

Unit 3 (Horizon 13 to Horizon 15), at 854 ft bml, is interpreted as the top of the “Red Unit”, a regional slope fan sequence. The Red Unit has been the source of overpressured sand layers in the region. Beneath the proposed wellsite Unit 3 consists of closely-spaced, parallel and continuous reflections (Figure B-1). This is a turbidite interval consisting of alternating layers of clay, silt, and sand. Some of the sands within the unit could be overpressured. Unit 3 is approximately 474 ft thick beneath proposed location GC 198-B.

Unit 4 (Horizon 15 to Horizon 17) consists of intervals of stratified reflections (turbidites) interlayered with discontinuous reflections (mass-transport deposits). The amplitudes of reflections within Unit 4 are

relatively low compared with those in the overlying Red Unit (Unit 3). The sand content of Unit 4 will be lower than Unit 3, and also, there is a reduced potential for overpressures. The upper 181 ft of Unit 4 consists of chaotic mass-transport deposits with slightly higher amplitudes than deeper in the unit. Any sands within this upper interval will likely be discontinuous.

Unit 5 (Horizon 17 to 20) consists of relatively low-amplitude reflections that are stratified and continuous. It is bounded by high-amplitude reflections Horizons 17 and 20 (Figures B-1 and B-2). Unit 5 possibly consists of pelagic and hemipelagic clays. Similar units in the area have been described as “gumbo” clays by drillers.

Unit 6 (Horizon 20 to Horizon 30) consists of weakly-stratified, low-amplitude intervals of mud-rich turbidites and mass-transport deposits (Figure B-1 and B-2). In the middle of the unit is an interval of moderate-amplitude reflections that are part of a slope fan interval. In places, this mid-unit interval possibly contains sand-rich deposits that may be overpressured. At this location the interval is relatively thin and shows only a slight increase in amplitude; therefore, the potential for overpressured sands is reduced.

Faults

There are no seafloor faults within ~6,200 ft of the proposed wellsite (Map B-4). In addition, no faults are defined at depth beneath the proposed GC 198-B location (Figures B-1 and B-2).

Shallow Water Flow

Shallow water flow has been reported at wells drilled in GC 243 within the survey area (MMS, 2007). The severity of the flows in these blocks is not listed. However, the initial well was drilled to only 6,090 ft, total vertical depth (tvd). Subsequent wells were drilled to 24,398 ft tvd and 17,250 ft tvd. The reported depths to the shallow water flows were 1,015 ft bml and 1,123 ft bml for the GC 243-1 and GC 243-2 wells, respectively. This interval correlates with Unit 3 in the study area. The potential for overpressured sands within sequences beneath proposed Wellsite GC 198-B varies from negligible to high. The lowest potential is associated with the mud-rich drape units in the shallow section (Units 1 and 2, Figures B-1 and B-2). The highest potential is associated with the various sequences associated with the Red Unit slope fan complex (Unit 3) and from a deeper fan interval in Unit 6.

The likely sand-rich intervals with high potential for overpressured sand within the shallow section at proposed Wellsite B are as follows:

Bounding Horizons	Unit Location	Depth BML	Depth BSL	Thickness
Horizon 13 to Horizon 15	Unit 3, “Red Unit”	854 ft to 1,328 ft	-3,637 ft to -4,111 ft	308 ft

Intervals with a moderate potential for overpressured sand layers include Unit 4 (1,328 ft to 2,305 ft bml), mid-Unit 6 (2,899 ft to 3,183 ft bml), and the base of Unit 6 (3,709 ft to 3,872 ft bml).

Shallow Gas

The well path will not penetrate any high-amplitude events in the upper ~3,900 ft beneath the seafloor (Figure B-1). Amplitude events occur within the area, but these events are deep within the section and are several hundred feet from the well path (Map B-4).

Power Spectrum

In accordance with NTL 2008-G04 and NTL 2008-G05 (MMS 2008a,b), we have extracted the power spectrum diagram (Figure B-4) from the 3-D seismic data cube. The extraction was generated within a 500-ft radius of the intersection of the inlines and crosslines at the proposed wellsite. We converted the amplitude vs. frequency spectrum, generated by the SMT software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978.

Closing

The seafloor at Proposed Wellsite B, Green Canyon Block 198 (OCS-G-31702), appears suitable for exploration drilling operations. Anchors supporting a drilling vessel at the proposed location should avoid the areas of potential chemosynthetic communities occurring to the north and to the northeast of the site.

At depth, engineers should be aware of the potential for overpressured sand layers.

The proposed well will be required to follow NTL 2008-G06 (MMS, 2008c) with respect to pre- and post-spud ROV visual inspection surveys.

We appreciate the opportunity to be of service to Davis Offshore, L.P., and look forward to working closely with you on other projects.

Sincerely,

**GEOSCIENCE EARTH & MARINE
SERVICES, INC.[®]**

Thomas W. Neurauter Ph. D.
Senior Marine Geologist

Michael J. Kaluza
President/Marine Geologist

Attachments (4 Figures, 4 Maps)

Distribution:

Mr. Mark Gillespie, Davis Offshore, L.P., Houston, TX (5)

References:

Coffeen, J. A., 1978, Seismic Exploration Fundamentals: Tulsa, the Petroleum Publishing Co., p. 125.

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GEMS, 2008, Geologic, Stratigraphic, and Archaeological Assessment of Block 198 (OCS G-31702), Green Canyon Area Gulf of Mexico. Report No. 0408-1483 submitted to Davis August, 2008.

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Minerals Management Service, 2007, Safety performance review-Shallow Waterflows Can Pose Significant hazards to deepwater drilling, <http://www.gomr/mms.gov/homepg/offshore/sftey/watrflow.html> website accessed April, 2008.

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August 25, 2008

Project No. 0408-1483

Noble Energy, Inc.
100 Glenborough Drive
Houston, Texas 77067

Attention: Mr. Todd Jones

**Site Clearance Letter
Proposed Wellsite D
Block 198 (OCS-G-31702)
Green Canyon Area
Gulf of Mexico**

The Proposed Wellsite D location in Green Canyon area (GC) Block 198 appears favorable for exploration drilling operations relevant to the shallow geologic and stratigraphic conditions. The geohazard and archaeological reports and this letter comply with the Minerals Management Service (MMS) Notice-to-Lessees (NTL's) 2000-G20, 2005-G07, 2008-G04 and 2008-G05 (MMS, 2000, 2005, and 2008a,b, respectively).

Introduction

Davis Offshore L.P., (Davis), contracted Geoscience Earth & Marine Services, Inc.®, (GEMS) to prepare a geohazard analysis of Blocks 198 of the Green Canyon area, Gulf of Mexico. The geohazard analysis was submitted to Davis in August, 2008, (GEMS, 2008). The geohazard analysis discusses the seafloor and subsurface conditions within GC 198 and surrounding blocks and was based on processed 3-D seismic data and high-resolution geophysical data (i.e., side-scan sonar, subbottom profiler, and multibeam data) collected with an autonomous underwater vehicle (AUV). The archaeological assessment, prepared by Fugro GeoServices, Inc., used the side-scan sonar data collected with the AUV (Fugro, 2008). The archaeological assessment was submitted to Davis in July, 2008.

Davis has designated several possible drilling locations within the study area. This Site Clearance Letter addresses the specific conditions at Proposed Wellsite GC 198-D (OCS-G-31702). The figures included with this letter are taken from both the 3-D data volume and the 2-D AUV survey used for the geohazard assessment of Green Canyon Block 198.

The Proposed Wellsite GC 198-D surface location is located in the southeastern quadrant of Block 198, Green Canyon area, Gulf of Mexico. Davis provided the following coordinates:

Proposed Wellsite GC 198-D			
Spheroid & Datum: Clarke 1866, NAD27		Line Reference	Block Calls
Projection: UTM Zone 15 North			
X: 2,341,228 ft	Latitude: 27.764594978° N	Inline 4083	7,229 ft FSL
Y: 10,081,469 ft	Longitude: -90.832507845° W	Crossline 2487	3,092 ft FEL

Attachments

The figures accompanying this letter were extracted from the 3-D and AUV data volumes. The figures (listed below) are centered on the proposed well location.

Figure D-1: Tophole Prognosis Chart, Proposed Wellsite D, Green Canyon Block 198

Figure D-2: Inline 4083 and Crossline 2487 Showing Conditions Beneath Proposed Wellsite D, Green Canyon Block 198

Figure D-3: Subbottom Profiler Line 201 Showing Near-Surface Conditions in the Vicinity of Proposed Wellsite D, Green Canyon Block 198

Figure D-4: Power Spectrum in the Vicinity of Proposed Wellsite GC 198-D.

The page-sized plat maps are taken from the full-scale (1:12,000) maps included in the report. The plat maps are centered on the proposed GC 198-D location. The maps included in this letter are as follows:

Map D-1: Bathymetry Map, Proposed Wellsite D, Green Canyon Block 198

Map D-2: Enhanced Seafloor Rendering, Wellsite D, Green Canyon Block 198

Map D-3: Side-Scan Sonar Mosaic, Wellsite D, Green Canyon Block 198

Map D-4 Geologic Features Map, Wellsite D, Green Canyon Block 198

Water Depth and Seafloor Conditions

The water depth at the proposed location is -2,331 ft (Figures D-1 and D-2). The seafloor slopes to the south with a gradient of 3.7° (6.5%).

The proposed location occurs along a relatively flat-topped southerly sloping ridge (Figure D-3 and Map D-1). The ridge is approximately 2,500 ft wide and is bounded by two seafloor channels or troughs (Figure D-3 and Maps D-1 through D-4). The proposed location is approximately 425 ft from the western trough and approximately 725 ft from the eastern channel. The feature to the east has more channel-like qualities in that it can be traced for several miles, whereas the feature to the west is less extensive and confined to a portion of GC 198 (Map D-2). The fill of both trough and channel extends up to or near the seabed. The pelagic drape that is evident along the ridge is poorly defined or absent in places in both troughs. The lack of a defined Holocene-aged drape suggests relatively recent activity. The mass-transport deposits do not extend over the proposed location, therefore, the seafloor at the site has been stable for thousands of years. However, the age and frequency of activity within the nearby trough and channel features will need to be addressed if production facilities are planned for this location.

A small seafloor scarp occurs approximately 700 ft east-southeast of the proposed location (Figure D-3 and Map D-4). This is the seafloor expression of a fault. The “scarp” appears to be less than 1-ft in height; therefore, the rate of movement is extremely slow. There is no indication of seepage along this fault.

Subbottom profiler records across the site show a ~200 ft thick section that generally consists of numerous closely-spaced, parallel and continuous reflections representing pelagic and hemipelagic clay-rich sediments (Figure D-3). Seafloor sediments at the location are likely to consist of a Holocene-aged drape approximately 8 ft thick (Figure D-3). The drape will consist of very soft, high water content, silty clays. At a depth of 60 ft below the mudline (bml) is a thin layer of mass-transport deposits. This layer is roughly 5-10 ft thick. The mass-transport deposits will be clays but could have shear strengths higher than normal because of dewatering during transport.

Chemosynthetic Communities

The Side-Scan Sonar Mosaic (Map D-3) shows normal or ambient backscatter along the seabed within a 1,500 ft radius of the proposed wellsite. No indications of hydrocarbon seepage appear on the side-scan sonar, subbottom profiler, or 3-D lines within 1,500 ft of the proposed GC 198-D location (Map D-4).

Therefore, the potential for high-density chemosynthetic communities within 1,500 ft of the proposed location is negligible.

Hard bottom areas, likely representing seepage-related carbonate features, occur to the north and northeast of the location (Map D-4). These features are associated with the topographic high centered in GC 154 to the north. The seafloor across this high is an erosion surface. In addition to extensive hard grounds, the area is highly faulted and there are areas of gassy sediments and expulsion-related mud mounds. Chemosynthetic communities are likely dispersed throughout the hard grounds, but it cannot be ascertained which outcrop has high-density communities. Therefore, any anchors extending out from the proposed location will need to avoid, by at least 250 ft, any of the hard grounds mapped on top of the topographic high. The nearest hard bottom features to the site are approximately 3,380 ft to the northeast.

Man-Made Features

The closest unidentified side-scan sonar target is approximately 2,680 ft to the southeast (Map D-4). No special avoidance was designated for this target (Target #11) by the archaeologist (Fugro GeoServices, 2008).

Existing wellsites occur to the east-northeast in GC 199 and to the south in GC 242 (Map D-4). Both existing drillsites are approximately 2.1 miles from the proposed wellsite GC 198-D. The nearest pipelines are to the east-northeast at ~2.1 miles and are associated with the production facility in GC 199.

Stratigraphy

The subbottom profiler defined approximately 200 ft of stratified sediments beneath the seafloor at proposed location GC 198-D (Figure D-3). The stratified sequence likely represents pelagic and hemipelagic sediments primarily consisting of clay. The soils at the seafloor will have high water contents and low shear strengths. This Holocene-aged (~12,000 years) drape is approximately 8 ft thick at the location. The water contents will gradually decrease with depth accompanied by a gradual increase in soil strength. The mass-transport deposits at 60 ft bml may have higher than normal shear strengths because of dewatering of the soils during transport.

Inline 4083 and Crossline 2487 are the closest lines to the proposed Wellsite 198-D location (Figure D-2). The Tophole Prognosis Chart (Figure D-1) shows the crossline annotated with calculated depths to the various horizons and predicted lithology of the sequences, along with their potential for shallow water flow and shallow gas.

The sediment column from the mudline to approximately 3,238 ft was analyzed for shallow geohazards (Figures D-1 and D-2). The shallow section is divided into approximately six units or sequences. The sequences represent a variety of depositional environments and lithologies, including, hemipelagic muds, mass-transport deposits, layered channel-levee deposits, and sand-rich turbidites.

The surficial unit (Unit 1) in this area is subdivided into two intervals (Figures D-1 and D-2). The upper interval from the seafloor to Horizon 5 is approximately 303 ft thick and generally consists of pelagic and hemipelagic silty clays. Thin, mud-rich, mass-transport deposits will also occur within this drape-like unit. The remaining 154 ft of Unit 1, from Horizon 5 to Horizon 10, consists of a thin layer of mass-transport deposits overlying stratified reflections representing a hard clay interval.

Unit 2 (Horizon 10 to Horizon 13) is a low-amplitude, weakly-stratified sequence. The sequence generally consists of turbidites interlayered with thin mass-transport deposits. However, at this location, the upper 194 ft consists of discontinuous reflections indicative of mass-transport deposits (Figure D-1). Overall, Unit 2 will be mud-rich with only thin sand seams likely. It has a low potential for overpressured sand layers. Unit 2 is approximately 419 ft thick.

Unit 3 (Horizon 13 to Horizon 15), at 876 ft bml, is interpreted as the top of the “Red Unit”, a regional slope fan sequence. The Red Unit has been the source of overpressured sand layers in the region. Beneath the proposed wellsite Unit 3 consists of closely-spaced, parallel and continuous reflections (Figure D-1). This is a turbidite interval consisting of alternating layers of clay, silt, and sand. Some of the sands within the unit could be overpressured. Unit 3 is approximately 337 ft thick beneath the proposed location GC 198-D.

Unit 4 (Horizon 15 to Horizon 17) consists of intervals of stratified reflections (turbidites) interlayered with discontinuous reflections (mass-transport deposits). The amplitudes of reflections within Unit 4 are relatively low compared with those in the overlying Red Unit (Unit 3). The sand content of Unit 4 will be lower than Unit 3 and also there is a reduced potential for overpressures.

Unit 5 (Horizon 17 to 20) consists of relatively low-amplitude reflections that are stratified and continuous. It is bounded by high-amplitude reflections Horizons 17 and 20 (Figures D-1 and D-2). Unit 5 possibly consists of pelagic and hemipelagic clays. Similar units in the area have been described as “gumbo” clays by drillers.

Unit 6 (Horizon 20 to Horizon 30) consists of weakly-stratified, low-amplitude intervals of mud-rich turbidites, and mass-transport deposits (Figure D-1 and D-2). In the middle of the unit is a moderate-amplitude reflection that separates two mass-transport intervals. Elsewhere in block 198 this mid-unit interval shows characteristics of slope fan deposits. However, at the GC 198-D the sand-prone interval appears to be absent.

Faults

A seafloor fault occurs approximately 700 ft to the east-southeast of the location (Figure D-3 and Map D-4). The fault is downthrown to the east and will not intersect the well bore at the proposed GC 198-D location. This fault may be the extension of a deeper fault observed on the 3-D data (Figure D-2).

The well bore will intersect a fault near the base of Unit 6 (Figure D-1). The point of intersection is approximately 3,143 ft bml or -5,474 ft below sea level. The fault does not extend to the seafloor and does not appear to be a conduit for migrating gas or fluids.

Shallow Water Flow

Shallow water flow has been reported at wells drilled in GC 243 within the survey area (MMS, 2007). The severity of the flows in these blocks is not listed. However, the initial well was drilled to only 6,090 ft, total vertical depth (tvd). Subsequent wells were drilled to 24,398 ft tvd and 17,250 ft tvd. The reported depths to the shallow water flows were 1,015 ft bml and 1,123 ft bml for the GC 243-1 and GC 243-2 wells, respectively. This interval correlates with Unit 3 in the study area. The potential for overpressured sands within sequences beneath proposed Wellsite GC 198-D varies from negligible to high. The lowest potential is associated with the mud-rich drape units in the shallow section (Units 1 and 2, Figures D-1 and D-2). The highest potential is associated with the various sequences associated with the Red Unit slope fan complex (Unit 3) and from a deeper fan interval in Unit 6.

The likely sand-rich intervals with high potential for overpressured sand within the shallow section at proposed Wellsite D are as follows:

Bounding Horizons	Unit Location	Depth BML	Depth BSL	Thickness
Horizon 13 to Horizon 15	Unit 3, “Red Unit”	876 ft to 1,213 ft	-3206 ft to -3543 ft	337 ft

Intervals with a moderate potential for overpressured sand layers include Unit 4 (1,213 ft to 1,983 ft bml) and the base of Unit 6 (3,143 ft to 3,238 ft).

Shallow Gas

The well path will not penetrate any high-amplitude events in the upper ~3,300 ft beneath the seafloor (Figure D-1). Amplitude events occur within the area, but these events are deep within the section and are several hundred feet from the well path (Map D-4).

Power Spectrum

In accordance with NTL 2008-G04 and NTL 2008-G05 (MMS 2008a,b), we have extracted the power spectrum diagram (Figure D-4) from the 3-D seismic data cube. The extraction was generated within a 500-ft radius of the intersection of the inlines and crosslines at the proposed wellsite. We converted the amplitude vs. frequency spectrum, generated by the SMT software, to power vs. frequency by squaring the amplitude values as described by J. A. Coffeen, 1978.

Closing

The seafloor at Proposed Wellsite D, Green Canyon Block 198 (OCS-G-31702), appears suitable for exploration drilling operations. Anchors supporting a drilling vessel at the proposed location should avoid the areas of potential chemosynthetic communities occurring to the north and to the northeast of the site.

At depth, engineers should be aware of the potential for overpressured sand layers and one buried fault.

The proposed well will be required to follow NTL 2008-G06 (MMS, 2008c) with respect to pre- and post-spud ROV visual inspection surveys.

We appreciate the opportunity to be of service to Davis, and look forward to working closely with you on other projects.

Sincerely,

**GEOSCIENCE EARTH & MARINE
SERVICES, INC.[®]**

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Senior Marine Geologist

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Attachments (4 Figures, 4 Maps)

Distribution:

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APPENDIX B: INTERPRETIVE PROCEDURES

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INTERPRETIVE PROCEDURES

The maps and profiles presented in this report reflect the integration of 3-D processed seismic data provided by Davis for this project along with high resolution data collected with an AUV. Identification of all geologic features and stratigraphic variations is limited to the resolution of the available data. The 3-D data were supplied to GEMS on a DVD for loading on a PC-based workstation for interpretation and identification of geologic constrains. The AUV data were provided to GEMS by Fugro GeoServices, Inc., and included digital copies of the side-scan sonar and subbottom profiler records.

AUV Data Specifications

Fugro GeoServices, Inc., collected AUV data over GC 198 along with portions of surrounding blocks. Multibeam echosounder, side-scan sonar, and subbottom profiler data were collected by Kongsberg Hugin 3000 AUV. The primary systems were as follows:

- Kongsberg EM2000 Swath Bathymetric System
- EdgeTech full spectrum side-scan sonar, and,
- EdgeTech full spectrum Subbottom profiler.

The AUV was positioned by means of an inertial navigation system Kongsberg HiPAP 500 Acoustic Positioning system. The *R/V Fugro Enterprise* was the survey vessel employed by Fugro. The survey took place from June 8-12, 2008. The survey grid consisted of 29 east-west primary lines, 2-north-south tie lines. Shot points were spaced at 125 m intervals.

The primary purpose of the AUV survey was to obtain side-scan sonar data for archaeological requirements. The archaeological assessment was completed by Mr. Ray Blackmon of Fugro GeoServices, Inc., and was submitted to Davis in July, 2008. The AUV data were then integrated with the 3-D interpretation by Dr. Thomas Neurauter of GEMS, to obtain further details on seafloor and near-surface features and conditions.

3-D Seismic Data Specifications

Davis provided reprocessed 3-D seismic data to GEMS in a standard SEG-Y format. All data are projected in UTM Zone 15 North, using the Clarke 1866 spheroid and the NAD27 datum. All map units are presented in U.S. survey feet. The 3-D data specifications are as follows:

Acquisition Date	1997
Inline spacing	41.0125 ft
Crossline spacing	65.62 ft
Inline range	3730 to 4456, increment by one
Crossline range	1786 to 2950, increment by one
Sample rate	4.0-milliseconds
Record length	~4.0 seconds (from 0 to 4.0 seconds)
Data Resolution	16-bit
Frequency Range (0 to 2,500 ft bml)	5 to > 60 Hz

3-D Data Resolution

Lateral resolution of the data set is limited by the line (bin) spacing. The data volume provided exceeds the minimum data density requirements set forth by the Minerals Management Service NTL 2008-G07 (MMS, 2008b), requiring survey bin spacing of less than 40 meters (131 ft) in both the inline and crossline dimension. Vertical resolution of the data set is based on the limit of separability, approximated by Rayleigh's criterion, $\lambda/4$ (Brown, 2004). The value of λ is represented by the following equation:

$$\lambda = V/f, \text{ where } V \text{ is velocity and } f \text{ is frequency.}$$

The average dominant frequency retained in the upper 600 ft of sediments was measured using an instantaneous frequency function. A velocity of 5,000 ft/sec calculated with the following relationship:

$$V = (D/t)*2, \text{ where } D \text{ is the interval thickness in feet and } t \text{ is the interval time in seconds.}$$

For the data set provided, the vertical resolution is approximately 30 ft. Individual strata, thinner than 30 ft, may be detected but not resolved in true thickness.

Exact water depths and details of subtle seafloor topography cannot be resolved and any seafloor obstructions (such as shipwrecks and other debris) usually cannot be detected with the data used for this assessment.

Velocity Calculations

Water and sediment column velocity curves were used in order to convert the seafloor event time to depth. The seafloor event was converted to depth using the seventh-order polynomial function described by Advocate and Hood (1993). Figure B-1 shows the velocity curve generated and used for the initial determination of the water depths using the time values obtained from the 3-D data set. The water depths were further adjusted based on reported water depths to existing wells in the area and upon data from previous investigations.

The sediment column velocity curve was generated using time-depth pairs provided by Davis. The time-depth pairs were generated from the analysis of checkshot data from the region. The time vs depth pairs for the upper 2.0 seconds were used to generate the polynomial shown in Figure B-2. A fourth order polynomial was then applied to the time-depth pairs. Figure B-2 shows the time to depth relationship and equation used to convert the time picks for each horizon.

Map 1, Base Map

The base map shows data coverage for both the 3-D data and of the 2-D AUV grid. The AUV grid consisted of 29 east-west lines, and 2 north-south lines. The main grid lines were spaced 300 m apart. Shot point spacing was 125 m.

The 3-D survey lines shown on the maps were generated through AutoCAD, from bin positions extracted from the SEG-Y data file. Representative inlines and crosslines are displayed on the “Base Map” to aid in referencing geologic and stratigraphic conditions identified from the 3-D data volume. Every 20th inline and every 40th crossline are displayed on this Base Map, with inline and crossline increment of one. Map 1 outlines the GC 198 Study Area and a one-block halo thereby creating a total of 9 blocks. Detailed subsurface mapping was done within GC 198. Seafloor assessment was completed for all nine blocks.

Maps 2a and 2b, Bathymetry Maps

The Bathymetry Map (Map 2a) represents the bathymetry defined within the entire 9-block Survey Area. The depth values from the 3-D data were obtained from the peak crossing of the water bottom return on the seismic profiles. The water depths for the entire 9-block survey area were calculated using the Advocate and Hood (1993) 7th order polynomial (Figure B-1). A bathymetric map was created and the water depths were then compared to water depths obtained from well reports and other data. The 3-D derived bathymetry at approximately 20 selected points averaged ~6 ft shallower than the water depths at these points as determined from other sources. Therefore a 6 foot correction factor was applied to the 3-D derived bathymetry.

The water depth values were exported from SMT to Surfer8 for final gridding and contouring.

The Bathymetry Map (Map 2a) represents the bathymetry of the entire 9-block survey area. This map is displayed at a 1:24,000 scale, and the contour interval is 20 ft. Map 2b is the bathymetric map which

includes seafloor features such as seafloor faults and areas of hydrocarbon seepage superimposed on the contours.

Figure 4, Seafloor Gradient Map

Figure 4 represents the seafloor gradient in degrees. The gradient was computed in Surfer using their “terrain modeling” routine. The slope values were color coded to show the variations in slope over the Study Area.

Maps 3a and 3b, Enhanced Surface Rendering and Amplitude-Enhanced Surface Rendering

The Enhanced Surface Rendering (Map 3a) of the seafloor was generated by GEMS using the Global Mapper software. The seafloor image was generated using the water bottom pick from the 3-D data set. Color enhancements of depth variances and a constant sun-angle display provide a uniform depiction of the elevation differences along the interfaces. A geotiff file was created. This file was imported directly into AutoCAD for sizing and annotation on a Base Map.

The Amplitude-Enhanced Surface Rendering (Map 3b) was also generated by GEMS. The Amplitude-Enhanced Surface Rendering is a similar rendering of the seabed with the relative amplitudes of the seabed returns overlain. A window around the seafloor pick was volume tracked for the RMS amplitude. The highest amplitudes possibly relate to the presence of venting hydrocarbons and/or authigenic carbonates. This method is described in various publications (Roberts et al., 1992; Booth et al., 1996; Doyle et al., 1996).

The Amplitude-Enhanced Surface Rendering was generated for the entire 9-block area. However, the AUV side-scan sonar and subbottom profiler data were used to delineate the areas of potential hydrocarbon seepage and zones of potential high-density chemosynthetic communities shown on Maps 2b and 5.

Map 4, Side-Scan Sonar Mosaic

Map 4 is a side-scan sonar mosaic. It is a composite of the mosaic created by Fugro from the 2008 survey and from a 2007 survey conducted for a wellsite in GC 199. The mosaics were combined in Global Mapper and exported as a geotiff into AutoCAD.

Map 5, Geologic Features Map

The Geologic Features Map (Map 5) is the result of the analysis of the and 3-D data volume. Surface renderings were imported into SMT. Features were mapped as culture layers and exported as dxf files to AutoCAD. Analysis of seepage areas was done by comparing the various renderings with the seismic profiles.

Subsurface high-amplitude events were auto-picked by the computer between the stratigraphic horizons. The results are amplitudes separated into depth intervals corresponding to depositional sequences Units 1 through 6. These zones correspond to the depositional units defined by the stratigraphy. Using the vatMIN function in SMT 2D-3D Pak[®], amplitudes with a strong trough were selected. A baseline criterion for the values of the amplitudes was then selected by comparing the computed results with a vertical section in amplitude envelope display. The files were imported into AutoCAD for final display on the Geologic Features Map (Map 5).

Maps 6 through 9, Isopach, Structure, and Unit Thickness Maps

Seven stratigraphic horizons, (05, 10, 13, 15, 17, 20, and 30), were mapped from the dataset. The horizons were mainly peak events representing sequence boundaries.

Time-to-depth conversions were conducted using the 4th order polynomial generated from the checkshot data (Figure B-2). The time is two-way travel time from the seafloor. The resulting depth is depth beneath

the seafloor. Therefore, the seafloor pick was subtracted from the time pick for each horizon. These time values were applied in the polynomial to generate thickness maps of the seafloor to each horizon, 05 through 30. The files were stored in the SMT project. For the report selected horizons were exported to create hard-copy maps. Horizon isopachs (i.e., the depth in feet from the seafloor to the horizon) were produced for Horizon 10 (Map 6) and Horizon 13 (the top of the Red Unit). A unit thickness map was produced for Unit 3 (Horizon 13 to Horizon 15) which is believed to be the sand-rich Red Unit. A structure map (sea surface to the horizon) was also produced for Horizon 30, (Map 9). The contour intervals on the hardcopy isopach maps are 20 ft.

Figures 5 through 12, Seismic Data Examples

The data examples shown in Figures 5 through 12 were selected from the AUV or 3-D data volumes to illustrate particular geologic conditions and stratigraphy that are discussed in this report. These displays were exported from the seismic workstation for set-up and annotation in a graphics editing program. The locations of the illustrated seismic profiles are shown on inset index maps on the respective figures.

APPENDIX B: ILLUSTRATIONS

APPENDIX C: REFERENCES

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SECTION D
HYDROGEN SULFIDE INFORMATION

(a) Concentration

QuarterNorth Energy LLC does not anticipate encountering any H₂S during the proposed operations being conducted under this EP.

(b) Classification

In accordance with 30 CFR 490.215(b), QuarterNorth Energy LLC requests that Green Canyon Block 198 be classified by BSEE as H₂S “absent.”

SECTION E
MINERAL RESOURCE CONSERVATION INFORMATION

(a) Technology and reservoir engineering practices and procedures

Technology and reservoir engineering practices and procedures are not required for this Initial EP per NTL No. 2008-G04.

(b) Technology and recovery practices and procedures

Technology and recovery practices and procedures are not required for this Initial EP per NTL No. 2008-G04.

(c) Reservoir Development

Reservoir Development information is not required for this Initial EP per NTL No. 2008-G04.

SECTION F
BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

(a) Deepwater benthic communities

The water depths in the study area exceed 300 meters (984 feet), the minimum depth for deepwater benthic community potential as outlined in NTL No. 2009-G40. NTL No. 2009-G40 states a separation distance of 250-feet for seafloor disturbances and 2000-feet for drill centers. The multibeam, side scan sonar, sub-bottom profiler data, and 3D seismic seafloor amplitudes were reviewed for high-density deepwater communities. No features were identified in the Shallow Hazards Assessment within 250-feet of the proposed well locations that could support high-density deepwater benthic communities.

Dynamically positioned vessels will be used, therefore, no anchors are proposed to be utilized.

(b) Topographic features map

Activities proposed in this EP do not fall within 305 meters (1,000 feet) of the “no activity zone,” therefore a map is not required.

(c) Topographic Features Statement

All activities proposed under this EP will be conducted outside all Topographic Feature Protective Zones, therefore shunting of drill cuttings and drilling fluids is not required.

(d) Live Bottoms (Pinnacle Trend) Map

Green Canyon Block 198 is not located within 61 meters (200 feet) of any live-bottom (pinnacle trend) features, therefore a map is not required.

(e) Live bottoms (low relief) map

Green Canyon Block 198 is not located within 100 feet of any live-bottom (low-relief) features.

(f) Potentially sensitive biological features

Green Canyon Block 198 is not located within 30 meters (100 feet) of potentially sensitive biological features.

(g) Threatened and 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 250, Subpart B, effective May 14, 2007, and further outlined in Notice to Lessees (NTL) 2008-G04, lessees/operators are required to address site-specific information on the presence of federally listed threatened or endangered species and critical habitat designated under the ESA and marine mammals protected under the Marine Mammal Protection Act (MMPA) in the area of proposed activities under this plan.

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 our operations.

(h) Air and Water Quality Information and (i) Socioeconomic Information

Per NTL 2008-G04, air and water quality information and socioeconomic information are not required for Exploration Plans outside the state of Florida.

**SECTION G
WASTES AND DISCHARGE INFORMATION**

(a) Projected generated wastes and (b) Projected ocean discharges

Table 1 – Waste estimated to be generated, treated and/or downhole disposes or discharged to the GOM is enclosed as **Attachment G-1**.

(c) Modeling report

Per NTL 2008-G04, a modeling report is not required for operations performed under this EP.

(d) National Pollutant Discharge Elimination System (NPDES) permit

Per NTL 2008-G04, NPDES permit information is not required for operations performed under this EP.

(e) Modeling report

Per NTL 2008-G04, a modeling report is not required for operations performed under this EP.

(f) Projected cooling water intake

Per NTL 2008-G04, projected cooling water intake information is not required for operations performed under this EP.

ATTACHMENT

- 1) Attachment G-1 – Table 1_Waste estimated to be generated, treated and/or downhole disposes or discharged to the GOM.**

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					
<i>EXAMPLE: Cuttings wetted with synthetic based fluid</i>	<i>Cuttings generated while using synthetic based drilling fluid.</i>	<i>X bbl/well</i>	<i>X bbl/day/well</i>	<i>discharge overboard</i>	<i>No</i>
Water-based drilling fluid	NaCl base fluid	10,000-20,000 bbl/well	10,000-20,000 bbl/day (~1-7 days only)	Riserless at seafloor	No
Synthetic based drilling fluid	Internal Olefine base fluid	1,044 bbl/well	0 bbl/day	Overboard with cuttings	No
Cuttings wetted with water-based fluid	Cuttings generated while using water based drilling fluid.	3,800 bbl/well	542 bbl/day (~1-7 days only)	Riserless at seafloor	No
Cuttings wetted with synthetic-based fluid	Cuttings generated while using synthetic based drilling fluid.	4,176 bbl/well	23 bbl/day	Overboard	No
Will humans be there? If yes, expect conventional waste					
<i>EXAMPLE: Sanitary waste water</i>	<i>Sanitary waste from living quarters</i>	<i>X bbl/well</i>	<i>X bbl/hr/well</i>	<i>chlorinate and discharge overboard</i>	<i>No</i>
Domestic waste	Grey Water	6,000 bbls/well	02.78 bbl/hr	Overboard	No
Sanitary waste	Black Water	3,461 bbls/well	02.29 bbl/hr	Chlorinated and discharged overboard	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Rainwater	1,873 - 3753 bbls/well	1.23 - .248 bbl/hr	Sheen test, discharged overboard (rain / rig wash) Processed (any other fluids)	No
Engine room sludge	Oil/water	410 bbls/well	.27 bbl/hr	Sent ashore for disposal	No
Will you conduct well treatment, completion, or workover?					
Well treatment fluids	11.5 ppg Sodium Bromide	1,050 bbls/well	500 bbls/treatment Frac job.	Discharge overboard	No
Well completion fluids	16.5 ppg Zinc Bromide	21,000 bbls/well	N/A (zero discharge)	N/A	No
Workover fluids	N/A	N/A	N/A	N/A	N/A
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization unit discharge	Saltwater/Freshwater	45,173 bbls/well	30 bbls/hr	Directly overboard below water line	No
Blowout prevent fluid	BOP Fluid	229 bbls/well	1.5 bbl/hr	Discharged through BOP during functioning	No
Ballast water	Saltwater	N/A	N/A	During drilling operations ballast is moved port to starboard to adjust trim	No
Bilge water	Oily Water	489 bbls/well	.32 bbl/hr	Through 15 ppm meter	No
Fire water	Saltwater	132 bbls/well	.0873 bbl/hr	Directly overboard during fire pump testing	No
Cooling water	Saltwater	39,117,263 bbls/well	25,871 bbls/hr	Directly overboard	No
Excess cement at seafloor	Cement and additives	400-800 bbls/well	n/a	Riserless at seafloor	No
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced water	N/A	N/A	N/A	N/A	N/A
Please enter individual or general to indicate which type of NPDES permit you will be covered by?			General		
			NOTE: All discharged wastes should comply with the requirements of the NPDES permit.		

**SECTION H
AIR EMISSIONS INFORMATION**

(a) Projected emissions

Enclosed under this section is one set of emissions worksheets showing the emissions calculations for the Plan Emissions in Lease OCS-G 36021, Green Canyon Block 198.

Screen Procedures for DOCD's	Yes	No
Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development activities more than 90% of the amounts calculated using the following formulas: $CT = 3400D^{2/3}$ for CO, and $CT = 33.3D$ for the other air pollutants (where D = distance to shore in miles)?		X
Do your emission calculations include any emission reduction measures or modified emission factors?		X
Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?		X
Do you expect to encounter H ₂ S at concentrations greater than 20 parts per million (ppm)?		X
Do you propose to flare or vent natural gas in excess or criteria set for the under 250.1105(a)(2) and (3)?		X
Do you propose to burn produced hydrocarbon liquids?		X
Are your proposed development and production activities located within 25 miles (40 kilometers) from shore?		X
Are your proposed development and production activities located within 124 miles (200 kilometers) of the Breton Wilderness Area?		X

Enclosed as **Attachment H-1** is one set of emissions worksheets showing the emissions calculations for the Plan Emissions. There are no existing facilities or activities co-located with the currently proposed activities therefore, the Complex Total Emissions are the same as the Plan Emissions.

This information calculated by: Name: Jamie Nease, HLP Engineering, Inc.
Email address - jnease@hlpengineering.com

ATTACHMENT

1) Attachment H-1 – EP Air Quality Worksheet

EP - AIR QUALITY

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

COMPANY	QuarterNorth Energy, LLC
AREA	Green Canyon
BLOCK	198
LEASE	OCS-G-36021
FACILITY	N/A
WELL	A
COMPANY CONTACT	Melissa Guidry
TELEPHONE NO.	(713) 969-1310
REMARKS	This AQR is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.

ATTACHMENT H-1

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/ttnchie1/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s05.pdf
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
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/ch03/final/c03s04.pdf
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (light smoke)	lbs/MMscf	2.10	2.10	2.10	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Combustion Flare (medium smoke)	lbs/MMscf	10.50	10.50	10.50	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttnchie1/ap42/ch13/final/C13S05_02-05-18.pdf
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/lank						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.api.org/
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-ice – Other Construction Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-ice – Other Survey Equipment	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-ice – Tractor	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
On-ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day)	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI/TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels - Hovercraft Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI/TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

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	%

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-3621	N/A	A	Melissa Guidry	1713-962-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.																
OPERATIONS		EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR										ESTIMATED TONS							
		Diesel Engines	HP	HP	GAL/HR	GAL/D	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
		Nat. Gas Engines	MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR																	
		Burners	MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR																	
DRILLING	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Diesel Boiler	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		BPD	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRILLING	Liquid Flaring	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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	0	0.00	0.00	0.00	0.00	0.00	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	0	0.00	0.00	0.00	0.00	0.00	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	0	0.00	0.00	0.00	0.00	0.00	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	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	VESSLS	kw	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Ice Management Diesel	0	0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES															2,963.70			2,963.70	2,963.70	2,963.70			67,775.43
	89.0																							
DRILLING	VESSLS - Crew Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Tugs Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Material Tug Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Crew Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Support Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	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																						
	VESSLS	kw				HR/D	D/YR																	
	On-Ice - Loader	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	On-Ice - Other Construction Equipment	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	On-Ice - Other Survey Equipment	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	On-Ice - Tractor	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	On-Ice - Truck (for gravel island)	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	On-Ice - Truck (for surveys)	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Man Camp - Operation	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Hovercraft Diesel	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2023 Non-Facility Total Emissions								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-36221	N/A	A	Melissa Guidry	1713-982-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.																
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR											ESTIMATED TONS							
Diesel Engines		HP	HP	GAL/HR	GAL/D																			
Nat. Gas Engines		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	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Diesel Boiler		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			BPD																					
DRILLING	Liquid Flaring		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - light smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - medium smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - heavy smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	VESSLS		kw			HR/D	D/YR																	
	VESSLS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025 Facility Total Emissions								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES															2,963.70			2,963.70	2,963.70	2,963.70		67,775.43	
		89.0																						
DRILLING	VESSLS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - 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
FACILITY INSTALLATION	VESSLS - 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
	VESSLS - Crew Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRODUCTION	VESSLS - 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
ALASKA-SPECIFIC SOURCES	On-Ice Equipment			GAL/HR	GAL/D																			
	Man Camp - Operation (maximum people per day)		PEOPLE/DAY																					
	VESSLS		kw			HR/D	D/YR																	
	On-Ice - Loader		0	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
	On-Ice - Other Construction Equipment		0	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
	On-Ice - Other Survey Equipment		0	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
	On-Ice - Tractor		0	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
	On-Ice - Truck (for gravel island)		0	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
	On-Ice - Truck (for surveys)		0	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
	Man Camp - Operation		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
	VESSLS - Hovercraft Diesel		0		0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025 Non-Facility Total Emissions								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																	
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-36221	N/A	A	Melissa Guidry	1713-982-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.																	
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR											ESTIMATED TONS								
Diesel Engines		HP	HP	GAL/HR	GAL/D																				
Nat. Gas Engines		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	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
			BPD																						
DRILLING	Liquid Flaring		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
WELL TEST	COMBUSTION FLARE - no smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COMBUSTION FLARE - light smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COMBUSTION FLARE - medium smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COMBUSTION FLARE - heavy smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ALASKA-SPECIFIC SOURCES	VESSLS		kw		HR/D	D/YR																			
	VESSLS - Ice Management Diesel		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2026 Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES															2,963.70			2,963.70	2,963.70	2,963.70		67,775.43		
			89.0																						
DRILLING	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Tugs Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FACILITY INSTALLATION	VESSLS - Material Tug Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Support Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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																						
	VESSLS		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	0.00	
	VESSLS - Hovercraft Diesel		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2026 Non-Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-36221	N/A	A	Melissa Guidry	1713-962-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.																
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR											ESTIMATED TONS							
Diesel Engines		HP	HP	GAL/HR	GAL/D																			
Nat. Gas Engines		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	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Diesel Boiler		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			BPD																					
DRILLING	Liquid Flaring		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - light smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - medium smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - heavy smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	VESSLS		kw			HR/D	D/YR																	
	VESSLS - Ice Management Diesel		0			0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2027 Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES															2,963.70			2,963.70	2,963.70	2,963.70			67,775.43
	89.0																							
DRILLING	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Tugs Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Material Tug Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Support Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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																					
	VESSLS		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	0.00
	VESSLS - Hovercraft Diesel		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2027 Non-Facility Total Emissions							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS																	
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-36221	N/A	A	Melissa Guidry	1713-962-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.																	
OPERATIONS		EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR										ESTIMATED TONS								
		Diesel Engines	HP	HP	GAL/HR	GAL/D																			
		Nat. Gas Engines	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	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		BPD	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRILLING	Liquid Flaring	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WELL TEST	COMBUSTION FLARE - no smoke	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - light smoke	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - medium smoke	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - heavy smoke	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	VESSLS	kw	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Ice Management Diesel	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029 Facility Total Emissions								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES																2,963.70			2,963.70	2,963.70	2,963.70		67,775.43	
		89.0																							
DRILLING	VESSLS - Crew Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Tugs Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Material Tug Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INSTALLATION	VESSLS - Crew Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Support Diesel	0	0	0.00	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	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																							
	VESSLS	kw				HR/D	D/YR																		
	On-Ice - Loader	0	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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	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	0	0	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00	0.00
	VESSLS - Hovercraft Diesel	0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029 Non-Facility Total Emissions								0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL	CONTACT	PHONE	REMARKS															
QuarterNorth Energy, LLC	Green Canyon	195	OCS-G-36221	N/A	A	Melissa Guidry	1713-982-1310	The AQ26 is being submitted to assess air quality impact during 2024 for projected emissions associated with drilling an exploration well.															
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	MAXIMUM POUNDS PER HOUR											ESTIMATED TONS						
Diesel Engines		HP	HP	GAL/HR	GAL/D	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
Nat. Gas Engines		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR																	
Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR																	
DRILLING	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Drilling - Propulsion Engine - Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Diesel Boiler		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Heavy Lift Vessel/Derrick Barge Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			BPD																				
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
WELL TEST	COMBUSTION FLARE - no smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - light smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - medium smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMBUSTION FLARE - heavy smoke		0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALASKA-SPECIFIC SOURCES	VESSLS		kw		HR/D	D/YR																	
	VESSLS - Ice Management Diesel		0		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2030	Facility Total Emissions						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EXEMPTION CALCULATION	DISTANCE FROM LAND IN MILES														2,963.70			2,963.70	2,963.70	2,963.70			67,775.43
	89.0																						
DRILLING	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Tugs Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FACILITY INSTALLATION	VESSLS - Material Tug Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Crew Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	VESSLS - Supply Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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	VESSLS - Support Diesel		0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	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																				
	VESSLS		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
	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
	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
	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
	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
	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
	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	--	0.00
	VESSLS - 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
2030	Non-Facility Total Emissions						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

EP - AIR QUALITY

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

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL				
QuarterNorth Energy, LLC	198	OCS-G-36021	N/A	A					
Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2024	39.25	23.68	22.97	0.57	940.39	27.16	0.00	148.63	0.27
2025	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2026	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2027	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2028	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2029	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2030	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2031	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2032	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Allowable	2963.70			2963.70	2963.70	2963.70		67775.43	

**SECTION I
OIL SPILL INFORMATION**

(a) Oil Spill Response Planning

All proposed activities in this EP will be covered under QuarterNorth Energy LLC's, BOEM/BSEE Operator No. 03672, Regional Oil Spill Response Plan (OSRP) approved on September 23, 2023.

An update to QNE's OSRP will be submitted to BSEE by Friday, November 3rd, 2023 for the new Worst-Case Scenario as shown below in sub-section (d).

(b) SPILL RESPONSE SITES

Primary Response Equipment Location	Preplanned Staging Location(s)
Houma, LA	Houma, LA
Kiln, MS	Kiln, MS
Leeville, LA	Leeville, LA
Venice, LA	Port Fourchon, LA

(c) OSRO Information

QNE currently maintains agreements with Clean Gulf Associates (CGA), National Response Corporation (NRC) and Marine Spill Response Corporation (MSRC) to provide offshore oil spill removal services. In the case of an unanticipated discharge incident, CGA, NRC and MSRC will be the primary providers of the spill response equipment. The primary provider for personnel to staff this team will be Clean Gulf Associates Services (CGAS) and National Response Corporation's (NRC) Independent Contractor Network (ICN). In addition, QNE currently maintains agreements with the following OSROs to provide near shore oil spill removal services: AMPOL; ES&H Consulting Services, Inc.; Miller Environmental; and OMI Environmental Services.

(d) WORST-CASE SCENARIO COMPARISON

Category	Regional OSRP WCD	EP WCD
Type of Activity	>10 Miles Seaward of the Coastline	>10 Miles Seaward of the Coastline
Facility Location (Area/Block)	Green Canyon Block 39	Green Canyon Block 198
Facility Designation	Ewing Bank 1010 Well Loc A (Katmai West #2)	Well Loc A
Distance to Nearest Shoreline (miles)	73 miles	89 miles
Volume Storage tanks (total) Uncontrolled blowout Total Volume	421,050	556,500
Type of Oil(s) (crude, condensate, diesel)	Crude	Crude
API Gravity	37.9°	34.3°

Since the worst-case discharge supersedes the previously approved, per NTL 2015-N01, QuarterNorth hereby submits with this EP the calculations and assumptions related to the new worse case discharge enclosed as **Attachment I-1** in the proprietary copy of this plan.

QuarterNorth has determined that the worst-case scenario from the activities proposed in this EP *do* supersede the worst-case scenario from our approved Regional OSRP, therefore QuarterNorth has determined to replace the worst-case scenario in our Regional OSRP.

An update to QNE’s OSRP will be submitted to BSEE by Friday, November 3rd, 2023 for the new Worst-Case Scenario as shown above in sub-section (d).

(b) Spill response discussion

Please see attached Spill Response Discussion prepared by Forefront Emergency Management for this EP enclosed as **Attachment I-2**.

(c) Modeling Report

Per NTL 2008-G04, a modeling report is not required for operations performed under this EP.

ATTACHMENTS

- 1) Attachment I-1 – WCD Calculations and Assumptions (Proprietary)
- 2) Attachment I-2 – OSRP Discussion

FACILITY INFORMATION	
TYPE OF OPERATION	Drilling
FACILITY DESIGNATION	Drillship OCS-G 36021
FACILITY LOCATION	Green Canyon Block 198
DISTANCE TO NEAREST SHORELINE	89 miles
VOLUME Uncontrolled Blowout (Volume Per Day)	556,500 bbls
TYPE OF OIL(S) – (CRUDE OIL, CONDENSATE, DIESEL)	Crude Oil
API GRAVITY	34.3°

FACILITY, TANKS, AND PRODUCTION FACILITIES

There are no production vessels associated with the activities in this Exploration Plan (EP); however, there are storage tanks. All storage tanks are as follows:

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)
Mud Pits	Drillship	450	10	4,500
Brine	Drillship	1,430	2	2,860
Fuel	-	-	-	38,996
Oil/ Lube	Drillship	1	-	1
Drill Water	Drillship	-	-	16,353
Potable Water	Drillship	-	-	9,120
Base Oil	Drillship	-	-	2,852
Reserve Mud Pits	Drillship	1,395	4	5,580
Mud Pits	Drillship	110	4	440
Mud Pits	Drillship	230	2	460
Trip Mud Pits	Drillship	100	2	200
Stripping Tanks Pits	Drillship	15	1	15

OIL SPILL RESPONSE DISCUSSION

In the event of a spill at Green Canyon Block 198, our primary response would be to utilize the Oil Spill Response Vessels (OSRV) and Oil Spill Response Barge (OSRB) from Clean Gulf Associates (CGA). The initial response would likely be a 95' Fast Response Vessel (FRV) located in Leeville, Louisiana and the HOSS Barge located in Harvey, Louisiana. The 95' FRV has a derated recovery capacity of 22,885 barrels/day and a storage capacity of 249 barrels. With a maximum prep time of 2.0 hours, a maximum planning run time of 6.5 hours, and a deployment time of 1.0 hour, the response vessel would be on site in approximately 9.5 hours. The HOSS Barge has a derated recovery capacity of 76,285 barrels/day and a storage capacity of 4,000 barrels. With a maximum prep time of 12.0 hours, a maximum planning run time of 23.6 hours, and a deployment time of 2.0 hours, the response barge would be on site in approximately 37.6 hours.

Actual response times are generally quicker than planning times, since the vessel could be mobilized within one hour, weather permitting. As with any spill, additional "cascading" response equipment would be mobilized to the site from various CGA bases, such as Vermilion, LA and Fourchon, LA. For spills larger than 100 barrels, dispersants may be mobilized by plane from Airborne Support, Inc. in Houma, LA, pending approval from the U.S.C.G. FOSC and RRT-6.

For planning purposes, based on the worst-case discharge volume coupled with the distance from shore and guidance from Clean Gulf Associates, it is estimated that personnel can be on-scene within 5-24 hours. It is estimated that the spill could be contained within 6 days and recovered within 30 to 40 days.

LAND SEGMENT IDENTIFICATION

According to the risk assessment analysis conducted by the Bureau of Safety and Environmental Enforcement as part of their OSRAM project, spills originating in Green Canyon Block 198, Launching Area C043, have the potential for impacting land segments from Calhoun County, Texas to Plaquemines Parish, Louisiana within 30 days of oil persisting on the water. The probability of the impacts is summarized below:

PROBABILITY OF LAND IMPACT (% CHANCE)			
LAND AREA	3 DAYS	10 DAYS	30 DAYS
Calhoun, TX	-	-	-
Matagorda, TX	-	-	2
Brazoria, TX	-	-	1
Galveston, TX	-	-	3
Jefferson, TX	-	-	2
Cameron, LA	-	1	7
Vermilion, LA	-	-	3
Iberia, LA	-	-	1
St. Mary, LA	-	-	-
Terrebonne, LA	-	-	3
Lafourche, LA	-	-	1
Jefferson, LA	-	-	-
Plaquemines, LA	-	-	2

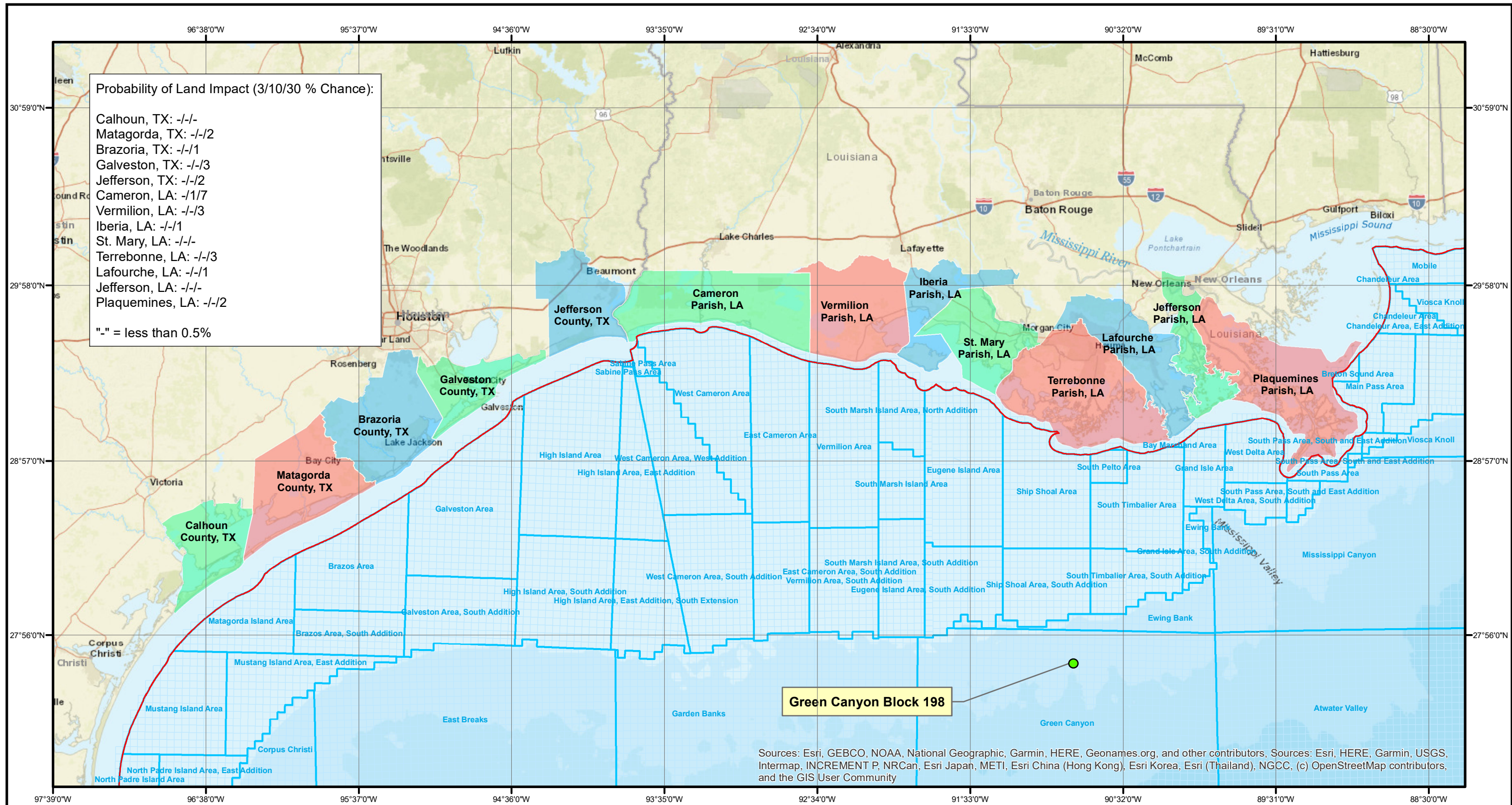
Note "-" = less than 0.5%.

RESOURCE IDENTIFICATION

The land segment with the highest probability of being impacted by a spill originating from this facility is the Cameron Parish land segment. According to the BSEE OSRAM program, there is a less than 0.5% chance of the spill impacting Cameron Parish within 3 days of the incident. In addition, the OSRAM program predicts a 1% and 7% chance of an oil slick that persists for 10 days and 30 days, respectively.

Economically, the potentially impacted areas are heavily industrialized, as well as, commercial and recreational fishing centers. The Cameron Parish area is one of the largest staging areas, in the southern Louisiana coastal area, for the oil and gas industry's operations in the Gulf of Mexico, as well as an abundant fishing community. The Rockefeller State Wildlife Refuge and Game Preserve and surrounding areas are of the most critically sensitive sites of economic concerns, should an oil slick threaten the Cameron Parish area. Special emphasis will be made on deployment of containment boom in order to attempt to keep any oil slicks from impacting these areas.

Environmentally, the Cameron Parish area has several shoreline types that could potentially be impacted. These include exposed solid man-made structures, exposed wave-cut platforms in clay, fine- to medium-grained sand beaches, coarse-grained sand beaches, mixed sand and gravel beaches, riprap, exposed tidal flats, sheltered rocky shores and sheltered scarps in mud or clay, sheltered tidal flats, and salt- and brackish-water marshes. The locations of these areas are on maps **LA-3, LA-4, LA-5, LA-6, LA-7, LA-11, LA-12, LA-13, LA-14, and LA-15** of the Environmental Sensitivity Index guide maps. The index pages of these maps can be found [online](#) as a guide to the species that could be potentially impacted should a spill of significance occur in the area.



— = Federal/ State Boundary Line

QuarterNorth Energy LLC Green Canyon Block 198 Impact Probability Map



RESPONSE

QuarterNorth Energy LLC has ensured, by means of contract, an experienced Incident Management Team as well as an extensive response resource contractor team in order to ensure it is well prepared to address the issues involved with a Worst Case Discharge from Green Canyon Block 198. These contracts include agreements with Clean Gulf Associates (CGA), National Response Corporation (NRC), Marine Spill Response Corporation (MSRC), Forefront Emergency Management, L.P., HWCG LLC, ES&H, AMPOL, Miller Environmental, and E3 OMI, LLC.

Once identification and assessment of the spill has occurred, QuarterNorth Energy LLC would activate mobilization of the contracted resources. The resources involved would involve mechanical recovery, storage, aerial surveillance, dispersants, subsea containment and subsea dispersant, *in-situ* burning, shoreline protection, and wildlife rehabilitation and support. These tactics are discussed below:

Mechanical Recovery

Mechanical recovery would involve the use of skimmers, oil spill response vessels, and fast response units to recover floating oil in open water. The resources for these operations are available from the contracted OSRO's CGA, NRC, and MSRC. A list of offshore skimming equipment, along with recovery rates and estimated response times, is available on the Offshore On-Water Recovery Activation List.

Oil Storage

In order to properly support the off-shore skimming vessels to be involved in the Worst Case Discharge Scenario, it is likely that additional temporary storage equipment will be necessary to store the recovered product for disposal. If this proves to be the case, the required storage tanks and/or barges will be secured at the time of the incident from contracts maintained with CGA and NRC. A list of barges is available on the Oil Storage Table.

Aerial Surveillance

In order to ensure accurate location, estimation, and tracking of any spill, it is the policy of QuarterNorth Energy LLC to utilize aircraft over flights, as warranted, to continually track the spill by obtaining GPS coordinates of the leading edge, center, and trailing edge of the slick. Personnel trained in spill spotter detection will obtain the visual and GPS data during each over flight. This up-to-the-minute information is vital in developing the necessary trajectories needed for an appropriate spill response. The Aerial Surveillance Table lists the resources available for this response capability.

Offshore Aerial Dispersants and Offshore Boat Spray Dispersants

Three types of dispersants are presently approved and available in the Gulf Coast area. These are COREXIT 9527, COREXIT 9500, and Accell Clean ® DWD. The most rapid way of acquiring dispersants in the event of an incident is through QuarterNorth Energy LLC's contract with CGA, NRC, and MSRC. The primary vendor for vessel application will be Clean Gulf Associates. Due to the significant delays involved with securing vessels for this type of application, this is not the preferred method. Aerial application of the dispersant has proved, in many recent applications, to be faster and more efficient than vessels application. This finding is mainly due to the availability of dedicated aerial application resources through the Clean Gulf Associates contract with Airborne Support, Inc. located in Houma Louisiana. In addition, through the National Response Corporation's contract with Florida Air Transport, QuarterNorth Energy LLC has access to the NRC's aerial application equipment. MSRC has a contract with Dynamic Aviation for (2) B737 aircraft for dispersant spraying in the Lower 48 states, the Caribbean, Hawaii, and Alaska (Prince William Sound and Cook Inlet). The equipment available for both vessel dispersant and aerial dispersant is listed on the Offshore Boat Spray Dispersant Table and the Offshore Aerial Dispersant Table.

RESPONSE (CONTINUED)

Subsea Containment

In the event of a subsea sources control issue emanating from a blowout well, QuarterNorth Energy LLC has entered into a contract with HWCG LLC to obtain the resources of the Helix Fast Response System (HFRS). The Helix Fast Response System is composed of the Q4000 Intervention Vessel, Helix Producer I Processing Vessel, Containment System, Tanker Unloading System, Subsea Capping Stacks, Top Hat, and Risers and Umbilicals. QuarterNorth Energy LLC has additional contracts in place for the deployment of containment equipment as well as subsea dispersant application and monitoring.

In-Situ Burning

Conditions permitting, *in-situ* burning is another response operation to be considered. The primary type of equipment necessary for *in-situ* burning is "Fire Boom". This type of containment boom is capable of retaining burning oil with risks of significant damage to the boom. After a thorough consideration of all aspects involved with *in-situ* burning between QuarterNorth Energy LLC and the Federal On-Scene Commander, the following procedures and considerations should be taken into account:

- Before ignition, ensure that the wind direction will not carry the smoke from any potential fire in the direction of a community or other sensitive resources.
- At the time of ignition, special care must be taken to ensure that the ignition source is located at a safe distance from the concentration of oil.
- The safest burn system at this point is to release burning gelled fuel from a heli-torch from heights of several hundred feet above the spill. If necessary, hand-held igniters can be released from vessels several hundred feet away.

Shoreline Protection

Should an oil slick persist and threaten shorelines, response strategies would be put into effect. The resources available for nearshore and shoreline response are given on the Shoreline Protection and Nearshore Skimming Equipment Table.

Wildlife Rehabilitation and Support

In the event that wildlife is impacted by a spill, the decision to capture and attempt to clean and rehabilitate any oiled wildlife will be made by the trustee agency in given area impacted. No handling or capture of any animals will be conducted without consultation and approval by the agency trustee's representative at the scene. Once the decision has been made that wildlife in the area have been sufficiently impacted to warrant a rehabilitation project, the incident management team will mobilize technical specialists to conduct the rehabilitation project. The equipment utilized to conduct the rehabilitation project will depend heavily on the species impacted. In general, the wildlife trailer maintained by CGA will be mobilized to the scene to provide generalized equipment. More specific equipment will be obtained as needed when determined necessary by the technical specialist and/or agency representatives. The preferred organizations are given on The Wildlife Protection Response and Equipment Tables.

120-DAY UNCONTROLLED WELL BLOW OUT CONSIDERATIONS

Beyond the equipment required for the initial phase of a Worst Case Discharge at this location, additional equipment may be necessary for a sustained response to an un-controlled well blow out for a duration of 120 days. Some additional support that may be necessary will include:

- Ocean-going, as well as inland-going temporary storage barges to store and transport recovered product from the skimming operations.
- A rotation of personnel to relieve the operators of all skimming vessels as well as the shoreline protection crews. Spills of duration will double the required personnel.
- Additional field safety personnel.
- Aircraft for continual monitoring of the incident.
- Infrared spill tracking, such as X-Band Radar, for night time spill tracking and response.
- Full logistical capabilities to maintain the response equipment as well as personnel.
- Sufficient communications equipment.
- Sufficient decontamination equipment and protocols.
- Long term supply of dispersants and fireproof boom in instance of an uncontrolled long-term blowout event.
- A decontamination plan.
- A waste disposal plan.
- A demobilization plan.
- Aircraft for dispersant application.
- Well containment equipment, personnel, and deployment capability for capturing and separating fluids at the source.

RESPONSE RESOURCES

QuarterNorth Energy LLC has secured a contract with CGA, NRC, and MSRC to respond to a worst case discharge. For planning purposes within this Exploration Plan, the following response resources would be utilized in the event of an incident at Green Canyon Block 198. The Initial Worst Case Discharge Volume associated with an uncontrolled blow-out at the Green Canyon Block 198 Drillship would be 556,500 barrels.

The following resources would be deployed via a tiered response to the incident location:

OFFSHORE RESPONSE EQUIPMENT

Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	Total ETA ⁴
95' FRV (J.L. O'Brien)	1	22,885	249	(2) 3-brush Lamor Skimmers	6 (2-CGAS, 4-OSRO)	5' seas	CGA/Leeville, LA	2	-	-	6.5	1	9.5
				(2) 32' x 3' air inflatable boom									
				Aptomar SECurus (infrared camera, HD digital video camer, high output spotlight, and Rutter X-band Radar)									
95' FRV (Breton Isl.)	1	22,885	249	(2) 3-brush Lamor Skimmers	6 (2-CGAS, 4-OSRO)	5' seas	CGA/ Venice, LA	2	-	-	7.9	1	10.9
				(2) 32' x 3' air inflatable boom									
				Aptomar SECurus (infrared camera, HD digital video camer, high output spotlight, and Rutter X-band Radar)									
S.T. Benz Responder OSRV	1	18,086	4,000	(1) Lamor LFF 100 Brush Skimmer	11	-	MSRC/ Grand Isle, LA	3	-	-	7	1	11
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									
95' FRV (H.I. Rich)	1	22,885	249	(2) 3-brush Lamor Skimmers	6 (2-CGAS, 4-OSRO)	5' seas	CGA/ Vermilion, LA	2	-	-	9.9	1	12.9
				(2) 32' x 3' air inflatable boom									
				Aptomar SECurus (infrared camera, HD digital video camer, high output spotlight, and Rutter X-band Radar)									
MSRC Louisiana Responder	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Fort Jackson, LA	2	-	-	10.5	1	13.5
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									
95' FRV (Galveston)	1	22,885	249	(2) 3-brush Lamor Skimmers	6 (2-CGAS, 4-OSRO)	5' seas	CGA/ Galveston, TX	2	-	-	14.6	1	17.6
				(2) 32' x 3' air inflatable boom									
				Aptomar SECurus (infrared camera, HD digital video camer, high output spotlight, and Rutter X-band Radar)									
MSRC Mississippi Responder	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Pascagoula, MS	2	-	-	17	1	20
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									
FRU Unit	3	12,753	500	Foilex 250 weir skimmer	4 (1-CGAS, 3-OSRO)	4' seas	CGA/ Leeville, LA	2	-	12	10	1	25
				75' of 53" air inflatable boom									
				(1) Petroleum Industry Designated Vessel									
Gulf Coast Responder OSRV	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Lake Charles, LA	2	-	-	24	1	27
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									

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OFFSHORE RESPONSE EQUIPMENT													
Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	Total ETA ⁴
OSRV NRC Perseverance	1	24,000	300	42" of 2,000' Containment Boom	(2) SROT Trained Personnel; (6) Labor Personnel	-	NRC/ Golden Meadow, LA	4	-	2	19	2	27
				42" of 100' Sweep Containment Boom									
				Marco Class XI AB Skimmer									
				17' Deployment Craft									
MSRC Texas Responder	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Galveston, TX	2	-	-	27	1	30
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									
Oceangoing Boom Barge - CGA 300	1	-	-	(1) Barge with 25,000' of 43" containment boom	4 (2-OSRO, 2-CGAS)	2' - 4' seas	CGA/ Leeville, LA	12	-	-	14.6	4	30.6
				(1) Tug - 1,200 HP									
				(2) Petroleum Industry Designated Vessel per 1,000' of boom deployed									
				(1) Support crew boat (supply)									
FRU Unit	2	8,502	400	Foilex 250 weir skimmer	4 (1-CGAS, 3-OSRO)	4' seas	CGA/ Venice, LA	2	4.6 ⁵	12	12.1	1	31.7
				75' of 53" air inflatable boom									
				(1) Petroleum Industry Designated Vessel									
MSRC Barge 401	1	0	40,000	(1) Tug Boat	3		MSRC/ Fort Jackson, LA	2	-	-	30	1	33
FRU Unit	2	8,502	300	Foilex 250 weir skimmer	4 (1-CGAS, 3-OSRO)	4' seas	CGA/ Vermillion, LA	2	4.4 ⁵	12	15	1	34.4
				75' of 53" air inflatable boom									
				(1) Petroleum Industry Designated Vessel									
CGA-200 HOSS Barge	1	76,285	4,000	(4) 5-brush Lamor Skimmers	12 (4-CGAS, 8-OSRO)	7' seas	CGA/ Harvey, LA	12	-	-	23.6	2	37.6
				2,640' of 67" Sea Sentry Boom									
				Aptomar SECurus (infrared camera, HD digital video cam, high output spotlight, and Rutter X-band Radar)									
				(2) Tugs -1,200 HP									
				(1) Tug - 1,800 HP									
MSRC Barge 402	1	0	40,300	(1) Tug Boat	3		MSRC/ Pascagoula, MS	2	-	-	36	1	39

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OFFSHORE RESPONSE EQUIPMENT

Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	Total ETA ⁴
MSRC Southern Responder	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Ingleside, TX	2	-	-	40	1	43
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									
OSRB NRC Defender	1	24,000	16,000	42" of 1,000' Containment Boom	(2) SROT Trained Personnel; (4) Labor Personnel	-	NRC/ Bayou La Batre, AL	8	-	2	41	2	53
				42" of 100' Sweep Boom									
				Marco Class XI AB Skimmer									
				18' Deployment Craft									
				Nearshore Tug									
				Offshore Tug									
Koseq Arms	6	108,978	24,000	MariFlex 150-HF	4	6' seas	T&T/ Harvey LA	12	12 ⁵	24	10	1	61.1
				(1) >200' Supply Vessel									
				(1) Petroleum Industry Designated Vessel									
				4,000 bbls of internal liquid mud tank storage ⁶									
Koseq Arms	6	137,310	24,000	Lamor Brush Skimmer	4 - T&T	6' seas	T&T/ Harvey, LA	12	12 ⁵	24	10	1	61.1
				(1) Skimmer Deployment System									
				(1) >200' Petroleum Industry Designated Vessel									
				4,000 bbls of internal liquid mud tank storage ⁶									
Koseq Arms	10	228,850	40,000	Lamor Brush Skimmer	4 - T&T	6' seas	T&T/ Galveston, TX	12	12 ⁵	24	10	1	61.1
				(1) Skimmer Deployment System									
				(1) >200' Petroleum Industry Designated Vessel									
				4,000 bbls of internal liquid mud tank storage ⁶									
OSRV NRC Quest	1	28,526	312	42" of 2,000' Containment Boom	(2) SROT Trained Personnel; (6) Labor Personnel	-	NRC/ Galveston, LA	4	-	2	61	2	69
				26" of 100' Containment Boom									
				Elastec X-150 Disk Skimmer									
				Marco Class XI AB Skimmer									
				18' Deployment Craft									
MSRC Florida Responder	1	10,567	4,000	(1) Transrec 350 Skimmer	11	-	MSRC/ Miami, FL	2	-	-	70	1	73
				2,640' of 67" Curtain Pressure Boom									
				(1) 32' Munson Support Boat									

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OFFSHORE RESPONSE EQUIPMENT													
Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	Total ETA ⁴
OSRB NRC Independence	1	24,000	22,490	42" of 2,000' Containment Boom	(2) SROT Trained Personnel; (4) Labor Personnel	-	NRC/ Aransas Pass, TX	8	-	2	89	2	101
				42" of 2,000' Sweep Boom									
				17' Deployment Craft									
				Nearshore Tug									
				Offshore Tug									
Marco Class XI AB Skimmer													
OSRV NRC Liberty	1	905	322	42" of 2,000' Containment Boom	(2) SROT Trained Personnel; (6) Labor Personnel	-	NRC/ Miami, FL	4	-	2	95	2	103
				42" of 200' Sweep Containment Boom									
				Desmi Helix Skimmer									
				17' Deployment Craft									
Offshore Storage Barge/ ATB	8	-	800,000	(1) Tug	6	7' seas	Various ⁷	24	-	-	24	-	48

Offshore EDRC	832,754
Offshore Recovered Oil Storage	1,041,671

¹Recovery rate and storage provides the total number for the quantity of skimming vessels listed.

²Equipment listed is for each skimming vessel.

³ Personnel number listed is for each skimming vessel.

⁴Response times dependent upon vessel procurement

⁵Asset to be relocated to staging area in Leeville, Louisiana

⁶Recovered liquid is pumped to a dedicated fixed storage tanks onboard the Petroleum Industry Designated Vessel. Once the storage tanks are full, the oil is transferred to a temporary storage barge for disposal in accordance with approved disposal plan.

⁷Barge resources are available through an agreement with CGA and MSRC. All equipment will be provided on an as-available basis, subject to the terms at the time requested by CGA, MSRC, or its member. Storage barge storage capacity will vary based on availability and can range from 6,500 bbls to 135,000 bbls.

NEARSHORE RESPONSE EQUIPMENT													
Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	Total ETA ⁴
46' FRV (R.W. Armstrong)	1	15,257	65	(2) 2-brush Lamor Skimmers (2) 23' x 3' air inflatable boom	4	4' seas	CGA/ Leeville, LA	2	-	-	6.5	1	9.5
60' Shallow Water FRV	1	22,885	249	(2) 3-brush Lamor Skimmers (2) 17' x 3' air inflatable boom	3	2' seas	CGA/ Leeville, LA	2	-	-	6.5	1	9.5
56' Shallow Water FRV	1	21,500	249	(2) 36" Marco belt skimmer (2) 20' flat bottom work boats (2) 75' x 3' air inflatable boom	4 for belt only op (2-CGAS, 2-OSRO) or 8 for full boom deployment (2-CGAS, 6-OSRO)	1' seas	CGA/ Leeville, LA	2	-	-	6.5	1	9.5
Marco SWS	1	3,588	34	Marco Class 1D skimmer	3 (1-CGAS, 2-OSRO)	<1' seas	CGA/ Leeville, LA	2	-	1	6.5	1	10.5
46' FRV (Grand Bay)	1	15,257	65	(2) 2-brush Lamor Skimmers (2) 23' x 3' air inflatable boom	4	4' seas	CGA/ Venice, LA	2	-	-	7.9	1	10.9
60' Shallow Water FRV	1	22,885	249	(2) 3-brush Lamor Skimmers (2) 17' x 3' air inflatable boom	3	2' seas	CGA/ Venice, LA	2	-	-	7.9	1	10.9
56' Shallow Water FRV	1	21,500	249	(2) 36" Marco belt skimmer (2) 20' flat bottom work boats (2) 75' x 3' air inflatable boom	4 for belt only op (2-CGAS, 2-OSRO) or 8 for full boom deployment (2-CGAS, 6-OSRO)	1' seas	CGA/ Venice, LA	2	-	-	7.9	1	10.9
46' FRV (Bastian Bay)	1	15,257	65	(2) 2-brush Lamor Skimmers (2) 23' x 3' air inflatable boom	4	4' seas	CGA/ Vermilion, LA	2	-	-	9.9	1	12.9
56' Shallow Water FRV	1	21,500	249	(2) 36" Marco belt skimmer (2) 20' flat bottom work boats (2) 75' x 3' air inflatable boom	4 for belt only op (2-CGAS, 2-OSRO) or 8 for full boom deployment (2-CGAS, 6-OSRO)	1' seas	CGA/ Vermilion, LA	2	-	-	9.9	1	12.9
Marco SWS	1	3,588	34	Marco Class 1D skimmer	3 (1-CGAS, 2-OSRO)	<1' seas	CGA/ Venice, LA	2	4.6 ⁵	1	7.9	1	16.5
60' Shallow Water FRV	1	22,885	249	(2) 3-brush Lamor Skimmers (2) 17' x 3' air inflatable boom	3	2' seas	CGA/ Galveston, TX	2	-	-	14.6	1	17.6
Marco SWS	1	3,588	34	Marco Class 1D skimmer	3 (1-CGAS, 2-OSRO)	<1' seas	CGA/ Vermilion, LA	2	4.4 ⁵	1	9.9	1	18.3
46' FRV (Timballer Bay)	1	15,257	65	(2) 2-brush Lamor Skimmers (2) 23' x 3' air inflatable boom	4	4' seas	CGA/ Aransas Pass, TX	2	-	-	20.9	1	23.9
56' Shallow Water FRV	1	21,500	249	(2) 36" Marco belt skimmer (2) 20' flat bottom work boats (2) 75' x 3' air inflatable boom	4 for belt only op (2-CGAS, 2-OSRO) or 8 for full boom deployment (2-CGAS, 6-OSRO)	1' seas	CGA/ Aransas Pass, TX	2	-	-	20.9	1	23.9
FRU Unit	1	4,251	200	Foilex 250 weir skimmer 75' of 53" air inflatable boom (1) Petroleum Industry Designated Vessel	4 (1-CGAS, 3-OSRO)	4' seas	CGA/ Galveston, TX	2	11.3 ⁵	12	23.7	1	50
FRU Unit	1	4,251	200	Foilex 250 weir skimmer 75' of 53" air inflatable boom (1) Petroleum Industry Designated Vessel	4 (1-CGAS, 3-OSRO)	4' seas	CGA/ Aransas Pass, TX	2	16.6 ⁵	12	34.4	1	66

NEARSHORE RESPONSE EQUIPMENT (CONTINUED)													
Type	Quantity	Recovery Rate (EDRC) ¹	Storage (Recovered Oil) ¹	Equipment ²	Personnel Required ³	Operating Limitations	Location	Response Times (Hours)					Total ETA ⁴
								Prep (At Site)	Transport (OTR)	Loadout (Staging)	Transit (Staging to Location)	Deployment	
Inland Storage Barge	15	-	300,000	(1) Tug	6	4-6' seas	Various ⁶	12	-	-	12	-	24

Nearshore EDRC	234,949
Offshore Recovered Oil Storage	302,505

¹Recovery rate and storage provides the total number for the quantity of skimming vessels listed.

²Equipment listed is for each skimming vessel.

³ Personnel number listed is for each skimming vessel.

⁴Response times dependent upon vessel procurement

⁵Asset to be relocated to staging area in Leeville, Louisiana

⁶Barge resources are available through an agreement with CGA and MSRC. All equipment will be provided on an as-available basis, subject to the terms at the time requested by CGA, MSRC, or its member. Storage barge storage capacity will vary based on availability and can range from 10,000 bbls to 30,000 bbls.

SHORELINE PROTECTION

Type of Shoreline Protection	Quantity	Equipment Required ¹	Personnel Required	Operating Limitations	Location	Response Times (Hours)				
						Callout	Travel ²	Loadout	Deployment	Total ETA ³
18" Containment Boom	13,500'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Belle Chasse, LA	1	2	1	2	6
10" Containment Boom	500'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Belle Chasse, LA	1	2	1	2	6
5" Absorbent Boom	64,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Belle Chasse, LA	1	2	1	2	6
18" Containment Boom	10,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Lake Charles, LA	1	4	1	2	8
5" Absorbent Boom	100'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Lake Charles, LA	1	4	1	2	8
18" Containment Boom	4,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Venice, LA	1	3	1	2	7
5" Absorbent Boom	32,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Venice, LA	1	3	1	2	7
18" Containment Boom	3,500'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Cut Off, LA	1	0.5	1	2	4.5
10" Containment Boom	800'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Cut Off, LA	1	0.5	1	2	4.5
5" Absorbent Boom	2,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Cut Off, LA	1	0.5	1	2	4.5
18" Containment Boom	4,400'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Gonzales, LA	1	2	1	2	6
10" Containment Boom	800'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Gonzales, LA	1	2	1	2	6
5" Absorbent Boom	3,200'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Gonzales, LA	1	2	1	2	6
18" Containment Boom	2,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Morgan City, LA	1	2	1	2	6
5" Absorbent Boom	1,800'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Morgan City, LA	1	2	1	2	6
18" Containment Boom	9,700'	(1) Response Vessel	3	2'-3' seas	E3 OMI/New Iberia, LA	1	2.5	1	2	6.5
5" Absorbent Boom	1,760'	(1) Response Vessel	3	2'-3' seas	E3 OMI/New Iberia, LA	1	2.5	1	2	6.5
4" Creek Boom	50'	(1) Response Vessel	3	2'-3' seas	E3 OMI/New Iberia, LA	1	2.5	1	2	6.5
18" Containment Boom	6,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Deer Park, TX	1	6	1	2	10
5" Absorbent Boom	5,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Deer Park, TX	1	6	1	2	10
4" Creek Boom	300'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Deer Park, TX	1	6	1	2	10
18" Containment Boom	10,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Lamarque, TX	1	6	1	2	10
10" Containment Boom	100'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Lamarque, TX	1	6	1	2	10
18" Containment Boom	12,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Port Arthur, TX	1	5	1	2	9
10" Containment Boom	150'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Port Arthur, TX	1	5	1	2	9
5" Absorbent Boom	2,000'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Port Arthur, TX	1	5	1	2	9
4" Creek Boom	100'	(1) Response Vessel	3	2'-3' seas	E3 OMI/Port Arthur, TX	1	5	1	2	9
18" Containment Boom - 100' sections in trailer	11,800'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	2.5	1	2	6.5
18" Containment Boom - 50' section in trailer	15,700'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	4	1	2	8
18" Containment Boom - in trailer	5,650'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	4	1	2	8

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SHORELINE PROTECTION

Type of Shoreline Protection	Quantity	Equipment Required ¹	Personnel Required	Operating Limitations	Location	Response Times (Hours)				
						Callout	Travel ²	Loadout	Deployment	Total ETA ³
Response Trailer with 18" Containment Boom	900'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	4	1	2	8
10" Containment Boom	4,150'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	4	1	2	8
10" Containment Boom	4,150'	(1) Response Vessel	3	2'-3' seas	AMPOL/New Iberia, LA	1	4	1	2	8
18" Containment Boom (Box trailer)	14,000'	(1) Response Vessel	3	2'-3' seas	AMPOL/Chalmette, LA	1	2	1	2	6
18" Containment Boom (Cage trailer)	2,000'	(1) Response Vessel	3	2'-3' seas	AMPOL/Chalmette, LA	1	2	1	2	6
Response Trailer with 18" Containment Boom	1,700'	(1) Response Vessel	3	2'-3' seas	AMPOL/Chalmette, LA	1	2	1	2	6
18" Containment Boom (Box trailer)	14,000'	(1) Response Vessel	3	2'-3' seas	AMPOL/Port Arthur, TX	1	6	1	2	10
18" Containment Boom (Cage trailer)	2,000'	(1) Response Vessel	3	2'-3' seas	AMPOL/Port Arthur, TX	1	6	1	2	10
18" Containment Boom - response trailer	900'	(1) Response Vessel	3	2'-3' seas	AMPOL/Morgan City, LA	1	3	1	2	7
18" Containment Boom - Goose neck trailer	2,700'	(1) Response Vessel	3	2'-3' seas	AMPOL/Decatur, AL	1	8	1	2	12
18" Containment Boom - 100' sections in trailer	11,800'	(1) Response Vessel	3	2'-3' seas	AMPOL/Gonzales, LA	1	2.5	1	2	6.5
10" Containment Boom (total linear footage)	1,400'	(1) Response Vessel	3	2'-3' seas	ES&H/Belle Chasse, LA	1	2	1	2	6
18" Containment Boom (total linear footage)	12,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Belle Chasse, LA	1	2	1	2	6
24" Containment Boom (total linear footage)	4,200'	(1) Response Vessel	3	2'-3' seas	ES&H/Belle Chasse, LA	1	2	1	2	6
10" Containment Boom (total linear footage)	1,100'	(1) Response Vessel	3	2'-3' seas	ES&H/Venice, LA	1	1	1	2	5
18" Containment Boom (total linear footage)	1,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Venice, LA	1	1	1	2	5
24" Containment Boom (total linear footage)	10,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Venice, LA	1	1	1	2	5
10" Containment Boom (total linear footage)	400'	(1) Response Vessel	3	2'-3' seas	ES&H/Laplace, LA	1	2	1	2	6
18" Containment Boom (total linear footage)	13,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Laplace, LA	1	2	1	2	6
10" Containment Boom (total linear footage)	2,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Houma, LA	1	3	1	2	7
18" Containment Boom (total linear footage)	49,700'	(1) Response Vessel	3	2'-3' seas	ES&H/Houma, LA	1	3	1	2	7
24" Containment Boom (total linear footage)	6,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Houma, LA	1	3	1	2	7

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SHORELINE PROTECTION

Type of Shoreline Protection	Quantity	Equipment Required ¹	Personnel Required	Operating Limitations	Location	Response Times (Hours)				
						Callout	Travel ²	Loadout	Deployment	Total ETA ³
18" Containment Boom (total linear footage)	500'	(1) Response Vessel	3	2'-3' seas	ES&H/Fourchon, LA	1	3.5	1	2	7.5
10" Containment Boom (total linear footage)	500'	(1) Response Vessel	3	2'-3' seas	ES&H/Golden Meadow, LA	1	3.5	1	2	7.5
18" Containment Boom (total linear footage)	10,500'	(1) Response Vessel	3	2'-3' seas	ES&H/Golden Meadow, LA	1	3.5	1	2	7.5
10" Containment Boom (total linear footage)	2,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Morgan City, LA	1	3	1	2	7
18" Containment Boom (total linear footage)	1,200'	(1) Response Vessel	3	2'-3' seas	ES&H/Morgan City, LA	1	3	1	2	7
10" Containment Boom (total linear footage)	200'	(1) Response Vessel	3	2'-3' seas	ES&H/Lafayette, LA	1	5	1	2	9
18" Containment Boom (total linear footage)	1,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Lafayette, LA	1	5	1	2	9
10" Containment Boom (total linear footage)	200'	(1) Response Vessel	3	2'-3' seas	ES&H/Lake Charles, LA	1	4	1	2	8
18" Containment Boom (total linear footage)	14,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Lake Charles, LA	1	4	1	2	8
24" Containment Boom (total linear footage)	1,000'	(1) Response Vessel	3	2'-3' seas	ES&H/Lake Charles, LA	1	4	1	2	8

¹Please refer to the equipment list in Appendix E for a specific list of response vessels available per location.

²Travel time to staging area in Leeville, Louisiana.

³Response time dependent on vessel procurement and availability.

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WILDLIFE PROTECTION RESPONSE

Wildlife Rehabilitation Organization	Location	Response Times (Hours)				
		Callout	Travel	Loadout	Deployment	Total ETA
Wildlife Center of Texas	7007 Katy Road Houston, TX 77024 Phone: 713-861-9453	1.5	7	0.5	1	10
Wildlife Response Services, LLC	P.O. Box 842 Seabrook, TX 77586 Phone: 713-705-5897	1.5	7	0.5	1	10
Tri-State Bird Rescue & Research	110 Possum Hallow Road Newark, DE 19711-3910 Phone: 302-737-9543	1.5	20	0.5	1	23
International Bird Rescue Research Center	4369 Cordelia Road Fairfield, CA 94534 Phone: 707-207-0380	1.5	34	0.5	1	37
Texas Marine Mammal Stranding Network	4700 Avenue U Galveston, TX 77551 Phone: 1-800-9-Mammal	1.5	8	0.5	1	11
Louisiana Marine Mammal Stranding Hotline	5304 Flanders Drive, Suite B Baton Rouge, LA 70808 Phone: 877-942-5343	1.5	3	0.5	1	6

WILDLIFE PROTECTION EQUIPMENT

Supplier	Warehouse	Type of Equipment	Quantity	Staging Area	Response Times (Hours)				
					Callout	Travel	Loadout	Deployment	Total ETA
CGA	Harvey, LA	Bird scare guns (set of 12)	2	Leeville, LA	1	2.6	1	1	5.6
CGA	Leeville, LA	Bird scare guns (set of 12)	2	Leeville, LA	1	0.5	1	1	3.5
CGA	Vermilion, LA	Bird scare guns (set of 12)	2	Leeville, LA	1	4.4	1	1	7.4
CGA	Galveston, TX	Bird scare guns (set of 12)	1	Leeville, LA	1	11.3	1	1	14.3
CGA	Aransas Pass, TX	Bird scare guns (set of 12)	1	Leeville, LA	1	16.6	1	1	19.6
CGA	Harvey, LA	Primary rehabilitation trailer	1	Leeville, LA	1	2.6	0.5	0.5	4.6
CGA	Harvey, LA	Husbandry trailer	1	Leeville, LA	1	2.6	0.5	0.5	4.6
CGA	Harvey, LA	Wildlife Supply Trailer	1	Leeville, LA	1	2.6	0.5	0.5	4.6

Prepared by:



DISPERSANTS INVENTORY

The most rapid way of acquiring dispersants in the event of an incident is through membership in Clean Gulf Associates, National Response Corporation, and Marine Spill Response Corporation. The inventory for both organizations is included below:

CLEAN GULF ASSOCIATES INVENTORY

TYPE	QUANTITY	LOCATION	PROVIDER
COREXIT 9500A	31,961 Gallons	ASI Inc. (Houma, LA)	ASI Inc.
COREXIT 9500A	27,720 Gallons	ASI (Houma, LA)	CGA
Accell Clean ® DWD	5,000 Gallons	ASI Inc. (Houma, LA)	CGA
COREXIT 9500A	84,370 Gallons	Harvey, LA	CGA
COREXIT 9500A	30,000 Gallons	Ft. Lauderdale, FL	CCA/OSRL ¹
COREXIT 9527	990 Gallons	Harvey, LA	CGA
Total:			180,041 gallons

MARINE SPILL RESPONSE CORPORATION INVENTORY

GULF REGION CAPABILITY

TYPE	QUANTITY	LOCATION	PROVIDER
COREXIT 9527	1,500 gallons	Galveston, TX	MSRC
COREXIT 9500	9,570 gallons	Galveston, TX	MSRC
COREXIT 9500	3,300 gallons	Ingleside, TX	MSRC
COREXIT 9500	15,349 gallons	Lake Charles, LA	MSRC
COREXIT 9500	660 gallons	Pascagoula, MS	MSRC
COREXIT 9500	5,280 gallons	Tampa, FL	MSRC
Total:			35,659 gallons

ATLANTIC REGION CAPABILITY

TYPE	QUANTITY	LOCATION	PROVIDER
COREXIT 9500	990 gallons	Portland, ME	MSRC
COREXIT 9500	8,910 gallons	Chesapeake City, MD	MSRC
COREXIT 9500	6,930 gallons	Savannah, GA	MSRC
COREXIT 9500	4,290 gallons	Bo. Palmas, Catano, PR	MSRC
Total:			21,120 gallons

PACIFIC REGION CAPABILITY

TYPE	QUANTITY	LOCATION	PROVIDER
COREXIT 9500	13,860 gallons	Everett, WA	MSRC
COREXIT 9500	4,320 gallons	Moses Lake, WA	MSRC
COREXIT 9500	660 gallons	Eureka, CA	MSRC
COREXIT 9500	12,870 gallons	Long Beach, CA	MSRC
COREXIT 9500	250 gallons	San Pedro, CA	MSRC
COREXIT 9500	9,405 gallons	Martinez, CA	MSRC
COREXIT 9500	250 gallons	Richmond, CA	MSRC
COREXIT 9500	8,984 gallons	Carpinteria, CA	MSRC
COREXIT 9500	350 gallons	Hilo, HI	MSRC
COREXIT 9500	7,300 gallons	Oahu, Kapolei, HI	MSRC
COREXIT 9500	350 gallons	Kauai, Lihue, HI	MSRC
COREXIT 9527	9,173 gallons	Carpinteria, CA	MSRC
Total:			67,772 gallons

NATIONAL RESPONSE CORPORATION INVENTORY

TYPE	QUANTITY	LOCATION	PROVIDER
FINASOL® OSR 52	2,120 gallons	St. Rose, LA	NRC
FINASOL® OSR 52	4,240 gallons	Pasadena, Texas	NRC
COREXIT® EC9500A	2,120 gallons	St. Rose, LA	NRC
COREXIT® EC9500A	4,240 gallons	Corpus Christi, Texas	NRC
COREXIT® EC9500A	4,240 gallons	Panama City, Florida	NRC
COREXIT® EC9500A	4,240 gallons	Opa-Locka, Florida	NRC
Total:			21,200 gallons

¹CGA maintains an agreement with Clean Caribbean to obtain up to 30,000 gallons of dispersants.

DISPERSANT USAGE EQUIPMENT

AIRCRAFT RESPONSE - CGA VIA ASI										
Aerial Dispersant System	Supplier & Phone	Warehouse	Aerial Dispersant Package	Quantity	Staging Area	Response Times (Hours)				
						Prep at Site	Loadout Time	Transit	Deployment Time	Total ETA
DC-3 Aircraft Spray Aircraft	Airborne Support (ASI) 985-851-6391	Houma, LA	Dispersant	1,200 Gallons	Houma, LA	2	2	0.7	0.2	4.9
			Spotter Aircraft	1						
			Wildlife Observer	1						
			Crew - Pilots	2						
Twin Commander 690A Spotter Aircraft	Airborne Support (ASI) 985-851-6391	Houma, LA	No Spraying Capability	N/A	Houma, LA	2	2	0.7	0.2	4.88
			Crew - Pilots	1						
BT-67 Spray Aircraft	Airborne Support (ASI) 985-851-6391	Houma, LA	Dispersant	1,650 Gallons	Houma, LA	2	2	0.7	0.2	4.9
			Spotter Aircraft	1						
			Wildlife Observer	1						
			Crew - Pilots	2						

AIRCRAFT RESPONSE - NRC VIA FLORIDA AIR TRANSPORT										
Aerial Dispersant System	Supplier & Phone	Warehouse	Aerial Dispersant Package	Quantity	Staging Area	Response Times (Hours)				
						Prep at Site	Loadout Time	Transit	Deployment Time	Total ETA
Convair 340 Spray Aircraft	Florida Air Transport 786-527-2963	Opa Locka, FL	Dispersant	1,500 Gallons	Opa Locka, FL ¹	1	1	2	0.2	4.2
			Spotter Aircraft	1						
			Wildlife Observer	1						
			Ground Personnel	6						
			Crew - Pilots	2						
Convair 340 Spray Aircraft	Florida Air Transport 786-527-2963	Opa Locka, FL	Dispersant	1,500 Gallons	Opa Locka, FL ¹	1	1	2	0.2	4.2
			Spotter Aircraft	1						
			Wildlife Observer	1						
			Ground Personnel	6						
			Crew - Pilots	2						
Convair 340 Spray Aircraft	Florida Air Transport 786-527-2963	Opa Locka, FL	Dispersant	1240 Gallons	Opa Locka, FL ¹	1	1	2	0.2	4.2
			Spotter Aircraft	1						
			Wildlife Observer	1						
			Ground Personnel	6						
			Crew - Pilots	2						

¹After initial loads are dropped, the staging area would move to MSY Louis Armstrong Airport in New Orleans, Louisiana. The dispersant stockpiles located in St. Rose, Louisiana would be utilized while other stockpiles are cascaded in from additional locations.

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AIRCRAFT RESPONSE - MSRC VIA DYNAMIC AVIATION											
Aerial Dispersant System	Supplier & Phone	Warehouse	Aerial Dispersant Package	Quantity	Staging Area	Response Times (Hours)					
						Prep at Site	Transit to Staging	Loadout Time	Transit to Incident Location	Deployment Time	Total ETA
737-500 Aircraft	Dynamic Aviation 540-828-6070	Weyers Cave, VA	Dispersant	4,125 Gallons ¹	Kiln, MS	2	3.5	1.5	5.5	0.2	10.7
			Spotter Aircraft	1							
			Wildlife Observer	1							
			Ground Personnel	6							
			Crew - Pilots	2							

¹Dispersant stockpile located in Lake Charles, LA would be brought to Kiln, MS with an estimated ETA of 7 hours.

OVER FLIGHT RESPONSE		
AIR TRANSPORTATION COMPANY	LOCATION	CAPABILITIES
Southern Seaplane, Inc.	#1 Coquille Drive	Southern Seaplane, Inc. has the ability for an aircraft to be ready for takeoff within (2) hours of notifying the Qualified Individual of a spill.
	Belle Chasse, LA 70037	
	Phone: 504-394-5633	

Prepared by:



IN-SITU BURNING EQUIPMENT								
TYPE	QUANTITY	EQUIPMENT	OWNER/ LOCATION	RESPONSE TIMES				
				PROCUREMENT OF PERSONNEL AND EQUIPMENT	TRANSIT TO STAGING	LOADOUT	TRANSIT FROM STAGING TO LOCATION	DEPLOYMENT
Elastic American Marine Hydro-Fire Boom System	2	500' of Fire Boom on a Boom Reel	CGA/Harvey, LA	24 Hours	7.0 Hours	2.0 Hours	-	-
		Boom reel is complete with a hydraulic power pack, breaking system, and integral air inflation system						
		(2) Elastec E600 Water Pumps with flow meters, pressure gauges, and suction strainer manifolds						
		(2) Towing packages with 400' of 1" two line, fire hose assemblies with 400' of fire hose						
Elastic American Marine Hydro-Fire Boom System	32	500' of Fire Boom on a Boom Reel	MSRC/ Houston, TX	5.0 Hours	7.0 Hours	12 Hours	12 Hours	3.0 Hours
		Boom reel is complete with a hydraulic power pack, breaking system, and integral air inflation system						
		(2) Elastec E600 Water Pumps with flow meters, pressure gauges, and suction strainer manifolds						
		(2) Towing packages with 400' of 1" two line, fire hose assemblies with 400' of fire hose						
IN-SITU BURNING PLAN	See Section 19							

Each in situ burn task force shall consist of two vessels of opportunity for towing the boom, a primary control vessel for command and control, general support and transportation of the boom to the site, and if necessary, vessels for deflection booming. Also included with the deployment vessels will be a small igniter boat for setting the igniters.

SECTION J
ENVIRONMENTAL MONITORING INFORMATION

(a) Monitoring Systems

There are no environmental monitoring systems currently in place or planned for the proposed activities.

(b) Incidental Takes

No incidental takes are anticipated. QuarterNorth implements the mitigation measures and monitors for incidental takes of protected species according to the following notices to lessees and operators from BOEM/BSEE:

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

(c) Flower Garden Banks National Marine Sanctuary

Green Canyon Block 198 is not located in the Flower Garden Banks National Marine Sanctuary therefore, per NTL 2008-G04, the information is not required for operations performed under this EP.

SECTION K
LEASE STIPULATION INFORMATION

Lease OCS-G 36021, Green Canyon Block 198, is subject to the following lease stipulation:

- **Stipulation No.8 - Protected Species**

The Federal Endangered Species Act and the Marine Mammal Protect Act are designed to protect threatened and endangered species and marine mammals and apply to activities on the Outer Continental Shelf (OCS).

In addition to the above stipulation, QNE will operate in accordance with the following Notices to Lessees (NTLs) in order to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species, and the prevention of intentional and/or accidental introduction of debris into the marine environment:

- NTL No. 2015-G03 “Marine Trash and Debris Awareness and Elimination”
- NTL No. 2016-G01 “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”
- NTL No. 2016-G02 “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program”

SECTION L
ENVIRONMENTAL MITIGATION MEASURES INFORMATION

(a) Measures taken to minimize or mitigate environmental impacts

The proposed action will implement mitigation measures required by laws and regulations, including all applicable Federal & State requirements concerning air emissions, discharges to water, and solid waste disposal, as well as any additional permit requirements and QNE's policies. Project activities will be conducted in accordance with the Regional OSRP.

(b) Incidental Takes

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

- NTL No. 2015-G03 "Marine Trash and Debris Awareness and Elimination"
- NTL No. 2016-G01 "Vessel Strike Avoidance and Injured/Dead Protected Species Reporting"
- NTL No. 2016-G02 "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"

SECTION M
RELATED FACILITIES AND OPERATIONS INFORMATION

(a) Related OCS Facilities and Operations

Related OCS Facilities and Operations information is not required for this Initial EP per NTL No. 2008-G04.

(b) Transportation System

Transportation system information is not required for this Initial EP per NTL No. 2008-G04.

(c) Produced Liquid Hydrocarbons Transportation Vessels

Produced liquid hydrocarbons transportation vessel information is not required for this Initial EP per NTL No. 2008-G04.

**SECTION N
SUPPORT VESSELS, AND AIRCRAFT INFORMATION**

(a) General

QNE will utilize the most practical, direct route from the shore base as permitted by weather and traffic conditions.

Drillship

Type of Vessel	Maximum Fuel Tank Storage Capacity	Maximum Number of Vessels in Area at Any Time	Trip Frequency or Duration
Crew Boat	1500 bbls	1	1 per week
Supply Boat	2500 bbls	2	2 per vessel per week
Helicopter	286 gallons	1	1 per day

(b) Diesel Oil Supply Vessels

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
280 foot	860,000 gals	Quarterly	From shorebase to block
280 foot	275,000 gals	4-6 weeks	From shorebase to block

(c) Solid and liquid wastes transportation

TABLE 2: Waste and Surplus estimated to be transported and/or disposed of onshore is enclosed as **Attachment N-1**.

(e) Vicinity Map

A vicinity map showing the location of the activities proposed herein relative to the shoreline with the distance of the proposed activities from the shoreline and the primary route(s) of the support vessels and aircraft that will be used when traveling between the onshore support facilities and the drilling unit is enclosed as **Attachment N-2**.

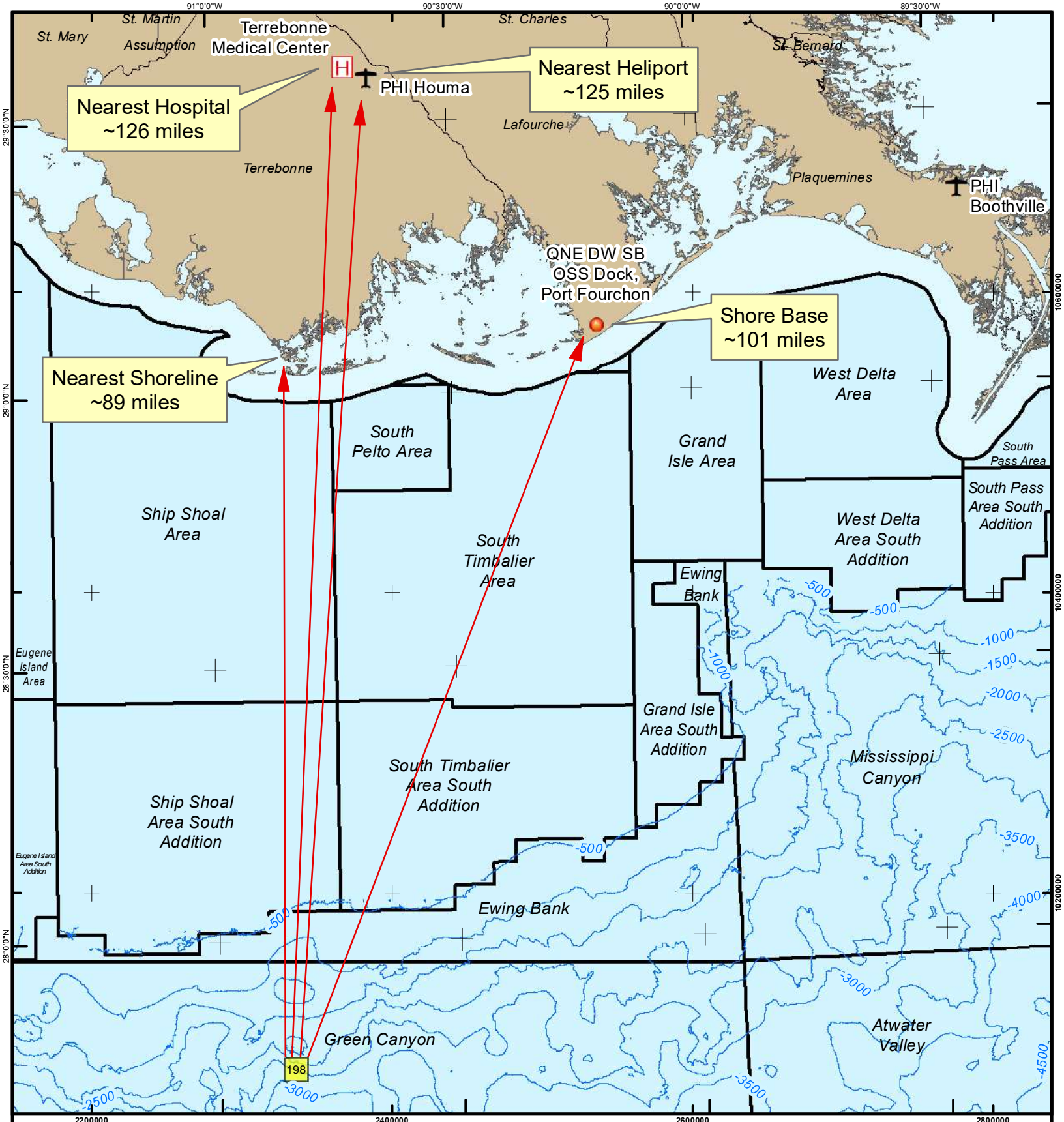
ATTACHMENTS

- 1) Attachment N-1 - Table 2 "Waste and Surplus Estimated to be Transported and/or Disposed of Onshore"
- 2) Attachment N-2 - Vicinity Map

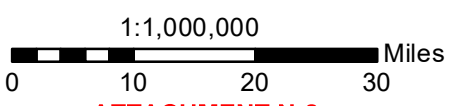
TABLE 2. WASTE AND SURPLUS ESTIMATED TO BE TRANSPORTED AND/OR DISPOSED OF ONSHORE

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.						
<i>EXAMPLE: Synthetic-based drilling fluid or mud</i>	<i>internal olefin, ester</i>	<i>Below deck storage tanks on offshore support vessels</i>	<i>Newport Environmental Services Inc., Ingleside, TX</i>	<i>X bbl/well</i>	<i>Recycled</i>	
Oil-based drilling fluid or mud	N/A	N/A	N/A	N/A	N/A	
Synthetic-based drilling fluid or mud	IO base, Emulsifiers, CaCL2, Fresh Water, brine, FLC, Barite, CaCO3	Transport via below deck storage tanks in Offshore Support Vessels (OSV)	Baroid , Port Fourchon, LA	6,500 bbls / well	Returned for credit, recycled	
Cuttings wetted with Water-based fluid	Formation Solids	N/A	N/A	N/A	N/A	
Cuttings wetted with Synthetic-based fluids	Cuttings/Cement/Metal	Cuttings Boxes	disposal facility	500 bbls / well	disposal facility method	
II						
Produced sand	N/A	N/A	N/A	N/A	N/A	
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.						
<i>EXAMPLE: trash and debris (recyclables)</i>	<i>Plastic, paper, aluminum</i>	<i>barged in a storage bin</i>	<i>ARC, New Iberia, LA</i>	<i>X lb/well</i>	<i>Recycled</i>	
Trash and debris	Plastic, paper, aluminum	Storage bins to shorebase; Trucked to recycling facility	Martin North-Galliano Waste	3,000 cu ft / well	Recycled	
Used oil	Various lubricating Oils	Storage bins to shorebase; Trucked to recycling facility	Ecoserve & R360 @ Port Fouchon	75 - 100 bbls / well	Recycled	
Wash water	Fresh or Seawater	N/A	N/A	N/A	Discharge Overboard per NPDES Permit	
Chemical product wastes	Various Drilling Waste	Environmental Drum/Tote Tanks to Shorebase: Trucked to Recycling facility as reqd if not via OSV	OSV, Rig & Tote Tank Cleaned by Tiger, HydroChem, PSC, Clean Tanks w/ processing via Ecoserve & R360 @ Port Fouchon	1000 bbls / well	Recycled or Disposal	



Coordinate System: NAD 1927 BLM Zone 15N
 Projection: Transverse Mercator
 Datum: North American 1927
 False Easting: 1,640,416.6667
 False Northing: 0.0000
 Central Meridian: -93.0000
 Scale Factor: 0.9996
 Latitude Of Origin: 0.0000
 Units: Foot US



ATTACHMENT N-2

QUARTER^oNORTH
ENERGY

"Talon" Prospect
Green Canyon Block 198

VICINITY PLAT

Date: 8/24/2023 Author: Kevin Gallatin
 Document Name: GC198_Talon_Vicinity_Plat_20230823

Document Path: T:\01_Projects\Talon_GC198\Regulatory\Preliminary\EP\GC198_Talon_Vicinity_Plat_20230823.mxd

SECTION O
ONSHORE SUPPORT FACILITIES INFORMATION

(a) General

The table below reflects the onshore facilities that will be used to provide supplies and service support for the proposed activities under this plan:

<i>Name of Shorebase</i>	<i>Location</i>	<i>Existing/New/Modified</i>
One DW SB OSS Dock	120 17th St. Bldg. #4 Golden Meadow, LA 70357 (Port Fourchon)	Existing
PHI Heliport	Houma, LA	Existing

The distance from the PHI Heliport to the proposed activities under this plan is 125 nautical miles.

(b) Support Base Construction or Expansion

There will be no new construction of an onshore support base, nor will we expand the existing shorebase as a result of the operations proposed in this plan.

(c) Waste Disposal

Please see Table 2 titled, "Waste and Surplus Estimated to be Transported and/or Disposed of Onshore" enclosed under Section N of this plan.

(d) Air emissions

Per NTL 2008-G04, information for air emissions generated by onshore support facilities is not required for operations performed under this EP.

(e) Unusual solid and liquid wastes

QuarterNorth does not plan to utilize any unusual solid or liquid wastes other than what is described in our NPDES permit.

**SECTION P
COASTAL ZONE MANAGEMENT (CZMA) INFORMATION**

CONSISTENCY CERTIFICATION

**INITIAL EXPLORATION PLAN
Lease OCS-G 36021, Green Canyon Block 198**

The proposed activities described in detail in this OCS Plan will comply with all enforceable policies as Louisiana's approved Coastal Management Program and will be conducted in a manner consistent with such program.

**QuarterNorth Energy LLC
Lessee or Operator**



Melissa Guidry for Brenda Montalvo, QNE Regulatory Director
Certifying Official

November 29, 2023

Date

SECTION Q
ENVIRONMENTAL IMPACT ANALYSIS

In accordance with the requirements of 30 CFR 250.227 and 250.261 an Environmental Impact Analysis (EIA) prepared by Trusted Compliance is enclosed as **Attachment Q-1**.

ATTACHMENT

- 1) [Attachment Q-1_Environmental Impact Analysis](#)

ENVIRONMENTAL IMPACT ANALYSIS FINAL REPORT

QuarterNorth Energy, LLC

Surface Location:

Green Canyon Area, Block 198
Lease No. OCS-G 31702
Well Locations A, B, & C

October 26, 2023

Prepared For:
QuarterNorth Energy, LLC
3737 Buffalo Speedway, Suite 800, Houston, TX 77098

QUARTER[®]NORTH
ENERGY

Prepared By:
Trusted Compliance, LLC
(337) 443-9000
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ENVIRONMENTAL IMPACT ANALYSIS WORKSHEET

Identify the IPF’s that can cause impacts to the listed environmental resources by placing an “x” in the space under each IPF category associated with your proposed activities that may impact a particular environmental resource. If you determine an IPF would not impact a particular environmental resource, leave the space blank. For those cells that are footnoted, provide a statement as to the applicability to your proposed operations, and, where there may be an effect, provide an analysis of the effect. If you are aware of other environmental resources at or near your activity’s site that are not included on the worksheet, address them too.

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

NOTE: The numbers in parentheses refer to the footnotes on page 2 of this form.

Footnotes for Environmental Impact Analysis Matrix

1. Activities that may affect a marine sanctuary or topographic feature. Specifically, if the well or platform site or any anchors will be on the seafloor within the:
 - (a) 4-mile zone of the Flower Garden Banks, or the 3-mile zone of Stetson Bank;
 - (b) 1000-m, 1-mile or 3-mile zone of any topographic feature (submarine bank) protected by the Topographic Features Stipulation attached to an OCS lease;
 - (c) Essential Fish Habitat (EFH) criteria of 500 ft from any no-activity zone; or
 - (d) Proximity of any submarine bank (500 ft buffer zone) with relief greater than 2 meters that is not protected by the Topographic Features Stipulation attached to an OCS lease.
2. Activities with any bottom disturbance within an OCS lease block protected through the Live Bottom (Pinnacle Trend) Stipulation attached to an OCS lease.
3. Activities within any Eastern Gulf OCS block where seafloor habitats are protected by the Live Bottom (Low- Relief) Stipulation attached to an OCS lease.
4. Activities on blocks designated by the BOEM as being in water depths 400 meters or greater.
5. Exploration or production activities where H₂S concentrations greater than 500 ppm might be encountered.
6. All activities that could result in an accidental spill of produced liquid hydrocarbons or diesel fuel that you determine would impact these environmental resources. If the proposed action is located a sufficient distance from a resource that no impact would occur, the EIA can note that in a sentence or two.
7. All activities that involve seafloor disturbances, including anchor emplacements, in any OCS block designated by the BOEM as having high-probability for the occurrence of shipwrecks or prehistoric sites, including such blocks that will be affected that are adjacent to the lease block in which your planned activity will occur. If the proposed activities are located a sufficient distance from a shipwreck or prehistoric site that no impact would occur, the EIA can note that in a sentence or two.
8. All activities that you determine might have an adverse effect on endangered or threatened marine mammals or sea turtles or their critical habitats.
9. Production activities that involve transportation of produced fluids to shore using shuttle tankers or barges.

Paperwork Reduction Act of 1995 (PRA) Statement: The PRA (44 U.S.C. 3501 et seq.) requires us to inform you that BOEM collects this information as part of an applicant's Exploration Plan (EP) or Development Operations Coordination Document (DOCD) submitted for BOEM approval. We use the information in our review and data entry for OCS plans. Responses are mandatory (43 U.S.C 1334). We will protect proprietary data according to the Freedom of Information Act and 30 CFR 550.197. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid Office of Management and Budget Control Number. The public reporting burden for this form is included in the burden for preparing EPs and DOCDs. We estimate that burden to average 600 hours per response for EPs and 700 hours per response for DOCDs, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms associated with subpart B. Direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, Bureau of Ocean Energy Management, Regulation and Enforcement, 45600 Woodland Road, Sterling, Virginia 20166.

II. ANALYSIS OF IMPACTS

The proposed project includes the drilling and completion of three wells (open water), and installation of a subsea tree.

A. SITE SPECIFIC IMPACTS

1. DESIGNATED TOPOGRAPHIC FEATURES

There are no impacts to designated topographic features expected from the proposed project including Impact Producing Factors (IPFs) such as emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

The proposed project is not located in an area affected by the designated topographic feature stipulation.

2. PINNACLE TREND AREA LIVE BOTTOMS

There are no impacts to a pinnacle trend area expected from the proposed project IPFs such as emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

The proposed project is not located in an area affected by the pinnacle trend feature stipulation.

3. EASTERN GULF LIVE BOTTOMS

There are no impacts to a live bottom low relief area expected from the proposed project including IPFs such as emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

The proposed project is not located in an area affected by the live bottom feature stipulation.

4. CHEMOSYNTHETIC COMMUNITIES

There are no impacts to high density deep-water benthic communities from the proposed project including IPFs such as emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

The proposed project is not located in an area affected by the known high-density deep water benthic community stipulation.

5. WATER QUALITY

IPFs that have the potential to cause impacts to water quality from the proposed project include effluents, physical disturbances to the seafloor, wastes sent to shore for treatment and disposal, and accidents.

Effluents: Discharges of effluents associated with drilling and production activity from the proposed project include overboard effluents including well cutting, drilling fluids, treatment and completion fluids, sanitary and domestic wastewater, deck drainage, excess cement and spacers, rig wash water, and uncontaminated cooling water from the drilling rig which will be in compliance with the Federal Water Pollution Control Act, regulated by the United States Environmental Protection Agency – Region 6, and authorized under the National Pollutant Discharge Elimination System General Permit for New and Existing Sources and New Dischargers in the Offshore Subcategory of the Oil and Gas Extraction Category for the Western Portion of the Outer Continental Shelf of the Gulf of Mexico

Permit (NPDES). A comprehensive list of types and quantities of effluent discharges associated with the proposed activities can be found in the governing document in which this report is included. Authorized effluent discharges in compliance with permit conditions are not expected to have significant impact on water quality.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. Impacts to water quality include water column turbidity and distribution of disturbed sediments and associated nutrients. Impacts from seafloor disturbances are expected to be minimal and effects temporary.

Wastes Sent to Shore for Treatment or Disposal: Wastes generated by the proposed project could include contaminated well cuttings and fluids, cement cuttings, wash water, oily debris, chemical wastes, used oil and non-contaminated domestic waste. Contaminated material will be manifested, transported, and recycled or disposed of as exempt Exploration and Production Waste to an approved facility in accordance with Louisiana Department of Natural Resources regulations regarding E&P Wastes. Domestic waste is transported to an approved domestic waste disposal facility. Waste generated which may be hazardous will be manifested, transported, and recycled or disposed of in accordance with the Resource Conservation and Recovery Act (RCRA). A comprehensive list of types, quantities, and methods of disposal can be found in the governing document in which this report is included. Impacts from waste sent to shore for treatment or disposal are not expected.

Accidents: An accidental spill or well blowout from the proposed project could cause temporary and possibly long-term impacts to water quality. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on water quality depending on the size and complexity of the event. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to water quality.

There are no other IPFs that have the potential to cause impact to water quality from the proposed project including emissions, or other factors or resources identified.

6. FISHERIES

IPFs that have the potential to cause impacts to fisheries from the proposed project include effluents, physical disturbances to the seafloor, and accidents. The Magnuson-Stevens Fishery and Conservation and Management Act protects fisheries through implementation of Fishery Management Plans (FMPs). Fisheries located in the Gulf of Mexico managed by the Gulf of Mexico Fishery Management Council plans include Coastal Migratory Pelagics, Red Drum, Reef Fish, Shrimp, Spiny Lobster, and Coral. Fisheries managed by National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) plans include Tuna, Swordfish, Billfish, and Sharks.

Effluents: Discharges from the proposed project will follow NPDES permit conditions and are expected to have minimal impact on fisheries or fishing activities in the area.

Physical Disturbances to the Seafloor Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. Impacts to water column turbidity and distribution of disturbed sediments and associated nutrients could affect fisheries. Impacts to fisheries from seafloor disturbances are expected to be minimal and effects temporary.

Accidents: An accidental spill or well blowout from the proposed project could cause temporary and possibly long-term impacts on fisheries and fishing activity. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts to fisheries. An accidental blowout of the well could have both short term and long-term effects on fisheries and fishing activity depending on the size and complexity of the event. Fishing activities could be interrupted or

temporarily closed. Effects on fishery populations could include mortality, bioaccumulation, and habitat degradation. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to fisheries.

There are no other IPFs that have the potential to cause impact to fisheries from the proposed project including emissions, wastes sent to shore for treatment or disposal, or other factors or resources identified.

7. MARINE MAMMALS

IPFs that have the potential to cause impacts to marine mammals from the proposed project include emissions, effluents, physical disturbances to the seafloor, and accidents. All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Several species of marine mammals including whales, dolphins, and porpoises occur in the Gulf of Mexico. The Endangered Species Act (ESA) further protects marine mammals designated as endangered or threatened. Species of marine mammals listed as endangered occurring in the Gulf of Mexico include Blue Whale (*Balaenoptera musculus*), Fin Whale (*Balaenoptera physalus*), Humpback Whale (*Megaptera novaeangliae*), Sei Whale (*Balaenoptera borealis*), and Sperm Whale (*Physeter macrocephalus*), Rice's Whale (*Balaenoptera ricei*) and West Indian Manatee (*Trichechus manatus*). No critical habitat for threatened or endangered marine mammal species are designated in the Gulf of Mexico.

Emissions: Noise emissions from the proposed project may have an impact on marine mammals. Noise levels from drilling and production activity are generally low in intensity and are not expected to have a significant impact on marine mammals.

Effluents: Discharges from the proposed project will be in compliance with NPDES permit conditions and are expected to have minimal impact on marine mammals in the area.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. Impacts to water column turbidity and distribution of disturbed sediments and associated nutrients could affect marine mammals. Impacts to marine mammals from seafloor disturbances are expected to be minimal.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to marine mammals ranging from sub-lethal to mortal. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts to marine mammals. An accidental blowout of the well could have both short term and long-term effects on marine mammals depending on the size and complexity of the event. Effects on marine mammal populations could include mortality, bioaccumulation, and habitat degradation. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to marine mammals.

Vessel traffic has the potential to impact marine mammals in the event of vessel strikes. To minimize the potential for vessel strikes and disturbance to marine mammals, the proposed project will abide by the guidelines of Joint NTL No. 2016-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting).

Marine debris has the potential to impact marine mammals through entanglement or ingestion causing serious injury or death. To minimize the impact potential to marine mammals, the proposed project will abide by the guidelines of BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination).

There are no other IPFs that have the potential to cause impact to marine mammals from the proposed project including wastes sent to shore for treatment or disposal, or other factors or resources identified.

8. SEA TURTLES

IPFs that have the potential to cause impacts to sea turtles from the proposed project include emissions, effluents, physical disturbances to the seafloor, and accidents. The Endangered Species Act (ESA) protects species designated as endangered or threatened, and all species of turtles which inhabit the Gulf of Mexico are currently listed as threatened or endangered. Species of turtles inhabiting the Gulf of Mexico include (1) Green Turtle (*Chelonia mydas*), (2) Hawksbill Turtle (*Eretmochelys imbricata*), (3) Kemp's Ridley Turtle (*Lepidochelys kempii*), (4) Leatherback Turtle (*Dermochelys coriacea*), and (5) Loggerhead Turtle (*Caretta caretta*) (6) Olive Ridley Turtle (*Lepidochelys olivacea*). The project is located in an area designated as a critical habitat for Loggerhead Turtles.

Emissions: Noise emissions from the proposed project may have an impact on turtles. Noise levels from drilling and production activity are generally low in intensity and are not expected to have a significant impact on turtles.

Effluents: Discharges from the proposed project will be in compliance with NPDES permit conditions and are expected to have minimal impact on turtles in the area.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. Impacts to water column turbidity and distribution of disturbed sediments and associated nutrients could affect turtles. Impacts to turtles from seafloor disturbances are expected to be minimal.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to turtles ranging from sub-lethal to mortal. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts to turtles. An accidental blowout of the well could have both short term and long-term effects on turtles depending on the size and complexity of the event. Effects on turtles could include mortality, bioaccumulation, and habitat degradation. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to turtles.

Vessel traffic has the potential to impact turtles in the event of vessel strikes. To minimize the potential for vessel strikes and disturbance to turtles, the proposed project will abide by the guidelines of Joint NTL No. 2016-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting).

Marine debris has the potential to impact turtles through entanglement or ingestion causing serious injury or death. To minimize the impact potential to turtles, the proposed project will abide by the guidelines of BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination).

There are no other IPFs that have the potential to cause impact to turtles from the proposed project including wastes sent to shore for treatment or disposal, or other factors or resources identified.

9. AIR QUALITY

IPFs that have the potential to cause impacts to air quality from the proposed project include emissions and accidents.

Emissions: Pollutant emissions from the proposed project include Particulate Matter (PM), Sulphur Oxides (SO_x), Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOC), and Carbon Monoxide (CO) and could cause short term impacts to air quality in the immediate vicinity of the project location. Calculated emissions are below BOEM exemption levels for additional air quality modeling and can be found in the governing document to which this report is included. The proposed project is not expected to have an impact on onshore air quality due to the activities proposed.

Accidents: An accidental spill or well blowout from the proposed project could impact air quality. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, resulting in minor and short-term impacts to air quality in the vicinity of the project location. An accidental blowout of the well could have both short term and long-term effects on air quality depending on the size and complexity of the event. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to air quality.

There are no other IPFs that have the potential to cause impact to air quality from the proposed project including effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

10. SHIPWRECK SITES

IPFs that have the potential to cause impacts to known or possible shipwreck sites from the proposed project include physical disturbances to the seafloor.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. An archaeological investigation was performed by Fugro GeoServices, Inc. (Document No. 2408-5004), to establish to the satisfaction of the Regional Director that an archaeological resource does not exist or will not be adversely affected by the operations as stated in BOEM NTL 2005-G07. The assessment reported 14 unidentified sonar targets that are interpreted as modern debris from the oil field and shipping activity in the area. No special avoidance was recommended for any of the unidentified targets. A shallow geohazards assessment was conducted by Geoscience Earth & Marine Services, Inc., (GEMS) (Project No. 0408-1483) which included well site clearance letters. No impacts to shipwrecks are expected from seafloor disturbances from the proposed project.

There are no other IPFs that have the potential to cause impact to shipwreck sites from the proposed project including emissions, effluents, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

11. PRE-HISTORIC ARCHEOLOGICAL SITES

IPFs that have the potential to cause impacts to known or pre-historic archeological sites from the proposed project include physical disturbances to the seafloor.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. An archaeological investigation was performed by Fugro GeoServices, Inc. (Document No. 2408-5004), to establish to the satisfaction of the Regional Director that an archaeological resource does not exist or will not be adversely affected by the operations as stated in BOEM NTL 2005-G07. The assessment reported 14 unidentified sonar targets that are interpreted as modern debris from the oil field and shipping activity in the area. No special avoidance was recommended for any of the unidentified targets. A shallow geohazards assessment was conducted by Geoscience Earth & Marine Services, Inc., (GEMS) (Project No. 0408-1483) which included well site clearance letters. No impacts to pre-historic archeological sites are expected from the proposed project.

There are no other IPFs that have the potential to cause impact to archeological sites from the proposed project including emissions, effluents, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified.

A. VICINITY IMPACTS

1. ESSENTIAL FISH HABITATS

IPFs that have the potential to cause impacts to essential fish habitats from the proposed project include effluents, physical disturbances to the seafloor, and accidents. The Magnuson-Stevens Fishery and Conservation and Management Act protects fisheries through implementation of Fishery Management Plans, which include designating Essential Fish Habitat (EFH) areas. As a Congressional mandate, EFH describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity. Nearly 1,000 species, at multiple life stages, have an Essential Fish Habitat (EFH) description, and more than 100 Habitat Areas of Particular Concern for enhanced EFH conservation have been designated at this time. EFH designated within the Gulf of Mexico include such species as Coastal Migratory Pelagic species, Coral, Red Drum, Reef Fish, Stone Crab, and Shrimp, Tuna, Swordfish, Billfish, and Sharks. The project location is within an area designated as Essential Fish Habitat (EFH) for species of Tuna, Sailfish, Marlin, Swordfish, Spearfish, and Sharks. The project location is in an area designated as a Habitat Area of Particular Concern (HAPC) for Bluefin Tuna.

Effluent: Discharges from the proposed project will be in compliance with NPDES permit conditions and are expected to have minimal impact on Essential Fish Habitat in the area.

Physical Disturbances to the Seafloor: Bottom disturbances to the seafloor from the proposed project could include rig placement, drilling of the well, and installation of pipelines, platforms, and subsea equipment. Impacts to water column turbidity and distribution of disturbed sediments and associated nutrients could affect Essential Fish Habitat. Impacts to those habitats from seafloor disturbances are expected to be minimal and effects temporary.

Accidents: An accidental spill or well blowout from the proposed project could cause temporary and possibly long-term impacts to Essential Fish Habitat. Accidental spills would be expected to be small, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on Essential Fish Habitat depending on the size and complexity of the event. Effects could include fish mortality, bioaccumulation, and habitat degradation. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to Essential Fish Habitat.

There are no other IPFs that have the potential to cause impact to Essential Fish Habitats from the proposed project including emissions, wastes sent to shore for treatment or disposal, or other factors or resources identified.

2. MARINE AND PELAGIC BIRDS

IPFs that have the potential to cause impacts to marine and pelagic birds from the proposed project include emissions and accidents. Marine and pelagic birds found in the gulf coast include Loons, Grebes, Albatrosses, Petrels, Shearwaters, Tropicbirds, Frigatebirds, Cormorants, Gannets, Boobies, Pelicans, Ducks, Geese, Swans, Phalaropes, Gulls, and Skimmers.

Emissions: Noise emissions from the proposed project may have an impact on marine and pelagic birds in the vicinity of the project location. Noise levels from drilling and production activity are generally low in intensity and are not expected to have a significant impact. Pollutant emissions could also have an impact on marine and pelagic birds in the vicinity, however, those impacts are expected to be short term and minimal.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to birds ranging from sub-lethal to mortal. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on birds and habitats depending on the size

and complexity of the event. Effects could include mortality, bioaccumulation, and habitat degradation. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to marine and pelagic birds.

Marine debris has the potential to impact marine birds through entanglement or ingestion causing serious injury or death. To minimize the impact potential to birds, the proposed project will abide by the guidelines of BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination).

There are no other IPFs that have the potential to cause impact to marine and pelagic birds from the proposed project including effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

3. PUBLIC HEALTH AND SAFETY

There are no IPFs that have the potential to cause impact to public health and safety from the proposed project including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, accidents, or other factors or resources identified. The project location is located 85 miles from the nearest shoreline in Terrebonne Parish, Louisiana. A prior hydrogen sulfide determination has been performed in the area of the proposed drilling operations has been classified as hydrogen sulfide absent.

B. COASTAL AND ONSHORE IMPACTS

1. BEACHES

IPFs that have the potential to cause impact to beaches from the proposed project location include accidents.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to beaches. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on beaches depending on the size and complexity of the event. The worst discharge probability estimates the highest chances of catastrophic event making impact to the onshore beaches of Terrebonne Parish, Louisiana at less than 0.5% based on 3 days from spill, less than 0.5% based on 10 days from spill, and 3% based on 30 days from spill. Due to the facility distance from shore and the capacity to respond to a worst-case discharge, no significant impacts to beaches would be expected. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to beaches.

There are no other IPFs that have the potential to cause impact to beaches from the proposed project including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

2. WETLANDS

IPFs that have the potential to cause impact to wetlands from the proposed project location include accidents.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to wetlands. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on wetlands depending on the size and complexity of the event. The worst discharge probability estimates the highest chances of catastrophic event making impact to the onshore beaches of Terrebonne Parish, Louisiana at less than 0.5% based on 3 days from spill, less than 0.5% based on 10

days from spill, and 3% based on 30 days from spill. Due to the facility distance from shore and the capacity to respond to a worst-case discharge, no significant impacts to wetlands would be expected. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to wetlands.

There are no other IPFs that have the potential to cause impact to wetlands from the proposed project including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

3. SHORE AND COASTAL NESTING BIRDS

IPFs that have the potential to cause impacts to shore and nesting birds from the proposed project include accidents. Shore and coastal nesting birds found in the gulf coast include Terns, Pelicans, Plovers, Skimmers, Cranes and Gulls. Piping Plover (*Charadrius melodus*) and Whooping Crane (*Grus americana*) are listed by the Endangered Species Act (ESA) as threatened and have critical habitat designated in the coastal areas and beaches.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to shore and coastal nesting birds. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on birds depending on the size and complexity of the event. The worst discharge probability estimates the highest chances of catastrophic event making impact to the onshore beaches of Terrebonne Parish, Louisiana at less than 0.5% based on 3 days from spill, less than 0.5% based on 10 days from spill, and 3% based on 30 days from spill. Due to the facility distance from shore and the capacity to respond to a worst-case discharge, no significant impacts to shore and coastal nesting birds would be expected. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to birds.

Marine debris has the potential to impact shore and coastal nesting birds through entanglement or ingestion causing serious injury or death. To minimize the impact potential to birds, the proposed project will abide by the guidelines of BSEE NTL No. 2015-G03 (Marine Trash and Debris Awareness and Elimination).

There are no other IPFs that have the potential to cause impact to shore and coastal nesting birds from the proposed project including emissions, effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

4. COASTAL WILDLIFE REFUGES

IPFs that have the potential to cause impacts to coastal wildlife refuges from the proposed project include accidents. The nearest coastal wildlife refuge to the proposed project location is the Isle Dernieres Barrier Islands Refuge located within Terrebonne Parish, LA.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to wildlife refuges. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on refuges depending on the size and complexity of the event. The worst discharge probability estimates the highest chances of catastrophic event making impact to the onshore beaches of Terrebonne Parish, Louisiana at less than 0.5% based on 3 days from spill, less than 0.5% based on 10 days from spill, and 3% based on 30 days from spill. Due to the facility distance from shore and the capacity to respond to a worst-case discharge, no significant impacts to coastal wildlife refuges would be expected. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to refuges.

There are no other IPFs that have the potential to cause impact to coastal wildlife refuges from the proposed project including effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

5. WILDERNESS AREAS

IPFs that have the potential to cause impacts to coastal wilderness areas from the proposed project include accidents. The nearest designated wilderness area to the proposed project location is the Breton Wilderness Area.

Accidents: An accidental spill or well blowout from the proposed project could cause impacts to wilderness areas. Accidental spills would be expected to be small in size, expeditiously recovered from the surface, and droplets in the water table microbiologically degraded, resulting in short term impacts. An accidental blowout of the well could have both short term and long-term effects on wilderness areas depending on the size and complexity of the event. The worst discharge probability estimates the highest chances of catastrophic event making impact to the onshore beaches of Terrebonne Parish, Louisiana at less than 0.5% based on 3 days from spill, less than 0.5% based on 10 days from spill, and 3% based on 30 days from spill. Due to the facility distance from shore and the capacity to respond to a worst-case discharge, no significant impacts to wilderness areas would be expected. In the event of a spill or blowout, the facility will immediately implement the Regional Oil Spill Response Plan and active controls and countermeasures to minimize the impact to wilderness areas.

There are no other IPFs that have the potential to cause impact to wilderness areas from the proposed project including effluents, physical disturbances to the seafloor, wastes sent to shore for treatment or disposal, or other factors or resources identified.

C. OTHER IDENTIFIED IMPACTS

No significant impacts are expected to environmental resources from the proposed project based on Impact Producing Factors identified in the Environmental Impact Analysis Worksheet discussed in this report and prior operations and development in the proposed project location.

III. POTENTIAL IMPACTS FROM ENVIRONMENTAL CONDITIONS

Potential impacts from environmental conditions for the proposed project include hazards to operations, equipment, and personnel from potential adverse weather conditions from significant storm systems during the hurricane season of June through November.

IV. ALTERNATIVES CONSIDERED TO REDUCE IMPACTS

No alternatives to the proposed project to reduce impacts were considered beyond applicable requirements of Lease Sale Stipulations, Notice to Lessees and Operators, and Regulatory Authorities.

V. MITIGATION MEASURES

No mitigation measures to the proposed project to avoid or reduce impacts are to be implemented beyond applicable requirements of Lease Sale Stipulations, Notice to Lessees and Operators, and Regulatory Authorities.

VI. AGENCIES AND PERSONS CONSULTED

No agencies or persons were consulted regarding potential impacts associated with the proposed project.

VII. PREPARERS

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VIII. REFERENCES

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SECTION R
ADMINISTRATIVE INFORMATION

(a) Exempted Information Description

The proposed bottom-hole locations of the planned wells have been removed from the public information copy of the EP as well as any discussions of the target objectives, geologic or geophysical data, and any interpreted geology.

(b) Bibliography

- Archaeological Assessment prepared by Fugro Geoservices, Inc., Report No. 2408-5004
- Shallow hazards assessment prepared by Geoscience Earth & Marine Services, Inc., Project No. 0408-1483