UNITED STATES GOVERNMENT MEMORANDUM October 22, 2021

To: Public Information
From: Plan Coordinator, OLP, Plans Section (GM235D)

Subject: Public Information copy of Plan

Control #	-	S-08058
Type	-	Supplemental Development Operations Coordinations Document
Lease(s)	-	OCS-G15607 Block - 743 & 787 Green Canyon Ara
Operator	-	BP Exploration & Production Inc
Description	-	Subsea Well DC802, 803, 277 and 228
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

Catherine Nesbit, P.E.
Regulatory Compliance Advisor
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September 15, 2021

Ms. Michelle Uli Picou *via e-mail Michelle.Picou@boem.gov*
Plans Section Chief MS GM 1053C
Bureau of Ocean Energy Management
1201 Elmwood Park Blvd.
New Orleans, LA 70123-2394

Re: Supplemental Development Operations Coordination Document
Atlantis Phase 3 DC8 WI Expansion Project
Green Canyon Block 743, Lease OCS-G 15607

Dear Ms. Picou,

In accordance with the provisions of Title 30 CFR 550, Subpart B and Notice to Lessees (NTL) 2008-G04 and 2009-G27, BP Exploration & Production Inc. (bp) hereby submits for your review and approval a supplemental Development Operations Coordination Document (Plan) for Lease OCS-G 15607, Green Canyon Blocks 743, offshore Louisiana. This supplemental DOCD provides for the addition of 4 wells; DC802, DC803, DC227, and DC228 and their 3 contingency locations. DC227 and DC228 are re-spuds of previously approved DC223 and DC224 wells as part of the Atlantis Phase 3 S-DOCD S-7944 and will be producing wells located at Drill Center 2 in GC743, OCSG 15607. The two well trees will be connected by rigid jumpers to the existing manifold and subsea kit as approved in S-7944.

Enclosed for BOEM review:

- One proprietary version digital copy and one public version digital copy

bp requests an expediated review of this Supplemental DOCD as drilling activities are currently scheduled to commence *as early as January 2022*.

Should you have any questions or require additional information, please contact the undersigned at (281) 896-5128 or by e-mail to Catherine.Nesbit@bp.com.

Sincerely,

Betsy Cleland

for
Catherine Nesbit
Compliance Advisor

BP Exploration & Production Inc.

Gulf of Mexico

Supplemental

Development Operations Coordination Document

Atlantis Development

Green Canyon Blocks:
GC699, OCSG 15604
GC742, OCSG 15606
GC743, OCSG 15607
GC744, OCSG 15608
GC743 Unit, Agreement No. 754305003

Public Copy

AMENDMENT RECORD

Amendment Date	Revision Number	Amender Initials	Amendment

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1 Plan Contents

1.1 History of Unit Leases

BP Exploration & Production Inc. (BP) received approval for the Atlantis Project's Initial Development Operations Coordination Document (DOCD) (N-7646) in 2003. Subsequent Revised and Supplemental DOCDs have been submitted to address various project revisions and expansion activities. The DOCD has recently been updated by approved submissions R-6173, R-5984, S-7530, and S-7944. A list of DOCD Plan Control Numbers associated with the Atlantis Unit activities may be found in Section 16. The Atlantis GC743, Unit, Agreement No.754305003 currently includes GC699, OCSG 15604; GC742, OCSG 15606; GC743, OCSG 15607; and GC744, OCSG 15608. Block GC700, OCSG15605 contracted out of the Green Canyon Block 743 Unit effective October 6, 2013, as required by the Unit Agreement. Lease GC700, OCSG 15605 expired on October 6, 2014.

The previously approved Initial, Revised, and Supplemental DOCDs describe 20 wells in Drill Center No. 1 (DC1), 1 well in Drill Center No. 8 (DC8), 9 wells in Drill Center No. 3 (DC3), 8 wells in Drill Center No. 2 (DC2), the associated subsea pipeline architecture to transport production from the individual wells in the drill centers to the GC787 A Platform, RUE 23579, and the processing, measurement and allocation of production for royalty and sales on the platform prior to final delivery to export pipelines for transportation to shore facilities.

The current status of previously approved wells may be found in Wells Status Chart Section 16.

1.2 Description of Activities

This supplemental DOCD describes the addition of 4 wells; DC802, DC803, DC227, and DC228 and their 3 contingency locations. DC227 and DC228 are re-spuds of previously approved DC223 and DC224 wells as part of the Atlantis Phase 3 S-DOCD S-7944 and will be producing wells located at Drill Center 2 in GC743, OCSG 15607. The two well trees will be connected by rigid jumpers to the existing manifold and subsea kit as approved in S-7944.

The DC802 and DC803 proposed wells are water injection wells at Drill Center 8 in GC743, OCSG 15607. This DOCD proposes adding a short jumper to DC802 and DC803 wells, umbilicals and flying leads will be installed to allow well control and communications to existing Water PLET W2 in DC8. Plan changes resulting from the well and pipeline location changes are noted in the appropriate sections of this plan.

Appendix A contains revised BOEM-0137 forms showing the location information and tentative schedules to drill and complete these wells and to install the proposed lease-term pipeline.

BP will not be utilizing pile-driving in this plan.

This supplemental DOCD updates the activities and estimates of the emissions of an air pollutant due to potential increase from the amount specified in our AQR submitted with the previously approved Revised DOCD R-6976.

Additional Measures described in Appendices A, B, C and J of the NMFS Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico, 2020, revised 2021 will be implemented, to the extent they are applicable to the activities described in this document.

1.3 Location

Maps showing required location features were previously provided in DOCD S-0530 and R-5984, **Appendix B**. Updated location plats for GC743, DC802, DC802 Contingency, DC803, DC803 Contingency, DC227, DC228, and DC227/DC228 Contingency have been included in the **Appendix B** to show the updated information for the revised well location and approximate routes of the lease-term pipeline structures.

1.4 Storage Tanks and Production Vessels

Storage Tanks for Drillship

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
#1 Fuel Oil	Drillship	11,993	2	23,986	33
#2 Fuel Oil	Drillship	6,438	2	12,876	33
DO Service Tank	Drillship	476	2	952	33
Lube Oil	Drillship	328	1	328	35
Lube Oil	Drillship	275	3	825	35

Storage Tank DP for Semisubmersible

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel Oil	Semisubmersible	4,324 avg.	5	21,620	38
Lube Oil	Semisubmersible	70 avg.	5	350	22
Lube Oil	Semisubmersible	28 avg.	4	112	22
Base Oil	Semisubmersible	4,722	1	4,722	39

Storage Tanks for Support Vessels

Type of Storage Tank	Type of Facility	Tank Capacity (bbls)	Number of Tanks	Total Capacity (bbls)	Fluid Gravity (API)
Fuel Oil	Supply Boat (Typical 280-feet)	450	16	7,200 bbls Depending on cargo carried	31.14

1.5 Pollution Prevention Measures

Safety and pollution prevention features utilized during drilling operations will include the use of appropriately designed casing and cement programs; appropriate blowout preventers, diverters, and other associated well equipment, appropriate mud monitoring equipment and sufficient mud volumes for well control; and properly trained personnel as described in 30 CFR Part 250, Subparts C, D, E, F and O, 30 CFR Part 550, Subparts B and C, and as further described in Notices to Lessees (NTLs).

Appropriate fire drills and abandon ship drills will be conducted, and navigational aids, lifesaving equipment, and all other shipboard safety equipment will be installed and maintained as mandated by the U.S. Coast Guard regulations contained in 33 CFR Part 144.

These operations do not propose activities for which the State of Florida is an affected state.

1.6 Additional Measures

In addition to the safety, pollution prevention, and early spill detection measures proposed in 30 CFR § 250, bp will rely on its Operating Management System (OMS) to help deliver safe and reliable operations. OMS is a system of interdependent activities that drive how bp will perform work and comply with internal and external standards and regulations. bp has also implemented an Environmental Management System (EMS) which provides a systematic way to identify risks, potential impacts, and compliance requirements that need to be managed. BP has also presented to the BOEMRE a report entitled ***Deepwater Horizon Containment and Response: Harnessing Capabilities and Lessons Learned***. This document assesses the capabilities that are now available to respond to oil spills in the GoM.

2 General Information

2.1 Applications and Permits

The following table lists standard applications that will be submitted to drill and complete the revised well, install the lease-term pipeline, and begin production.

Application / Permit	Issuing Agency	Status
Supplemental Deepwater Operations Plan (SDWOP)	BSEE	Pending Submittal
Lease Term Pipeline Applications	BSEE	Pending Submittal
Application for Permit to Drill	BSEE	Pending Submittal
Application for Permit to Modify (Completion APM)	BSEE	Pending Submittal
Enhanced Oil and Gas Recovery	BSEE / BOEM	Pending Submittal
NPDES Permit GMG-290110	EPA R6	Existing

2.2 Drilling Fluids

The following table shows information on the types and amounts of the drilling fluids that are planned to be used to drill the proposed wells.

Type of Drilling Fluid	Estimated Volume of Drilling Fluid to be Used per Well
Water-based (seawater, freshwater, barite)	65,000-bbls
Synthetic-based (internal olefin, ester)	16,800-bbls

2.3 Anticipated Production

The following table shows information for the average water injector well's anticipated production uplift rates based on the field's existing profile data.

Anticipated Production Rate Uplift

Type	Average Injector Production Rate Uplift	Peak Injector Production Rate Uplift	Life Of Reservoir
Oil	PROPRIETARY	PROPRIETARY	PROPRIETARY
Gas	PROPRIETARY	PROPRIETARY	PROPRIETARY

2.4 Oil Characteristics and Composition

The following are characteristics of the oil composition most likely to result in the largest volume spill (e.g., the oil from the expected largest reservoir, stored oil or pipeline oil combined from a number of wells).

Oil Characteristics

Characteristic	Value	Analytical Methodologies Should be Compatible With:
(1) Gravity (API)	26 Degrees API	ASTM D5002
(2) Flash Point (C)	13.9	ASTM D93 Flash Point
(3) Pour Point (C)	-22.78	ASTM D97
(4) Viscosity (Centipose at 25° C)	35.51 cp	ASTM D7042
(5) Wax Content (wt%)	3.6%	UOP 46 Modified
(6) Asphaltene Content (wt%)	7.8 %	ASTM D 4055 modified
(7) Resin Content (wt%)	18.3%	Estimation
(8) Boiling Point Distribution - Boiling point distribution including, for each fraction, the percent volume or weight and the boiling point range in degrees C (8) Simulated Distillation (ASTM D86)		
Initial Boiling Point, °C	25.88	GC Simulated Distribution
5	85.63	GC Simulated Distribution
10	122.32	GC Simulated Distribution
15	154.22	GC Simulated Distribution
20	182.84	GC Simulated Distribution
25	208.45	GC Simulated Distribution
30	231.56	GC Simulated Distribution
35	252.6	GC Simulated Distribution
40	267.96	GC Simulated Distribution
45	284.42	GC Simulated Distribution
50	299.99	GC Simulated Distribution
55	315.26	GC Simulated Distribution
60	329.52	GC Simulated Distribution
65	342.79	GC Simulated Distribution
70	355.09	GC Simulated Distribution
75	366.49	GC Simulated Distribution
80	377.04	GC Simulated Distribution
85	386.81	GC Simulated Distribution
90	395.87	GC Simulated Distribution
95	404.29	GC Simulated Distribution
End Point, °F	412.17	GC Simulated Distribution
(9) Sulphur (wt%)	2.31%	ASTM D 4294

The data shown above was based on an analysis of the oil sample taken from the following well:

Table 1 Sample Well

Sample Well	
Area / Block	GC743

Platform ID	GC787 A
API Well No.	60-811-40349-02
Completion Perforation Interval	17,814'-17,891' MD / 17,251'-17,298' TVD
Reservoir Name	M54
Sample Date	June 10, 2009
Sample No.s (if more than one is taken) (wt%)	Single Sample Only

2.5 New or Unusual Technologies

Drilling activities in Green Canyon Blocks 743 are evaluating the applicability of Managed Pressure Drilling (MPD) technology to mitigate non-productive events associated with pore pressure / fracture gradient (PPFG) uncertainty. A MPD overview is included in **Appendix I** of this Supplemental DOCD.

2.6 Bonding Information

The bonding requirements for the activities proposed in this supplemental DOCD are satisfied by an area-wide bond, furnished and maintained according to 30 CFR 556, Subpart I; NTL No. 2000-G16, "Guidelines for General Lease Surety Bonds"; and additional security under 30 CFR 556.53(d) and NTL 2008-N07, "Supplemental Bond Procedures".

2.7 Oil Spill Financial Responsibility

BP Exploration & Production Inc. (Operator No. 02481) has demonstrated oil spill financial responsibility for the facilities proposed in this supplemental DOCD according to 30 CFR 553, and NTL 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities."

2.8 Deepwater Well Control

BP Exploration & Production Inc. (Operator No. 02481) has the financial capability to drill a relief well and conduct other emergency well control operations. According to NTL 2008-G04, this Section of the Plan is not applicable to the proposed operations.

2.9 Suspension of Production

There are no approved suspensions of production, or that bp currently intends to seek, to hold the leases or unit involved with the proposed DOCD activities.

2.10 Blowout Scenario

2.10.1 Blowout Scenario

The worst-case discharge of the 7 wells proposed in this plan based on analysis is not expected to exceed the worst-case discharge of the Blowout Scenario that was described in the Supplemental DOCD S-7530, approved on July 13th, 2012.

The blowout scenario for SDOCD S-7530 is for a potential blowout of the GC-699, DC312 development well, which bp expects will have the highest volume of liquid hydrocarbons in the Atlantis Project area. The blowout scenario assumes that the pipe has been tripped out of the hole when a problem with the wellhead connector develops resulting in the removal of the BOP stack. Due to the loss of riser margin, the well flows unrestricted. Day 1, worst case discharge is approximately 179,400 bpd, shown with the calculation support package submitted with SDOCD S-7530. The maximum duration of the blowout is estimated at 120-days (see relief well timing below). The rate profile associated with the well blowout over this 120-day period (also included in the attachment) results in a potential worst case spill volume estimated at 18.8-mmbo.

2.10.2 The Potential for the Well to Bridge Over

While bridging is possible due to generally low formation strengths in the Gulf of Mexico, no bridging was assumed in the 'worst case scenario'. The open hole intervals experienced on each well have multiple formations open simultaneously. The modeling of the failure point of the weakest interval includes many variables, and using no bridging yields a maximum flow potential.

2.10.3 The Likelihood for Surface Intervention to Stop the Blowout

The likelihood for above-mudline intervention to stop a blowout is dependent on the failure mechanism. Depending on the circumstances, bp may address a failure of the BOP stack by repairing the control system via ROVs, replacing the BOPs, or adding a BOP on top of the current BOP stack. Failure of the wellhead or casing would be more difficult and require clear access to the well below the failure point in order to run drill pipe and/or tools in the well.

2.10.4 The Availability and Timing of a Rig to Drill a Relief Well

The table below lists the Mobile Offshore Drilling Units (MODU) capable of drilling a relief well. The estimated time to spud is 3 to 10 days, pending requirements to safely secure the current operations of the MODU, required material logistics, mobilization to location, and regulatory approvals. The possibility of drilling a relief well from a neighboring platform or land is not applicable to operations proposed in this Exploration Plan; there is no existing drilling infrastructure in the vicinity of the proposed bottom hole locations.

Rig Name	Current Location	Current Operator	Contract Expire Date	Rated WD (feet)	Rated TD (feet)	Rated BOPs (psi)	Moor Type	Relevant Drill Package Limitations
Auriga	GOM	bp	2023	10K	37.5K	15K	DP	None identified at this time
Diamond	GOM	bp	2022	10K	40K	15K	DP	None

Ocean BlackLion								identified at this time
Diamond Ocean BlackHornet	GOM	bp	2023	10K	40K	15K	DP	None identified at this time

The estimated time to drill a relief well is: 10 days to mobilize and spud, 75 days from spud to casing shoe above WCD zone, plus 35 days for ranging, intersection, and kill operation- for a total of 120 days.

2.10.5 **Measures that would Enhance the Ability to Prevent a Blowout**

Measures employed to prevent a blowout include compliance with applicable regulations (30 CFR 250 and 550), current NTLs, and in particular, the Interim Final Rule focused on BOP certification and reliability. Additional measures:

1. Volume measurements relative to the well will be monitored at all times during all operations;
2. Flow checks before leaving bottom, after pulling into shoe, and before BHA enters stack.
3. bp representative will observe well conditions prior to each trip and after well kills or testing;
4. bp representative will be the only person authorized to initiate opening the well as part or conclusion of well control measures;
5. On rig JSA/contingency plan before running any non-shearable tools or pipe through the BOP stack; and
6. BP has a 24/7 monitoring center, Wells Remote Collaboration Center, Wells RCC, (formerly referred to as the 'Houston Monitoring Center (HMC)', located at bp's Westlake Campus. Through continuous monitoring, onshore staff have the ability to communicate issues they observe on the well with the Wells Superintendent and Wells Engineer, as well as the rig. The rig team can then make corrective actions as necessary; and additionally, bp has adopted the following performance standards:

    a. BP will use and will require its contractors involved in drilling operations to use, subsea blowout preventers (BOPs) equipped with no fewer than two blind shear rams and a casing shear ram on all drilling rigs under contract to bp for deepwater service operating in dynamic position mode. With respect to moored drilling rigs under contract to BP for deepwater drilling service using subsea BOPs, the subsea BOP will be equipped with two shear rams, which will include at least one blind shear ram and either an additional blind shear ram or a casing shear ram.

    b. Each time a subsea BOP from a moored or dynamically positioned drilling rig is brought to the surface and testing and maintenance on the BOP are conducted, bp will require that a third party verify that the testing and maintenance of the BOP is performed in accordance with manufacturer recommendations and API Std 53.

2.10.6 Measures that would Reduce the Likelihood of a Blowout

Measures to reduce the likelihood of a blowout include compliance with applicable regulations (30 CFR 250 and 550) and current NTLs. Additional measures:

1. Minimize any influx events to the wellbore, by using the best pore pressure / frac gradient predictions available, using downhole tools when appropriate, such as PWDs to monitor the wellbore and update pore pressure / frac gradient predictions;
2. Management of change process will be followed for all procedure changes; and
3. A Well Control Response Guide will be in place.
4. With the integration of the Wells RCC, bp has staff monitoring well(s) 24/7. Having a monitoring center away from the rig in a controlled environment gives bp the opportunity to evaluate data real time and communicate issues to the Wells Superintendent, Wells Engineer, as well as the rig.

2.10.7 Measures that would Enhance the Ability to Conduct Early Intervention

Measures to enhance the ability to conduct early intervention in addition to the regulation and NTL requirements include:

1. Possible relief well locations have been identified and screened for general acceptability. In the event of a blow out or other event necessitating a relief well, data will be collected post-event to ensure that previously-identified relief well locations are still valid, or to assist in determining alternate relief well locations if required;
2. Wellhead equipment and sufficient casing is identified and available for a relief well;
3. A rig(s) is identified and available for a relief well;
4. A Well Control Response Guide is in place; and
5. Incident Management System (IMS) is in place.
   The bp IMS is comprised of government-approved plans which cover various scenarios; Incident Management Teams are trained annually in the Incident Command System, which is a part of the National Incident Management System; BP has access to response capability through various contractors and technical specialists; and pre-designated facilities, where the teams can provide adequate oversight to the response.

2.10.8 Other Measures

An Oil Spill Response Plan (OSRP) was filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019. Any spill from the vessel(s) conducting the activities covered by this DOCD would also be addressed by the vessel operator in accordance with the response plan of the vessel(s) from which the spill emanated

2.10.9 Worst Case Discharge Model Report

A Worst-Case Discharge Modeling Report was included in Appendix C of Supplemental DOCD S-7530. The Discharge Modeling Report provided assumptions related to the

blowout scenario for Atlantis GC699, DC312 and the Thunderhorse MC776, Well No.6. Geological and Geophysical Information (30 CFR 550.244)

3 Geological and Geophysical Information

3.1 Geological Description

A discussion of the geological objectives, including a brief description of the hydrocarbon trapping elements, is included in **Appendix C** in the Proprietary Information copy of this Supplemental DOCD.

3.2 Structure Contour Maps

Current structure contour maps are included in **Appendix C** in the Proprietary Information copy of this Supplemental DOCD

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

Migrated and annotated 3-D seismic lines with depth scale within 152 meters (500 feet) of the proposed surface locations are enclosed with the site clearance letters included in **Appendix C** in the Proprietary Information copy of this Supplemental DOCD

3.4 Geological Structure Cross-Sections

Interpreted geological structure cross-section maps are included in **Appendix C** in the Proprietary Information copy of this Supplemental DOCD.

3.5 Shallow Hazards Report

A shallow hazards and archeological report was submitted in separate binders with plan S-7530. A list of the Shallow Hazards and archeological reports and shallow hazards assessments provided were include in Appendix E, Supplemental DOCD (S-7530).

Pipelines will be permitted under separate cover as lease term pipelines. The pipeline application will contain hazard assessment.

3.6 Shallow Hazards Assessment

Shallow hazards assessments for the DC3 and DC1 areas were submitted in separate binders with plan S-7530. A list of these assessments is found in Appendix E, Supplemental DOCD (S-7530).

New assessment Information specific to the DC802, DC803, DC227 and DC228 and their contingency well locations is found in the current **Appendix D**: Shallow Hazards and Archeological Reports and Hazard Assessment Table.

3.7 High-Resolution Seismic Lines

High-resolution (Kirchhoff) seismic lines are included in **Appendix C** in the Proprietary Information copy of this Supplemental DOCD.

4 Hydrogen Sulfide (H_2S) Information

4.1 Concentration

It is not expected that H2S will be encountered during the operations proposed in this plan.

4.2 Classification

Based on previous drilling, no H2S is known to occur in the project area. bp has requested in earlier submissions that Green Canyon 743 Unit Area Blocks 699, 742, 743, and 744 be classified as a "Zone where the absence of H2S has been confirmed".

The following wells in the bp unit were drilled to similar geologic horizons as proposed by this DOCD without encountering H2S:

- GC 743 #5 (19,590-ft MD), oil sands in PROPRIETARY
- GC 699 #1 WB2 (20,097-ft MD), oil sands in PROPRIETARY
- GC 743 #3 (19,150-ft MD), oil sands in PROPRIETARY
- GC 743 DC123 (18,610-ft MD), oil sands in PROPRIETARY
- GC 743 #1 ST1 (18,488-ft MD), oil sands in PROPRIETARY
- GC743 Atlantis Phase 3 Wells including DC221 (22,610-ft MD), oil sands in PROPRIETARY

Between the years 1998 and 2018, Atlantis has acquired MDT samples in 30 wellbores. These samples were acquired and analyzed from all middle Miocene producing reservoirs as well as from lower Miocene reservoirs. None of the analyzed MDT samples showed evidence of H2S gas

BP requests that BOEM re-confirm the “H2S absent” classification.

4.3 Modeling Report

H2S concentrations greater than 500-parts per million (ppm) are not expected in the operations proposed in this plan; therefore, a modeling report is not required.

5 Mineral Resource Conservation Information

Technology and Reservoir Engineering Practices and Procedures, Technology and Recovery Practices and Procedures, and Reservoir Development Plans or descriptions were submitted with Supplemental Plan S-7530. These items are unrelated to or unaffected by the change in well location.

The well proposed by this revision will continue to inject water into target reservoirs previously approved for development in the Conservation Information Document last approved on July 1, 2020.

5.1 Technology and Reservoir Engineering Practices and Procedures

BP uses dual (redundant) downhole pressure and temperature gauges for reservoir surveillance. In addition, commingled mid-Miocene PROPRIETARY producers using on / off downhole flow control technology, allows for zonal surveillance as well as zonal intervention (i.e. water shut-offs). Performance analysis of the aquifer response to production, coupled with seismic imaging improvements, will dictate the benefit and timing of any water injection. Options proposed in Supplemental Plan S-7530 included a subsea water injection line to a subsea distribution manifold, or possibly with advances in technology, the use of stand-alone subsea direct sea water injectors.

5.2 Technology and Recovery Practices and Procedures

Primary drive mechanism will be aquifer drive for these wells. Analysis of the aquifer response to production, coupled with seismic imaging improvements, will dictate the benefit and timing of additional water injection and other recovery technologies.

5.3 Reservoir Developments

The Atlantis discovery well GC699 #1WB01 (and sidetrack WB02) encountered the main pay PROPRIETARY sands, sub-salt, and down structure to the northeast. Both wellbores indicated a potential oil-water contact on the northeastern portion of Atlantis at approximately 17845' TVD-SS in the PROPRIETARY. Due to well stability problems, no reservoir pressures were obtained.

The Atlantis GC743 #1 well was drilled to the southwest of GC699 #1WB01 and encountered oil bearing PROPRIETARY sands at 16,397-ft TVD-SS and 16,629'-ft TVD-SS respectively. This well was bypassed for whole core in the GC743#1BP01 and then sidetracked GC743#1ST01 back through the Middle and Early Miocene where additional oil bearing sands were found. Formation pressures and fluid samples were taken in these oil bearing zones.

The GC743-2 well built angle too rapidly and had to be bypassed. GC743-2BP1 crossed a large sub-salt fault interpreted to be roughly east-west that separates the north and south portions of the Atlantis structure. The main mid-Miocene pay sands were faulted out, although oil of good quality was encountered in lower mid-Miocene sands. The GC743-2ST1 targeted the southeastern part of the structure, but a cone was left in the hole, requiring the well to be bypassed. The GC743-2-ST1-BP1 found pay in the M55 (full to base) and M54 (drilled an oil water contact) middle Miocene sands. Formation pressures were acquired in the PROPRIETARY reservoirs.

The GC743 #3 well was a downdip test for an oil-water contact in the main PROPRIETARY reservoirs. The GC743 #3 well found an oil bearing PROPRIETARY sand at 17,851-ft TVD-SS and wet PROPRIETARY sands at 18,262-ft and 18,579-ft TVD-SS respectively. Formation pressures taken in this well provided important constraints on the Atlantis Field PROPRIETARY oil-water contacts. The parent wellbore to the GC743 #5ST1, the GC743 #5 (as well as the #5BP1 bypass for core) was drilled sub-salt, down structure in the central portion of the north side of Atlantis. The main pay sands PROPRIETARY were oil charged and establish lowest known oil depths of approximately 17,540-ft TVD-SS in the PROPRIETARY and 17,790-ft TVD-SS in the PROPRIETARY. In addition, a shallower, thin oil charged PROPRIETARY sand was encountered. MDT pressure and fluids were collected in all oil sands. The deeper mid-Miocene and lower-Miocene sands were penetrated but wet.

The GC743 #5ST1, permanently abandoned since 2012, was drilled sub-salt up structure, and encountered oil charged PROPRIETARY mid-Miocene sands. MDT pressures were collected in all oil sands, while MDT fluids were collected in the PROPRIETARY main pay sands. Fluid and pressure data suggest some degree of baffling / compartmentalization with the down structure GC743 #5 and #5BP1 wellbores.

The Atlantis Conservation Information Document (CID) discusses overall field plans. It was last updated in 2019 to include the 8 wells for Atlantis Phase 3. The CID will be updated to reflect the new surface locations for the four new topholes in a Revised CID.

6 Biological Information

6.1 High Density Deepwater Benthic Communities Information

The BOEM requires site-specific surveys and reviews for proposed bottom-disturbing actions in water depths greater than 300-m in order to judge the potential of the region for supporting high density benthic communities. bp has conformed with this requirement and has located wells and pipeline routes to avoid potential sites for benthic communities during the deepwater development project described by this plan.

BP proposes to spud the DC2 well locations in GC743, OCSG 15607. The center of the DC2 is about 1,750 ft southeast of the southern edge of the salt related Sigsbee Escarpment. A zone of potential gas seepage and localized authigenic carbonates was mapped along the Escarpment from the 2001 AUV data. The southern edge of the mapped zone is about 1,500 ft northwest of the proposed DC2. In 2001, BP investigated this zone, northwest of the proposed DC2, and found several localized hard grounds and bacterial mats. The features are greater than 2,000 ft from the DC2. Based on this combination of data, there is a Low potential for high-density benthic communities to be within 2000 ft of the proposed DC2. The proposed wells, and the other activities planned will use dynamically positioned rigs or vessels; therefore, physical disturbance of the seafloor will not occur due to anchor emplacements.

The pipeline route and components, and commissioning equipment will be located in areas previously surveyed to protect benthic communities. Hazard reports and Assessments listed in **Appendix D** provide a current review of available data confirming the absence of high-density benthic communities within the prescribed distances from drilling discharges and subsea equipment.

6.2 Biologically Sensitive Underwater Features and Areas

The proposed activities will be conducted in a water depth of approximately 6500' therefore, requirements of NTL 2009-G39 for biologically sensitive underwater features and areas such as Topographic Features, Live Bottom (low-relief), Live Bottom (Pinnacle Trend) features, and other potentially sensitive biological features when conducting OCS operating in water depth less than 300-m (984-ft) in the Gulf of Mexico do not apply to this plan.

All proposed bottom-disturbing activities in this SDOCD will occur outside of the nearest Topographic Features, "No Activity Zones', Live Bottom (low relief), and Live Bottom (Pinnacle Trend) Stipulation Blocks described in NTL 2009-G39 and shown on BOEM "Western and Central Gulf of Mexico Topographic Features Stipulation Map Package for Oil and Gas Leases in the Gulf of Mexico March 2018".

6.3 Threatened or Endangered Species, Critical Habitat, and Marine Mammal Information

All marine mammals and sea turtles are protected under the Marine Mammal Protection Act (MMPA) and some are also protected under the Endangered Species Act (ESA). In addition to the seven species listed as threatened and endangered under the ESA, there are 22 additional species protected under the MMPA, including the following: two species of mysticeti whales, Rice's whales (formerly called Gulf of Mexico Bryde's whales) and minke whales; and 20 species of odontocetes (including 14 delphinids, 4 species of beaked whales, and dwarf (*Kogia sima*) and pygmy sperm whales (*Kogia breviceps*) (Waring et al. 2013). The distribution and abundance of cetaceans within the northern GoM is strongly influenced by various mesoscale oceanographic circulation patterns and prey availability (e.g. squid) (BOEM 2012a).

One cetacean, the sperm whale and one sirenian species, the West Indian manatee are listed as endangered under the Endangered Species Act (ESA), occur in the GoM (USDOI, BOEMRE Final S-EIS CPA 2012-058). The sperm whale (*Physeter macrocephalus*) is the only endangered marine mammal that is likely to be found within the ATP3 area. Resident populations occur in the GoM year round and are wide spread (Davis et al. 2000; Waring et al. 2013). The West Indian manatee (*Trichechus manatus*) is listed as an endangered species by the USFWS. It is found in freshwater, brackish and marine habitats, usually along the coast. In the GoM the distribution is mainly limited to peninsular Florida during the winter, but manatees expand their range during the summer months and have been seen as far north as Rhode island and as far west as Texas (USFWS 2001). Although the West Indian manatee typically inhabits only coastal marine waters, a few individuals have very rarely been observed in deeper water (USFWS 2001; Fertl et al. 2005; Pabody et al. 2009). In 2013, three manatees were reported from deep water by seismic observers in the GoM (BOEM 2017). At least one sighting was from Green Canyon (Block 653) in 4,356 ft. (1,328m) of water. Given the rarity of manatees to be found in deep water, it is unlikely that a manatee would be found near ATP3.

Five mysticeti whales (blue whale, fin whale, humpback whale, North Atlantic right whale, and sei whale) that are listed as endangered have been reported from the GoM, but are considered rare, occasional migrants and highly unlikely to occur in the ATP3 area (BOEM 2012a and Würsig et al. 2000). None of these species have designated critical habitat in the GoM.

The NMFS Biological Opinion for the Five-Year Oil and Gas Leasing Program in the Central and Western Planning Areas of the GoM (2007) did not include any of these mysticeti whales as affected species. Due to the rare occurrence of these whales in the Northern GoM, it is unlikely that any of these endangered whales would come into contact with any routine activities in the ATP3 area or be impacted by accidental events.

Endangered or threatened species that may occur in the project area and/or along the northern Gulf Coast are listed in Table 4 of Appendix I in SDOCD S-7944.

Five of the seven species of sea turtles are found in the GoM, including the leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), and hawksbill sea turtle (*Eretmochelys imbricata*) (BOEM 2012a). Four of the five species are listed as endangered

for the Gulf of Mexico ranges of the species under the ESA (leatherback, green, Kemp's ridley, and hawksbill sea turtles), while the loggerhead sea turtle is listed as threatened. Individuals of all species inhabit nearshore and coastal habitats, with significant overlap in species ranges throughout their life cycles. All species of sea turtles have the potential to occupy the ATP3 area during their post hatchling pelagic phase.

Two species (leatherback and loggerhead sea turtles) occupy open ocean GoM waters as sub-adults and adults and are more likely to occur in the ATP3 area. Green, hawksbill, and Kemp's ridley turtles typically inhabit the inner shelf and nearshore waters making them less likely to occur near the ATP3 area as their adult counterparts. Hatchlings or juveniles of any of the sea turtle species could be present in deepwater areas, including the ATP3 area, where they may be associated with floating mats of Sargassum. Sea turtle hatchlings use the sargassum mats for camouflage and food.

Nesting locations vary for each of the sea turtle species, with nesting on the northern Gulf of Mexico coast occurring for some species, as summarized below:

- Loggerhead turtles – Loggerhead turtles nest in significant numbers along the Florida Panhandle and, to a lesser extent, from Texas through Alabama (NMFS and USFWS 2008; Florida Fish and Wildlife Conservation Commission 2017a). The nearest significant nesting area of loggerhead turtles is found in Louisiana on beaches within the Breton NWR.

- Green and leatherback turtles - Green and leatherback turtles infrequently nest on Florida Panhandle beaches (Florida Fish and Wildlife Conservation Commission 2017b, c).

- Kemp's ridley turtles – The Kemp's ridley turtle nests almost exclusively on a small stretch of coastline in Tamaulipas, Mexico (NMFS et al. 2011). Due to reintroduction efforts, a small number of Kemp's ridley turtles have begun nesting on Padre Island National Seashore in Texas. Recent counts from 2016, identified 185 Kemp's ridley turtle nests on Texas beaches (Turtle Island Restoration Network 2017). Typically, Kemp's ridley turtles do not nest anywhere near ATP3.

- Hawksbill turtles – Typically, hawksbill turtles do not nest anywhere near ATP3.

Effective August 11, 2014, NOAA-NMFS designated critical habitat for the Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead sea turtles. Critical habitat includes a combination of nearshore reproductive habitat, wintering areas, breeding areas, migratory corridors and Sargassum habitat stretching from Mississippi to the Florida Keys and north along the Atlantic coast to North Carolina. A total of 38 marine areas and 685 miles of shoreline (1,102 km) are designated as critical habitat (Final Rule 78 FR 39855 for marine areas and Final Rule 78 FR 39755 for coastal areas). Green Canyon Block 743 falls within Sargassum critical habitat designated for the loggerhead sea turtle. In February 2010, the DOI and Department of Commerce (DOC) were jointly petitioned to designate critical habitat for Kemp's ridley sea turtle's nesting habitat along beaches of the Texas coast and for marine habitats in the GoM and Atlantic Ocean. NMFS initiated its 5-year status review of the species in 2012 and the petition to designate critical habitat is still under review as of 2021. 2012 5-year review was published in July 2015. On 6/29/2021 the 5-year review was reinitiated.

Five species of fish are the only listed threatened and endangered fish species in the Gulf of Mexico.

- Smalltooth Sawfish (*Pristis pectinata*)
- Gulf Sturgeon (subspecies *Acipenser oxyrinchus desotoi*)
- Nassau grouper (*Epinephelus striatus*)
- Giant Manta Ray (Manta birostris)
- Oceanic whitetip shark (Carcharhinus longimanus)

The Gulf sturgeon (Acipenser oxyrinchus desotoi) is an anadromous fish species listed as threatened under the ESA in 1991 (NOAA OPR 2014a). The Gulf sturgeon is a subspecies of the sturgeon species Acipenser oxyrinchus which has 2 subspecies, the Gulf Sturgeon and the Atlantic Sturgeon. The Gulf Sturgeon is found in coastal rivers of the Gulf of Mexico ranging from the Pearl River, Louisiana to the West and Suwannee River, Florida to the East

Adult Gulf sturgeon migrate from the Gulf of Mexico into coastal rivers during early spring to spawn (Huff 1975; Sulak and Clugston 1998 1999; Fox et al. 2000). Post-spawning adults, subadults and juvenile Gulf sturgeon remain in the rivers throughout the summer months, where they do not feed (Gu et al. 2001), and emigrate from the rivers in the fall (Foster and Clugston 1997). Gulf sturgeon feed on benthic prey in the estuaries and offshore areas in the Gulf of Mexico (Sulak and Clugston 1998).

Populations of Gulf sturgeon have been reduced or extirpated throughout much of their historic range by fishing, development, dam construction, and water quality changes (Barkuloo 1988). The largest populations of Gulf sturgeon are found in the Suwannee River (Sulak and Clugston 1998) and the Yellow River (Berg et al. 2007) in Florida. The NMFS and United States Fish and Wildlife Service designated critical habitat for the Gulf sturgeon in fourteen geographic areas from Cedar Key, Florida to Lake Pontchartrain, Louisiana, encompassing spawning rivers and adjacent estuarine areas (U.S. Fish and Wildlife Service (USFWS) 2003).

ATP3 is approximately 180 statute miles (290 km) from the nearest Gulf sturgeon critical habitat.

The Nassau grouper (Epinephelus striatus) is listed as threatened under the ESA (Federal Register Volume 81, Number 125, June 29, 2016). The Nassau grouper is a slow growing, long-lived grouper found from inshore to depths of approximately 100 meters (Bush et al. 2006; Hill and Sadovy de Mitcheson 2013), except during spawning when they may be found at depths of 255 m (Starr et al. 2007). Adults are typically associated with high relief rocky bottoms, while juveniles are typically found in shallower water, over seagrass beds or associated with smaller hardbottom areas covered with macroalgae (NMFS 2017a).

The distribution of the Nassau grouper includes Florida and Bermuda, as well as the Bahamas and throughout the Caribbean Sea (Heemstra and Randall 1993). In the GoM, the Nassau grouper has been documented off the Yucatan Peninsula and are occasional visitors to the waters off of Texas. Nassau grouper were first reported in the FGBNMS in 2007 (Foley et al. 2007).

The smalltooth sawfish (Pristis pectinata) is listed as endangered under the ESA (NOAA OPR 2014b). Smalltooth sawfish inhabit shallow coastal waters in tropical seas and estuaries, are usually found in shallow waters (less than 32 ft.) very close to shore, and over mud and sandy substrates. Smalltooth sawfish prefer warm water (22–28°C) and

salinities of 18-24 ppt. Currently, the U.S. distribution of the species is confined to the Florida peninsula, common only in the Everglades region.

The giant manta ray was listed as Threatened under the ESA in 2018 by NMFS (83 FR 2916). The species is a slow-growing, migratory, and planktivorous, inhabiting tropical, subtropical, and temperate bodies of water worldwide (NOAA, 2018a).

Commercial fishing is the primary threat to giant manta rays (NOAA, 2018a). The species is targeted and caught as bycatch in several global fisheries throughout its range. Although protected in U.S. waters, protection of populations is difficult as they are highly migratory with sparsely distributed and fragmented populations throughout the world. Some estimated regional population sizes are small (between 100 to 1,500 individuals) (Marshall et al., 2018; NOAA, 2018a). Stewart et al. (2018) recently reported evidence that the Flower Garden Banks serves as nursery habitat for aggregations of juvenile manta rays. Approximately 100 unique individuals have been positively identified at the Flower Garden Banks based on unique underbelly coloration (Belter et al., 2020). Genetic and photographic evidence in the Flower Garden Banks over 25 years of monitoring showed that 95% of identified giant manta ray male individuals were smaller than mature size (Stewart et al., 2018).

The oceanic whitetip shark was listed as Threatened under the ESA in 2018 by NMFS (83 FR 4153). Oceanic whitetip sharks are found worldwide in offshore waters between approximately 30° N and 35° S latitude, and historically were one of the most widespread and abundant species of shark (Rigby et al., 2019). However, based on reported oceanic whitetip shark catches in several major long-line fisheries, the global population appears to have suffered substantial declines (Camhi et al., 2008) and the species is now only occasionally reported in the Gulf of Mexico (Rigby et al., 2019).

Oceanic whitetip shark management is complicated due to it being globally distributed, highly migratory, and overlapping in areas of high fishing; thus, leaving assessment of population trends on fishery dependent catch-and-effort data rather than scientific surveys (Young and Carlson, 2020). A comparison of historical shark catch rates in the Gulf of Mexico by Baum and Myers (2004) noted that most recent papers dismissed the oceanic whitetip shark as rare or absent in the Gulf of Mexico. NMFS (2018b) noted that there has been an 88% decline in abundance of the species in the Gulf of Mexico since the mid-1990s due to commercial fishing pressure

Two coastal species of birds that inhabit the GoM are listed as threatened and endangered species under the ESA:

- Piping Plover (*Charadrius melodus*)
- Whooping Crane (*Grus americana*).

Critical overwintering habitat for the Piping plover has been designated in GoM, including beaches in Texas, Louisiana, Mississippi, Alabama, and Florida. The nearest Piping Plover designated critical habitat is located in Venice, in southern Louisiana approximately 125 statute miles (201 km) away. Whooping crane critical habitat has been designated within the GoM region within the Aransas National Wildlife Refuge in Texas. Whooping cranes are only found wintering along the Texas coast at Aransas NWR, which is the nearest designated critical habitat for this species. Due to the distance of the ATP3 from this NWR (399 statute miles/ 642 km away).

Four out of the five beach mice subspecies occurring in the GoM are listed as endangered under the ESA and occupy restricted habitats in the mature coastal dunes of Florida and Alabama:

- Alabama beach mouse (*Peromyscus polionotus ammobates*)
- Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*)
- St. Andrew beach mouse (*Peromyscus polionotus peninsularis*)
- Perdido Key Beach mouse (*Peromyscus polionotus trissyllepsis*)

Additionally, there is one subspecies of Florida salt marsh marsh vole (Microtus pennsylvanicus dukecampbelli) that is listed as endangered under the ESA. Its range is very limited in coastal Florida from the Suwanne River to the Withlacoochee River.

There are currently seven species of corals listed as threatened under the ESA in the Gulf of Mexico:

- elkhorn coral (*Acropora palmata*)
- lobed star coral (*Orbicella annularis)*
- mountainous star coral (*Orbicella faveolata*)
- boulder star coral (Orbicella franksi)
- staghorn coral (Acropora cervicornis)
- pillar coral (Dendrogyra cylindrus)
- rough cactus coral (Mycetophyllia ferox)

None of the listed coral species have been documented near the DC802, DC803, DC227, or DC228 sites.

6.4 Archaeological Report

Green Canyon Area Blocks 699, 742, 743, and 744 are not located within the area of high archaeological potential as described in NTL No. 2011-JOINT-G-01. However, the recent mitigation guidelines released by BOEMRE in March 2011 entitled, "Pre-Seabed Disturbance Survey Mitigation," requires archaeological assessments prior to undertaking any bottom-disturbing activities, such as drilling a well. BP has provided Archaeological reports completed by a Marine Archaeologist with the Hazards Reports listed in Appendix E, of Supplemental DOCD S-7530.

7 Wastes and Discharges Information

7.1 Projected Generated Wastes

A table providing information on the projected solid and liquid wastes likely to be generated by the proposed activities is included in **Appendix F**: Waste and Discharge Tables.

7.2 Projected Ocean Discharges

A table providing information on the projected ocean discharges likely to be generated during the proposed activities is included in **Appendix F**: Waste and Discharge Tables

8 Air Emissions

8.1 Screening Questions

Yes	No	**Screening Questions for DOCD's**
X		Is any calculated Complex Total (CT) Emission amount (tons) associated with your proposed development and production activities more than 90% of the amounts calculated using the following formulas: CT = 3400D2/3 for CO, and CT = 33.3D for the other air pollutants (where D = distance to shore in miles)?
	X	Do your emission calculations include any emission reduction measures or modified emission factors?
X		Does or will the facility complex associated with your proposed development and production activities process production from eight or more wells?
	X	Do you expect to encounter H2S at concentrations greater than 20 parts per million (ppm)?
X		Do you propose to flare or vent natural gas in excess of the criteria set forth under 30 CFR 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?

8.2 Emissions Worksheets

An emission workbook (Atlantis Facility BOEM Form 0139) showing calculated Plan/Complex Total Emissions associated with the activities proposed in this Supplemental DOCD is provided in **Appendix E**, Attachment 1. That form includes all covered and proposed drilling, construction, well intervention and maintenance activity for the Atlantis field for the period 2021-2030.

8.3 Emissions Reduction Measures

The Table below identifies the emission reduction measures applied in the Atlantis Facility BOEM Form 0139. The quantity of emission reductions achieved by each measure is also provided.

Emission Source	Emission Reduction Method	Proposed Reductions (Tons/Year)	Monitoring System
West Vela Engines	Actual Fuel Usage Rate	3769	Maintain records of actual fuel consumed while operating for the Project.
Black Hornet Engines	Actual Fuel Usage Rate	508	Maintain records of actual fuel consumed while operating for the Project.
Grand Canyon II Engines	Design Fuel Usage Rate	254	Maintain records of the vessel specification sheet with the design fuel usage rate.
Q5000 Engines	Actual Fuel Usage Rate	245	Maintain records of actual fuel consumed while operating for the Project.
Deep Blue	Design Fuel Usage Rate	318	Maintain records of the vessel specification sheet with the design fuel usage rate.
Siem Stingray	Design Fuel Usage Rate	35	Maintain records of the vessel specification sheet with the design fuel usage rate.

Notes: The assessed ERM values are based on the worst-case emission year 2021.

8.4 Verification of Non-Default Emissions Factors

The Atlantis Facility BOEM 0139 Form emissions worksheet tabs (EMISSIONS1 through EMISSIONS10) include the vessel manufacturer's transit fuel usage rates and Dynamic Positioning (DP) rates which are normally used while vessels are attached to Atlantis wells or subsea infrastructure. The transit fuel usage rates were obtained from the vessel specification sheets published by each manufacturer. The vessel specification sheets are provided in **Appendix E**, Attachment 2. The actual fuel usage rates for MODUs are also provided in **Appendix E**, Attachment 2.

8.5 Non-Exempt Activities

The summary Table below shows proposed emissions calculated per the exemption threshold formulas in 30 CFR 550.303(d). BP proposes NOx emissions higher than the exemption levels in 30 CFR 550.303(d).

(maximum year highlighted in yellow)

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
BP Exploration & Production Inc.	Green Canyon	GC734 Unit Agreement #754305003	OCS-G 15604 - 15608	Atlantis	

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	210.25	149.56	146.59	7.37	6282.72	554.02	0.02	1677.60	1.14
2022	185.16	134.42	131.90	7.01	5681.58	536.73	0.02	1583.32	0.97
2023	182.50	132.82	130.35	6.97	5617.84	534.90	0.01	1573.32	0.95
2024	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2025	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2026	180.06	131.35	128.92	6.93	5559.42	533.22	0.01	1564.16	0.93
2027	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2028	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2029	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2030	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
Allowable	4062.60			4062.60	4062.60	4062.60		83634.50	

In accordance with 30 CFR 550.303(e) through (i): an approved air quality model was used to demonstrate whether worst case total complex modeled impacts of NOx/NO_2 exceed relevant thresholds (i.e.- Significance Impact Levels (SIL) and/or National Ambient Air Quality Standards (NAAQS). The predicted impact for the 1-hour average was added to the background concentration for comparison to the NAAQS. Predicted annual impacts were compared directly to the applicable Significant Impact Level (SIL).

For both hourly and annual impacts, 100% of the predicted NOx concentration was conservatively assumed to be NO2. The most recent three years of data with all four quarters available (2018, 2019, and 2020) were used to calculate a three-year average background concentration of 67.10 µg/m3. This value was adopted as the background concentration despite its probable over-prediction of the true ambient background concentration. When combined with the spatially consistent 5-year average of the highest eighth-high maximum daily 1-hour modeled concentration in the five years (8.16 µg/m3), the maximum total impact is calculated to be 75.26 µg/m3 which is well below the NAAQS (188 µg/m3). Likewise, the maximum single-year modeled concentration combined with the maximum single-year background concentration (14.07 µg/m3 + 67.10 µg/m3 = 81.17 µg/m3) is well below the NAAQS. Further, the 5-year maximum of the annual average impact concentrations of the project at the shore (0.04 µg/m3) is below the annual average modeling Significant Impact Level (SIL) (1.0 µg/m3) and requires no further analysis.

The NAAQS air dispersion modeling report supporting this result, is provided in Attachment 3, BP Atlantis NAAQs Modeling Report.

The NAAQS modeling results confirm that projected emissions of NO_2 do not significantly affect the air quality of the onshore area at the closest point of landfall, or at the Breton Sound Class I area.

9 Oil Spill Information

9.1 Oil Spill Response Planning

9.1.1 Regional OSRP Information

An Oil Spill Response Plan (OSRP) was filed by BP America Inc. (Operator No. 21372) under cover letter dated February 14, 2019 on behalf of several companies listed in the plan including BP Exploration & Production Inc. (Operator No. 02481) and approved by BSEE on March 15, 2019. Modifications were made to the approved OSRP under cover letter dated June 20, 2019 and confirmed in compliance by BSEE on July 24, 2019. Any spill from the vessel(s) conducting the activities covered by this DOCD would also be addressed by the vessel operator in accordance with the response plan of the vessel(s) from which the spill emanated.

9.1.2 Spill Response Site

Primary Response Equipment Location	Preplanned Staging Location(s)
Pensacola, FL; Tampa, FL; Mobile, AL; Pascagoula, MS; Houma, LA.; Leeville, LA; Morgan City, LA; Lake Charles, LA.; Fort Jackson, LA; Venice, LA; Galveston, TX; Corpus Christi, TX; Ingleside, TX.	Fourchon, LA.

9.1.3 OSRO Information

BP is a member of the Marine Spill Response Corporation (MSRC), Clean Gulf Associates (CGA) and the National Response Corporation and would utilize said Oil Spill Response Organization (OSRO) personnel and equipment in the event of an oil spill at Green Canyon Area Block 743.

9.1.4 Worst-case Scenario Determination

Category	Regional OSRP Approved March 15, 2019 Drilling	Atlantis SDOCD S-7530 Plan Drilling	Regional OSRP approved March 15, 2019 Production	Atlantis SDOCD S-7530 Plan Production
Type of Activity	Drilling > 10 miles	Plan Drilling >10 miles	Production > 10-miles	Production >10 miles
Facility Location	MC 778 (SL)	GC743	MC 822-11	Not Applicable
Facility Designation	Thunder Horse Well 778-15	MODU - GC699, DC312 Development Well	Thunder Horse PDQ – MC822-11	Not Applicable
Distance to Nearest Shoreline	68-miles	121-miles	68-miles	Not Applicable
Volume Facility Storage:				
Volume storage tanks and flowline (total)	50,000-bbls	0-bbls	50,000-bbls	Not Applicable
Volume released due to facility pipeline break	13,000-bbls	0-bbls	13,000-bbls	Not Applicable
Lease Term pipelines	0-bbls	1,648-bbls	0-bbls	Not Applicable
Daily Production Volume Max Well	0-bbls	0-bbls	55,000-bbls	Not Applicable
Volume Uncontrolled Blowout (Day 1)	360,000-bbls	179,400-bbls	0-bbls	Not Applicable
Total Volume	423,000-bbls	181,048-bbls	118,000-bbls	Not Applicable
Type of Oil(s) – (Crude Oil, Condensate, Diesel)	Crude	Crude	Crude	Not Applicable
API Gravity(s)	32.0	25.5	33.0	Not Applicable

BP has conducted an analysis of the well(s) proposed in this SDOCD and has concluded that the worst case discharge scenario associated with the wells does not exceed the worst case discharge scenario described in supplemental DOCD, S-7530.

Because the worst case discharge scenario described in supplemental DOCD S-7530 does not exceed the worst case discharge scenario covered by BP's approved OSRP, the well(s) proposed in this SDOCD also do not supersede the worst-case scenario in BP's GoM Regional OSRP approved by BSEE on March 15, 2019.

Pursuant to NTL No. 2008-G04, bp makes the following statement:

Since BP Exploration & Production Inc. has the capability to respond to the worst-case spill scenario included in its Regional Oil Spill Response Plan approved on March 15, 2019, and since the worst-case scenario determined for our Supplemental DOCD does not replace the worst-case scenario in our regional or sub-regional OSRP, BP certifies that it has the capability to respond, to the maximum extent practicable, to a worst-case discharge, or a substantial threat of such a discharge, resulting from the activities proposed in this Supplemental DOCD.

See table above, which shows data from worst case discharge scenario well in the previous Supplement DOCD S-7530 (DC312 Development Well).

Wellbore data, geologic data, reservoir data, and fluid data used in modeling and making the WCD determination are provided in Appendix F in the Proprietary Information copies of the supplemental DOCD S-7530.

9.2 Oil Spill Response Discussion

A detailed discussion of a response to an oil spill at Green Canyon Area Block 743 is included in **Appendix G**: Oil Spill Response Discussion. This Appendix addresses topics such as oil spill release modeling, environmental and socioeconomic resources that could potentially be impacted, response technologies, and source containment / control.

10 Environmental Monitoring and Environmental Mitigation Measures Information

10.1 Under Monitoring Systems

In accordance with the conditions of approvals described in the NMFS 2020, revised in 2021, Biological Opinion and its Appendices, a person onboard the rig will visually monitor the moonpool using a remote camera system. Daily logs will be kept for documenting presence/absence of marine animals in the moonpool. If a protected species is observed in the moonpool, required reporting to the appropriate agencies will be made.

10.2 Under Incidental Takes Section

Additionally, mitigation measures described in Appendices A, B, C and J of the NMFS 2020Biological Opinion (as revised in 2021), will be implemented to the extent they are applicable to the activities outlined in this plan. Monitoring activities are conducted by personnel on vessels to prevent accidental loss of materials overboard, and to report sightings of injured/dead protected species. Reporting of dead/injured protected species is addressed in "GoM Incident Reporting Matrix for Offshore Activities". Further mitigation measures can be found throughout the supporting EIA

10.3 Under Flower Garden Banks National Marine Sanctuary

All proposed activities will occur outside of the Protective Zones of the Flower Garden Banks National Marine Sanctuary boundaries

11 Lease Stipulations

Additionally, mitigation measures described in Appendices A, B, C & J of the NMFS 2020 Biological Opinion (as revised in 2021), will be implemented to the extent they are applicable to the activities outlined in this plan.

12 Related Facilities and Operations Information

12.1 Related OCS Facilities and Operations

The Atlantis project includes the use of either the Drill Ship Auriga, the Drill Ship Black Lion, or the Drill Ship Black Hornet, the GC787 A Platform, existing and previously approved wells in Drill Center 1 and Drill Center 3, and previously approved and existing pipelines, umbilical, and other appurtenances. The Lease Term Pipelines are designed to transport hydrocarbon from the new DC2 to existing DC1. The hydrocarbons will be transported to GC787, A Platform on previously approved and existing pipelines from DC1. The Atlantis production will be transported from the platform by the existing export pipeline system. Other than these Atlantis project facilities and operations, there are no other existing drilling units, production platforms, pipeline accessory platforms, host facilities, pipelines and associated umbilical, or other facilities and operations located on the OCS that directly relate to the proposed development activities.

12.2 Transportation Systems

The Atlantis production will be transported by the existing export pipeline system. Gas production from wells in the Green Canyon Block 743 Unit will continue to be measured for sales and royalty purposes on the Atlantis Green Canyon Block 787 A Platform, a semisubmersible Production Quarter (PQ) Facility, prior to delivery to shore via Operations System Nos. 23.5/ H00, 24.0/ XWO, and/or 26.5/K00. Liquid hydrocarbons from the Green Canyon Block 743 Unit will continue to be measured for sales and royalty purposes using an LACT unit located on this same facility prior to delivery to shore via the Cameron Highway Oil Pipeline System (Operations System No. 2.5), the Poseidon Pipeline System (Operations System No. 29.5), and / or the Amberjack Pipeline System (Operations System No. 36.5).

12.3 Produced Liquid Hydrocarbons Transportation Vessels

There are currently no plans to transport produced liquid hydrocarbons including well test fluids by means other than the export system described in Section 12.2.

13 Support Vessels and Aircraft Information

In accordance with the NMFS 2020Biological Opinion (as revised in 2021) transit routes will avoid the Rice's whale (formerly Bryde's whale) area. As outlined in the table below, vessels will transit directly from shorebases in Louisiana to the blocks where activities will occur under this SDOCD.

13.1 Support Vessel and Aircraft Information Table

Type	Maximum Fuel Tank Storage Capacity	Maximum No. in Area at Any Time	Trip Frequency or Duration
Aircraft-Helicopter	760-gallons	2	10 rt/week
Crew boats	928-bbls	2	Every 3 days
Supply boats	7,000-bbls	3	Every 2 days

13.2 Diesel Oil Supply Vessels

Size of Fuel Supply Vessel	Capacity of Fuel Supply Vessel	Frequency of Fuel Transfers	Route Fuel Supply Vessel Will Take
240-feet to 280-feet	50,000 gallons (boat fuel) 150-K to 250-K gallons of transferable fuel (rig fuel)	Weekly as needed	From the shorebase in Fourchon, LA to GC 743, GC Field 787

13.3 Solid and Liquid Wastes Transportation

A table providing Information on the transportation of solid and liquid wastes and the onshore facilities used for disposal of solid and liquid wastes generated by the proposed activity is included in Table 2 found in **Appendix F**.

13.4 Onshore Support Facilities Information

The onshore support base for the proposed operations will be in Fourchon, Louisiana, Green Canyon Area Block 787 is located approximately 121 miles from the onshore support base located in Fourchon, Louisiana, refer to **Appendix B** for vicinity map.

The following table provides information of the onshore facility that will be used to provide supply and service support for the activities proposed in this plan.

Name	Location	Existing / New / Modified
C-Port	Port Fourchon, LA	Existing
Heliport	Houma, LA	Existing
Core Yard	Theodore, AL	Existing
Ship Channel Shorebase	Houston, TX	Existing

BP will primarily use the existing C-Port Fourchon Shorebase located in Fourchon, Terrebonne Parish, Louisiana to support general vessel operations. No expansion of these physical facilities is expected to result from the proposed activities. The C-Port Fourchon facility is located approximately 129 miles from the general activity area, provides a vehicle parking lot, office space, radio communication equipment, outside and warehouse storage space, crane, forklifts, water and fueling facilities, and boat dock space. The base is in operation 24-hours each day. Helicopters will be based out of Houma, Louisiana.

A small amount of vessel and helicopter traffic may originate from bases other than those described above in order to address changes in weather conditions. It is expected that this vessel traffic will originate from bases and locations that are in the near vicinity of the bases previously described.

13.5 Support Base Construction or Expansion

BP will utilize existing support bases for the proposed activities and will not require the construction or expansion of additional support bases.

14 Coastal Zone Management Act (CZMA) Information

14.1 Consistency Certification

No updates or changes made to this section when compared to previously approved Supplemental DOCD (S-7944) on August 29, 2019.

15 Environmental Impact Analysis (EIA)

No updates or changes made to this section when compared to previously approved Supplemental DOCD (S-7944) on August 29, 2019. The impact producing factors (IPFs) and affected resources have remained the same.

16 Administrative Information

16.1 Exempted information Description

In accordance with 43 CFR Part 2, Appendix E, sections (4) and (9), the following information has been determined by the BOEM GOMR exempt from public disclosure:

- Geologic Objectives (BHL, TVD and MD) on BOEM-137 forms
- Production rates and life of reservoirs
- Proprietary New or Unusual Technology
- Geological and Geophysical Information (except for non-proprietary Shallow Hazard Assessment)
- Hydrogen Sulfide Correlative Well Information

This information is excluded from the "Public Information" copies of the submitted plan.

16.2 Bibliography

Previously Approved DOCDs for GC743 Unit Blocks

SHL	BHL	Lease No.	BP ID	Well Names, Subsea Structure	Plan No.	Approval Date
GC743	GC742 GC743	15606 15607	Initial Plan	Platform and Wells A, B4, B5, C4, C5, D,E4, E5, F, G5, I, J, M57-1, M57-2, N, U, Inj B,C, F, and J GC743 Unit Total = 20 Wells	N7646	2003 09 12
GC743	GC742 GC743	15606 15607	ADC	Revise Subsea Arch – DC1, GC743 and Re-assigned Well Names by Manifold DC111 to DC114 DC121 to DC124 DC131 to DC134 DC141 to DC144 DC101 to DC104	R4369	2006 12 04
GC743	GC743	15607	ANFD	Drill Center 3: Add Well DC313, + Subsea Architecture, GC743	S6999	2007 02 12
GC743	GC699 GC700 GC743	15604 15605 15607	DC3 -Phase 2B	DC311, DC312, DC321, DC323, DC324 (GC743) + DC314 (GC699) + DC322 (GC700) + Subsea Architecture, GC743	S7328	2009 08 04
GC743	GC744	15608	GC744, DC131	Revise BHL DC131 to GC744 GC743 Unit Total = 28 Wells	R4969	2009 09 11
GC743	GC699 GC743	15604 15607	DC3-Man 2-Batch	DC321, DC322, DC323, and DC324 Batch Operations	R-5593	2012 05 31
GC743	GC699 GC700 GC743	15604 15605 15606	DC1+ DC3, Subsea and	DC101, DC103, DC106, DC121, DC141, DC132, DC134, DC141, DC311, DC312, DC317, DC321,	S-7530	2012 0713

	GC744	15607	Plt A	DC322, DC323, DC324.		
GC743	GC743	15607	West Auriga Rig in DC1+DC3 + Subsea	DC101, DC103, DC104, DC121, DC141, DC132, DC134, DC141, DC311, DC312, DC317, DC321, DC322, DC323, DC324	R-5984	2014 01 30
GC743	GC699	15604	DC323	DC323 BHL Change to GC699	R-6173	2014 10 16
GC743	GC699 GC700 GC743 GC744	15604 15605 15606 15607	DC104 & DC801	Well Revised: GC743, Well DC104 New Well Name: GC743, Well DC801	R-6308	2015 06 05
GC743	GC743	15607	West Vela DC2	DC212, DC213, DC214, DC215, DC221, DC222, DC223, DC224	S-7944	2019 08 29
GC743	GC743	15607	H2S Field Designation	Revised H2S Classification for Atlantis Field as H2S Absent	R-6976	2020 08 28

Well Status Chart

This table has been updated to show current well names and status at time of submission. The proposed new wells are **bolded**.

WELL	Spud	TD*	Status	Proposed or Actual BHL Block
DRILL CENTER 1 (DC1)				
DC101	NO	NO	Proposed Water Injector, not yet spud	GC743
DC102	2009	X	Active Water Injector	GC743
DC103	2011	X	SI	GC743
DC801 (Previously DC104)	2015	X	Active Water Injector	GC743
DC802	**NO**	**NO**	**New Water Injector Proposed**	**GC743**
DC802 Contingency	**NO**	**NO**	**New Water Injector Proposed**	**GC743**
DC803	**NO**	**NO**	**New Water Injector Proposed**	**GC743**
DC803 Contingency	**NO**	**NO**	**New Water Injector Proposed**	**GC743**
DC111	2004	X	Producing	GC743
DC112 ST1	2007	X	Producing	GC743
DC113 BP2	2008	X	Producing	GC743
DC114	2004	X	SI	GC743
DC121ST1BP1	2014	X	Producing	GC743
DC122 ST1	2007	X	Producing	GC743
DC123	2004	X	Producing	GC743
DC124 ST2	2004	X	Producing	GC743
DC131	2004	X	Producing	GC744
DC132	2004	X	Producing	GC743
DC133 BP1 (Current)	2010	X	Producing	GC743
DC134	2004	X	Producing	GC743
DC141	2004	X	Producing	GC743
DC142	2004	X	Producing	GC742

DC143	2004	X	Producing	GC743
DC144	2004	X	Producing	GC743 Actual BHL [Original GC742]
DRILL CENTER 3 (DC3)				
DC311	2009	X	Producing	GC743
DC312 BP1	2012	X	Producing	GC699
DC313 (#5 ST1)	2003	X	PA'd	GC743
DC314 ST1	2010	X	Producing	GC743
DC317	2012	X	Producing	GC743
DC321	2012	X	Producing	GC743
DC322 BP2	2013	X	SI	GC699
DC323 (BHL Change)	2012	X	Producing	GC743
DC324	2012	X	Producing	GC743
DRILL CENTER 2 (DC2)				
DC212	2019	X	Producing	GC743
DC213	2019	X	Producing	GC743
DC214	2019	NO	Proposed well; not producing	GC743
DC215	2019	NO	Proposed well; not producing	GC743
DC221	2019	X	Producing	GC743
DC222	2019	NO	Proposed well; not producing	GC743
DC223	2019	NO	Initial Wellbore drilled; TA'd	GC743
DC224	2019	NO	Initial Wellbore drilled; TA'd	GC743
DC227	**NO**	**NO**	**Proposed Well**	**GC743**
DC228	**NO**	**NO**	**Proposed Well**	**GC743**
DC227/228 Contingency	**NO**	**NO**	**Proposed Well**	**GC743**

16.3 Other Reference Items

There are no changes to the reference items previously submitted in Supplemental Plan S-7944, that are related to or affected by the proposed change in well and pipeline locations.

- Bureau of Ocean Energy Management. 2017a. Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2025. Gulf of Mexico Lease Sales 249, 250, 251, 252, 253, 254, 256, 257, 259, and 261. Final Multisale Environmental Impact Statement. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-009.

- Bureau of Ocean Energy Management. 2017b. Gulf of Mexico OCS Oil and Gas Lease Sale. Final Supplemental Environmental Impact Statement 2018. U.S. Department of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region. New Orleans, LA. OCS EIS/EA BOEM 2017-074.

- Biological Opinion on the Federally Regulated Oil and Gas Program Activities in the Gulf of Mexico. Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, March 13, 2020, revised April 24, 2021

16.4 Recovery Fees

Appendix H: Recovery Fee Receipt contains receipts showing the payment of the service processing fee of $16,952 required by 30 CFR § 250.125, based on the proposed new wells.

Appendix A: Plan Information Forms

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

PUBLIC INFORMATION

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

OCS PLAN INFORMATION FORM

General Information

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

Company Name: BP Exploration & Production Inc.	BOEM Operator Number: 02481
Address: 501 Westlake Park Blvd.	Contact Person: Catherine Nesbit
	Phone Number: 281-896-5128
	E-Mail Address: Catherine.Nesbit@bp.com

If a service fee is required under 30 CFR 550.125(a), provide the	Amount paid	$ 16,952	Receipt No.	26T9P1Q4 & 26T9OF16

Project and Worst Case Discharge (WCD) Information

Lease(s): 15604,15606,15607,15608	Area: GC	Block(s) 699, 742,743, 744, 787	Project Name (If Applicable): Atlantis Phase 3 Project; DC8 WI expansion

Objective(s)	x	Oil		Gas		Sulphur		Salt	Onshore Support Base(s):

Platform/Well Name: Atlantis CPXID: 1223 GC787 RUE G23579 DC2 wells: DC227, DC228, DC8 wells: DC802, DC803	Total Volume of WCD: 18.8 mmbo over 120 days	API Gravity: 25.5

Distance to Closest Land (Miles): 121	Volume from uncontrolled blowout: 179,400 bpd

Have you previously provided information to verify the calculations and assumptions for your WCD?	x	Yes		No
If so, provide the Control Number of the EP or DOCD with which this information was provided	S-7530			
Do you propose to use new or unusual technology to conduct your activities?		Yes	X	No
Do you propose to use a vessel with anchors to install or modify a structure?		Yes	X	No
Do you propose any facility that will serve as a host facility for deepwater subsea development?		Yes	X	No

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

Proposed Activity	Start Date	End Date	No. of Days
Development drilling and complete	January 2022	May 2029	~200
Well test flaring (for more than 48 hours)	July 2022	December 2029	Event driven
Installation of subsea wellheads and/or manifolds, lease term pipelines, jumpers and commission	September 2022	December 2029	~ 20
Commence production/Water Injection	July 2022	December 2029 2028	~ 20 days / well
Maintenance, operational and decommissioning activity	July 2022	December 2029	Event driven

Description of Drilling Rig

	Jackup	X	Drillship
	Gorilla Jackup		Platform rig
	Semisubmersible		Submersible
x	DP Semisubmersible		Other (Attach Description)

Drilling Rig Name (If Known):

Description of Structure

	Caisson		Tension leg platform
	Fixed platform		Compliant tower
	Spar		Guyed tower
x	Floating production system		Other (Attach Description)

Description of Lease Term

From (Facility/Area/Block)	To (Facility/Area/Block)	Diameter (Inches)	Length (Feet)
Atlantis/GC743/DC1	Atlantis/GC743/DC2	10.75”	~5,816’
Atlantis/GC743/DC1	Atlantis/GC743/DC8	6”	~5,300’

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

Proposed Well/Structure

Well or Structure Name/Number (If renaming well or structure, reference previous name): Location: Atlantis PQ	Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure? X Yes No	If this is an existing well or structure, list the Complex ID or API No.	GC787 RUE G23579 Complex ID 1223			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?			Yes	X	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid		

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	RUE G 23579	OCS	OCS OCS
Area Name	GC		
Block No.	787		
Blockline Departures (in feet)	N/S Departure: 4224' FNL	N/S Departure: F L	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 6848' FEL	E/W Departure: F L	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2606752	X:	X: X: X:
	Y: 9879936	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°19545.638"	Latitude:	Latitude Latitude Latitude
	Longitude: -90°0269845"	Longitude:	Longitude Longitude Longitude
Water Depth (Feet): 7070'		MD (Feet): / TVD (Feet):	MD (Feet): MD (Feet): MD (Feet): / TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA			

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

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

Include one copy of this page for each proposed well/structure

Proposed Well/Structure

Well or Structure Name/Number (If renaming well or structure, reference previous name): Location: DC227				Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						x	Yes		No

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

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 15607	OCS-G	OC S
Area Name	GC		
Block No.	743		
Blockline Departures (in feet)	N/S Departure: 6276.02' FSL	N/S Departure: FNL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2683.19' FEL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2610916.89	X:	X: X: X:
	Y: 9890436.09	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°13'26.55"	Latitude:	Latitude Latitud e
	Longitude: 90°0'48.29"	Longitude:	Longitude Longitud e

Water Depth (Feet): 6247'	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA				

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

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

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): Location: DC228				Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						x	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 179,400	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 15607	OCS-G	OCS OCS
Area Name	GC		
Block No.	743		
Blockline Departures (in feet)	N/S Departure: 6247.9' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2742.78' FEL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2610857.30	X:	X: X: X:
	Y: 9890407.86	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°13'27.28"	Latitude:	Latitude Latitude Latitude
	Longitude: 90°00'49.07"	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 6248'	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA				

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

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

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): Location: DC228-1 Contingency				Previously reviewed under an approved EP or DOCD?		Yes	X No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?					x	Yes	No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 179,400	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**	
Lease No.	OCS-G 15607	OCS-G	OCS OCS	
Area Name	GC			
Block No.	743			
Blockline Departures (in feet)	N/S Departure: 6261.94' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L	
	E/W Departure: 2712.90 FEL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L	
Lambert X-Y coordinates	X: 2610887.10	X:	X: X: X:	
	Y: 9890421.94	Y:	Y: Y: Y:	
Latitude/ Longitude	Latitude: 27°13'26.41"	Latitude:	Latitude Latitude Latitude	
	Longitude: 90°0'48.63"	Longitude:	Longitude Longitude Longitude	
Water Depth (Feet): 6248'		MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA					

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

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

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): Location: DC802			Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?					x	Yes	No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 179,400	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 15607	OCS-G	OCS OCS
Area Name	GC		
Block No.	743		
Blockline Departures (in feet)	N/S Departure: 4058.92' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2325.08' FWL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2600085.09	X:	X: X: X:
	Y: 9888218.91	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°13'07.15"	Latitude:	Latitude Latitude Latitude
	Longitude: 90°02'48.74"	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 6876'	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA				

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

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

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): Location: DC802-1 Contingency				Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						x	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 179,400	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	

	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 15607	OCS-G	OCS OCS
Area Name	GC		
Block No.	743		
Blockline Departures (in feet)	N/S Departure: 4090.96' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2367.45 FEL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2600127.46	X:	X: X: X:
	Y: 9888250.95	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°13'07.46"	Latitude:	Latitude Latitude Latitude
	Longitude: 90°02'48.27"	Longitude:	Longitude Longitude Longitude

Water Depth (Feet): 6876'	MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA				

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

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

Include one copy of this page for each proposed well/structure

Proposed Well/Structure

Well or Structure Name/Number (If renaming well or structure, reference previous name): Location: DC803				Previously reviewed under an approved EP or DOCD?		Yes	X	No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.			
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						x	Yes		No

WCD info	For wells, volume of uncontrolled blowout (Bbls/day):	For structures, volume of all storage and pipelines (Bbls):	API Gravity of fluid	
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**	
Lease No.	OCS-G 15607	OCS-G	OC S	
Area Name	GC			
Block No.	743			
Blockline Departures (in feet)	N/S Departure: 4068.75' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L	
	E/W Departure: 2224.67' FWL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L	
Lambert X-Y coordinates	X: 2599984.68	X:	X: X: X:	
	Y: 9888228.75	Y:	Y: Y: Y:	
Latitude/ Longitude	Latitude: 27°13'07.27"	Latitude:	Latitude Latitud e	
	Longitude: 90°02'49.85"	Longitude:	Longitude Longitud e	
Water Depth (Feet): 6876'		MD (Feet):	TVD (Feet):	MD (Feet): MD (Feet): MD (Feet):	TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA					

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

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

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): Location: DC803-1 Contingency				Previously reviewed under an approved EP or DOCD?		Yes	X No
Is this an existing well or structure?		Yes	x	No	If this is an existing well or structure, list the Complex ID or API No.		
Do you plan to use a subsea BOP or a surface BOP on a floating facility to conduct your proposed activities?						x Yes	No
WCD info	For wells, volume of uncontrolled blowout (Bbls/day): 179,400			For structures, volume of all storage and pipelines (Bbls):		API Gravity of fluid	

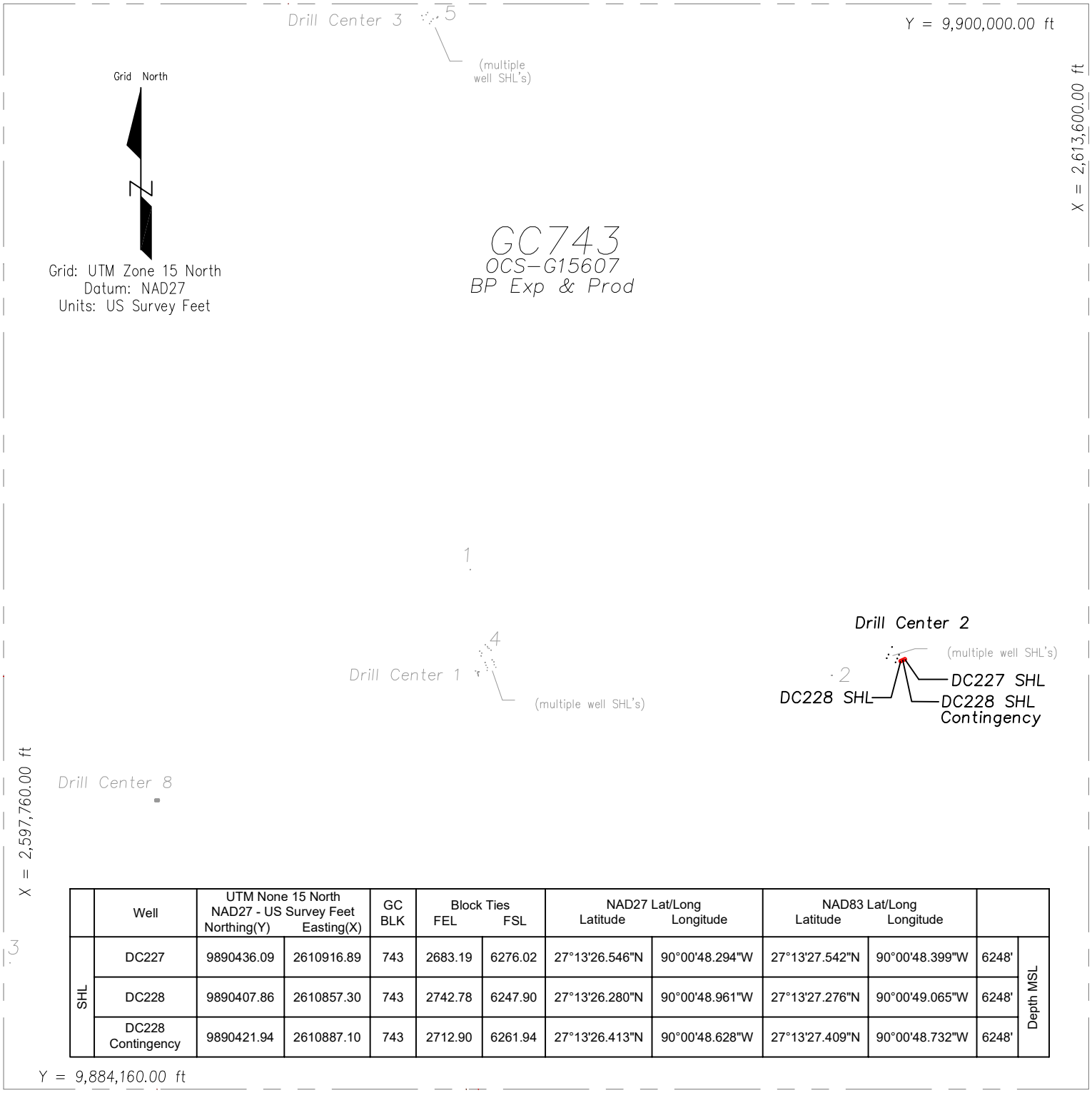
	Surface Location	**Bottom-Hole Location (For Wells)**	**Completion (For multiple completions, enter separate lines)**
Lease No.	OCS-G 15607	OCS-G	OCS OCS
Area Name	GC		
Block No.	743		
Blockline Departures (in feet)	N/S Departure: 4047.23' FSL	N/S Departure: FSL	N/S Departure: F____L N/S Departure: F____L N/S Departure: F____L
	E/W Departure: 2274.58' FWL	E/W Departure: FWL	E/W Departure: F____L E/W Departure: F____L E/W Departure: F____L
Lambert X-Y coordinates	X: 2600034.58	X:	X: X: X:
	Y: 9888207.23	Y:	Y: Y: Y:
Latitude/ Longitude	Latitude: 27°13'07.05"	Latitude:	Latitude Latitude Latitude
	Longitude: 90°02'49.31"	Longitude:	Longitude Longitude Longitude
Water Depth (Feet): 6523'		MD (Feet): / TVD (Feet):	MD (Feet): MD (Feet): MD (Feet): / TVD (Feet): TVD (Feet): TVD (Feet):
Anchor Radius (if applicable) in feet: NA			

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

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

Paperwork Reduction Act of 1995 Statement: The Paperwork Reduction Act of 1995 (44 U.S.C. 2501 et seq.) requires us to inform you that BOEM collects this information as part of an applicant's Exploration Plan or Development Operations Coordination Document submitted for BOEM approval. We use the information to facilitate our review and data entry for OCS plans. We will protect proprietary data according to the Freedom of Information Act and 30 CFR 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. Responses are mandatory (43 U.S.C. 1334). The public reporting burden for this form is included in the burden for preparing Exploration Plans and Development Operations Coordination Documents. We estimate that burden to average 600 hours with an accompanying EP, or 700 hours with an accompanying DPP or DOCD, 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, 45600 Woodland Road, Sterling, Virginia 20166.

Appendix B: Vicinity and Location Plats



	Well	UTM None 15 North NAD27 - US Survey Feet Northing(Y)	Easting(X)	GC BLK	Block Ties FEL	FSL	NAD27 Lat/Long Latitude	Longitude	NAD83 Lat/Long Latitude	Longitude		
SHL	DC227	9890436.09	2610916.89	743	2683.19	6276.02	27°13'26.546"N	90°00'48.294"W	27°13'27.542"N	90°00'48.399"W	6248'	Depth MSL
SHL	DC228	9890407.86	2610857.30	743	2742.78	6247.90	27°13'26.280"N	90°00'48.961"W	27°13'27.276"N	90°00'49.065"W	6248'	Depth MSL
SHL	DC228 Contingency	9890421.94	2610887.10	743	2712.90	6261.94	27°13'26.413"N	90°00'48.628"W	27°13'27.409"N	90°00'48.732"W	6248'	Depth MSL

Notes:
1) All data hereon based on UTM Zone 15 North, NAD27, US Survey feet, unless otherwise noted;
2) All coordinate transformations by NADCON 2.0, or better equivalent software;
3) All well SHL and BHL based upon BSEE data for AUG 2021 and BP internal data sources.

"Public Information"

BP EXPLORATION AND PRODUCTION

Proposed Well DOCD Location OCS-G15607 GC743 DC227,228 ST00BP00

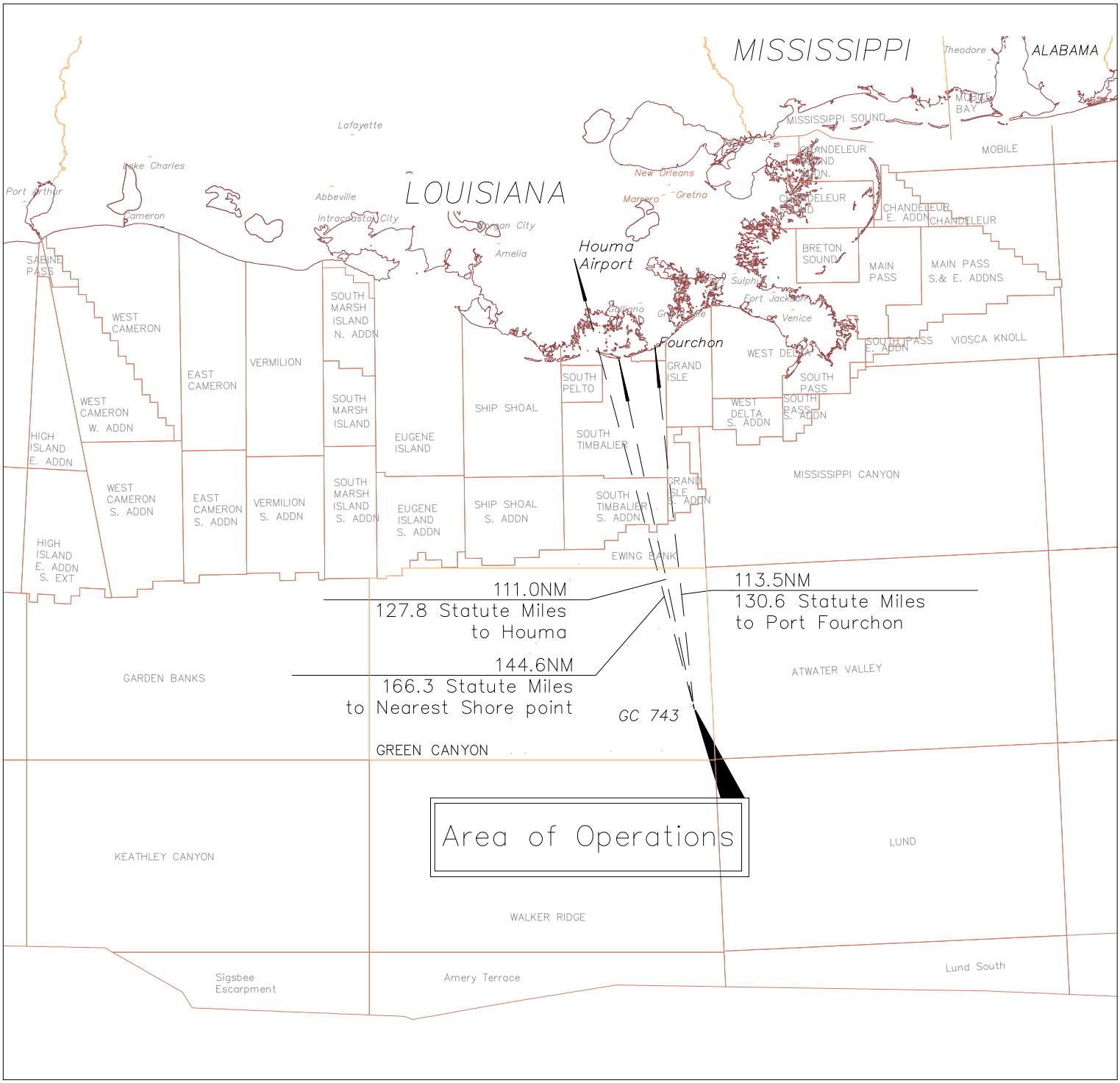
Green Canyon Area (OPD# NG15-03) Block 743 Offshore Federal

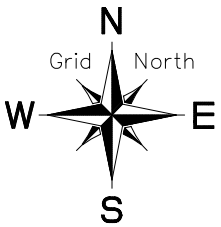
Plat prepared by: Kyle Beeson, Surveyor, bp America, Inc.

Scale 1" = 2000 ft

Date: 14 August 2021

BKB

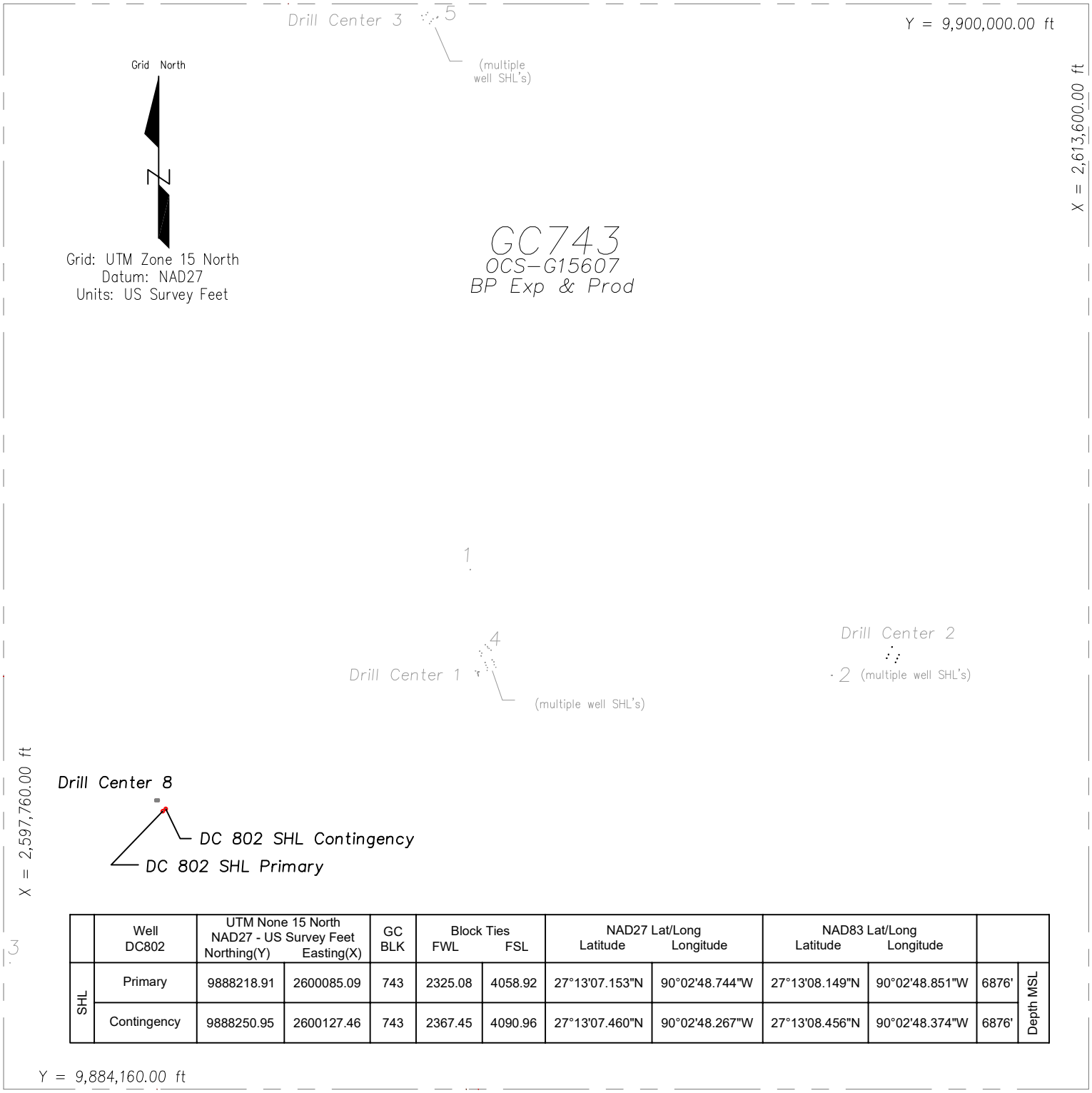




Grid: UTM Zone 15 North
Datum: NAD27
Units: US Survey Feet

"VICINITY CHART"

bp	BP EXPLORATION AND PRODUCTION	Scale 1" = 50 miles
	Proposed Well DOCD Location OCS-G15607 GC743 DC803 ST00BP00	Date: 14 Aug 2021
	Green Canyon Area (OPD# NH15-03) Block 743 Offshore Federal	
	Plat prepared by: Kyle Beeson, Surveyor, bp America, Inc	BKB



	Well DC802	UTM None 15 North NAD27 - US Survey Feet Northing(Y)	Easting(X)	GC BLK	Block Ties FWL	FSL	NAD27 Lat/Long Latitude	Longitude	NAD83 Lat/Long Latitude	Longitude		
SHL	Primary	9888218.91	2600085.09	743	2325.08	4058.92	27°13'07.153"N	90°02'48.744"W	27°13'08.149"N	90°02'48.851"W	6876'	Depth MSL
SHL	Contingency	9888250.95	2600127.46	743	2367.45	4090.96	27°13'07.460"N	90°02'48.267"W	27°13'08.456"N	90°02'48.374"W	6876'	Depth MSL

Notes:
1) All data hereon based on UTM Zone 15 North, NAD27, US Survey feet, unless otherwise noted;
2) All coordinate transformations by NADCON 2.0, or better equivalent software;
3) All well SHL and BHL based upon BSEE data for AUG 2021 and BP internal data sources.

"Public Information"

BP EXPLORATION AND PRODUCTION

Proposed Well DOCD Location OCS-G15607 GC743 DC802 ST00BP00

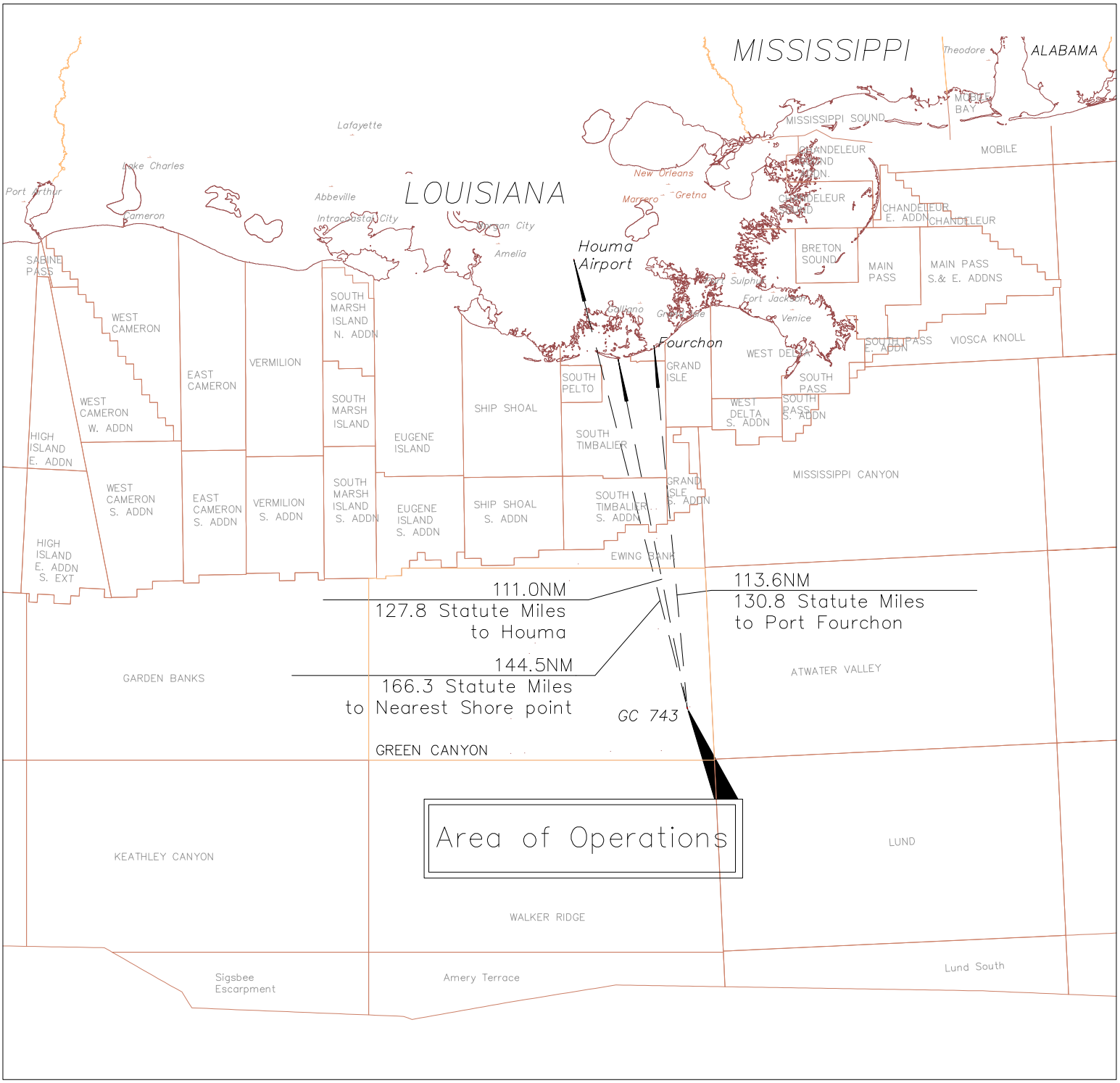
Green Canyon Area (OPD# NG15-03) Block 743 Offshore Federal

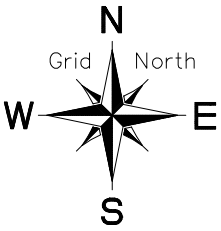
Plat prepared by: Kyle Beeson, Surveyor, bp America, Inc.

Scale 1" = 2000 ft

Date: 14 August 2021

BKB

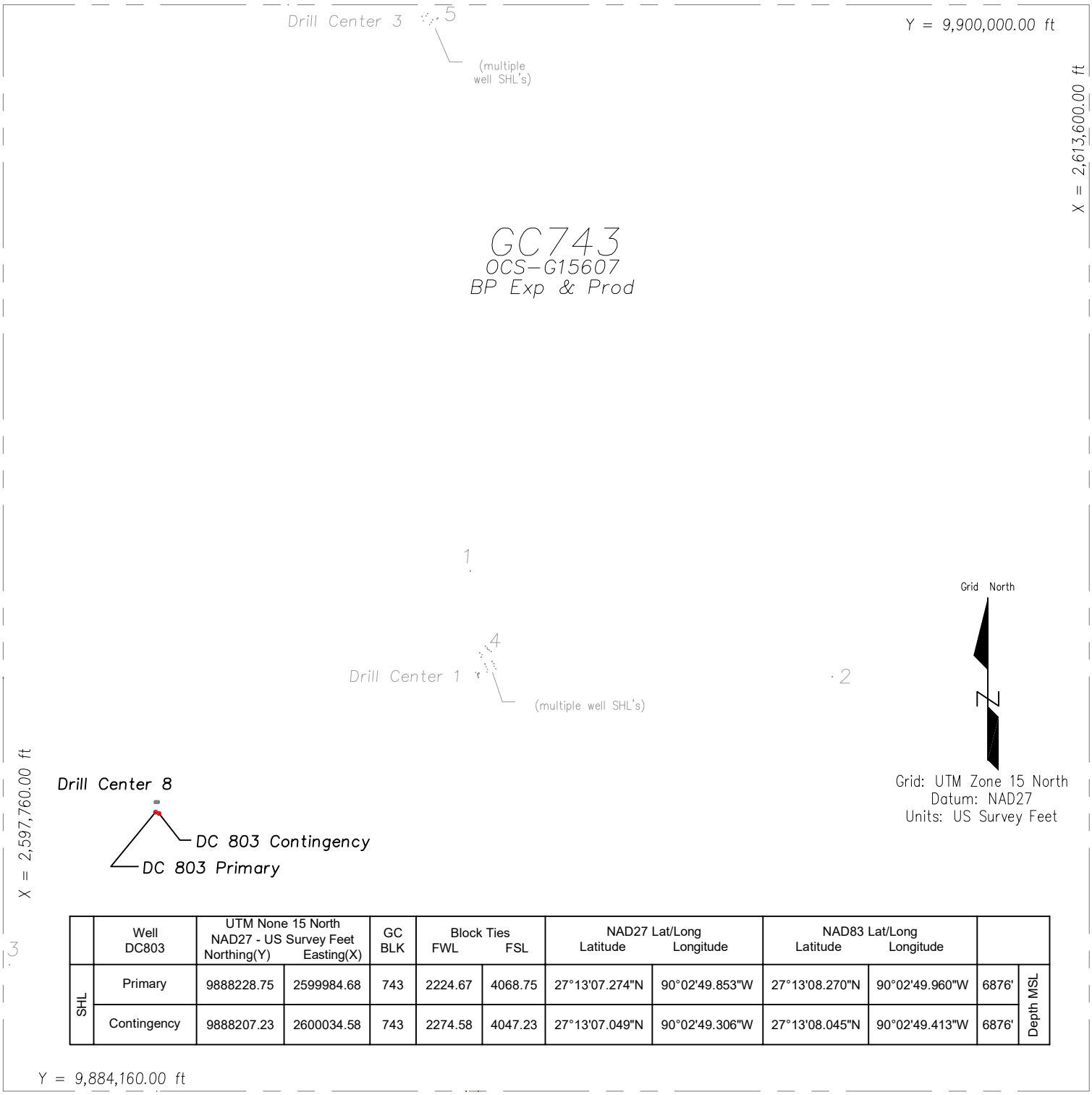




Grid: UTM Zone 15 North
Datum: NAD27
Units: US Survey Feet

"VICINITY CHART"

bp	BP EXPLORATION AND PRODUCTION	Scale 1" = 50 miles
	Proposed Well DOCD Location OCS-G15607 GC743 DC802 ST00BP00	Date: 14 Aug 2021
	Green Canyon Area (OPD# NH15-03) Block 743 Offshore Federal	
	Plat prepared by: Kyle Beeson bp Surveyor bp America Inc	



	Well DC803	UTM None 15 North NAD27 - US Survey Feet Northing(Y)	Easting(X)	GC BLK	Block Ties FWL	FSL	NAD27 Lat/Long Latitude	Longitude	NAD83 Lat/Long Latitude	Longitude		
SHL	Primary	9888228.75	2599984.68	743	2224.67	4068.75	27°13'07.274"N	90°02'49.853"W	27°13'08.270"N	90°02'49.960"W	6876'	Depth MSL
SHL	Contingency	9888207.23	2600034.58	743	2274.58	4047.23	27°13'07.049"N	90°02'49.306"W	27°13'08.045"N	90°02'49.413"W	6876'	Depth MSL

Notes:
1) All data hereon based on UTM Zone 15 North, NAD27, US Survey feet, unless otherwise noted;
2) All coordinate transformations by NADCON 2.0, or better equivalent software;
3) All well SHL and BHL based upon BSEE data for AUG 2021 and BP internal data sources.

"Public Information"

BP EXPLORATION AND PRODUCTION

Proposed Well DOCD Location OCS-G15607 GC743 DC803 ST00BP00

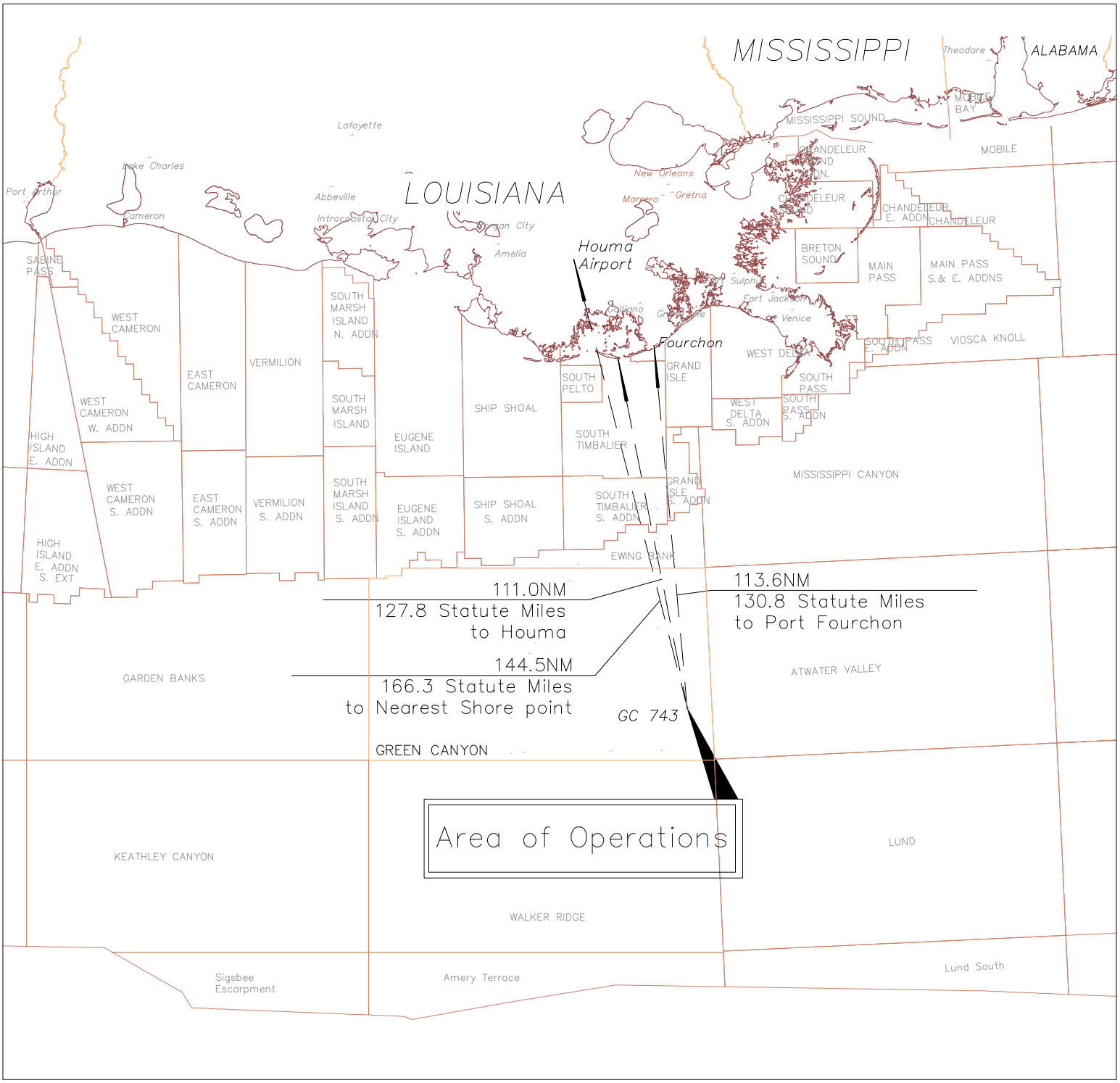
Green Canyon Area (OPD# NG15-03) Block 743 Offshore Federal

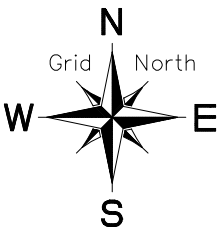
Plat prepared by: Kyle Beeson, Surveyor, bp America, Inc.

Scale 1" = 2000 ft

Date: 14 August 2021

BKB





Grid: UTM Zone 15 North
Datum: NAD27
Units: US Survey Feet

"VICINITY CHART"

bp	BP EXPLORATION AND PRODUCTION	Scale 1" = 50 miles
	Proposed Well DOCD Location OCS-G15607 GC743 DC803 ST00BP00	Date: 14 Aug 2021
	Green Canyon Area (OPD# NH15-03) Block 743 Offshore Federal	
	Plat prepared by: Kyle Beeson bp Surveyor, bp America Inc	

Appendix C: Geologic Structure Maps, Interpreted Seismic Lines, Geologic Cross-sections

Included in PROPRIETARY copy

Appendix D: Shallow Hazards Archaeological Report and Hazard Assessment

SITE CLEARANCE LETTER

PROPOSED DEVELOPMENT WELL LOCATIONS
DC227, DC228, DC228_CONTINGENCY
BLOCK 743, OCS-G-15607
GREEN CANYON AREA
ATLANTIS DC2

PROPOSED SURFACE LOCATION – DC227	
90° 0′ 48.294″ W	27° 13′ 26.546″ N
X = 2,610,916.89 ft E	Y = 9,890,436.09 ft N
Water Depth:	6516 ft below MSL
PROPOSED SURFACE LOCATION – DC228	
90° 0′ 48.961″ W	27° 13′ 26.280″ N
X = 2,610,857.30 ft E	Y = 9,890,407.86 ft N
Water Depth:	6521 ft below MSL
PROPOSED SURFACE LOCATION – DC228_Contingency (DC228_C)	
90° 0′ 48.628″ W	27° 13′ 26.413″ N
X = 2,610,887.10 ft E	Y = 9,890,421.94 ft N
Water Depth:	6519 ft below MSL

X and Y Coordinates in UTM 15N (US Survey ft)
Geodetic Datum: NAD 1927
Spheroid: Clarke 1866

PROPOSED WELL LOCATIONS DC227, DC228, DC228_CONTINGENCY

BLOCK 743, OCS-G-15607

GREEN CANYON AREA, GULF OF MEXICO, USA

Introduction

This wellsite clearance letter addresses the shallow hazards for proposed wellsites DC227, DC228 and DC228_Contingency (DC228_C) (Plate 1) at the Atlantis Drill Center 2 (DC2) in Block 743, Green Canyon, Gulf of Mexico (OCS-G-15607). BP currently plans to drill two new wells, with a third well as contingency, which will be tied back to the existing manifolds at DC2. Plate 2 shows the current subsea layout around DC2. 8 wells and topholes have been drilled at DC2 to date, and associated subsea equipment such as PLETs, manifolds, and flowlines are present.

This letter is intended to provide a review of geological and geophysical data within 985 ft (300m) of the proposed wellsites from the seafloor (approximately -6,521 ft True Vertical Depth Sub-Sea; TVDSS) to 5,345 ft below seabed (approximately -11,868 ft TVDSS). BP plans to drill the proposed development wells from a dynamically positioned vessel, therefore, an anchoring assessment is not required and wells will be vertical in the riserless section. All three planned wells are within 64 ft of each other, so DC228 will be used as the reference point for this report. Geologic conditions are expected to be similar at all three locations due to their proximity. DC228 is approximately 125 ft from the nearest manifold and 64 ft from well DC213 (Plates 2, 8 and 9).

This document supports the Supplemental Development Operations Coordination Document (SDOCD) to be submitted to the Bureau of Ocean Energy Management (BOEM) and complies with Bureau of Ocean Energy Management (BOEM) guidelines provided in Notice to Lessees (NTL) 2008-G05 (Shallow Hazards), 2009-G40 (Benthic Communities), and 2005-G07 and 2011-Joint-G01 (Archaeological Resources).

Attachments

Seafloor plates 2 - 7 are centered on the proposed well locations and are displayed at a 1 inch = 1,000 ft scale (1:12,000). A 2,000 ft radius circle, for benthic community screening, and a 985 ft radius circle, for geologic and hazard screening, around the proposed drill locations is shown on the plates. Plates (8, 9, 10) were extracted from the AUV and 3D seismic data volumes. Plate 11 is a top-hole prognosis diagram for the proposed well locations.

Geological and Geophysical Data

The following geological and geophysical data has been reviewed to assess any seafloor and subsurface geologic and manmade features and conditions that may have an adverse effect on the proposed well operations.

- The field-wide geohazards assessment report for the Atlantis field prepared by C&C Technologies, Inc. in October 2002 based on C&C-acquired 2001 AUV survey data (C&C, 2002).
- An integrated deep water geologic/geotechnical study of the Atlantis field, based on the 2001 AUV data, conventional 3D seismic data, and results of extensive soil boring, piston core, and box core sampling programs carried out in 2001 (GEMS, 2002)

- High-resolution 3D (HR3D) seismic data acquired in the area by Gardline Surveys, Inc. in 2000 and 2001 (Plates 8, 9) processed by Fugro GeoServices, Inc. in 2001. The MMS approved the use of this HR3D seismic data for shallow hazards assessment on April 16, 2008 (ref: MS5231). This data was re-processed by Fugro Seismic Imaging in 2010 which improved the quality of subsurface imaging.
- Conventional 3D seismic data was acquired by Western Geco in 2015 and re-processed by CGG in 2017 using a FWI inversion velocity model. This seismic was used for supporting the shallow hazards assessment, specifically in the deeper intervals where HR3D seismic resolution is reduced.
- Ocean Bottom Node 3D seismic data acquired in 2019 by Magseis Fairfield and processed by CGG in 2020 using a FWI velocity model. This seismic was used for supporting the shallow hazards assessment, specifically in the deeper intervals where HR3D seismic resolution is reduced. The velocity volume from this seismic was used to depth stretch the HR3D time volume to depth.
- Archaeological assessment reports based on the AUV survey data (C&C, 2010 and 2011) which cover the entire Atlantis field.
- Well reports and LWD logs for offset wells within Green Canyon Block 743, with a particular focus on the 8 existing DC2 wells which had topholes drilled at this location in 2019 and GC743#2 which was one of the early exploration and appraisal wells for the field (Located approximately 1025 ft to the West).

Shallow hazards assessments for the 8 wells previously drilled at this location (DC212-DC215 and DC221-DC224), and other wells in the Atlantis prospect, have been accepted by BOEM based on these reports and associated data sets.

SEAFLOOR CONDITIONS

Water Depth and Seafloor Gradient

Water depth, seafloor gradient and seafloor conditions are shown on Plates 1 - 6. Water depths within 985 ft of the proposed drill locations range from -6,435 to -6,600 ft and are -6,521 ft at the proposed DC228 location, -6,516 ft at the proposed DC227 location and -6,519 ft at the proposed DC228_C location. Seafloor gradients at the three proposed drill locations are 2.3 – 3.3 degrees, with erosional furrows to the West, outside the Drill Center footprint, having slopes up to 20 degrees.

Seafloor Sediment

Based on geotechnical samples, AUV geophysical interpretation, and jetting experience seafloor and near-seafloor sediments are interpreted to consist of soft to very stiff, stratified fine grained marine clays interlayered with debris flows and possible thin silt. The sediment stiffness at the seabed may be variable for first couple hundred feet below mudline due to erosion (Plate 10).

Seafloor Geologic Hazards

Small, slump evacuation zones in the Sigsbee Escarpment are present more than 2,000 ft upslope, to the North and Northwest of the proposed well locations (Plate 1). Slope stability analysis and assessment of the potential impact of slope failures and run-out were conducted for the first Atlantis drill center, DC1 (GEMS, 2002; and internally by BP geotechnical

engineers). Based on these studies, the large slump evacuation zones to the north appear generally stable with **NEGLIGIBLE** potential for future large-scale slope failures that could impact current Atlantis developments, including the existing DC2 Drill Center and the three new proposed wells at this location.

The proposed well locations are situated in an area of relatively flat and smooth seabed. This location avoids the main geomorphological features in the vicinity which are large seafloor furrows caused by erosion from bottom currents that surround the DC2 area (Plates 3, 4). Furrows are not typically present where slump deposits drape the seafloor.

Benthic Communities

A regional AUV site survey was acquired by C&C across the Atlantis Field in 2001 and followed by an infield AUV survey in 2010. The center of DC2 is about 1,750 ft southeast of the southern edge of the salt related Sigsbee Escarpment. A zone of potential gas seepage and localized authigenic carbonates was mapped along the Escarpment from the 2001 AUV data. The southern edge of the mapped zone is about 1,500 ft northwest of DC2. In 2001 BP investigated this zone, northwest of the DC2, and found several localized hard grounds and bacterial mats (Plate 3). The features are greater than 2,000 ft from DC2 and the new proposed well locations. No benthic communities were reported during top hole observation while drilling the eight top holes at DC2 in 2019. Based on this combination of data, there is a **NEGLIGIBLE** potential for high-density benthic communities to be within 2,000 ft of the proposed DC2.

Manmade Hazards

The proposed well locations are not located within a known chemical or munitions dump site and no potentially hazardous wastes or unexploded ordnance were detected in the AUV survey area.

There are no AUV sonar contacts within 985 ft of the proposed well locations (Plate 6), but drilling and installation activities have occurred since the AUV data was acquired. A pre-spud ROV survey is recommended to confirm that no manmade hazards, such as debris, are present at the drill location.

8 wells and topholes have been drilled at DC2 to date, and associated subsea equipment such as PLETs, manifolds, and flowlines are present. DC228 is approximately 125 ft from the nearest manifold and 64 ft from well DC213 (Plates 2, 8 and 9).

Archaeological Resource Survey

The study areas lie within an area designated as archeologically sensitive according to NTL No. 2005-G07 and NTL 2011-JOINT-G01. An archaeological assessment conducted using AUV survey data (C&C, 2010 and 2011) was previously submitted to the BOEM as supplementary documentation for the 2011 EP for Atlantis DC2. The assessment determined, "None of the sonar contacts are recommended for investigation or avoidance based on archaeological potential."

SUBSURFACE CONDITIONS

Stratigraphy

Plates 8, 9, 11 illustrates twelve horizons (Horizons A, A1, B, C, D, E1, F, F1, Ga, H, I, Lam Top, Lam Base) that were mapped in the DC2 area. These horizons divide the shallow subsurface

into 13 stratigraphic units (Units I through XIII). Units I though X are described in a paper presented at the 2005 Offshore Technology Conference on the prediction of shallow water flow sands at the Atlantis DC1 location (Mannaerts, et. al, 2005). Sediments in the shallow section from the seafloor through Unit X consist predominantly of thick mass transport complexes that have originated from slope failure as the Sigsbee Escarpment evolved. These mass transport complexes are interpreted to consist primarily of stacked slumps and large-scale debris flow deposits, which are generally represented by chaotic reflectors in the HR3D seismic data. However, there are also thin debris flow and turbidity current deposits forming relatively thin layers of stratified sediment. In Units XI and XII the sediments are primarily slumped turbidite deposits. Thick channel levee sands (Lam Sands) are present within Unit XIII.

Plates 8 and 9 shows gamma ray and resistivity logs, along with sand encountered for offset wells GC743-DC213 and GC743#2 on 3DHR seismic sections through the proposed well locations. Based on seismic data interpretation and offset well history, the shallow section is interpreted to consist primarily of fine-grained sediments, but interpreted silts and sands are expected to occur locally within Units II. III, IV, V, VI, VII, VIII, IX, XI, and XVII. Thick sands are expected to occur in Unit XIII (Lam sand), but the current plan is to finish open hole drilling before encountering these sands. The potential presence of these sands is the main criteria for elevated potential for shallow water flow.

Faulting

A major thrust-fault complex occurs along the base of the Sigsbee Escarpment in the Atlantis area, but is more than 1,500 ft to the North of DC2 and the three proposed well locations. Fault activity studies for the Atlantis field indicate very low levels of activity on the thrust faults in the last 20,000 years. Numerous existing wells at Atlantis DC1 and DC801 have penetrated the outer fault in the thrust fault complex, and there have been no issues to date. Shallow buried faults have been observed, but only within the first 100 ft of the mudline and the nearest are located more than 500 ft north and northwest of the DC2 location (Plate 7). No fault related issues were reported while drilling the eight topholes at DC2 in 2019. Therefore, faulting is not expected to impact the three proposed well locations.

Shallow Gas

No high amplitude anomalies interpreted to represent shallow gas will be penetrated in the top-hole section by the wellbores at the proposed well locations. Several isolated amplitude anomalies representing possible shallow gas in the top-hole section are scattered within 985 ft of the proposed wellbore and are illustrated on Plate 7. The closest amplitude anomaly indicative of possible shallow gas is located approximately 290 ft to the Southwest, within Unit VI. No bubbles or other evidence of shallow gas were observed by tophole observers while drilling the eight topholes at DC2 in 2019.

The shallow section is assessed a **NEGLIGIBLE** potential for shallow gas.

Shallow Water Flow (SWF)

SWF has been experienced at wells in the Atlantis Field, with most of the DC1 wells (approximately 6,000 ft to the West) experiencing low to moderate severity SWF. The GC743-4 appraisal well, at DC1, was lost when the 22" casing buckled on a ledge attributed to SWF excavation (Mannaerts, et al. 2005). SWF is now detected at Atlantis wells using ROV monitoring and controlled using pump and dump mud, so no additional wells have been lost.

Wells at DC2, including the three proposed well locations for this report, are expected to encounter fewer shallow sands than wells at DC1. This was confirmed during drilling of the eight topholes at DC2 in 2019. DC2 is on the eastern margin of the large mass wasting catchment area up-dip from DC1, so sands are expected to be thinner near the margins of this mass transport complex. This is supported by interpretation of 3D seismic data and drilling results from the eight DC2 topholes in 2019. No SWF was observed in these eight wells which were drilled in overbalance conditions using pump and dump mud down to approximately 10,750 ft (+-150 ft and within Unit XI or XII).

Shallow stratigraphy in the DC2 area is interpreted to consist primarily of fine-grained sediments, but interpreted silts and sands occur locally, and are more common within Units II-IV, VI, and IX. These three units are known sand-prone intervals at Atlantis DC1, where they have resulted in shallow water flows in the past (Mannaerts, et. al, 2005). Therefore, all or parts of Units II-VIII, XI, XII at the three proposed well locations, are assessed **LOW** or **MODERATE** potential for shallow water flow. These intervals are planned to be drilled in overbalance conditions, like previous wells at DC2, in order to prevent shallow water flow. The Lam sands (Unit XIII) are most significant sand interval in the shallow section and is assessed a **HIGH** potential for SWF, but these sands will be topset, like previous DC2 wells, in order to reduce the potential for SWF.

Closing

No other notable shallow hazards that could have an adverse effect on well operations were detected at the proposed well locations.

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Aug 23, 2021

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Aug 23, 2021

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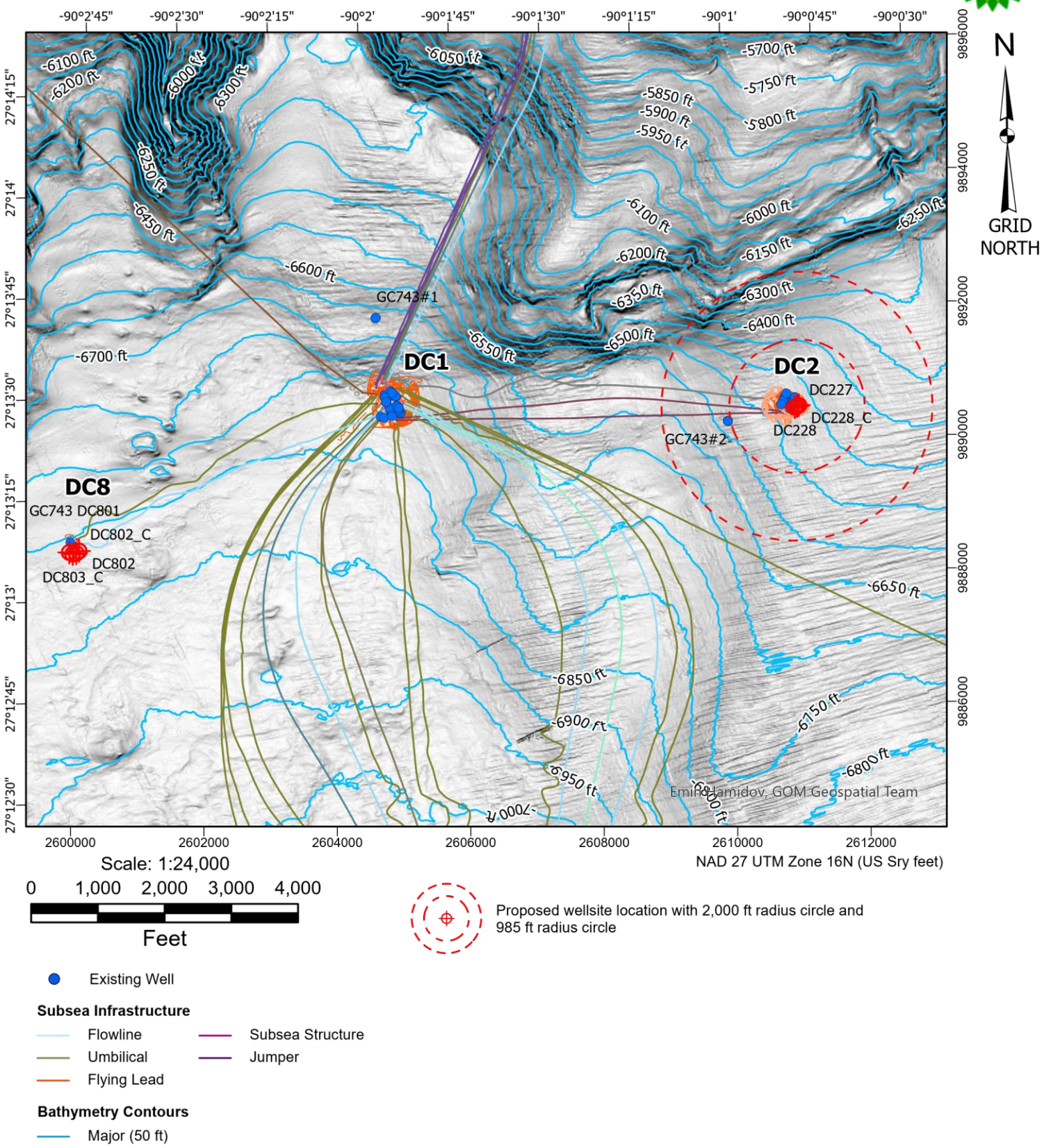
Mannaerts, H., et al., 2005, "Atlantis, the Quest for its Stray Shallow Water Flow Sands." OTC Paper 17658.

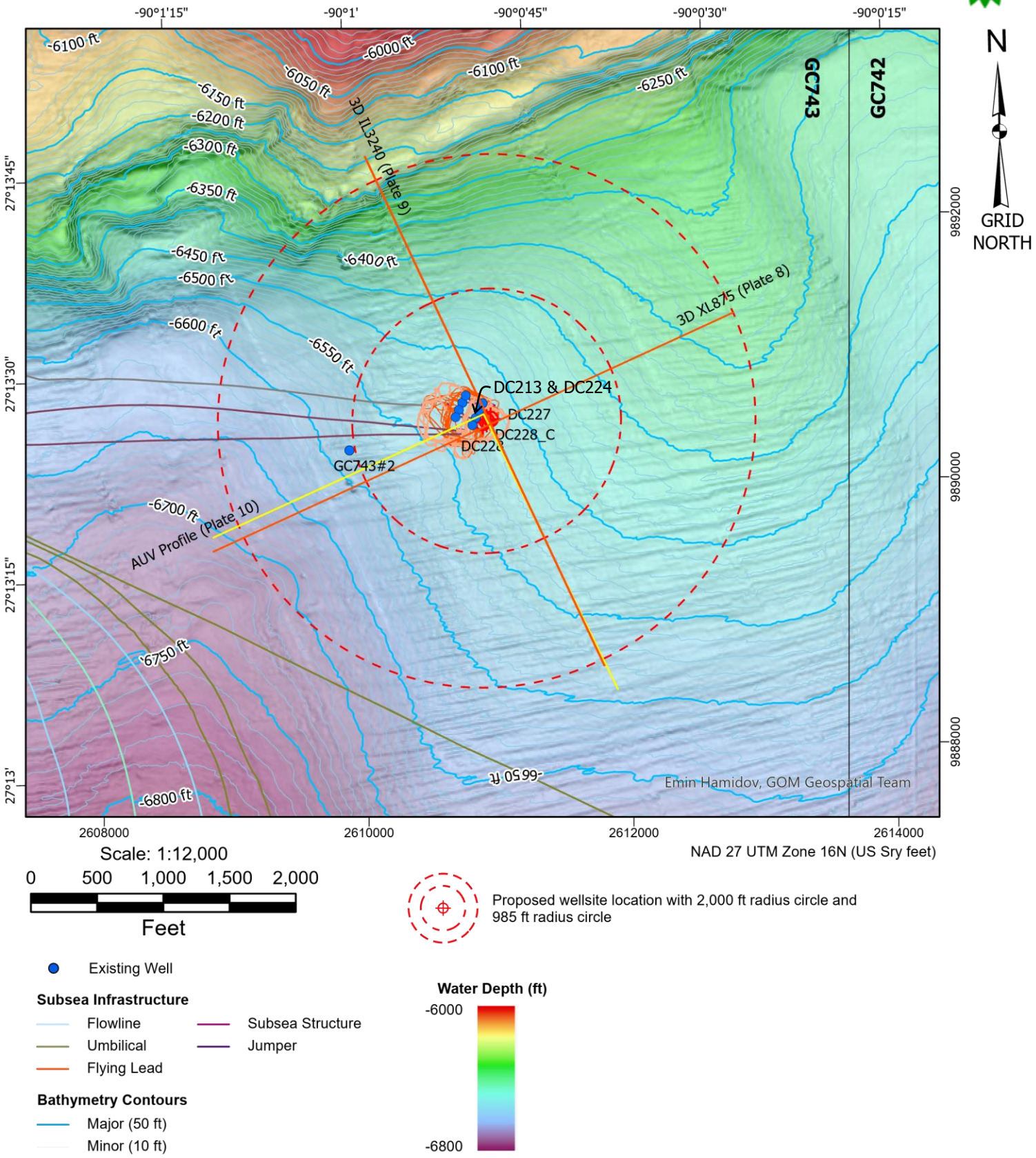
ATTACHMENTS:

Plate 1	Atlantis Field Overview in Vicinity of DC2 (Green Canyon Block 743) Overlain on Seafloor Rendering with Drill Centers, Wells and Subsea Infrastructure
Plate 2	AUV Water Depth and Seafloor Rendering with AUV and Seismic Profile Locations
Plate 3	Seafloor Features, Sonar Contacts, Geotechnical Locations, and Seafloor Rendering
Plate 4	AUV Seafloor Gradient
Plate 5	AUV Multibeam Backscatter
Plate 6	AUV Sidescan Sonar with Sonar Contacts
Plate 7	Subsurface Amplitude Anomalies and Faults
Plate 8	3DHR Seismic Cross Section XL 875 with Offset Well GC743 DC213
Plate 9	3DHR Seismic Cross Section IL 3240 with Offset Well GC743 DC213 & GC743#2
Plate 10	Closest AUV Profiler Lines to Proposed Locations with Geology Interpretation and 36" Conductor Setting Depth from Offset well GC743 DC224
Plate 11	Top-Hole Prognosis Diagram, Atlantis DC2, Block 743, Green Canyon Area, Proposed Wellsites DC227, DC228 & DC228_Contingency

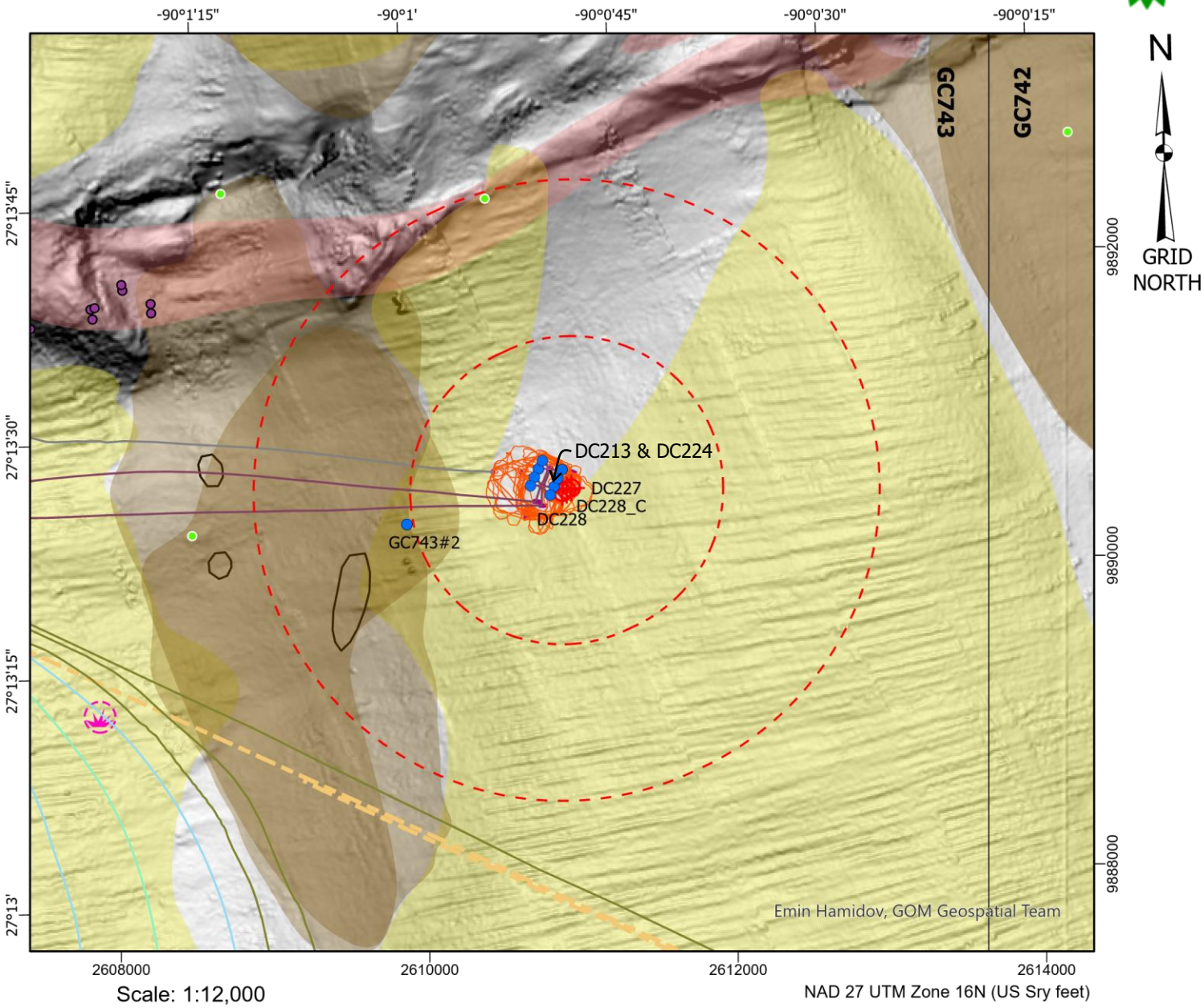
BP Western Hemisphere New Wells Solution Team
Site Clearance Letter, Proposed Development Well Locations DC227, DC228, DC228_Contingency
BLOCK 743, OCS-G-15607, Green Canyon Area, Atlantis DC2



Atlantis Field Overview in Vicinity of DC2 (Green Canyon Block 743)
Overlain on Seafloor Rendering with Drill Centers, Wells and Subsea Infrastructure



AUV Water Depth and Seafloor Rendering with AUV and Seismic Profile Locations



Scale: 1:12,000

0 500 1,000 1,500 2,000

Feet

Proposed wellsite location with 2,000 ft radius circle and 985 ft radius circle

Existing Well

Geotechnical sample location

Benthic communities (bacterial mats) verified by 2001 ROV survey

Subsea Infrastructure

Flowline

Subsea Structure

Umbilical

Jumper

Flying Lead

** Background is greyscale seafloor gradient (dip) map*

Seafloor Features

Sidescan Sonar Contact with 100ft Buffer

Anchor Chain

Mounds (Rafted Blocks)

Drag Scar

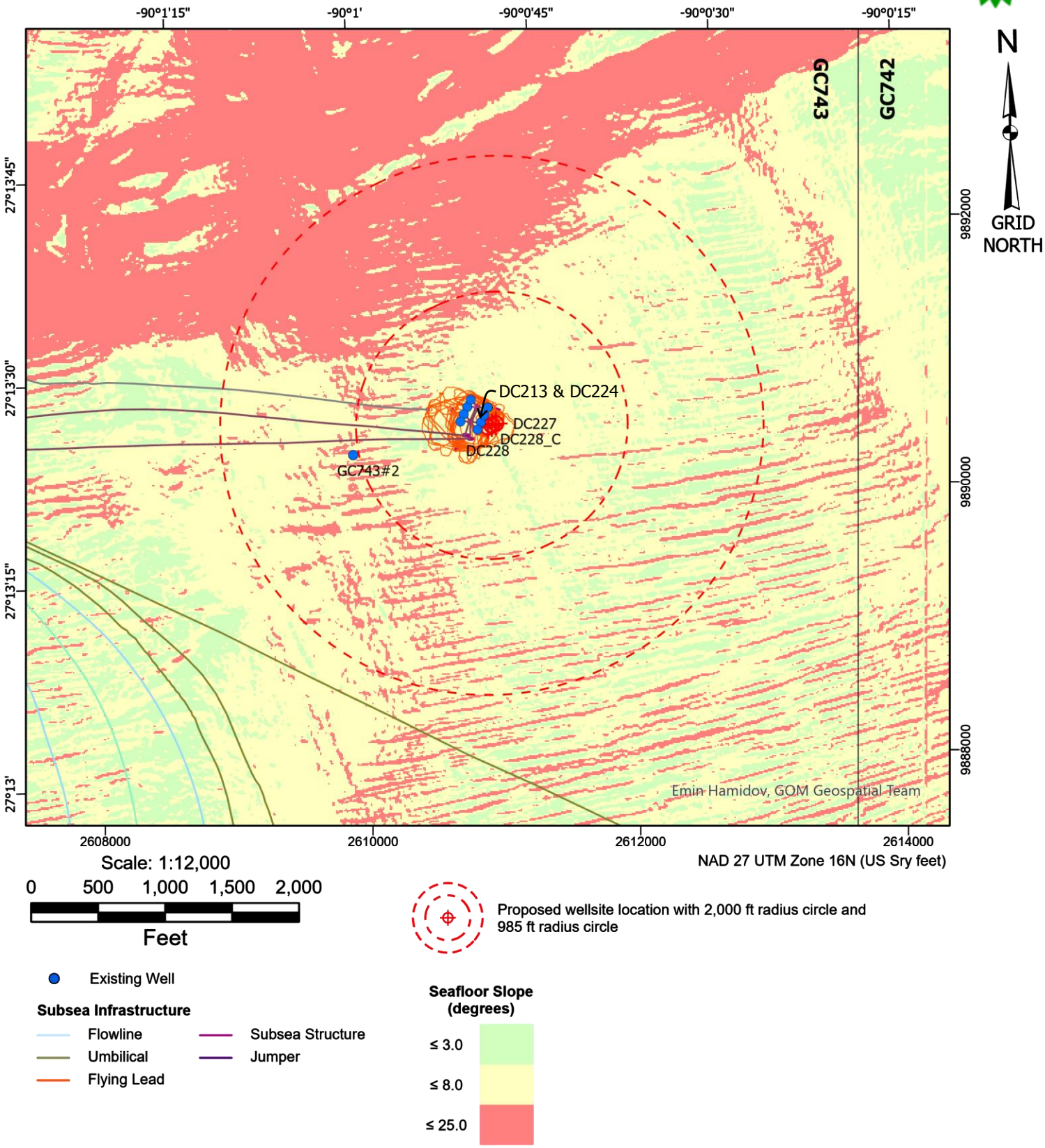
Large scale mass transport deposits exposed at seafloor by erosion

Seafloor Furrows

Acoustic Hardground

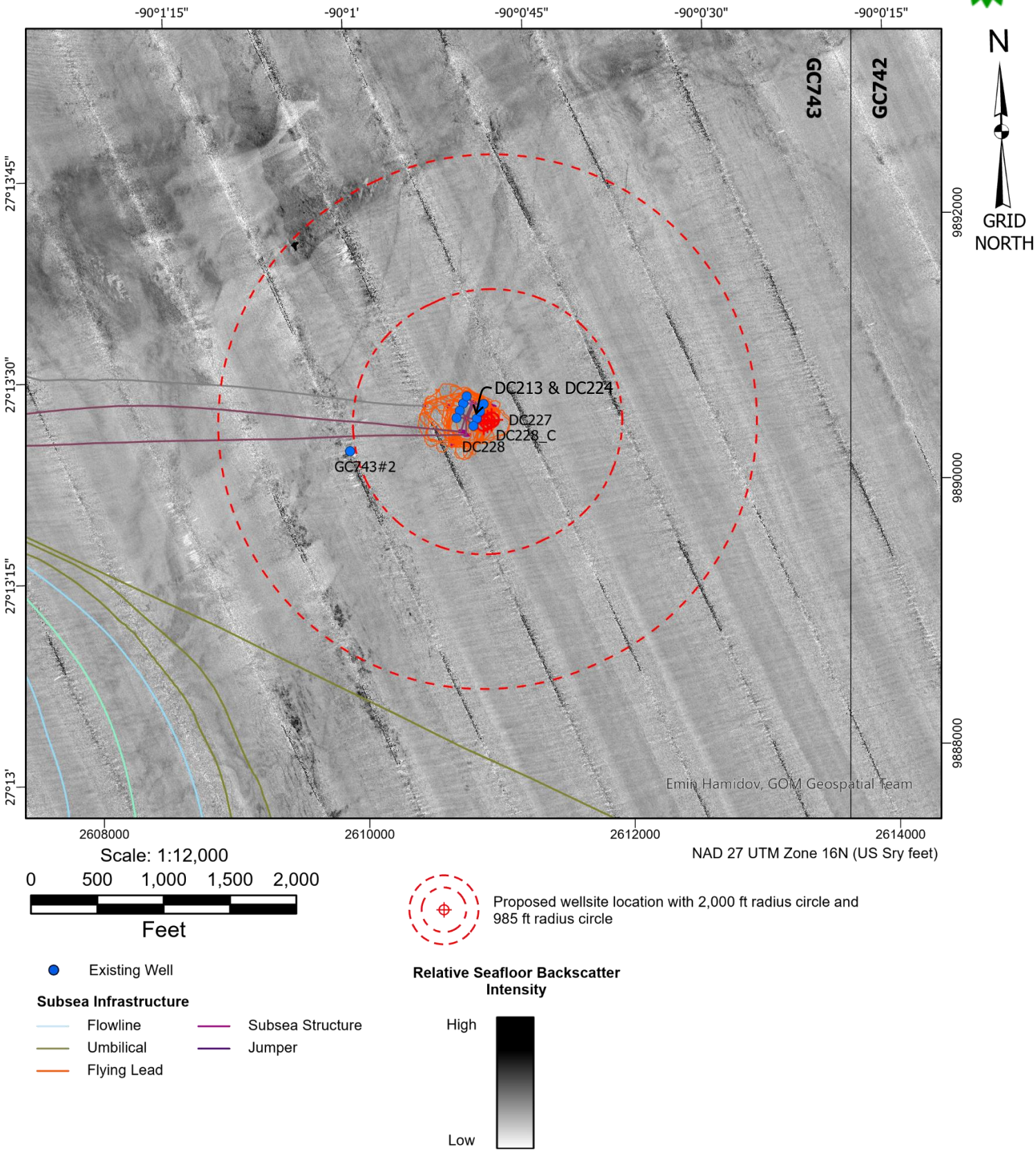
Seafloor Features, Sonar Contacts, Geotechnical Locations, and Seafloor Rendering

BP Western Hemisphere New Wells Solution Team
Site Clearance Letter, Proposed Development Well Locations DC227, DC228, DC228_Contingency
BLOCK 743, OCS-G-15607, Green Canyon Area, Atlantis DC2

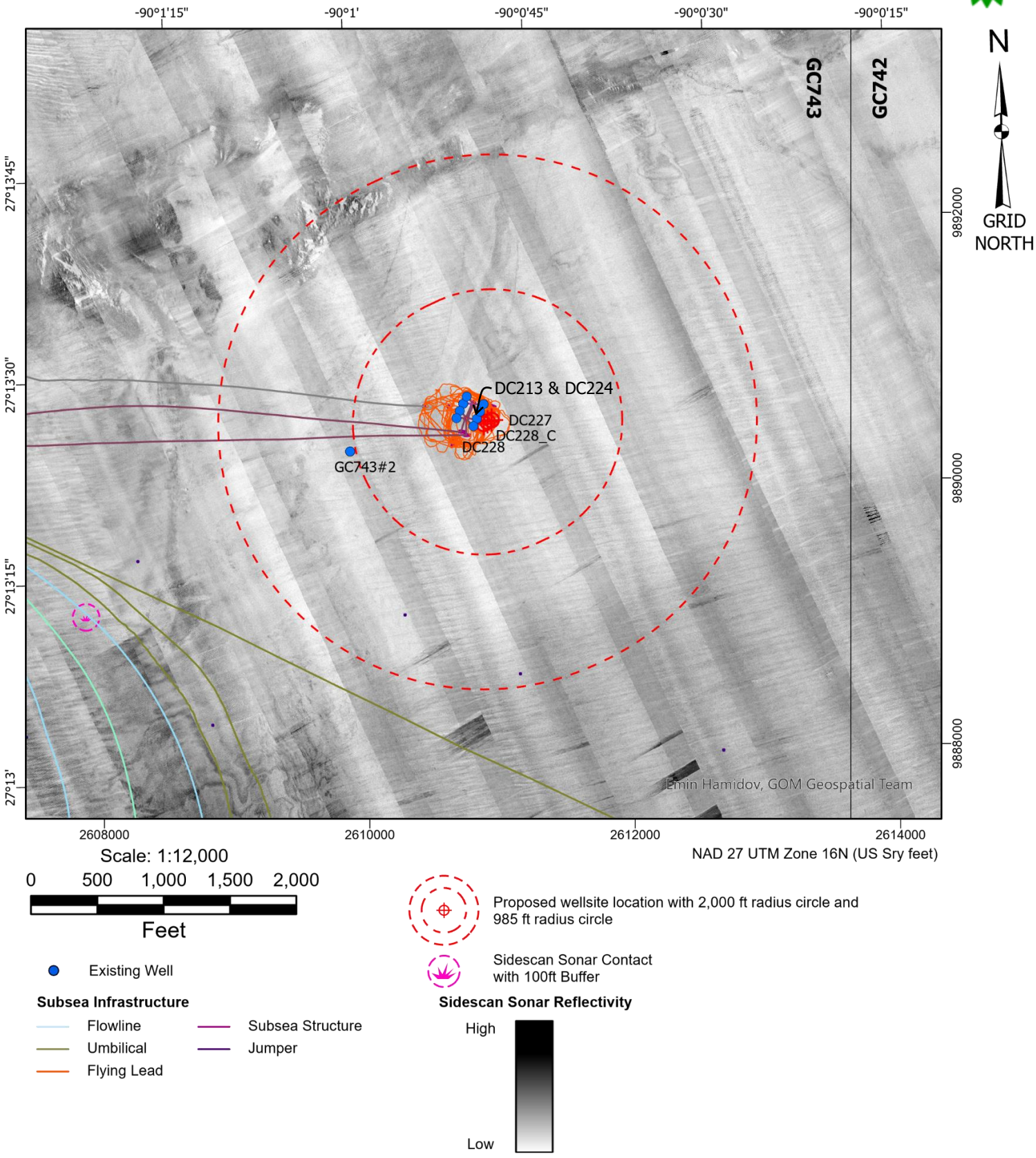


AUV Seafloor Gradient

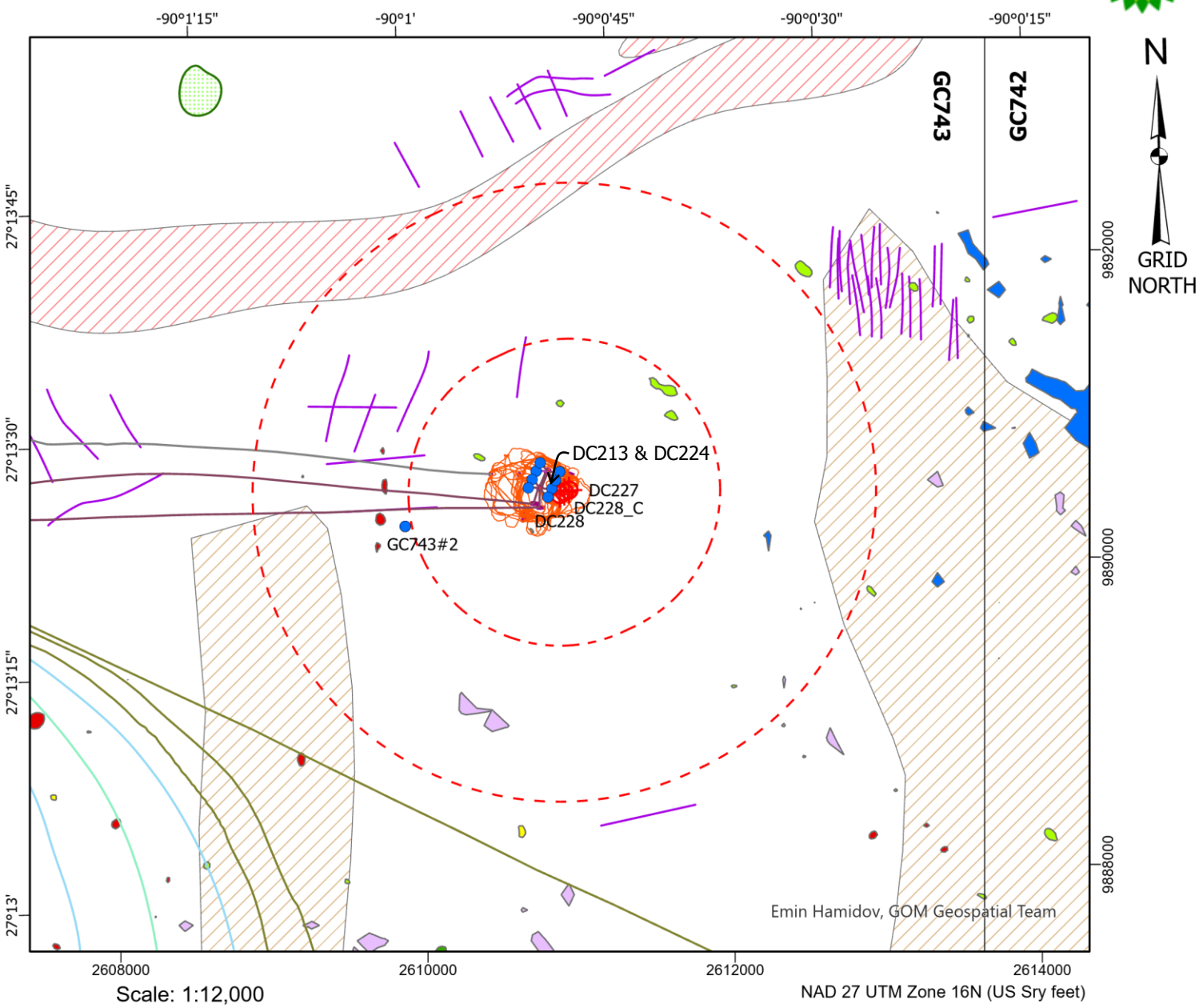
BP Western Hemisphere New Wells Solution Team
Site Clearance Letter, Proposed Development Well Locations DC227, DC228, DC228_Contingency
BLOCK 743, OCS-G-15607, Green Canyon Area, Atlantis DC2



AUV Multibeam Backscatter



AUV Sidescan Sonar with Sonar Contacts



Scale: 1:12,000

0 500 1,000 1,500 2,000

Feet

Proposed wellsite location with 2,000 ft radius circle and 985 ft radius circle

- Existing Well
- Subsurface Faults (AUV)
- Shallow Gas (AUV)
- Debris Flow / MTD
- Acoustic Hardground

Subsea Infrastructure

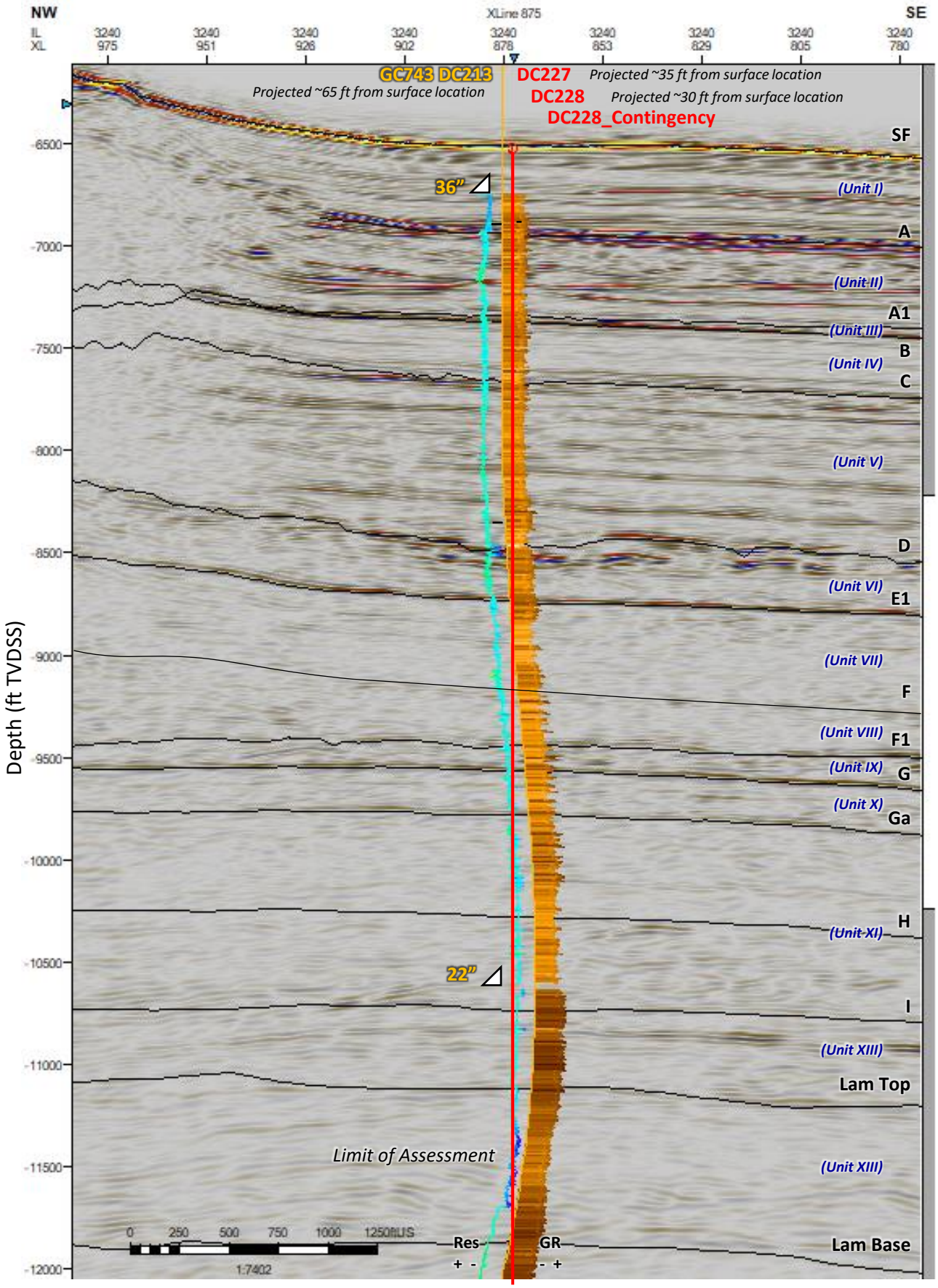
- Flowline
- Umbilical
- Flying Lead
- Subsea Structure
- Jumper

HIGH AMPLITUDE ANOMALIES

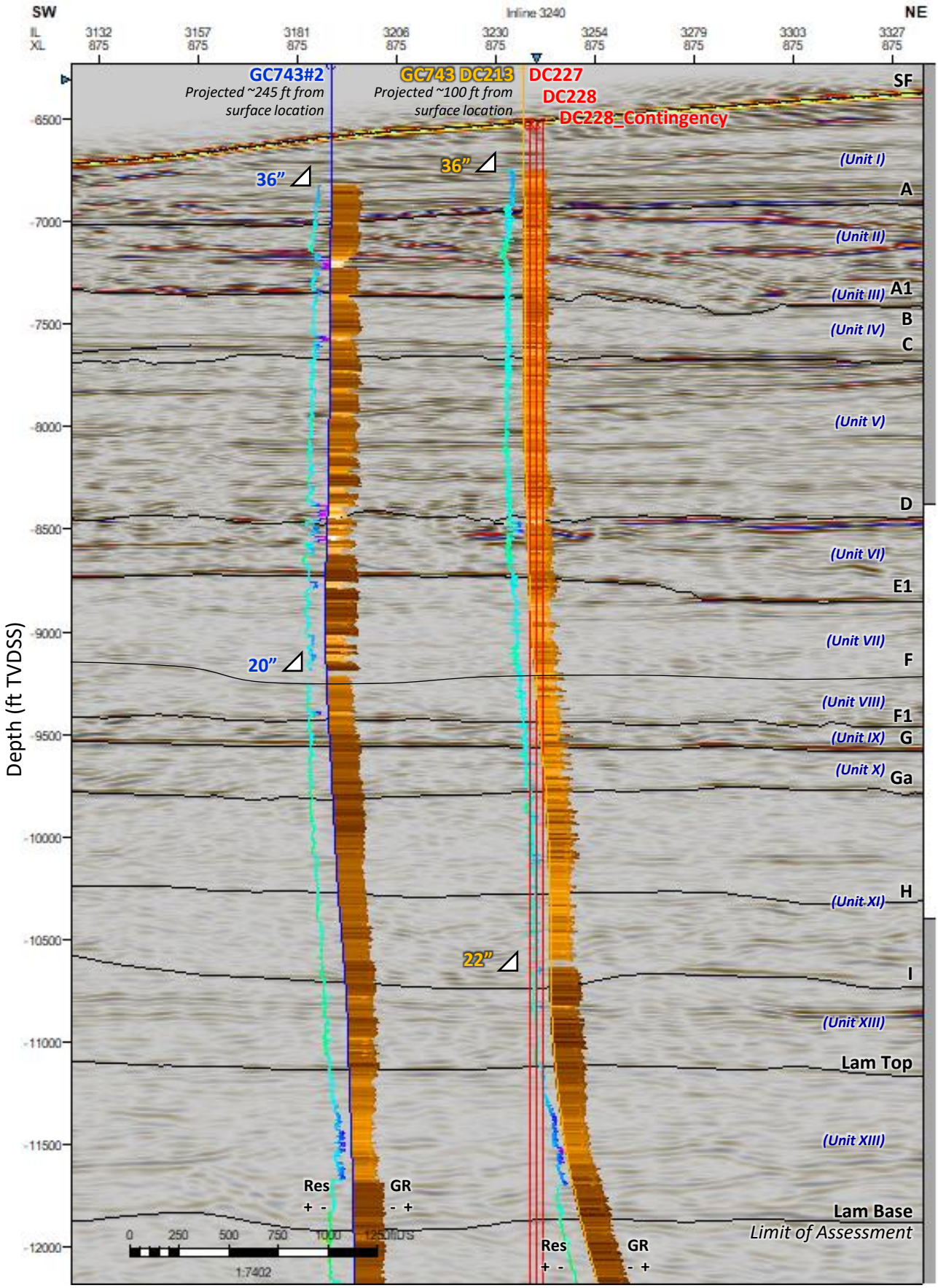
- Hrz A1 - B (Unit III)
- Hrz B - C (Unit IV)
- Hrz C - D (Unit V)
- Hrz D - E1 (Unit VI)
- Hrz E1 - F1 (Units VII & VIII)
- Hrz F1 - Ga (Unit IX
- Hrz Ga - H (Unit X)
- Hrz H - I (Unit XI)
- Hrz I - Lam Top (Unit XII)
- Hrz Lam Top - Lam Base (Unit XIII)

** No anomalies shown for Units I & II from 3DHR*

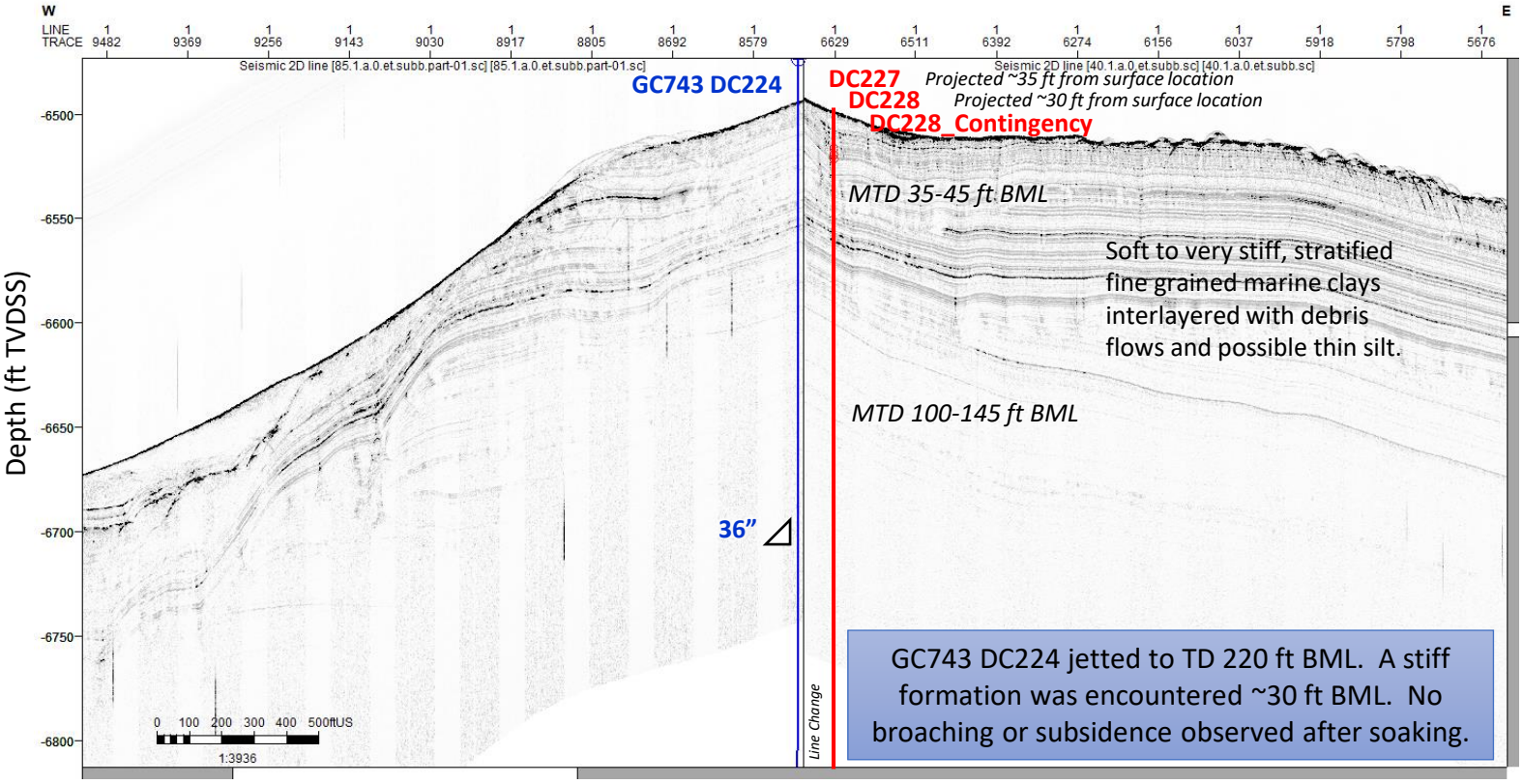
Subsurface Amplitude Anomalies and Faults



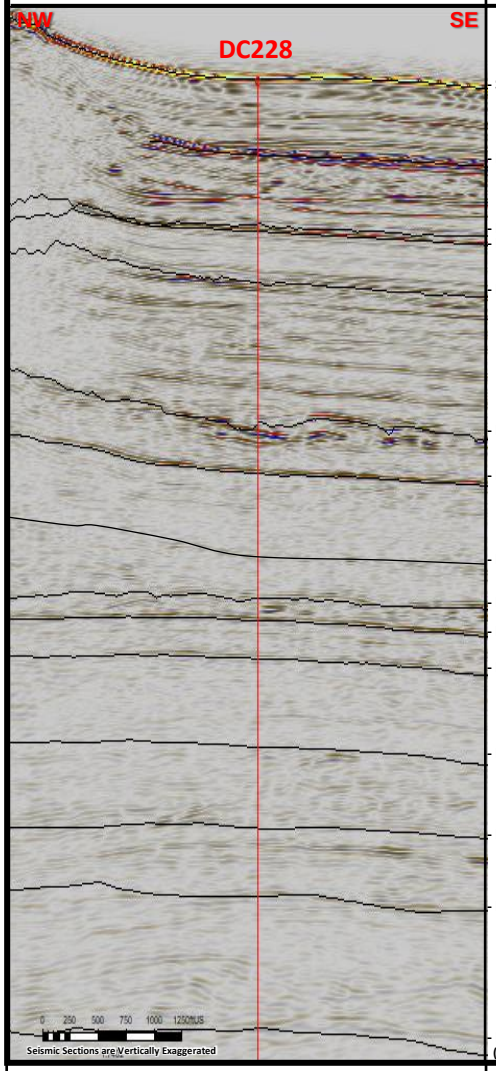
3DHR Seismic Cross Section XL 875 with Offset Well GC743 DC213



3DHR Seismic Cross Section IL 3240 with Offset Well GC743 DC213 & GC743#2



Closest AUV Profiler Lines to Proposed Locations with Geology Interpretation and 36" Conductor Setting Depth from Offset well GC743 DC224



3D Seismic InLine 3240	Horizon & Unit	Lithology & Top-hole Conditions	DEPTHS BML (Feet)	DEPTHS TVDSS (Feet)	THICKNESS (Feet)	SHALLOW GAS POTENTIAL	SHALLOW WATER FLOW POTENTIAL
		Seafloor slopes ~3° to Southwest					
	Seafloor		0	-6521			
	(Unit I)	*Very soft to stiff clays in first few feet with hemipelagic drape and onset of well-laminated clays and silty clays. Mass transport deposits. Predominantly stiff clays with local silt inclusions.*			423		
	Hrz A		423	-6944			
	(Unit II)	*Alternating debris flows and channelized turbidites. Clay / silts.*			391		
		Channelized deposits of clays, silts, and potentially sand					
	Hrz A1		814	-7335			
	(Unit III)	*Slumped turbidite sand*			39		
	Hrz B		853	-7374			
	(Unit IV)	*Alternating mass transport deposits and channelized turbidites, Clay, silt and thin patches of sand possible.*			301		
	Hrz C		1154	-7675			
	(Unit V)	*Slumped turbidites and debris flow*			775		
		Predominantly clay and silts					
		Channelized deposit of clay, silts, and potentially sand					
	Hrz D		1929	-8450			
	(Unit VI)	*Mass transport deposits and slumped turbidites. Clay, silt and thin sand inclusions.*			285		
	Hrz E1		*2214*	-8735			
	(Unit VII)	*Slumped and channelized turbidites. Mass transport deposits. Clay, and silts, possibly sand.*			475		
	Hrz F		2689	-9210			
	(Unit VIII)	*Mass transport deposits and slumped turbidites. Clay, silt, and thin patches of sand possible.*			233		
	Hrz F1		2922	-9443			
	(Unit IX)	*Channelized debris flow*			125		
	Hrz G		3047	-9568			
	(Unit X)	*Mass transport deposits alternating with stratified hemiplegic deposits. Clay and silty clay*			214		
	Hrz Ga		3261	-9782			
	(Unit XI)	*Slumped turbidites. Clay and silty clay*			955		
	Hrz H						
		Slumped turbidites. Clay and clayey silts. Isolated sands possible.					
	Hrz I		4216	-10737			
	(Unit XII)	*Slumped turbidites. Clay and clayey silts, thins stringers of sand and silts.*			384		
	Lam Top		4600	-11121			
	(Unit XIII)	*Stratified hemipelagic deposits alternating with slumped turbidite deposits. Clay and silts. Sand resistivity response observed in DC2 wells across approximately 400 ft channel levee interval.*			747		
	Lam Base (Limit of Assessment)		5347	-11868			

Proposed **DC228** Location X = 2,610,857.303 ft; Y = 9,890,407.859 ft
DC227 wellsite 66 ft to NE, **DC228_Contingency** wellsite 33 ft to NE
UTM Zone 15N (US ft) Geodetic Datum: NAD 1927

BML = Below Mudline
TVDSS = True Vertical Depth Subsea

Unit and horizon names modified slightly from pervious Site Clearance letter for Atlantis DC2 to maintain consistency with DC8 Site Clearance Letter

Water depths were derived from the AUV multibeam bathymetry. Sub-seabed depths based on 3D depth seismic and associated velocity model.

Potential Scale	Negligible	Low	Moderate	High

Top-Hole Prognosis Diagram
Atlantis DC2, Block 743, Green Canyon Area
Proposed Wellsites DC227, DC228, D228_Contingency

SITE CLEARANCE LETTER

PROPOSED DEVELOPMENT WELL LOCATIONS
DC802, DC802_CONTINGENCY, DC803, DC803_CONTINGENCY
BLOCK 743, OCS-G-15607
GREEN CANYON AREA
ATLANTIS DC8

PROPOSED SURFACE LOCATION – DC802	
90° 02′ 48.744″ W	27° 13′ 07.153″ N
X = 2,600,085.09 ft E	Y = 9,888,218.91 ft N
Water Depth:	6862 ft below MSL
PROPOSED SURFACE LOCATION – DC803	
90° 02′ 49.853″ W	27° 13′ 07.274″ N
X = 2,599,984.68 ft E	Y = 9,888,228.75 ft N
Water Depth:	6859 ft below MSL
PROPOSED SURFACE LOCATION – DC802_Contingency	
90° 02′ 48.267″ W	27° 13′ 07.460″ N
X = 2,600,127.46 ft E	Y = 9,888,250.95 ft N
Water Depth:	6860 ft below MSL
PROPOSED SURFACE LOCATION – DC803_Contingency	
90° 02′ 49.306″ W	27° 13′ 07.049″ N
X = 2,600,034.58ft E	Y = 9,888,207.23 ft N
Water Depth:	6861 ft below MSL

X and Y Coordinates in UTM 15N (US Survey ft)
Geodetic Datum: NAD 1927
Spheroid: Clarke 1866

PROPOSED WELL LOCATIONS DC802, DC802_CONTINGENCY, DC803, DC803_CONTINGENCY

BLOCK 743, OCS-G-15607

GREEN CANYON AREA, GULF OF MEXICO, USA

Introduction

This wellsite clearance letter addresses the shallow hazards for proposed wellsites DC802, DC802_Contingency (DC802_C), DC803, D803_Contingecy (DC803_C) (Plate 1) at the Atlantis Drill Center 8 (DC8) in Block 743, Green Canyon, Gulf of Mexico (OCS-G-15607). BP currently plans to drill two new wells, with two respud locations (Contingency locations), which will be tied back to the existing manifold at DC8. Plate 2 shows the current subsea layout around DC8. One active water injection well, GC743-DC801, and a subsea manifold are already present at this location.

This letter is intended to provide a review of geological and geophysical data within 985 ft (300m) of the proposed wellsites from the seafloor (approximately -6,862 ft True Vertical Depth Sub-Sea; TVDSS) to 5,192 ft below seabed (approximately -12,054 ft TVDSS). BP plans to drill the proposed development wells from a dynamically positioned vessel, therefore, an anchoring assessment is not required. Both planned wells are approximately 100 ft from the existing manifold. Proposed wells DC802_Contingency and DC803_Contingency are currently planned as alternate surface locations (re-spud location) for proposed wells DC802 and DC803 respectively. The three other locations are within 100 ft of DC802 (Plate 2), so geologic conditions are expected to be similar at all four locations and therefore only one Top-Hole Prognosis Diagram for DC802 (Plate 11) has been produced.

This document supports the Supplemental Development Operations Coordination Document (SDOCD) to be submitted to the Bureau of Ocean Energy Management (BOEM) and complies with Bureau of Ocean Energy Management (BOEM) guidelines provided in Notice to Lessees (NTL) 2008-G05 (Shallow Hazards), 2009-G40 (Benthic Communities), and 2005-G07 and 2011-Joint-G01 (Archaeological Resources).

Attachments

Seafloor plates 2 - 7 are centered on the drill center manifold which sits in the middle of the proposed well locations and are displayed at a 1 inch = 1,000 ft scale (1:12,000). A 2,000 ft radius circle, for benthic community screening, and a 985 ft radius circle, for geologic and hazard screening, around the proposed drill locations is shown on the plates. Plates 8, 9 and 10 were extracted from the AUV and 3D seismic data volumes. Plate 11 is a top-hole prognosis diagram for the proposed well locations.

Geological and Geophysical Data

The following geological and geophysical data has been reviewed to assess any seafloor and subsurface geologic and manmade features and conditions that may have an adverse effect on the proposed well operations.

- The field-wide geohazards assessment report for the Atlantis field prepared by C&C Technologies, Inc. in October 2002 based on C&C-acquired 2001 AUV survey data (C&C, 2002).

- An integrated deep water geologic/geotechnical study of the Atlantis field, based on the 2001 AUV data, conventional 3D seismic data, and results of extensive soil boring, piston core, and box core sampling programs carried out in 2001 (GEMS, 2002)
- High-resolution 3D (HR3D) seismic data acquired in the area by Gardline Surveys, Inc. in 2000 and 2001 (Plates 8, 9) processed by Fugro GeoServices, Inc. in 2001. The MMS approved the use of this HR3D seismic data for shallow hazards assessment on April 16, 2008 (ref: MS5231). This data was re-processed by Fugro Seismic Imaging in 2010 which improved the quality of subsurface imaging.
- Conventional 3D seismic data acquired by Western Geco in 2015 and re-processed by CGG in 2017 using a FWI inversion velocity model. This seismic was used for supporting the shallow hazards assessment, specifically in the deeper intervals where HR3D seismic resolution is reduced.
- Ocean Bottom Node 3D seismic data acquired in 2019 by Magseis Fairfield and processed by CGG in 2020 using a FWI velocity model. This seismic was used for supporting the shallow hazards assessment, specifically in the deeper intervals where HR3D seismic resolution is reduced. The velocity volume from this seismic was used to depth stretch the HR3D time volume to depth.
- Archaeological assessment reports based on the AUV survey data (C&C, 2010 and 2011) which cover the entire Atlantis field.
- Well reports and LWD logs for offset wells within Green Canyon Block 743, with a particular focus on well GC743-DC801 which was drilled at this location in 2015.

Shallow hazards assessments for the GC743-DC801 well at this location, and other wells in the Atlantis prospect, have been accepted by BOEM based on these reports and associated data sets.

SEAFLOOR CONDITIONS

Water Depth and Seafloor Gradient

Water depth, seafloor gradient and seafloor conditions are shown on Plates 1 - 6. Water depths within 985 ft of the proposed drill locations range from -6,810 to -6,900 ft and are -6,862 ft at the proposed DC802 location, -6860 ft at the proposed DC802_Contingency location, -6,859 ft at the proposed DC803 location, and -6861 ft at the proposed DC803_Contingency location. Seafloor gradients within 985 ft of the proposed drill locations are generally less than 6.0 degrees with some isolated features, such as mounds, having slopes up to 15 degrees. Linear AUV acquisition artifacts, oriented NNW – SSE, are present that cause higher than actual seafloor gradients. Seafloor gradients at the proposed locations are 2.1 – 3.2 degrees.

Seafloor Sediment

Based on geotechnical samples, AUV geophysical interpretation, and jetting experience seabed sediments surrounding the proposed drill locations are expected to be predominantly very soft to soft hemipelagic clays and thin clayey turbidites and debris flow deposits. Soft to very stiff clays with local silt inclusions (In mass transport deposit) are present deeper in the conductor interval (Plate 10).

Seafloor Geologic Hazards

A large slump evacuation zone in the Sigsbee Escarpment is present more than 3,000 ft upslope, to the north of the proposed well locations (Plate 1). Slope stability analysis and assessment of the potential impact of slope failures and run-out were conducted for the first Atlantis drill center, DC1 (GEMS, 2002; and internally by BP geotechnical engineers). Based on these studies, the large slump evacuation zones to the north appear generally stable with **NEGLIGIBLE** potential for future large-scale slope failures that could impact current Atlantis developments, including the existing GC743-DC801 well and the two new proposed wells at this location.

The proposed well locations are situated in an area of relatively flat and smooth seabed. This location avoids the main geomorphological features in the vicinity which are large seafloor mounds that are rafted blocks from mass transport deposits from the slump evacuation zone to the north. The closest of these blocks is approximately 715 ft to the east (Plate 3). The mounds tend to exhibit high levels of acoustic backscatter in AUV multibeam backscatter and sidescan sonar data, indicating they consist of relatively harder substrate (over-consolidated clays) than the surrounding seabed (Plates 5, 6).

Benthic Communities

Some smaller mounds interpreted as authigenic carbonate, based on AUV data, were identified in the area to the south of DC3 and east of DC1 in the greater Atlantis field. The most conspicuous of these authigenic carbonate mounds were investigated during a 2001 video ROV survey and the results were summarized in the DC801 Site Clearance Letter that was previously provided to BOEM. The identified benthic communities were more than 6,000 ft from current proposed well locations. The seafloor mounds that occur to the east of the proposed well locations are interpreted as rafted blocks of stiff clay, and not authigenic carbonate. There is no evidence of seafloor seepage in or around the rafted blocks that could support chemosynthetic communities, and it is unlikely the stiff clays comprising the blocks would host deep-water corals (and no corals were observed on the more favorable authigenic carbonate mounds investigated by ROV). Therefore, these clay mounds are interpreted to have **NEGLIGIBLE** potential for hosting high-density deep-water benthic communities. Based on interpretation of AUV data there are no other seafloor features within 2,000 ft that are likely candidates to host benthic communities, therefore there is a **NEGLIGIBLE** potential for high-density benthic community habitats within 2,000 ft of the proposed well locations.

Manmade Hazards

The proposed well and pipeline / umbilical route are not located within a known chemical or munitions dump site and no potentially hazardous wastes or unexploded ordnance were detected in the AUV survey area.

There are no AUV sonar contacts within 985 ft of the proposed well locations (Plate 6) but drilling and installation activities have occurred since the AUV data was acquired. A pre-spud ROV survey is recommended to confirm that no manmade hazards, such as debris, are present at the drill location.

One active water injection well and associated water injection subsea infrastructure are present within 985ft of the proposed well locations (Plate 2). The GC743-DC801 well is located 180 ft to the NNW, the water injection manifold is located 75 ft to the NNW, and the umbilical termination assembly is located 200 ft to the North of DC802. Associated flowlines, umbilicals and jumpers link these three subsea installations.

Archaeological Resource Survey

The study areas lie within an area designated as archeologically sensitive according to NTL No. 2005-G07 and NTL 2011-JOINT-G01. An archaeological assessment conducted using AUV survey data (C&C, 2010 and 2011) was previously submitted to the BOEM as supplementary documentation for the 2011 EP for Atlantis DC2. The assessment determined, "None of the sonar contacts are recommended for investigation or avoidance based on archaeological potential."

SUBSURFACE CONDITIONS

Stratigraphy

Plates 8, 9, 11 illustrates twelve horizons (Horizons A, A1, B, C, D, E1, F, F1, Ga, H, I, Lam Top, Lam Base) that were mapped in the DC801 area. These horizons divide the shallow subsurface into 13 stratigraphic units (Units I through XIII). Units I through X are described in a paper presented at the 2005 Offshore Technology Conference on the prediction of shallow water flow sands at the Atlantis DC1 location (Mannaerts, et. al, 2005). Sediments in the shallow section from the seafloor through Unit X consist predominantly of thick mass transport complexes that have originated from slope failure as the Sigsbee Escarpment evolved. These mass transport complexes are interpreted to consist primarily of stacked slumps and large-scale debris flow deposits, which are generally represented by chaotic reflectors in the HR3D seismic data. However, there are also thin debris flow and turbidity current deposits forming relatively thin layers of stratified sediment. In Units XI and XII the sediments are stratified hemipelagic deposits alternating with slumped turbidite deposits. Thick channel levee sands (Lam Sands) are present within Unit XIII.

Plates 8 and 9 show gamma ray and resistivity logs, along with sand encountered for offset well GC743-DC801 on 3DHR seismic sections through the proposed well locations. Based on seismic data interpretation and offset well history, the shallow section is interpreted to consist primarily of fine-grained sediments, but interpreted silts and sands are expected to occur locally within Units III, VI, IX, X, and VII. Thick sands are expected to occur in Unit XIII (Lam sand), but the current plan is to finish open hole drilling before encountering these sands.

Fault Penetrations

A thrust-fault complex occurs along the base of the Sigsbee Escarpment in the Atlantis area. The GC743-DC801 well penetrated this fault at approximately 1,248 ft below the sea floor and experienced no drilling issues. Offset on this fault where it intersects the proposed DC802 well location, at approximately -8,097 ft TVDSS, is approximately 25 ft. The thrust fault is buried within Unit I and does not show indications of recent activity in the AUV data or HR3D seismic data. This is further supported by fault activity studies for the Atlantis field which indicate very low levels of activity on the thrust faults in the last 20,000 years. Numerous wells at Atlantis DC1 have penetrated the outer fault in the thrust fault complex, and there have been no drilling issues to date.

Shallow Gas

No high amplitude anomalies interpreted to represent shallow gas will be penetrated in the top-hole section by the wellbores at the proposed wellsites. Several isolated amplitude anomalies representing possible shallow gas in the top-hole section are scattered within 985 ft of the proposed wellbore and are illustrated on Plate 7. The closest amplitude anomalies indicative of possible shallow gas are located approximately 250 ft to the Southwest of DC802,

within Unit VI, and approximately 310 ft to the West, in Unit III. No bubbles or other evidence of shallow gas were observed while drilling the closest offset well, GC743-DC801.

The shallow section is assessed a **NEGLIGIBLE** potential for shallow gas.

Shallow Water Flow (SWF)

SWF has been experienced at wells in the Atlantis Field, with most of the DC1 wells (approximately 5,000 ft to the east) experiencing low to moderate severity SWF. The GC743-4 appraisal well, at DC1, was lost when the 22" casing buckled on a ledge attributed to SWF excavation (Mannaerts, et al. 2005). SWF is now detected at Atlantis wells using ROV monitoring and controlled using pump and dump mud, so no additional wells have been lost.

Wells at DC8, including the proposed well locations for this report, are expected to encounter fewer shallow sands than wells at DC1. DC8 is on the western margin of the large mass wasting catchment area up-dip from DC1 so sands are expected to be thinner near the margins of this mass transport complex. This is supported by interpretation of 3D seismic data and drilling results from well GC743-DC801. No SWF was observed in the GC743-DC801 well shallow section which was drilled in overbalance conditions using pump and dump mud down to 10,004 ft (Unit X).

The proposed wells are expected to encounter predominantly fine-grained sediments and any encountered sands are expected to be thin and patchy (Similar to well DC801) down through Unit X. Units III and IX, as well as portions of Units VI (below the thrust fault) and XI are assessed a **LOW** potential for SWF

The GC743-DC801 offset well at this location set casing and drilled Units XII and XIII with returns to the rig. Up to 5% sand was encountered from 11,090 to 11,300 ft MD in Unit XII. The base of Unit XII is assessed a **MODERATE** potential for SWF. The Lam sands (Unit XIII) contained up to 40% sand from 11,450 – 11,810 ft MD. This is the most significant sand interval in the shallow section and is assessed a **HIGH** potential for SWF. The potential for SWF in the rest of the top-hole section is **NEGLIGIBLE** from the seafloor to the base of the shallow hazards assessment interval. The sands at the base of Unit XII and within Unit XIII (Lam Sands) are planned to be topset to reduce the potential for SWF.

Closing
No other notable shallow hazards that could have an adverse effect on well operations were detected at proposed well locations DC802 and DC803.

Prepared By:

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August 23, 2021

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August 23, 2021

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BP America Inc., 2015), "Site Clearance Narrative, Atlantis, Proposed Well DC801 and Pipeline / Umbilical Route from DC801 to DC1, Block 743, OCSG 15607, Green Canyon Area, Gulf of Mexico", Issue Date: 16 March 2015

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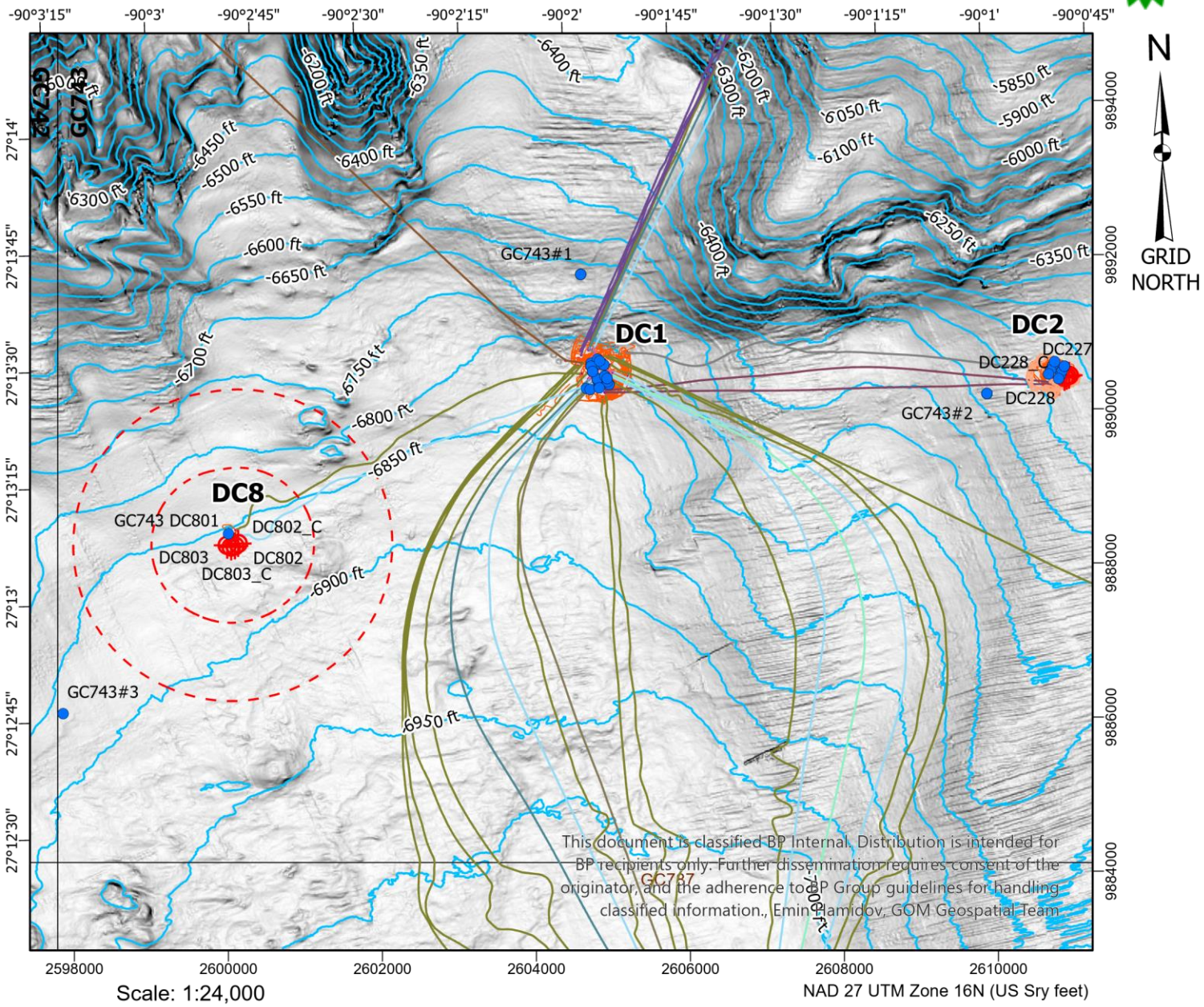
Mannaerts, H., et al., 2005, "Atlantis, the Quest for its Stray Shallow Water Flow Sands." OTC Paper 17658.

ATTACHMENTS:

Plate 1	Atlantis Field Overview in Vicinity of DC8 (Green Canyon Block 743) Overlain on Seafloor Rendering with Drill Centers, Wells and Subsea Infrastructure
Plate 2	AUV Water Depth and Seafloor Rendering with AUV and Seismic Profile Locations
Plate 3	Seafloor Features, Sonar Contacts, Geotechnical Locations, and Seafloor Rendering
Plate 4	AUV Seafloor Gradient
Plate 5	AUV Multibeam Backscatter
Plate 6	AUV Sidescan Sonar with Sonar Contacts
Plate 7	Subsurface Amplitude Anomalies and Faults
Plate 8	3DHR Seismic Cross Section XL 1000 with Offset Well GC743 DC801
Plate 9	3DHR Seismic Cross Section IL 2717 with Offset Well GC743 DC801
Plate 10	Closest AUV Profiler Lines to Proposed Locations with Geology Interpretation and 36" Conductor Setting Depth from Offset well GC743 DC801
Plate 11	Top-Hole Prognosis Diagram, Atlantis DC8, Block 743, Green Canyon Area, Proposed Wellsites DC802, DC802_Contingency, DC803, DC803_Contingency

BP Western Hemisphere New Wells Solution Team
Site Clearance Letter, Proposed Development Well Locations DC802, DC802_Contingency, DC803, DC803_Contingency, BLOCK 743, OCS-G-15607, Green Canyon Area, Atlantis DC8



Scale: 1:24,000

0 1,000 2,000 3,000 4,000

Feet

Proposed wellsite location with 2,000 ft radius circle and 985 ft radius circle

Existing Well

** Background is grayscale seafloor gradient (dip) map*

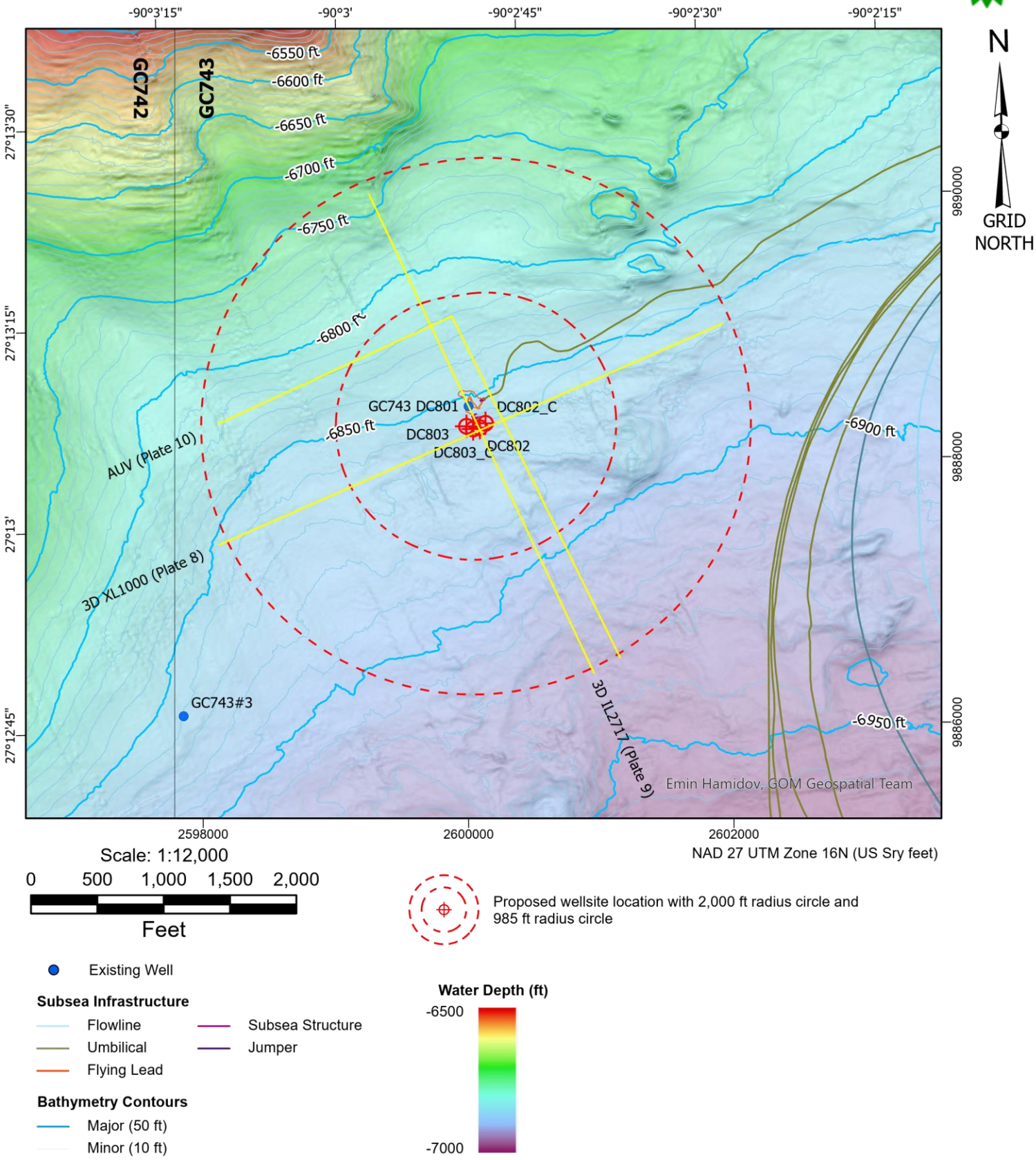
Subsea Infrastructure

- Flowline
- Umbilical
- Flying Lead
- Subsea Structure
- Jumper

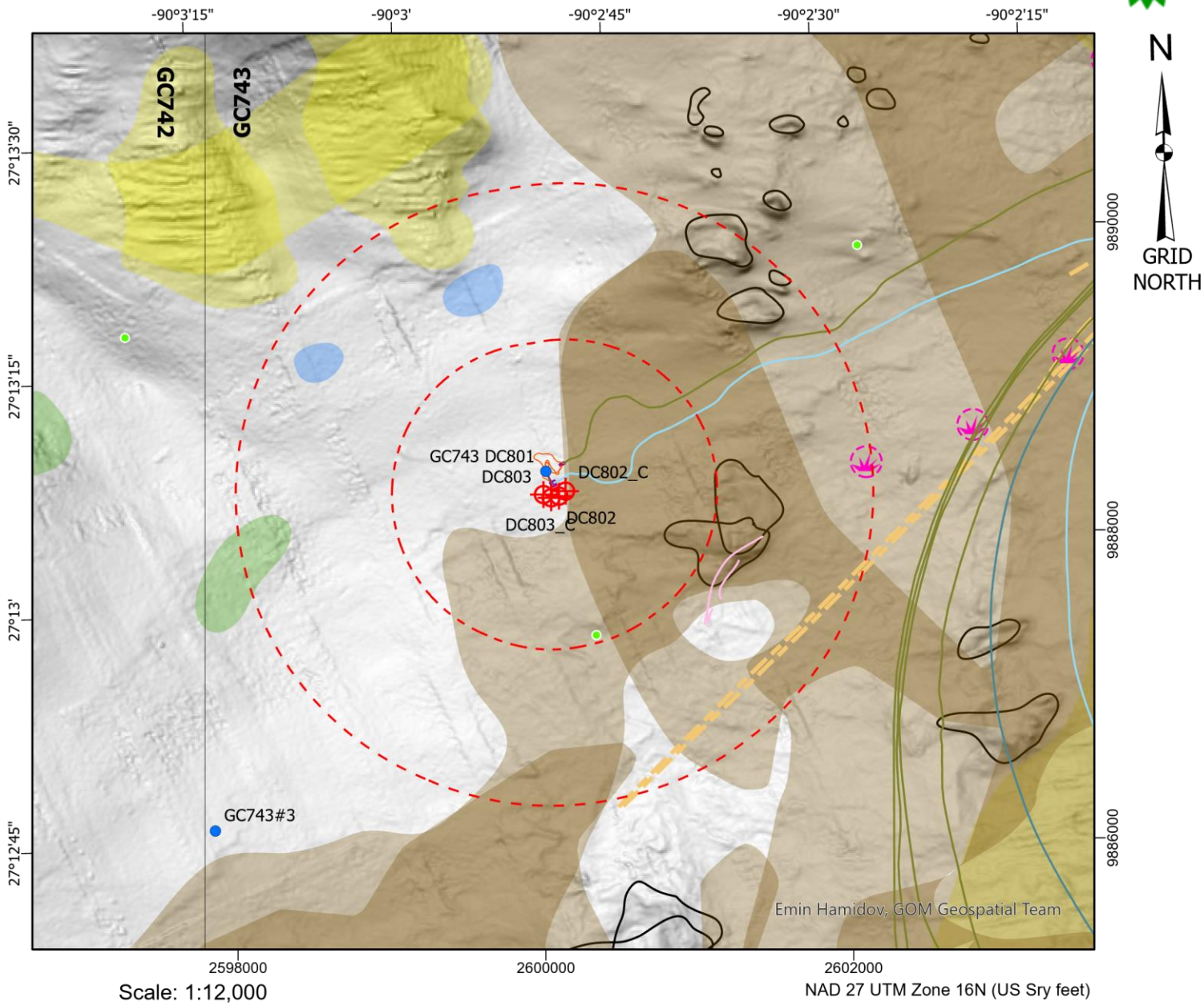
Bathymetry Contours

- Major (50 ft)

Atlantis Field Overview in Vicinity of DC8 (Green Canyon Block 743)
Overlain on Seafloor Rendering with Drill Centers, Wells and Subsea Infrastructure



AUV Water Depth and Seafloor Rendering with AUV and Seismic Profile Locations



Proposed wellsite location with 2,000 ft radius circle and 985 ft radius circle

Existing Well

Geotechnical sample location

Subsea Infrastructure

Flowline

Umbilical

Flying Lead

Subsea Structure

Jumper

** Background is greyscale seafloor gradient (dip) map*

Seafloor Features

Sidescan Sonar Contact with 100ft Buffer

Anchor Chain

Mounds (Rafted Blocks)

Drag Scar

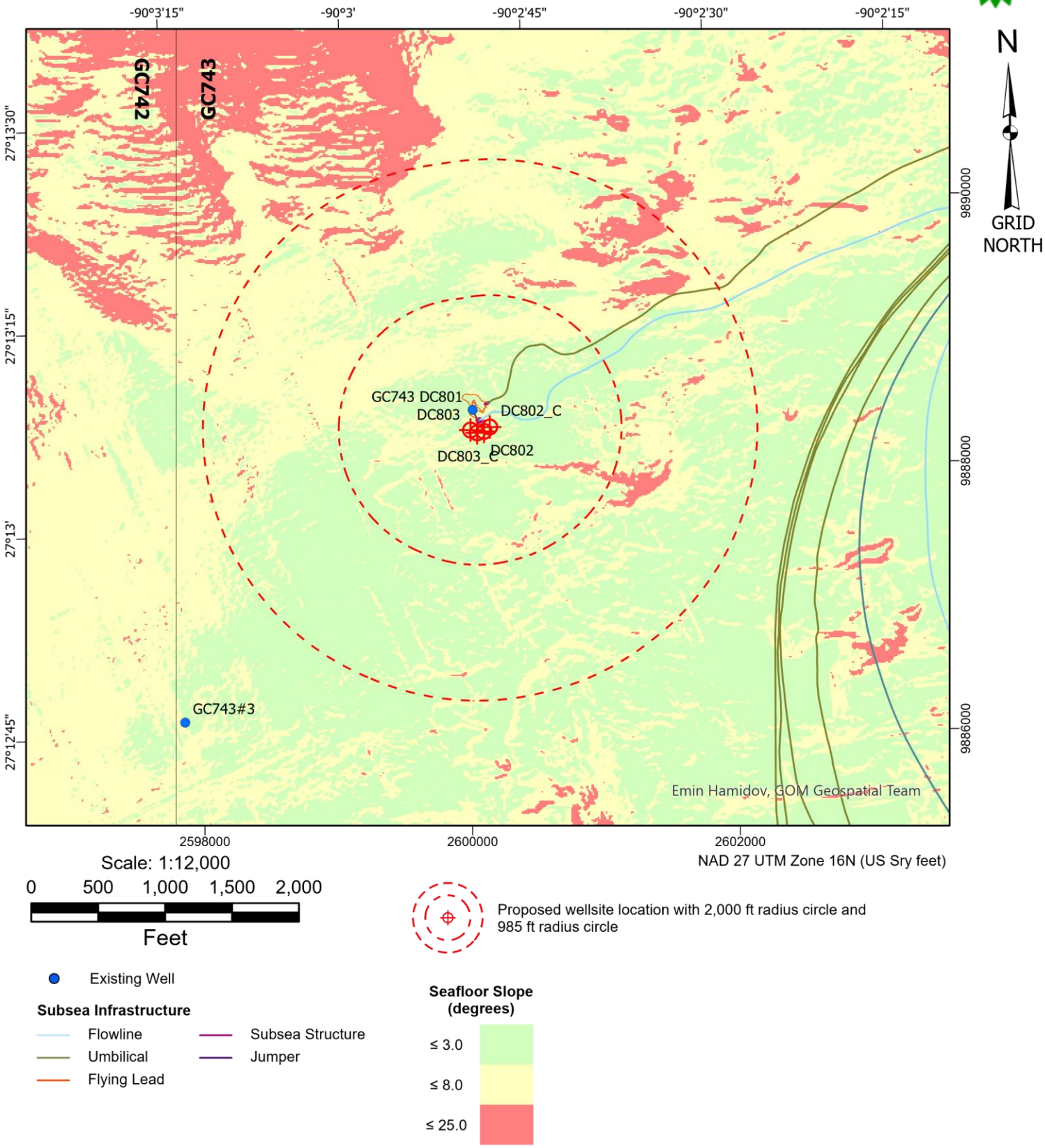
Large scale mass transport deposits exposed at seafloor by erosion

Small scale mass transport deposit exposed at seafloor by erosion

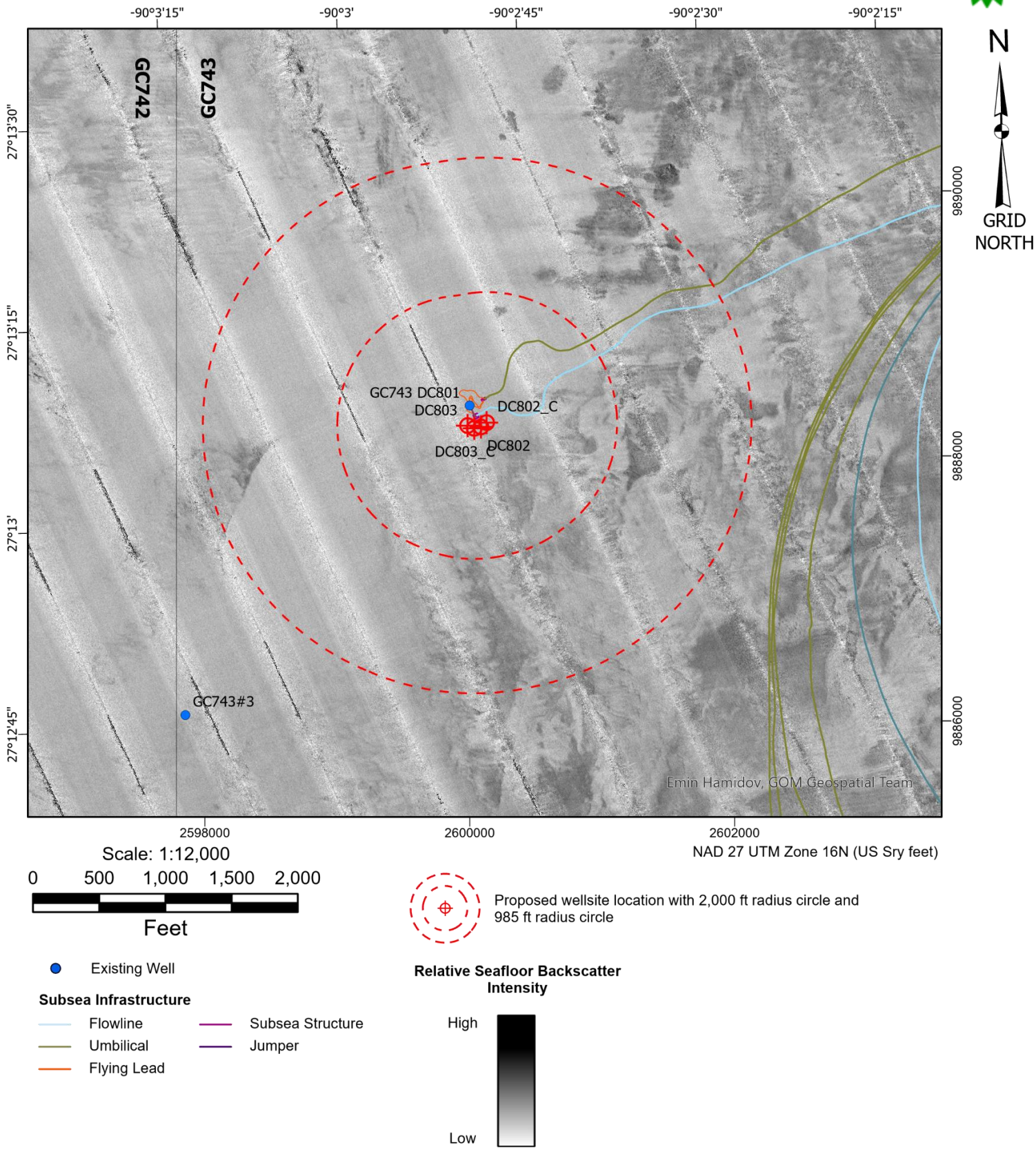
Truncated subsurface exposure

Seafloor Furrows

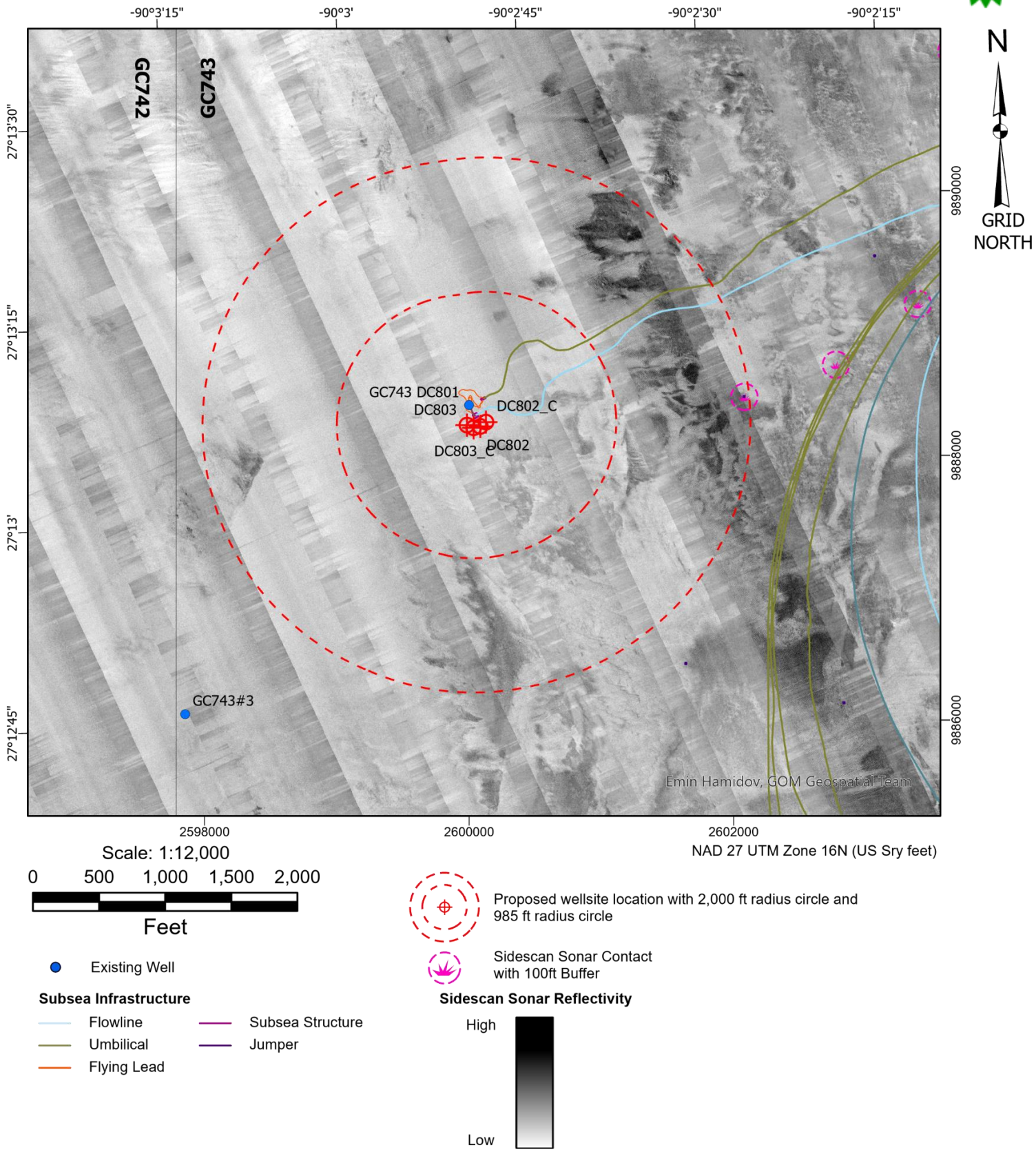
Seafloor Features, Sonar Contacts, Geotechnical Locations, and Seafloor Rendering



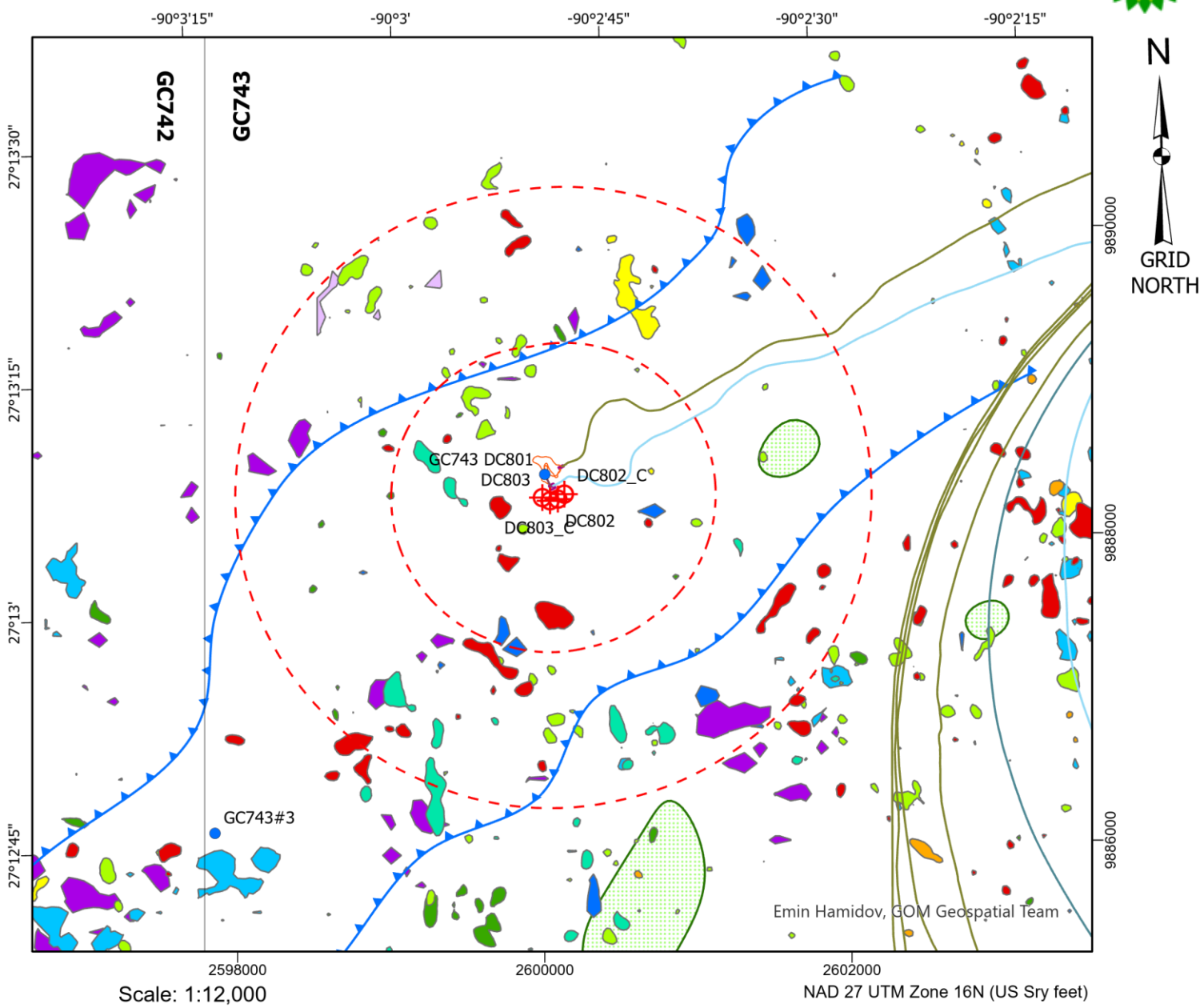
AUV Seafloor Gradient



AUV Multibeam Backscatter



AUV Sidescan Sonar with Sonar Contacts



Proposed wellsite location with 2,000 ft radius circle and 985 ft radius circle

Existing Well
Subsurface Faults
Shallow Gas (AUV)

Subsea Infrastructure

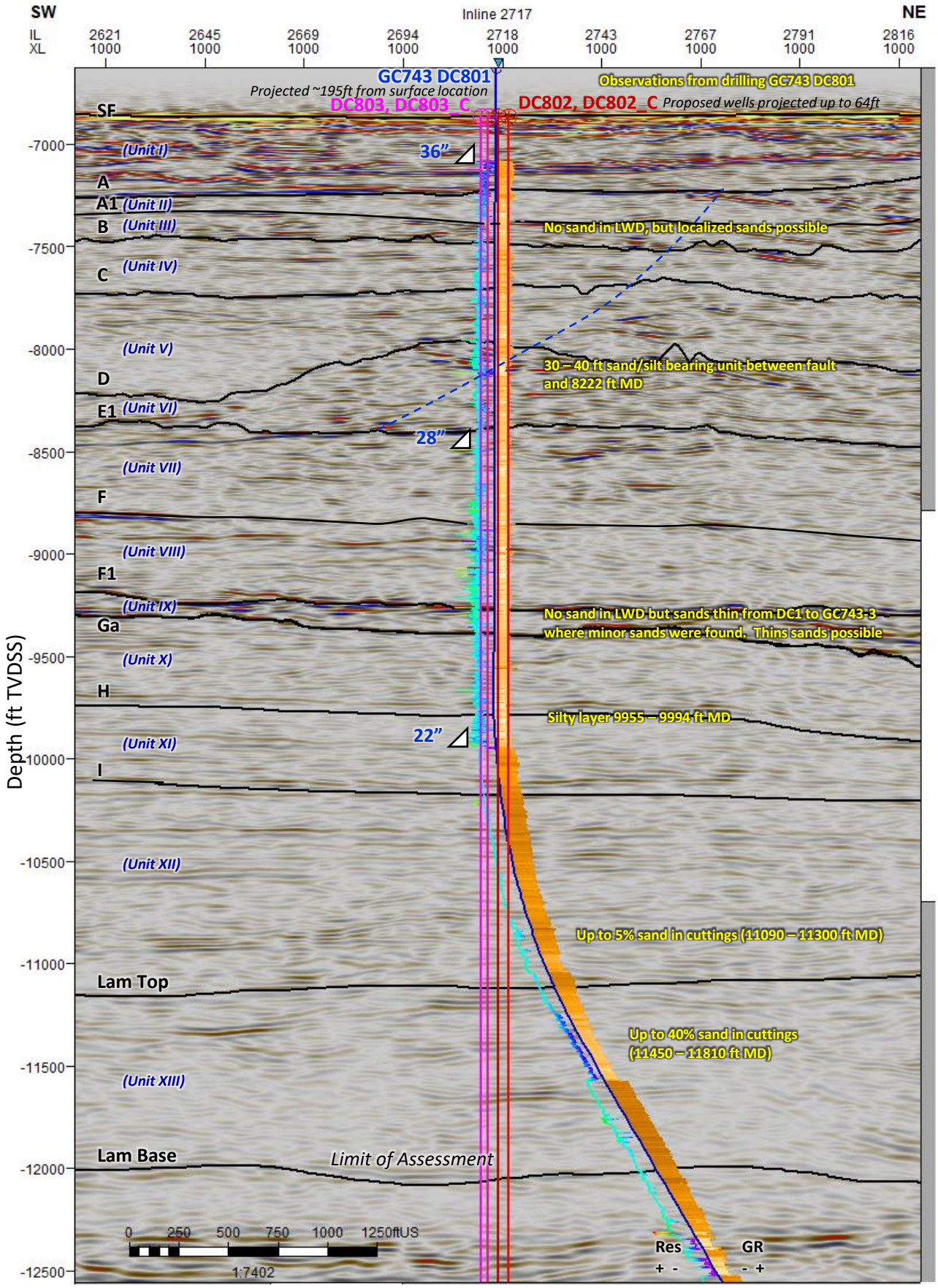
Flowline
Umbilical
Flying Lead
Subsea Structure
Jumper

HIGH AMPLITUDE ANOMALIES

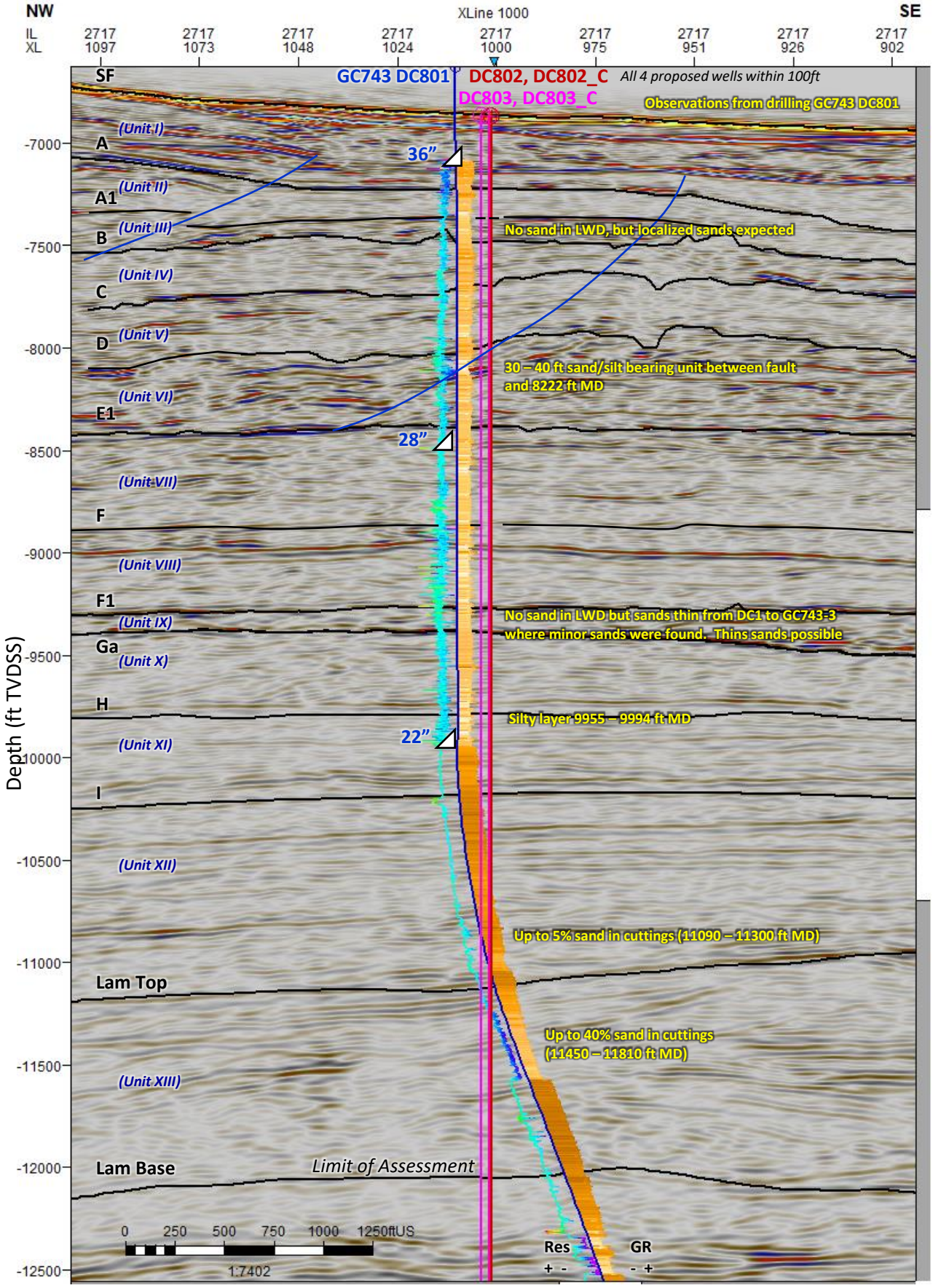
Hrz A1 - B (Unit III)
Hrz B - C (Unit IV)
Hrz C - D (Unit V)
Hrz D - E1 (Unit VI)
Hrz E1 - F1 (Units VII & VIII)
Hrz F1 - Ga (Unit IX
Hrz Ga - H (Unit X)
Hrz H - I (Unit XI)
Hrz I - Lam Top (Unit XII)
Hrz Lam Top - Lam Base (Unit XIII)

** No anomalies shown for Units I & II from 3DHR*

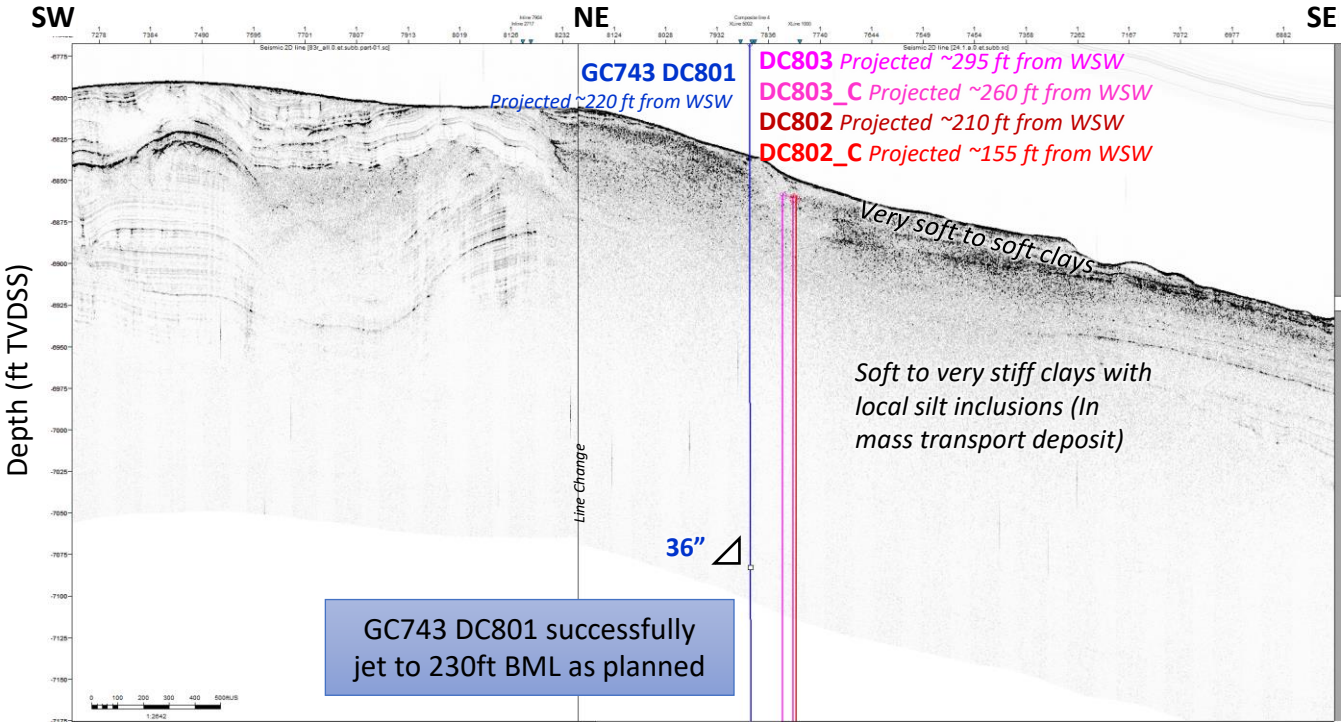
Subsurface Amplitude Anomalies and Faults



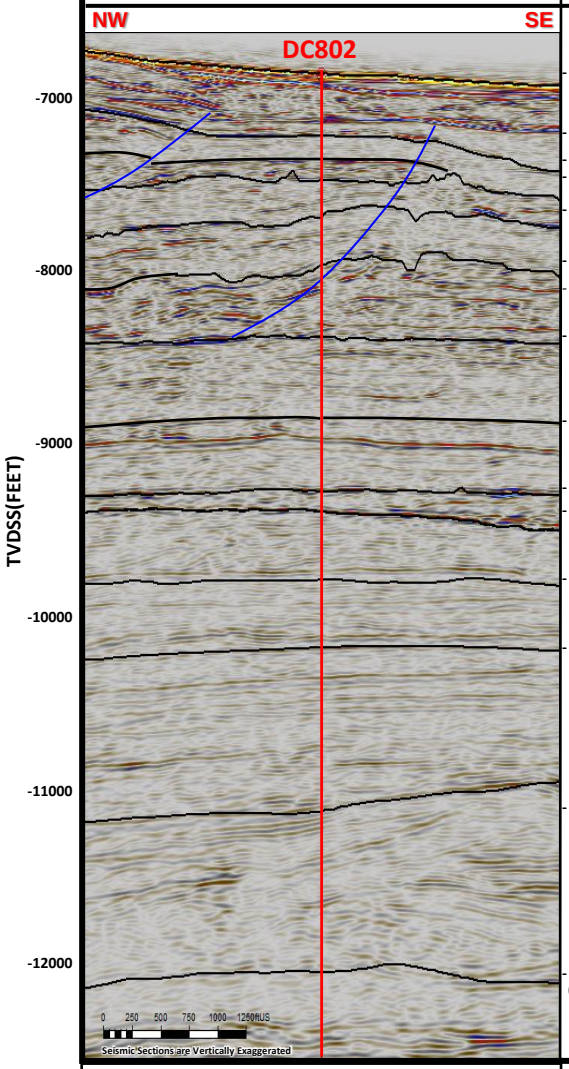
3DHR Seismic Cross Section XL 1000 with Offset Well GC743 DC801



3DHR Seismic Cross Section IL 2717 with Offset Well GC743 DC801



Closest AUV Profiler Lines to Proposed Locations with Geology Interpretation and 36” Conductor Setting Depth from Offset well GC743 DC801



3D Seismic Iline 2717	Horizon & Unit	Lithology & Top-hole Conditions	DEPTHS BML (Feet)	DEPTHS TVDSS (Feet)	THICKNESS (Feet)	SHALLOW GAS POTENTIAL	SHALLOW WATER FLOW POTENTIAL
		Seafloor slopes ~3° to South					
	Seafloor		0	-6862			
	(Unit I)	*Very soft to soft clay and silty clay overlying mass transport deposits consisting of soft to very stiff clays with local silt inclusions. Mass transports deposits are stiffer when jetting.*			362		
	Hrz A		362	-7224			
	(Unit II)	*Stratified hemipelagic deposits alternating mass transport deposits. Clays and silts*			152		
	Hrz A1		514	-7376			
	(Unit III)	*Mass transport deposits. Clay, silt, & thin patches of sand possible*			98		
	Hrz B		612	-7474			
	(Unit IV)	*Mass transport deposits. Clay and silts*			211		
	Hrz C		823	-7685			
	(Unit V)	*Mass transport deposits. Clay and silts*			283		
	Hrz D		1106	-7968			
	Fault		*1235*	*-8097*	129		
	(Unit VI)	*Mass transport deposits. Clay, silt, & possible thin sands. 30 – 40 ft thick sand/silt unit encountered below the fault in GC743-DC801*			287		
	Hrz E1		1522	-8384			
	(Unit VII)	*Mass transport deposits. Clay and silts*			471		
	Hrz F		1993	-8855			
	(Unit VIII)	*Mass transport deposits alternating with stratified hemipelagic deposits. Clay and silty clay*			420		
	Hrz F1		2413	-9275			
	(Unit IX)	*Mass transport deposits. Clay, silt, & thin patches of sand possible*			118		
	Hrz Ga		2531	-9393			
	(Unit X)	*Mass transport deposits. Clay and silty clay*			394		
	Hrz H		2925	-9787			
	(Unit XI)	*Stratified hemipelagic deposits alternating mass transport deposits. Clay and clayey silts. GC743-DC801 encountered an approximately 40 ft thick silty interval.*			391		
	Hrz I		3316	-10178			
	(Unit XII)	*Stratified hemipelagic deposits alternating with slumped turbidite deposits. Clay and clayey silts. Up to 5% sand measured in cuttings in GC743-DC801 across 210 ft interval at the base of this unit.*			944		
	Lam Top		4260	-11122			
	(Unit XIII)	*Stratified hemipelagic deposits alternating with slumped turbidite deposits. Clay and silts. Up to 40% sand measured in cuttings in GC743-DC801 across 360 ft channel levee interval.*			932		
	Lam Base (Limit of Assessment)		5192	-12054			
		Unit and horizon names from pervious Site Clearance letter for Atlantis DC801 through Hrz Ga & Unit X.					

Proposed DC802 Location X = 2,600,085.09 ft; Y = 9,888,218.91 ft
DC803 ~100 ft to W, DC802_Contingency ~55 ft to NE, DC803_Contingency ~50 ft to E
UTM Zone 15N (US ft) Geodetic Datum: NAD 1927

Water depths were derived from the AUV multibeam bathymetry. Sub-seabed depths based on 3D depth seismic and associated velocity model.

Potential Scale	Negligible	Low	Moderate	High

BML = Below Mudline
TVDSS = True Vertical Depth Subsea

Top-Hole Prognosis Diagram
Atlantis DC8, Block 743, Green Canyon Area
Proposed Well Locations DC802, DC802_Contingency, DC803, DC803_Contingency

Appendix E: Air Emissions Information – Form BOEM-0139

Attachment 1: Plan Total emissions worksheet

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

COMPANY	BP Exploration & Production Inc.
AREA	Green Canyon
BLOCK	GC743 Unit Agreement #754305003
LEASE	OCS-G 15604 - 15608
FACILITY	Atlantis
WELL	4 Wells
COMPANY CONTACT	Rachel Owen (Air Quality Review)/Catherine Nesbit
TELEPHONE NO.	907-331-9034 /281-896-5128
REMARKS	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and maintenance.

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:

YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2021	see OSC Plan Info Form 0137	314
2022		96
2023		96
2024		96
2025		96
2026		96
2027		96
2028		96
2029		96
2030		96

AIR EMISSIONS COMPUTATION FACTORS

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

Equipment/Emission Factors	units	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	REF.	DATE	Reference Links
Natural Gas Turbine	g/hp-hr		0.0086	0.0086	0.0026	1.4515	0.0095	N/A	0.3719	N/A	AP42 3.1-1& 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
RECIP. 2 Cycle Lean Natural Gas	g/hp-hr		0.1293	0.1293	0.0020	6.5998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://cfpub.epa.gov/webfire/
Vessels – Propulsion	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
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	
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/tank						4.300				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Fugitives	lbs/hr/component						0.0005				API Study	12/93	https://www.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b623870125d
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
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	
On-Ice – Truck (for gravel island)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
On-Ice – Truck (for surveys)	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	
Man Camp - Operation (max people/day)	tons/person/day		0.0004	0.0004	0.0004	0.006	0.001	N/A	0.001	N/A	BOEM 2014-1001	2014	https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2014-1001.pdf
Vessels - Ice Management Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels - Hovercraft Diesel	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	

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

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

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

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

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604	Atlantis	4 Wells					Rachel Chern (Air Quality Review)	(907-331-9634 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and maint

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	52	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.89	0.05	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
Black Hornet	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**																				
Main Engines: Hyundai Himsen 9H32/40 and 18H32/40V	VESSELS- Drilling / Well Intervention		60354	3104.97189	34818	24	61	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	14.56	8.79	8.52	0.21	348.91	10.03	0.00	54.73	0.10
Egen: Cummins 1900 kW	VESSELS – Drilling Prime Engine, Auxiliary		2458	126.454268	3034.90	2	9	1.73	1.05	1.01	0.03	41.55	1.19	0.00	6.52	0.01	0.02	0.01	0.01	0.00	0.37	0.01	0.00	0.06	0.00
Temporary Large/ Small Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	61	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.29	0.78	0.76	0.02	30.93	0.89	0.00	4.85	0.01
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	153	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	35.19	21.23	20.60	0.51	843.18	24.24	0.00	132.25	0.25
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	153	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.24	1.95	1.90	0.05	77.58	2.23	0.00	12.17	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	73	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	6.61	3.99	3.87	0.10	158.40	4.55	0.00	24.85	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	42	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.89	0.54	0.52	0.01	21.30	0.61	0.00	3.34	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	48	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	5.12	3.09	3.00	0.07	122.74	3.53	0.00	19.25	0.04
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	48	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2021	**Facility Total Emissions**							**237.05**	**147.08**	**143.17**	**5.21**	**6,328.94**	**255.58**	**0.02**	**1,153.79**	**1.49**	**210.25**	**149.56**	**146.59**	**7.37**	**6,282.72**	**554.02**	**0.02**	**1,677.60**	**1.14**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**					**Modeled Rates**		**---**	**---**	**---**	**---**	**5996.64**	**---**	**---**	**---**	**---**	**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0											**(grey cells excluded from modeling)**													
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	153	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.33	5.63	5.46	0.14	223.44	6.42	0.00	35.05	0.07
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	61	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.72	2.24	2.18	0.05	89.08	2.56	0.00	13.97	0.03
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	37	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.26	1.36	1.32	0.03	54.03	1.55	0.00	8.48	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	24	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.46	0.88	0.86	0.02	35.05	1.01	0.00	5.50	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2021	**Non-Facility Total Emissions**							**92.04**	**55.53**	**53.87**	**1.34**	**2,205.30**	**63.41**	**0.01**	**345.90**	**0.64**	**74.46**	**44.92**	**43.58**	**1.08**	**1,784.05**	**51.30**	**0.01**	**279.82**	**0.52**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)	(907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and ma

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	151	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	34.73	20.95	20.33	0.51	832.15	23.93	0.00	130.52	0.24
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	151	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.20	1.93	1.87	0.05	76.57	2.20	0.00	12.01	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	28	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	2.54	1.53	1.48	0.04	60.76	1.75	0.00	9.53	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	28	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.59	0.36	0.35	0.01	14.20	0.41	0.00	2.23	0.00
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	14	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	1.49	0.90	0.87	0.02	35.80	1.03	0.00	5.62	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	14	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.30	0.18	0.17	0.00	7.10	0.20	0.00	1.11	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2022	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**185.16**	**134.42**	**131.90**	**7.01**	**5,681.58**	**536.73**	**0.02**	**1,583.32**	**0.97**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	151	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.20	5.55	5.39	0.13	220.52	6.34	0.00	34.59	0.06
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	14	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.85	0.51	0.50	0.01	20.45	0.59	0.00	3.21	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	7	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.43	0.26	0.25	0.01	10.22	0.29	0.00	1.60	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2022	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**63.31**	**38.20**	**37.05**	**0.92**	**1,516.80**	**43.61**	**0.00**	**237.91**	**0.44**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #754308	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)(	907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and ma

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	59	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	5.34	3.22	3.13	0.08	128.03	3.68	0.00	20.08	0.04
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	59	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.25	0.75	0.73	0.02	29.92	0.86	0.00	4.69	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	27	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.88	1.74	1.69	0.04	69.04	1.99	0.00	10.83	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	27	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.57	0.34	0.33	0.01	13.69	0.39	0.00	2.15	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2023	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**182.50**	**132.82**	**130.35**	**6.97**	**5,617.84**	**534.90**	**0.01**	**1,573.32**	**0.95**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	30	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.83	1.10	1.07	0.03	43.81	1.26	0.00	6.87	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	14	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.85	0.51	0.50	0.01	20.45	0.59	0.00	3.21	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2023	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.82**	**37.90**	**36.76**	**0.91**	**1,505.12**	**43.28**	**0.00**	**236.07**	**0.44**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Reviewy	907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and ma

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	366	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.77	47.52	46.10	1.15	1887.27	54.26	0.01	296.01	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	366	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.21	24.21	24.21	0.68	341.32	25.18	--	73.35	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	366	--	--	--	--	--	37.20	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	366	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.98	61.38	--	556.10	--
	COLD VENT				2	24	366	--	--	--	--	--	20.38	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	366	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.90	--	--	--
	GLYCOL DEHYDRATOR				1	24	366	--	--	--	--	--	4.38	--	--	--	--	--	--	--	--	19.24	--	--	--
2024	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.67**	**0.02**	**980.64**	**1.16**	**180.38**	**131.60**	**129.17**	**6.95**	**5,569.95**	**533.82**	**0.01**	**1,567.71**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	366	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.31	13.46	13.06	0.32	534.50	15.37	0.00	83.84	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2024	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.21**	**37.53**	**36.41**	**0.91**	**1,490.51**	**42.86**	**0.00**	**233.78**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)	(907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and mai

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2025	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2025	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)(	907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and ma

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2026	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.06**	**131.35**	**128.92**	**6.93**	**5,559.42**	**533.22**	**0.01**	**1,564.16**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2026	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)	(907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and mai

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2027	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2027	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #754300	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)(	907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and ma

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	366	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.77	47.52	46.10	1.15	1887.27	54.26	0.01	296.01	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	366	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.21	24.21	24.21	0.68	341.32	25.18	--	73.35	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	366	--	--	--	--	--	37.20	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	366	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.98	61.38	--	556.10	--
	COLD VENT				2	24	366	--	--	--	--	--	20.38	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	366	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.90	--	--	--
	GLYCOL DEHYDRATOR				1	24	366	--	--	--	--	--	4.38	--	--	--	--	--	--	--	--	19.24	--	--	--
2028	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.67**	**0.02**	**980.64**	**1.16**	**180.38**	**131.60**	**129.17**	**6.95**	**5,569.95**	**533.82**	**0.01**	**1,567.71**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	366	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.31	13.46	13.06	0.32	534.50	15.37	0.00	83.84	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2028	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.21**	**37.53**	**36.41**	**0.91**	**1,490.51**	**42.86**	**0.00**	**233.78**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)	(907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and mai

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2029	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2029	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS
BP Exploration & Production Inc.	Green Canyon		GC743 Unit Agreement #75430	OCS-G 15604 -	Atlantis	4 Wells					Rachel Owen (Air Quality Review)	(907-331-9034 /281-896-5128	Supplemental DOCD for the addition of 4 new wells, connection to manifold, umbilical flow lines and other subsea components. Allowance is provided for on-going well intervention and mai

OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2030	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																								
	122.0																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2030	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
BP Exploration & Production Inc.	Green Canyon	GC743 Unit Agreement #754305003	OCS-G 15604 - 15608	Atlantis	4 Wells

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	210.25	149.56	146.59	7.37	6282.72	554.02	0.02	1677.60	1.14
2022	185.16	134.42	131.90	7.01	5681.58	536.73	0.02	1583.32	0.97
2023	182.50	132.82	130.35	6.97	5617.84	534.90	0.01	1573.32	0.95
2024	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2025	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2026	180.06	131.35	128.92	6.93	5559.42	533.22	0.01	1564.16	0.93
2027	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2028	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2029	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2030	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
Allowable	4062.60			4062.60	4062.60	4062.60		83634.50	

Attachment 2: Actual fuel usage records for Vessels

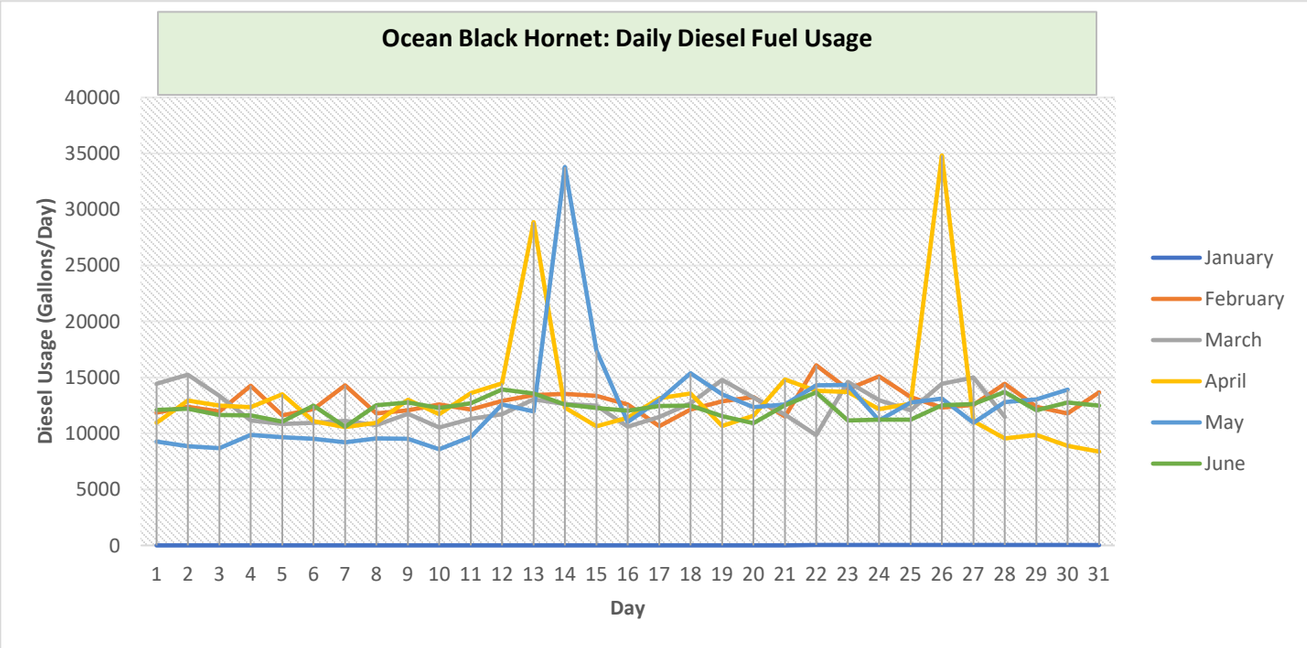
Vessel Specification Sheets

OCEAN BLACK HORNET ACTUAL FUEL USAGE (JANUARY - JUNE 2019)

	January		February		March		April		May		June	
Day	(Cubic Meter)	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons	Cubic Meters	Gallons
1	44.9	11861	54.6	14424	41.4	10937	35.1	9272	45.8	12099	47.7	12601
2	46.9	12390	57.7	15243	48.9	12918	33.5	8850	46.2	12205	43.5	11491
3	45.3	11967	50.5	13341	47.2	12469	32.9	8691	44.1	11650	39.1	10329
4	54	14265	42.3	11174	46.7	12337	37.3	9854	44	11624	39.1	10329
5	44	11624	41.1	10857	51.1	13499	36.6	9669	41.9	11069	41.4	10937
6	46.1	12178	41.5	10963	42	11095	36	9510	47.3	12495	41.2	10884
7	54.1	14292	42.1	11122	40	10567	34.8	9193	40.1	10593	50.6	13367
8	44.6	11782	40.7	10752	41.4	10937	36.2	9563	47.4	12522	46.8	12363
9	45.7	12073	44.5	11756	49.2	12997	36	9510	48.3	12760	41.7	11016
10	47.7	12601	39.8	10514	44.4	11729	32.5	8586	46.5	12284	46	12152
11	45.9	12125	42.8	11307	51.5	13605	36.7	9695	48.1	12707	40.8	10778
12	48.8	12892	44.4	11729	54.8	14477	47.6	12575	52.7	13922	41	10831
13	50.8	13420	49.3	13024	109.3	28874	45.3	11967	51.3	13552	43.3	11439
14	51.2	13526	47.8	12627	46.6	12310	127.9	33788	47.6	12575	46.1	12178
15	50.5	13341	47.2	12469	40.3	10646	65.8	17383	46.4	12258	41.7	11016
16	47.6	12575	40.1	10593	43.2	11412	41.7	11016	45.5	12020	50.3	13288
17	40.3	10646	43.4	11465	49.7	13129	49.1	12971	47.1	12443	54.6	14424
18	45.9	12125	48.1	12707	51.4	13578	58.2	15375	47.2	12469	45.9	12125
19	48.7	12865	56	14794	40.4	10673	51.1	13499	43.7	11544	52.5	13869
20	50.1	13235	50	13209	43.8	11571	46.7	12337	41.3	10910	53	14001
21	43.6	11518	44.2	11676	56.1	14820	47.7	12601	47.4	12522	49.9	13182
22	60.9	16088	37.3	9854	52.2	13790	54.1	14292	51.8	13684	56	14794
23	52.8	13948	55.3	14609	51.9	13711	54.2	14318	42.2	11148	55	14529
24	57.1	15084	49.1	12971	46	12152	42.2	11148	42.5	11227	44.5	11756
25	50.1	13235	45.6	12046	47.9	12654	48.3	12760	42.5	11227	51.3	13552
26	46.6	12310	54.6	14424	131.8	34818	49.6	13103	47.4	12522	55.7	14714
27	47.5	12548	56.8	15005	42	11095	41.5	10963	47.8	12627	56.1	14820
28	54.6	14424	43.4	11465	36.2	9563	48.5	12812	51.9	13711	48	12680
29	46.8	12363			37.3	9854	49.3	13024	45.7	12073	45.8	12099
30	44.6	11782			33.7	8903	52.6	13895	48.3	12760	48.8	12892
31	51.8	13684			31.7	8374			47.3	12495		
Total	**1509.5**	**398768**	**1310.2**	**346118**	**1550.1**	**409493**	**1409**	**372218**	**1437.3**	**379694**	**1417.4**	**374437**
Average	**49**	**12864**	**47**	**12362**	**51**	**13210**	**47**	**12408**	**47**	**12249**	**48**	**12482**
Maximum	**60.9**	**16088**	**57.7**	**15243**	**131.8**	**34818**	**127.9**	**33788**	**52.7**	**13922**	**56.1**	**14820**

Average Daily Fuel Usage Rate = 13210 gals/day

Maximum Daily Fuel Usage Rate = 34818 gals/day


Ocean Black Hornet: Daily Diesel Fuel Usage
Diesel Usage (Gallons/Day)
40000
35000
30000
25000
20000
15000
10000
5000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Day
January
February
March
April
May
June

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
4/6/2016	9,214
4/7/2016	9,917
4/8/2016	9,518
4/9/2016	8,976
4/10/2016	9,415
4/11/2016	8,799
4/12/2016	8,654
4/13/2016	7,661
4/14/2016	7,661
4/15/2016	7,965
4/16/2016	11,367
4/17/2016	8,988
4/18/2016	8,207
4/19/2016	10,622
4/20/2016	8,623
4/21/2016	7,739
4/22/2016	9,371
4/23/2016	8,998
4/24/2016	8,187
4/25/2016	9,275
4/26/2016	6,572
4/27/2016	7,890
4/28/2016	9,750
4/29/2016	8,361
4/30/2016	7,088
5/1/2016	7,639
5/2/2016	8,443
5/3/2016	8,991
5/4/2016	7,149
5/5/2016	7,629
5/6/2016	8,998
5/7/2016	7,217
5/8/2016	7,304
5/9/2016	7,661
5/10/2016	7,276
5/11/2016	7,378
5/12/2016	8,321
5/13/2016	7,064
5/14/2016	7,433
5/15/2016	8,726
5/16/2016	7,679
5/17/2016	7,035
5/18/2016	7,532
5/19/2016	9,409

Q5000 Summary

Average Fuel Rate	8,365	gal
Max Fuel Rate	12,827	gal

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
5/20/2016	8,265
5/21/2016	7,058
5/22/2016	9,087
5/23/2016	8,334
5/24/2016	8,496
5/25/2016	8,808
5/26/2016	8,715
5/27/2016	8,850
5/28/2016	8,758
5/29/2016	8,274
5/30/2016	9,679
5/31/2016	9,353
6/1/2016	8,657
6/2/2016	8,819
6/3/2016	8,671
6/4/2016	8,393
6/5/2016	8,671
6/6/2016	5,418
6/7/2016	9,504
6/8/2016	7,951
6/9/2016	7,713
6/10/2016	9,014
6/11/2016	8,427
6/12/2016	8,157
6/13/2016	9,211
6/14/2016	8,491
6/15/2016	8,253
6/16/2016	6,043
6/17/2016	8,887
6/18/2016	8,681
6/19/2016	9,132
6/20/2016	6,174
6/21/2016	8,866
6/22/2016	8,723
6/23/2016	8,512
6/24/2016	8,834
6/25/2016	8,303
6/26/2016	8,451
6/27/2016	8,105
6/28/2016	8,440
6/29/2016	8,274
6/30/2016	8,250
7/1/2016	9,576
7/2/2016	7,767

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
7/3/2016	7,576
7/4/2016	8,850
7/5/2016	8,234
7/6/2016	8,321
7/7/2016	8,631
7/8/2016	8,625
7/9/2016	7,994
7/10/2016	8,760
7/11/2016	7,491
7/12/2016	8,791
7/13/2016	8,567
7/14/2016	7,967
7/15/2016	8,523
7/16/2016	8,556
7/17/2016	8,425
7/18/2016	9,803
7/19/2016	8,784
7/20/2016	7,760
7/21/2016	8,178
7/22/2016	8,162
7/23/2016	6,641
7/24/2016	6,606
7/25/2016	8,361
7/26/2016	7,662
7/27/2016	8,502
7/28/2016	7,796
7/29/2016	9,880
7/30/2016	10,968
7/31/2016	5,291
8/1/2016	9,117
8/2/2016	9,597
8/3/2016	8,778
8/4/2016	9,428
8/5/2016	8,990
8/6/2016	8,377
8/7/2016	9,095
8/8/2016	8,073
8/9/2016	10,226
8/10/2016	8,439
8/11/2016	8,329
8/12/2016	8,078
8/13/2016	12,020
8/14/2016	8,078
8/15/2016	8,810

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
8/16/2016	9,106
8/17/2016	8,347
8/18/2016	8,302
8/19/2016	8,622
8/20/2016	8,020
8/21/2016	8,435
8/22/2016	8,899
8/23/2016	8,358
8/24/2016	8,962
8/25/2016	9,460
8/26/2016	7,972
8/27/2016	9,377
8/28/2016	7,372
8/29/2016	10,970
8/30/2016	12,782
8/31/2016	8,520
9/1/2016	8,350
9/2/2016	8,350
9/3/2016	9,863
9/4/2016	7,509
9/5/2016	7,096
9/6/2016	8,419
9/7/2016	7,539
9/8/2016	7,632
9/9/2016	7,785
9/10/2016	8,480
9/11/2016	9,658
9/12/2016	8,884
9/13/2016	10,754
9/14/2016	9,235
9/15/2016	7,870
9/16/2016	8,234
9/17/2016	8,123
9/18/2016	7,806
9/19/2016	8,176
9/20/2016	7,822
9/21/2016	7,468
9/22/2016	8,070
9/23/2016	8,147
9/24/2016	7,835
9/25/2016	7,600
9/26/2016	7,788
9/27/2016	7,788
9/28/2016	10,356

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
9/29/2016	5,336
9/30/2016	9,261
10/1/2016	8,488
10/2/2016	8,340
10/3/2016	8,755
10/4/2016	9,200
10/5/2016	7,456
10/6/2016	11,073
10/7/2016	10,150
10/8/2016	9,977
10/9/2016	7,271
10/10/2016	9,390
10/11/2016	5,808
10/12/2016	9,184
10/13/2016	7,620
10/14/2016	7,199
10/15/2016	6,855
10/16/2016	8,117
10/17/2016	8,017
10/18/2016	8,435
10/19/2016	8,306
10/20/2016	8,332
10/21/2016	8,137
10/22/2016	6,795
10/23/2016	8,179
10/24/2016	8,263
10/25/2016	7,547
10/26/2016	8,147
10/27/2016	12,448
10/28/2016	7,825
10/29/2016	7,656
10/30/2016	8,691
10/31/2016	7,275
11/1/2016	9,687
11/2/2016	9,687
11/3/2016	7,384
11/4/2016	6,313
11/5/2016	6,137
11/6/2016	8,631
11/7/2016	8,543
11/8/2016	10,366
11/9/2016	8,955
11/10/2016	9,269
11/11/2016	7,056

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
11/12/2016	1,008
11/13/2016	8,649
11/14/2016	7,348
11/15/2016	8,911
11/16/2016	8,247
11/17/2016	8,276
11/18/2016	7,752
11/19/2016	8,427
11/20/2016	7,353
11/21/2016	7,739
11/22/2016	8,827
11/23/2016	6,853
11/24/2016	7,003
11/25/2016	7,821
11/26/2016	6,718
11/27/2016	8,715
11/28/2016	7,917
11/29/2016	8,808
11/30/2016	7,996
12/1/2016	9,875
12/2/2016	9,412
12/3/2016	8,321
12/4/2016	8,578
12/5/2016	7,825
12/6/2016	9,101
12/7/2016	9,008
12/8/2016	9,064
12/9/2016	9,418
12/10/2016	8,628
12/11/2016	7,555
12/12/2016	9,951
12/13/2016	7,141
12/14/2016	9,484
12/15/2016	7,893
12/16/2016	8,343
12/17/2016	8,247
12/18/2016	9,357
12/19/2016	10,120
12/20/2016	7,159
12/21/2016	6,287
12/22/2016	7,738
12/23/2016	7,645
12/24/2016	8,631
12/25/2016	8,398

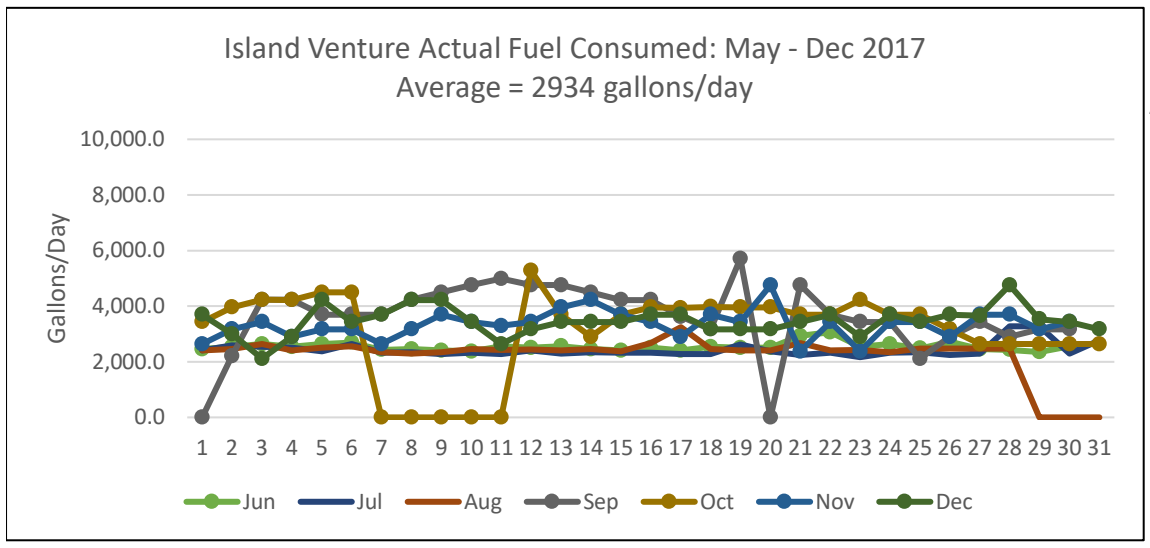
Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
12/26/2016	7,859
12/27/2016	8,575
12/28/2016	7,748
12/29/2016	8,057
12/30/2016	9,464
12/31/2016	7,009
1/1/2017	8,962
1/2/2017	8,076
1/3/2017	7,505
1/4/2017	8,733
1/5/2017	6,995
1/6/2017	7,911
1/7/2017	12,827
1/8/2017	7,649
1/9/2017	7,467
1/10/2017	7,570
1/11/2017	7,603
1/12/2017	10,136
1/13/2017	7,777
1/14/2017	5,368
1/15/2017	8,625
1/16/2017	7,312
1/17/2017	8,588
1/18/2017	8,406
1/19/2017	9,130
1/20/2017	7,016
1/21/2017	7,701
1/22/2017	12,606
1/23/2017	7,695
1/24/2017	7,970
1/25/2017	7,872
1/26/2017	8,689
1/27/2017	9,610
1/28/2017	8,927
1/29/2017	8,768
1/30/2017	8,041
1/31/2017	10,224
2/1/2017	6,543
2/2/2017	8,120
2/3/2017	8,456
2/4/2017	7,567
2/5/2017	8,170
2/6/2017	7,361
2/7/2017	8,292

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
2/8/2017	9,436
2/9/2017	8,152
2/10/2017	6,541
2/11/2017	7,489
2/12/2017	9,085
2/13/2017	7,331
2/14/2017	7,706
2/15/2017	9,994
2/16/2017	7,333
2/17/2017	8,697
2/18/2017	8,070
2/19/2017	7,355
2/20/2017	5,640
2/21/2017	9,922
2/22/2017	7,003
2/23/2017	7,482
2/24/2017	8,467
2/25/2017	7,755
2/26/2017	8,454
2/27/2017	7,276
2/28/2017	11,314
3/1/2017	8,350
3/2/2017	9,901
3/3/2017	8,176
3/4/2017	8,540
3/5/2017	10,067
3/6/2017	8,827
3/7/2017	9,216
3/8/2017	8,506
3/9/2017	11,674
3/10/2017	7,999
3/11/2017	8,150
3/12/2017	8,879
3/13/2017	8,757
3/14/2017	8,242
3/15/2017	9,154
3/16/2017	8,697
3/17/2017	7,230
3/18/2017	8,123
3/19/2017	7,455
3/20/2017	8,348
3/21/2017	7,960
3/22/2017	8,057
3/23/2017	8,845

Q5000 - Intervention Vessel	
Month	***Fuel Consumption (gal)***
3/24/2017	8,469
3/25/2017	8,676
3/26/2017	7,533
3/27/2017	7,260
3/28/2017	8,538
3/29/2017	7,350
3/30/2017	7,437
3/31/2017	9,189

Island Venture - Actual Fuel Consumed - May to December 2017
(Gallons)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1						2,457.0	2,404.0	2,404.0	0.0	3,434.0	2,642.0	3,698.0
2						2,536.0	2,589.0	2,457.0	2,208.0	3,963.0	3,170.0	3,000.0
3						2,642.0	2,536.0	2,642.0	4,227.0	4,227.0	3,434.0	2,113.0
4						2,536.0	2,509.0	2,410.0	4,227.0	4,226.0	2,905.0	2,905.0
5						2,642.0	2,377.0	2,510.0	3,698.0	4,490.0	3,170.0	4,226.0
6						2,695.0	2,641.0	2,562.0	3,698.0	4,490.0	3,170.0	3,434.0
7						2,430.0	2,324.0	2,351.0	3,698.0	0.0	2,642.0	3,698.0
8						2,456.0	2,351.0	2,298.0	4,227.0	0.0	3,170.0	4,226.0
9						2,401.0	2,271.0	2,351.0	4,490.0	0.0	3,698.0	4,226.0
10						2,378.0	2,324.0	2,457.0	4,755.0	0.0	3,434.0	3,434.0
11						2,562.0	2,271.0	2,430.0	4,990.0	0.0	3,290.0	2,642.0
12						2,509.0	2,404.0	2,435.0	4,755.0	5,283.0	3,434.0	3,170.0
13						2,562.0	2,300.0	2,410.0	4,755.0	3,698.0	3,962.0	3,434.0
14						2,456.0	2,351.0	2,457.0	4,490.0	2,905.0	4,226.0	3,434.0
15						2,403.0	2,325.0	2,377.0	4,226.0	3,698.0	3,698.0	3,434.0
16						2,509.0	2,324.0	2,668.0	4,226.0	3,962.0	3,434.0	3,698.0
17					2,404.0	2,403.0	2,271.0	3,245.0	3,620.0	3,941.0	2,905.0	3,698.0
18					2,911.0	2,536.0	2,272.0	2,456.0	3,170.0	3,977.0	3,698.0	3,170.0
19					2,615.0	2,509.0	2,615.0	2,403.0	5,711.0	3,962.0	3,434.0	3,170.0
20					2,694.0	2,503.0	2,378.0	2,405.0	0.0	3,962.0	4,755.0	3,170.0
21					2,668.0	2,932.0	2,245.0	2,668.0	4,755.0	3,698.0	2,377.0	3,434.0
22					2,720.0	3,064.0	2,325.0	2,403.0	3,698.0	3,698.0	3,434.0	3,698.0
23					2,694.0	2,536.0	2,166.0	2,430.0	3,434.0	4,226.0	2,376.0	2,905.0
24					2,509.0	2,642.0	2,325.0	2,351.0	3,434.0	3,698.0	3,434.0	3,698.0
25					2,384.0	2,483.0	2,351.0	2,483.0	2,113.0	3,698.0	3,434.0	3,434.0
26					2,430.0	2,721.0	2,245.0	2,483.0	2,906.0	3,170.0	2,905.0	3,698.0
27					2,588.0	2457	2298	2483	3434	2642	3698	3662
28					2,641.0	2,430.0	3,276.0	2,483.0	2,906.0	2,642.0	3,698.0	4,755.0
29					2,800.0	2,351.0	3,276.0	0.0	3,170.0	2,642.0	3,170.0	3,535.0
30					2,536.0	2,562.0	2,298.0	0.0	3,170.0	2,642.0	3,434.0	3,434.0
31					2,510.0		2774	0		2642		3170
Full Year	**0.0**	**0.0**	**0.0**	**0.0**	**39,104.0**	**76,303.0**	**75,416.0**	**69,512.0**	**108,191.0**	**95,616.0**	**100,231.0**	**107,403.0**



Average Daily Fuel Usage = 2,934 gallons/day
Maximum Daily Fuel Usage = 5,711 gallons/day

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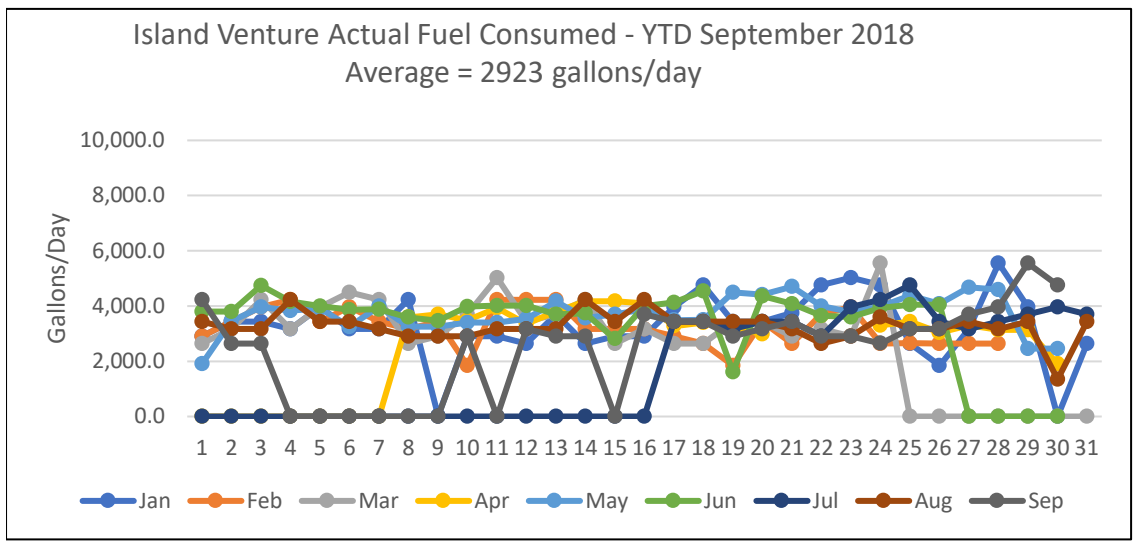
Island Venture - Actual Fuel Consumed - January to September 2018
(Gallons)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2,906.0	2,905.0	2,641.0	0.0	1,904.0	3,800.0	0.0	3,434.0	4,226.0			
2	3,434.0	3,434.0	3,170.0	0.0	3,461.0	3,804.0	0.0	3,170.0	2,641.0			
3	3,434.0	3,962.0	4,226.0	0.0	3,963.0	4,745.0	0.0	3,170.0	2,641.0			
4	3,170.0	4,226.0	3,170.0	0.0	3,830.0	4,161.0	0.0	4,226.0	0.0			
5	3,963.0	3,434.0	3,963.0	0.0	3,910.0	3,991.0	0.0	3,434.0	0.0			
6	3,170.0	3,962.0	4,491.0	0.0	3,249.0	3,867.0	0.0	3,434.0	0.0			
7	3,170.0	3,434.0	4,227.0	0.0	3,990.0	3,881.0	0.0	3,170.0	0.0			
8	4,227.0	3,170.0	2,642.0	3,592.0	3,249.0	3,590.0	0.0	2,906.0	0.0			
9	24.0	3,434.0	2,906.0	3,698.0	3,249.0	3,469.0	0.0	2,905.0	0.0			
10	2,906.0	1,849.0	3,698.0	3,487.0	3,407.0	3,978.0	0.0	2,905.0	2,906.0			
11	2,906.0	4,226.0	5,019.0	3,936.0	3,407.0	4,018.0	0.0	3,170.0	0.0			
12	2,641.0	4,226.0	3,434.0	3,355.0	3,539.0	4,018.0	0.0	3,170.0	3,170.0			
13	3,698.0	4,226.0	3,698.0	3,804.0	4,173.0	3,705.0	0.0	3,170.0	2,905.0			
14	2,641.0	3,170.0	4,226.0	4,173.0	3,566.0	3,742.0	0.0	4,226.0	2,905.0			
15	2,906.0	3,170.0	2,641.0	4,173.0	3,698.0	2,814.0	0.0	3,434.0	0.0			
16	2,906.0	3,170.0	3,169.0	4,094.0	3,882.0	4,007.0	0.0	4,226.0	3,698.0			
17	3,963.0	2,905.0	2,641.0	3,275.0	3,494.0	4,131.0	3,434.0	3,434.0	3,434.0			
18	4,755.0	2,641.0	2,641.0	3,400.0	3,502.0	4,548.0	3,434.0	3,434.0	3,434.0			
19	3,434.0	1,849.0	3,434.0	3,222.0	4,490.0	1,617.0	3,170.0	3,434.0	2,906.0			
20	3,434.0	3,434.0	3,434.0	2,985.0	4,411.0	4,366.0	3,434.0	3,434.0	3,170.0			
21	3,746.0	2,642.0	2,905.0		4,702.0	4,076.0	3,434.0	3,170.0	3,434.0			
22	4,755.0	3,698.0	3,170.0	3,645.0	3,992.0	3,645.0	2,905.0	2,642.0	2,906.0			
23	5,019.0	3,962.0	2,911.0		3,780.0	3,606.0	3,965.0	2,906.0	2,906.0			
24	4,755.0	2,642.0	5,547.0	3,302.0	3,989.0	3,941.0	4,226.0	3,592.0	2,648.0			
25	2,642.0	2,660.0	0.0	3,434.0	4,377.0	4,049.0	4,755.0	3,170.0	3,170.0			
26	1,849.0	2,642.0	0.0	3,036.0	4,083.0	4,049.0	3,434.0	3,170.0	3,170.0			
27	3,170.0	2,641.0	0.0	3,302.0	4,670.0	0	3170	3434	3698			
28	5,548.0	2,641.0	0.0	3,141.0	4,591.0	0.0	3,434.0	3,170.0	3,962.0			
29	3,963.0		0.0	3,141.0	2,462.0	0.0	3,698.0	3,434.0	5,547.0			
30	0.0		0.0	1,904.0	2,462.0	0.0	3,963.0	1,344.0	4,755.0			
31	2,641.0		0.0				3698	3440				
Full Year	**101,776.0**	**90,355.0**	**84,004.0**	**72,099.0**	**111,482.0**	**99,618.0**	**54,154.0**	**101,358.0**	**74,232.0**	**0.0**	**0.0**	**0.0**



Average Daily Fuel Usage = 2,923 gallons/day
Maximum Daily Fuel Usage = 5,548 gallons/day

BP CONFIDENTIAL

	WEST VELA 2018											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	7,700	11,537	9,658	13,574	9,499	10,276	9167	10408	9880	9774	11298	10822
2	8,811	8,970	8,282	7,753	10,488	10,408	9431	11703	10937	11941	8732	8123
3	9,076	11,616	8,203	9,631	10,276	10,805	8031	11042	12548	10356	10690	9526
4	12,013	9,420	9,870	9,484	9,220	9,405	14054	9589	9246	10081	9155	8732
5	9,737	8,441	9,605	10,778	9,431	9,220	7582	7555	10346	8600	10346	9605
6	6,827	7,885	9,817	8,586	9,510	8,269	10303	15084	13759	11351	10690	8282
7	10,055	6,948	9,088	9,537	17,979	9,906	11412	6234	13521	27391	9049	10690
8	12,357	9,484	10,065	11,597	10,118	8,612	8982	7118	9420	20639	9870	10452
9	6,985	6,789	7,872	9,405	13,975	9,986	10910	6880	9658	10372	8256	9446
10	8,533	7,001	9,431	9,537	14,556	11,122	10673	6641	8414	8573	9817	9314
11	8,876	8,004	7,899	10,382	13,341	10,646	9367	4842	9076	9340	7885	9817
12	11,861	7,687	9,748	8,427	17,277	9,510	9949	6985	9790	9949	11722	9378
13	10,408	11,756	8,930	8,295	10,567	10,399	10928	3863	10755	8785	8864	8638
14	7,502	6,921	7,819	10,540	8,929	9,923	14818	5451	13495	10610	10118	8216
15	8,480	6,862	8,110	8,084	10,276	10,372	8626	7065	13204	10769	9140	8148
16	6,736	8,242	8,295	8,559	12,671	9,975	7832	6562	12780	11563	8691	7925
17	9,827	10,540	8,876	8,454	13,468	9,923	9287	4922	11060	11854	9114	10540
18	9,642	7,859	10,118	9,261	8,203	9,923	10240	5530	9076	10805	8295	5151
19	8,427	12,046	9,510	8,732	9,817	9,975	9658	6906	10118	8982	8744	7687
20	8,744	10,012	9,589	8,811	10,214	9,182	11087	6234	9008	9272	8929	9431
21	9,616	7,091	9,208	6,721	9,658	8,838	9499	6234	8929	7635	9167	9589
22	9,510	9,287	9,129	8,626	12,912	8,758	9499	11095	11756	11201	9220	8321
23	7,952	7,541	9,235	9,208	10,928	10,266	10187	11095	7740	8137	9748	7133
24	9,896	8,864	9,975	11,748	8,705	10,743	10138	8533	8506	10250	10514	8718
25	11,007	11,325	10,240	9,817	10,981	11,484	9404.527	8057	9616	9933	8744	8321
26	11,854	7,435	8,414	9,287	10,265	10,108	8876.183	10963	9854	8269	9193	9843
27	11,510	11,325	8,123	10,558	9,340	9,906	10514	18175	11439	10408	9035	10319
28	8,573	8,097	10,505	8,626	11,246	8,348	10540	8480	9986	10144	9129	6906
29	9,552		10,346	9,711	9,287	8,638	10065	14899	11518	10144	9949	8441
30	9,049		9,579	11,563	9,774	10,144	9563	11782	8718	8295	10081	8758
31	9,023		9,589		11,201		9457	11941		10435	10002	7779
Total	290139	248985	285128.4	285292	344112	295070	310079.7	271868	314153	335858	294187	274051
Average	9359	8892	9198	9510	11100	9836	10003	8770	10472	10834	9490	8840
Maximum	12357	12046	10505	13574	17979	11484	14818	18175	13759	27391	11722	10822

2018 Maximum Daily Fuel Rate 27391 gallons
2018 Max Avg Daily Fuel Rate 11100 gallons

Fuel Consumed by West Vela in Years 2013 - 2018							
SUMMARY	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**ALL**
Annual Maximum Average Daily	8,164	11,871	11,264	9,363	11,113	11,100	11,871
Annual Maximum Daily	17,066	31,389	20,605	18,653	27,391	27,391	31,389

	WEST VELA 2017											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9,431	11,201	11,296	9,880	9,446	9,367	8374	12839	7740	9774	9817	8758
2	7,555	13,235	9,182	9,088	10,214	10,161	10039	11941	11280	11941	7594	10108
3	11,888	8,797	10,266	10,382	9,352	7,753	8771	10091	13526	10356	10849	7488
4	7,740	14,926	14,050	9,537	10,488	9,076	9035	9405	11703	10081	10187	8996
5	7,133	9,537	13,336	10,171	11,042	9,711	9102	10461	9571	8600	9949	9446
6	6,763	9,325	10,822	13,473	11,439	8,520	9446	8665	8150	11351	8970	10372
7	9,669	9,140	9,340	10,435	11,439	9,684	8626	10408	9102	27391	9658	9287
8	6,842	10,884	8,335	11,756	8,137	9,049	8573	12971	8811	20639	9182	9658
9	6,684	8,586	11,695	10,329	9,484	8,970	7806	13071	10029	10372	9737	9049
10	9,669	9,801	11,695	10,303	7,529	9,949	9367	9579	10028	8573	8996	11537
11	7,978	10,197	11,378	7,582	11,861	7,885	9896	8943	8705	9340	9208	7356
12	9,801	10,646	10,981	9,632	8,850	8,732	7859	9949	11060	9949	10187	9711
13	9,748	9,616	10,372	12,357	9,272	9,949	8891	9923	8467	8785	9314	10118
14	10,435	9,880	10,240	11,695	9,035	8,823	8335	9473	11616	10610	11351	9035
15	14,292	12,152	9,499	9,552	7,899	9,272	9155	9605	13389	10769	8004	9246
16	16,285	13,658	9,526	9,870	9,642	7,687	8944	11272	13442	11563	10382	10144
17	9,722	13,684	8,811	9,711	11,703	9,748	7409	11404	10002	11854	9114	8163
18	7,529	11,333	10,214	6,668	8,796	9,008	7356	10610	9579	10805	8903	9563
19	10,118	10,937	12,555	8,917	8,796	10,197	8441	13653	9870	8982	9193	8691
20	9,774	7,952	11,431	9,923	8,665	11,993	9049	13997	8982	9272	9484	10937
21	10,620	9,801	12,621	8,970	9,827	10,197	8176	13442	11782	7635	8718	7370
22	11,835	8,876	10,276	10,055	8,903	9,510	8811	13362	10250	11201	9510	9880
23	10,540	9,801	9,431	9,684	10,171	6,736	8758	8982	8586	8137	10144	9431
24	10,857	10,408	10,884	9,473	10,065	8,295	11431	9140	9088	10250	7820	9748
25	9,510	9,774	8,057	7,832	8,903	9,695	7329	10223	9722	9933	11465	9748
26	9,933	10,356	9,220	7,435	10,981	8,242	8533	10012	9880	8269	10144	8665
27	8,823	9,616	10,725	9,393	9,110	9,140	9801	8982	9642	10408	7846	9393
28	9,114	9,484	9,827	8,864	8,811	10,039	8865	9695	15111	10144	8084	9235
29	8,770		8,903	9,923	8,917	9,405	8321	15745	10408	10144	9790	15109
30	10,118		9,563	9,367	7,144	11,729	9801	16299	9642	8295	9224.054	10875
31	10,012		10,567		8,441		10356	10356		10435		8414
Total	299188	293603	325098	292257	294362	278522	274656	344498	309163	335858	282824.1	295531
Average	9651	10486	10487	9742	9496	9284	8860	11113	10305	10834	9427	9533
Maximum	16285	14926	14050	13473	11861	11993	11431	16299	15111	27391	11465	15109

2017 Maximum Daily Fuel Rate	27391	gallons
2017 Max Avg Daily Fuel Rate	11113	gallons

	WEST VELA 2016											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9246	6446	9167	8689	11385	7027	8314	7397	14820	5915	6483	9193
2	7793	6789	8129	9975	8929	8031	9006	8480	8427	5339	6829	9695
3	9985	7635	11901	8041	10983	8321	9035	8487	8823	5598	4338	9959
4	9589	8137	8712	8723	9219	11306	8908	7017	9933	5997	8636	9774
5	8796	5891	8934	8147	8744	9008	8760	9029	8665	5785	6647	8533
6	9986	8137	10411	8718	8922	9431	8213	8144	10012	5865	8073	7952
7	9714	5891	10498	8251	8215	8876	9267	8583	10488	6182	7542	8295
8	8741	6419	10327	7608	8770	10250	9368	9103	10884	5785	7246	9457
9	7724	7137	9219	9962	8215	9193	8461	10701	9510	8242	8337	9114
10	9579	7319	9219	8757	8215	7978	10488	11190	9405	9167	7593	8057
11	8839	7872	11517	8308	9272	9801	8290	10688	8533	5891	9423	8560
12	9381	5838	9642	9521	8184	7899	9966	12606	11491	5996	7875	7080
13	7812	9457	8215	8274	9573	9669	8004	12306	8876	7291	8166	9933
14	9560	7291	8162	8023	8077	7080	10646	10141	9998	6287	9394	8638
15	8332	9378	8770	9386	9257	11571	7846	8113	8778	5415	7246	12812
16	9288	7106	8585	9157	8078	9986	8797	10509	7825	6261	9035	4782
17	9405	7503	8638	10884	8126	8586	9167	8398	8641	5627	7423	9669
18	9415	7096	9974	8931	8937	8137	9299	9072	8665	5997	8295	8612
19	8689	7320	12310	8234	8034	15190	8401	9460	8163	6446	7872	8718
20	8459	6900	6736	8057	10305	7872	9484	8216	8527	6023	6974	9325
21	9375	6242	8031	10487	10068	5812	7608	9457	6668	7265	8454	7635
22	11563	6464	8717	9853	8826	9058	7370	9722	13420	6472	7819	10514
23	9465	9294	9404	9351	8102	7186	6340	7341	6095	3540	9431	7978
24	6464	9582	8215	9510	8712	13679	6605	12258	5915	6393	9880	9378
25	9658	8683	8691	9747	9481	7349	6868	10805	6176	5548	9484	8427
26	9103	8916	8823	9985	9418	7959	8348	9457	4562	6404	8586	10990
27	10434	10242	10989	8321	8800	7135	6287	10223	7272	7018	9405	6974
28	8506	9259	8453	10223	7756	7994	8189	8216	6237	5651		8348
29	6815	10937	8083	8105	9647	8586	7345	10488	7006	6367	8691	9405
30	7159		10802	13287	7717	9000	6895	6657	5870	18653	9140	9167
31	10276		9352		9394		7767	7978		7851		9748
Total	279151	225181	288626	274515	277361	268970	259342	290242	259685	206271	234317	276722
Average	9005	7765	9311	9151	8947	8966	8366	9363	8656	6654	8080	8927
Maximum	11563	10937	12310	13287	11385	15190	10646	12606	14820	18653	9880	12812

2016 Maximum Daily Fuel Rate	18653	gallons
2016 Max Avg Daily Fuel Rate	9363	gallons

	WEST VELA 2015											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	9246	10118	9906	10298	13808	6736	9619	9689	5608	8638	8432	8065
2	10356	10593	9986	10184	10673	5389	10308	11877	6721	8347	11389	6810
3	9906	10435	11967	8979	9880	6599	10110	10184	5402	8347	10403	8028
4	10233	13959	11014	9637	10509	5088	9164	11888	12923	7528	9880	7349
5	12548	12226	13121	15493	10720	7022	10905	13129	6609	8902	9642	7547
6	12125	11301	9552	9740	10406	8314	9090	10329	8895	9853	10329	8126
7	12723	9391	10123	10897	9373	8348	10134	11755	14709	8506	9774	10767
8	10670	11208	10916	10435	9119	7545	9774	13155	8105	9906	8559	11674
9	10937	9721	13230	9795	11682	6322	11042	10857	7096	9721	8400	6987
10	12730	9946	10913	10205	9468	15057	10593	10831	4462	10566	9695	7598
11	14905	11024	11694	10218	10647	7898	10514	10646	5439	11068	9167	7954
12	12760	12699	10686	9354	10542	9378	8268	11861	6588	8374	8981	9436
13	11759	12110	9233	10115	10593	8691	9457	12178	4982	9615	9906	8612
14	10937	11449	11721	9724	11491	7079	9800	7898	5838	9410	11015	10229
15	9310	11473	12260	9985	12918	9615	8400	20605	5239	8160	7159	8247
16	9336	12683	9835	9589	9510	9140	9327	7423	6221	9121	10329	8796
17	10356	13906	9959	9589	10408	10276	9351	7423	14183	10517	11834	7925
18	10049	11729	10039	10329	10144	18186	10566	6234	7674	8644	10125	10064
19	9436	10197	11834	10408	9113	10804	9880	6348	8736	8403	10434	9959
20	9899	10540	11834	8691	7158	10487	9216	7122	7923	10025	8638	10883
21	10488	10593	10619	11200	10461	12891	9589	8102	7812	9106	11966	7872
22	9880	10233	10064	9985	21286	8929	10321	5770	8969	9962	11967	9510
23	11069	9906	12759	10620	15586	8929	9238	7690	8150	9370	8998	9906
24	10144	10091	12706	10751	7502	9589	10717	4211	8335	10189	8981	9972
25	10197	11254	13076	9563	7977	9634	11513	6515	8210	9671	10459	9008
26	10170	9748	11914	10249	7370	9082	10770	5989	10514	9185	9986	9774
27	11439	10197	12627	10233	6768	10789	10062	5003	7991	9946	9344	8057
28	10937	11624	12759	11782	8301	9119	10688	5923	8765	8585	8065	10699
29	11676		11227	10440	5880	10964	9346	6789	8031	9113	5783	8321
30	13050		10461	9595	4726	11140	11365	7009	8004	10099	14746	10275
31	12760		11148		7994		11436	4737		10617		9087
Total	342031	310354	349183	308083	312013	279040	310563	279170	238134	289494	294386	277537
Average	11033	11084	11264	10269	10065	9301	10018	9005	7938	9339	9813	8953
Maximum	14905	13959	13230	15493	13808	18186	11513	20605	14709	11068	14746	11674

2015 Maximum Daily Fuel Rate	20605	gallons
2015 Max Avg Daily Fuel Rate	11264	gallons

	WEST VELA 2014											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8137	9457		10699	8340	7579	10572	9109	9650	1260	25900	9626
2	7502	9642		11434	8691	7133	10733	8213	11560	7925	9650	9331
3	9510	9985	15295	10971	7841	7513	10866	9669	8929	7888	11248	9264
4	7608	10990	17963	10068	7949	6734	9811	10712	9061	8475	12474	10089
5	8955	9431	8532	10625	7130	7046	10411	11100	8110	7418	10704	9949
6	10200	9740	9616	11074	9040	6691	9492	11571	8691	7009	10163	10646
7	6715	8747	10038	11880	8018	6068	9077	10805	8823	6586	10210	8578
8	7579	8332	13367	11386	10593	8279	10152	11650	8850	6631	11209	10559
9	7184	9571	8321	10342	9481	6525	9914	11650	14926	6182	11330	11639
10	6095	9624	9140	10065	9233	6929	10065	11861	7001	6631	9788	9936
11	8672	7490	9140	11967	9584	7318	9588	11861	6551	6789	9177	11159
12	8234	8994	8665	10963	9830	7476	9588	10488	6261	5125	9542	7936
13	14738	7339	8108	10883	10039	7053	10884	10222	6446	6948	12123	10271
14	8826	8203	8826	10884	9753	8136	9827	10699	7265	15792	11719	10149
15	9954	7475	8057	10276	11280	7106	9061	10065	7053	7576	9716	10091
16	9346	12864	9320	10012	9774	7291	9669	10752	7053	7669	9624	9774
17	10881	9159	9317	10672	10989	9298	8612	11359	6871	9592	10250	9822
18	10979		8337	9880	10012	7635	8903	10118	6445	9479	11782	8411
19	10287	8863	10593	10620	9880	7898	9669	10276	6266	7267	7452	8816
20	9251	7978	9404	8664	9932	7925	10461	11098	7724	7864	7452	18075
21	10347	10065	8796	9563	10540	7687	9827	9455	6155	8763	31389	8240
22	10329	8189	14503	9748	9404	6313	9854	9746	6340	7896	12715	16564
23	9906	8929	20867	8823	9572	9088	8076	10807	7311	11301	19813	23419
24	9563		6816	7767	8744	7265	9655	8390	8781	12395	8506	9563
25	9589		8374	9431	8543	6419	9658	15092	7915	8155	8823	9035
26	10990		8771	10699	7767	7175	9455	8197	6924	8218	10229	10171
27	10593		11174	8796	9420	8097	9056	14677	7392	7841	10353	12099
28	10144		10990	7925	6842	8826	9939	8401	7209	7928	12326	8903
29	10408		10039	6102	6948	11914	9034	9003	8248	6171	9751	9616
30	9721		10593	7439	7693	10578	10117	7841	7737	9396	10712	8163
31	10223		10144		6826		8992	8903		10924		10118
Total	292466	201067	303106	299658	279688	230995	301018	323790	237548	249094	356130	330012
Average	9434	9139	10452	9989	9022	7700	9710	10445	7918	8035	11871	10646
Maximum	14738	12864	20867	11967	11280	11914	10884	15092	14926	15792	31389	23419

2014 Maximum Daily Fuel Rate	31389	gallons
2014 Max Avg Daily Fuel Rate	11871	gallons

	WEST VELA 2013											
	Volume Fuel Consumed in Gallons											
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	No BP related fuel										
2	0											
3												
4												
5	8427											
6	8586											
7	7529											
8	17066											
9	7344											
10	10118											
11	10447											
12	0											
13												
14	9720											
15	6973											
16	7898											
17	7581											
18												
19	10777											
20	9984											
21	9430											
22	9430											
23	10250											
24	10012											
25	8586											
26	8955											
27	8955											
28	8638											
29	8189											
30	7370											
31												
Total	212265	0	0	0	0	0	0	0	0	0	0	0
Average	8164	-	-	-	-	-	-	-	-	-	-	-
Maximum	17066	0	0	0	0	0	0	0	0	0	0	0

2013 Maximum Daily Fuel Rate	17066	gallons
2013 Max Avg Daily Fuel Rate	8164	gallons

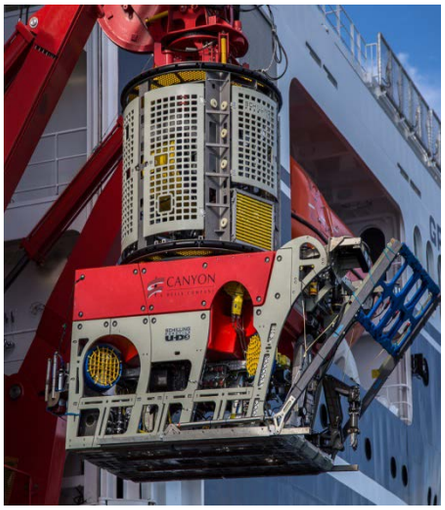
GRAND CANYON II

PURPOSE BUILT OFFSHORE CONSTRUCTION/ROV/SURVEY VESSEL

HELIX
CANYON OFFSHORE

GRAND CANYON II

PURPOSE BUILT OFFSHORE CONSTRUCTION/ROV/SURVEY VESSEL



The *Grand Canyon II* is specially designed for operation under severe weather conditions with high maneuverability and station keeping capabilities.

Main Characteristics	
Length Overall	127.75 m
Length Between Particulars	114.60 m
Breadth Moulded	25.00 m
Depth to Main Deck	10.80 m
Maximum Draft	7.50 m
DWT at SWL / 7.3 m	Approximately 7,500 Te

Anti-rolling Tanks

One anti-rolling heeling system

Class

DnV + 1A1, E0, ICE C, DYNPOS AUTRO, SPS, CLEAN DESIGN, COMF-C3-V3, HELDK-SH, NAUT- OSV(A), CRANE, TMON, BIS

Main Propulsion Equipment

Diesel electric propulsion plant

Two nozzle propellers for main propulsion, output of 5.0 MW each

Deck Equipment

250 t AHC offshore crane with 3,000 m wire

1 auxiliary crane, starboard, 15 Te / 20 m

1 auxiliary crane for provision handling 2 Te / 18 m

4 tuggerwinches, each 10 Te

2 capstans, each 10 Te

Tunnel Thrusters / Azimuths

2 electric driven tunnel thrusters aft, each 2,000 kW

4 electric driven tunnel thrusters in bow, each 2,000 kW

Working Deck	
Moonpool	7.2m x 7.2m
Deck Area aft of Hangar	1,650 m

Helideck	
Rating	Skorsky 92
Rules	CAP437, DNV Class & NORSOK
Diameter Helideck	26.1m

Speed

Maximum speed at 6.0 m draft approximately 15.0 kn

Accommodation

104 men in single and double cabins

Messroom with self-serving area

4 lounges

Meeting rooms, offices, etc. on various decks

Helideck reception area

Hospital and recreation area

Wardrobes

Laundries

Cinema

ROVs and ROV Area

2 x 250hp UHD Gen III WROVs

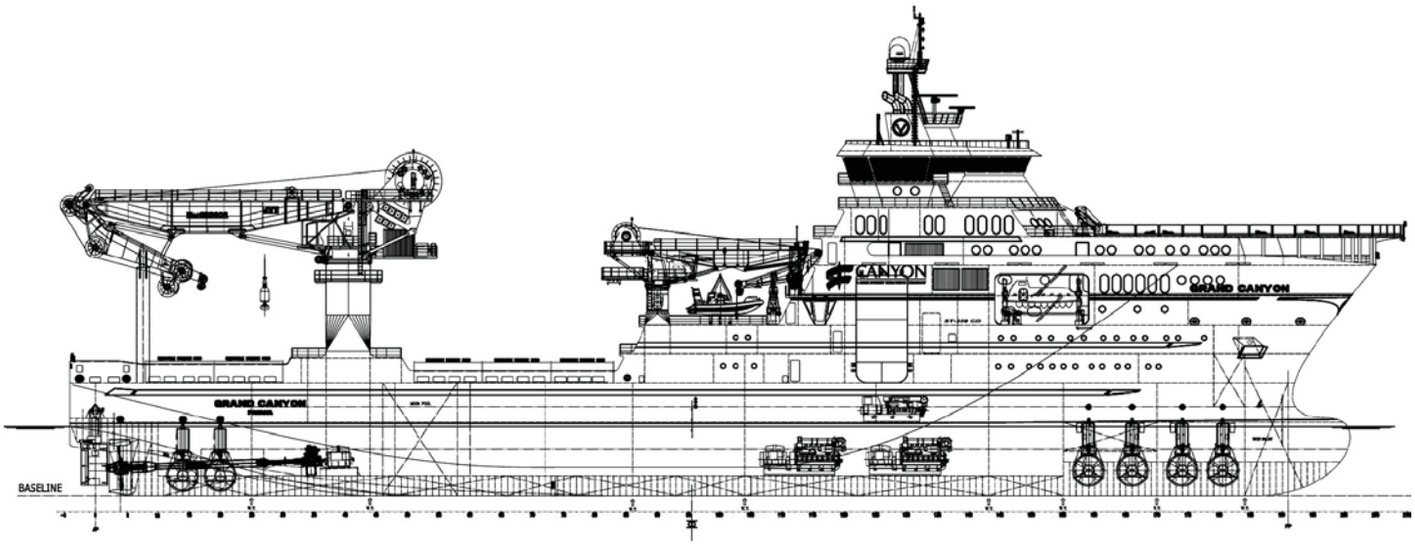
Hangar for port and starboard launching of WROV's

ROV workshop and maintenance area

Offices and meeting rooms for ROV operations

Online / offline rooms

Overhead crane in hangar 50 Te SWL



Dynamic Positioning System
Dual redundant dynamic positioning system (AUTRO / DP3)
2 Acoustic positioning units (HIPAP 500)
2 DGPS
Radius 1000
3 x MRUs
2 x tautwire winches / A-frames

Navigation and Radio Communication
Equipment according to GMDSS regulations, Area A4
Three radars, three gyro compasses
Auto pilot, DGPS
Electronic chart system
3 x Anshutz
Calling, command, telephone system + CCTV

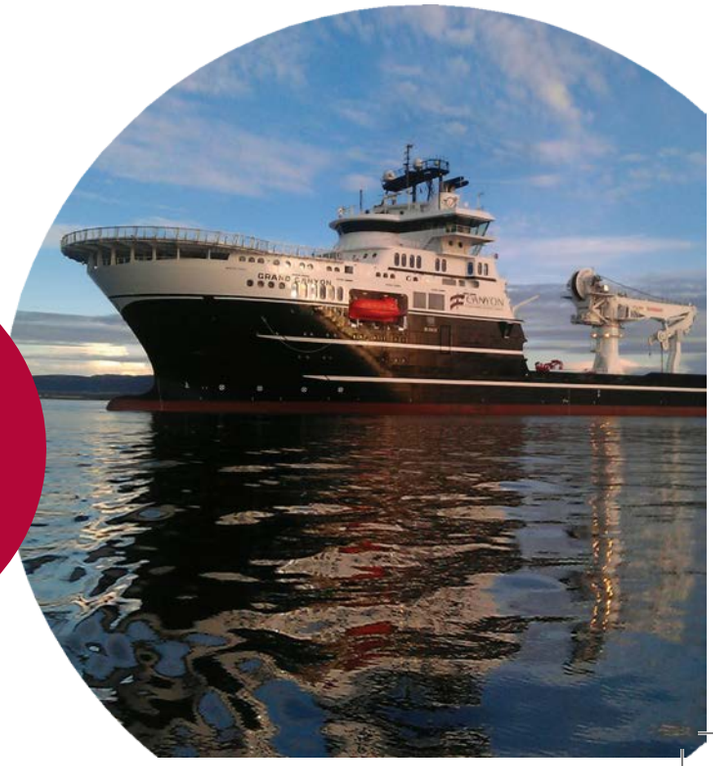
Safety Equipment
Fast Rescue Craft (FRC)
2 x 68 men lifeboats
According to SOLAS for the specified class and number of crew
Stability according to IMO Res. MSC.266 (84) code of safety for special purpose ships 2008

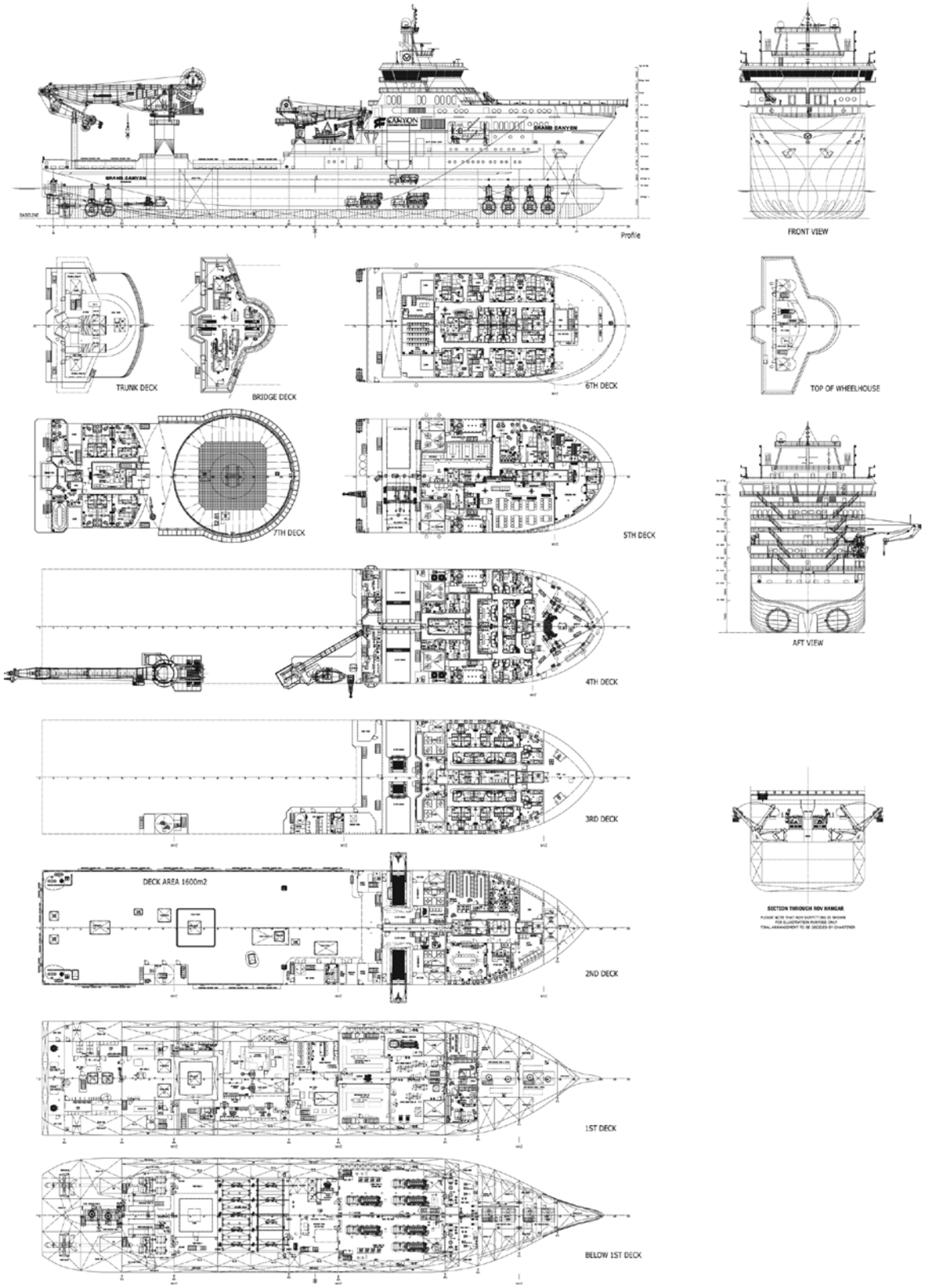
Tank Capacities	
Fuel Oil	Approximately 2,000 m^3
Potable Water	Approximately 500 m^3
Technical / Cargo Water	Approximately 750 m^3
Technical / System Water	Approximately 200 m^3
Water Ballast	Approximately 3,800 m^3

Power Generating Plant
6 x 3,000 kW diesel generator sets, 720 rpm
1 x 550 kW emergency generator

Fuel Consumption	
Dock	3.5 m^3 / day
Mob / Demob	5.5 m^3 / day
Normal Transit	35 m^3 / day
Fast Transit	50 m^3 / day
DP Low Loading Light Environmental Conditions	14 m^3 / day
DP Med Loading Increased Environmental Conditions	16 m^3 / day
DP High Loading High Environmental Conditions but within Operating Limits	22 m^3 / day

SPECIALLY DESIGNED FOR OPERATING UNDER SEVERE WEATHER CONDITIONS





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SCHILLING ROBOTICS UHD-III ROV

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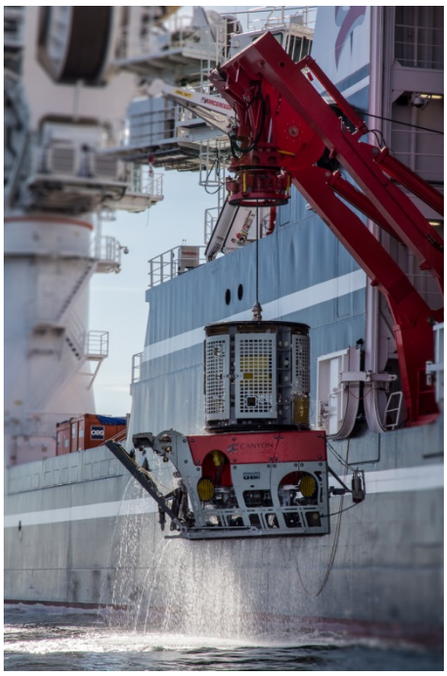
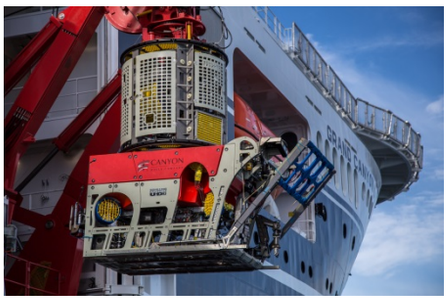
SCHILLING ROBOTICS UHD-III ROV

The UHD-III system delivers market-leading performance for the most difficult deepwater tasks. The 250-hp vehicle is capable of handling all ultra-heavy-duty requirements, capabilities with API 53 standards for secondary BOP intervention. This capability also enables users to perform other demanding tasks, including well intervention and hydrate remediation, using multiple fluids that can be carried onboard the ROV.



- Versatile 250-hp ROV and 150-hp auxiliary output
- Intelligent power management system providing highest thrust performance for ultra-heavy-duty tasks
- Industry's most accurate StationKeep with independent thruster control
- High-definition (HDTV) video suite
- 60-minute modular maintenance
- High-integrity hydraulic system - all stainless-steel tubing

In addition to providing the most comprehensive intervention capability available, UHD-III incorporates features that further enhance the productivity of offshore operations. The system leverages the benefits of modular design for rapid maintenance, first introduced with Schilling Robotics' HD ROV. This modular approach improves maintenance times by a factor of 6-to-1 compared to traditional vehicles, and ensures that ROV operations are more reliable and productive than ever before. Performance of intervention tasks has also been enhanced through the integration of a high-definition video suite (HDTV). Enhanced automation dramatically reduces the time required to perform common intervention tasks by stabilizing the position of tooling relative to the intervention panel.



System-level design addresses all the major equipment elements (ROV, TMS, LARS, vans, and umbilical) to effectively optimize offshore operations. All aspects of the system have been aligned to provide exceptionally high reliability, combined with ease of operation and maintainability.

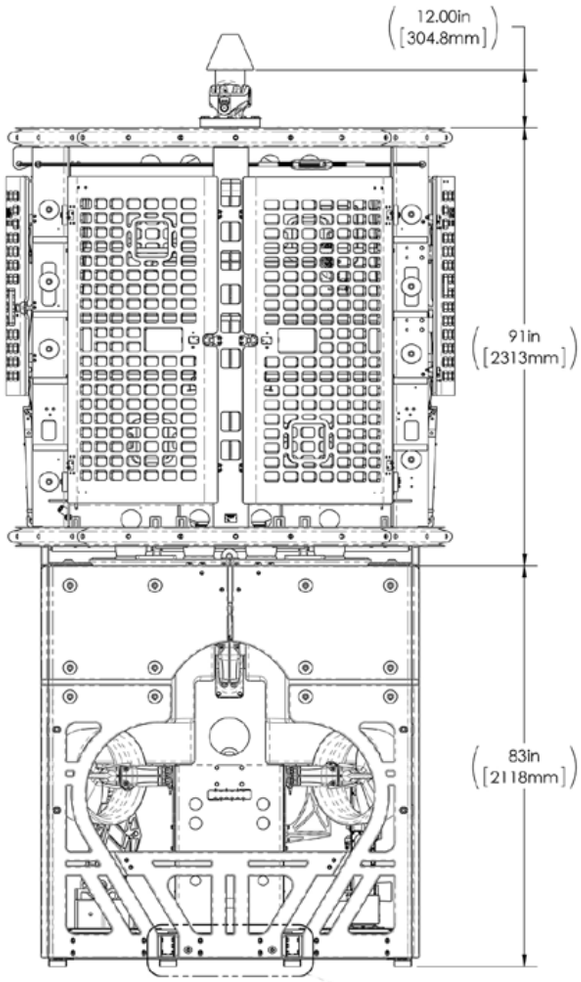
Specifications	
Docking Interface SWL	13,025 kg
Through-Frame Lift	3,500 kg
Weight in Air	5,600 kg
Dimensions	3.5m X 1.9m X 2.1m
Payload	450 kgf

Peak Thrust Performance

Forward / Aft / Lateral	1,200 kgf
Vertical – Up / Down	1,000 kgf
Station Keep	10 cm

Equipment Fit

Manipulators	(1) Titan 4 7 Function (1) Atlas 7 Function
Cameras	SD and HD Options
Depth Sensor	TOGS
DVL	RDI 1200kHz
Lights	(12) Variable 120 VAC / 250 W
Pan & Tilt	Schilling Electric
Valves	(14) 8 LPM (4) 32 LPM (2) 160 LPM



AFT BACK VIEW

SCHILLING ROBOTICS UHD-III ROV

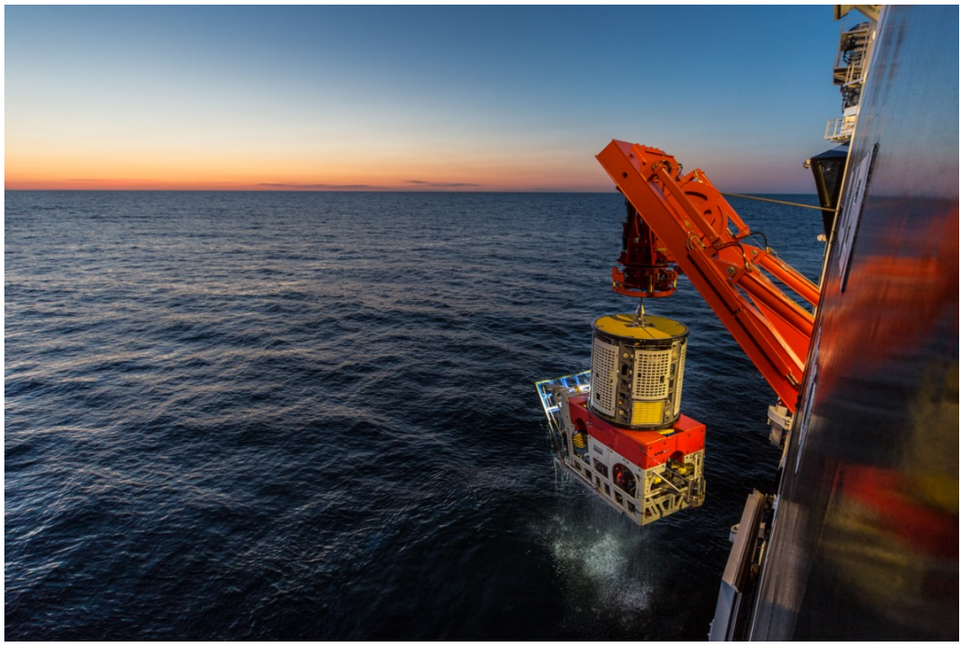
Digital Video Suite

The digital video-over-Ethernet system can transport both HD and SD video, through H.264 compression, that can be annotated and recorded via the video PC on surface.

- High-definition, low-latency streaming video at 1920 x 1080 resolution, 60 frames per second
- Video streaming using H.264 compression over RTSP
- SD low-latency streaming video at NTSC/PAL resolution
- Topside video output: HDMI, NTSC/PAL analog video
- Enables 1080P HD video transmission over standard Ethernet communications

Hydraulic System	
HPU	250 hp
Auxiliary	150 hp
Operating Pressure	207 Bar
Thrusters	(7) Sub Atlantic 420

Auxiliary Pump Capabilities	
Output	50 GPM at 5,000 psi 75 GPM at 2,500 psi
Pumps Independent Aux 1 and Aux 2 Fluids Simultaneously	
Fluids Supported	Hydraulic Oils Glycols Seawater MEG Methanol



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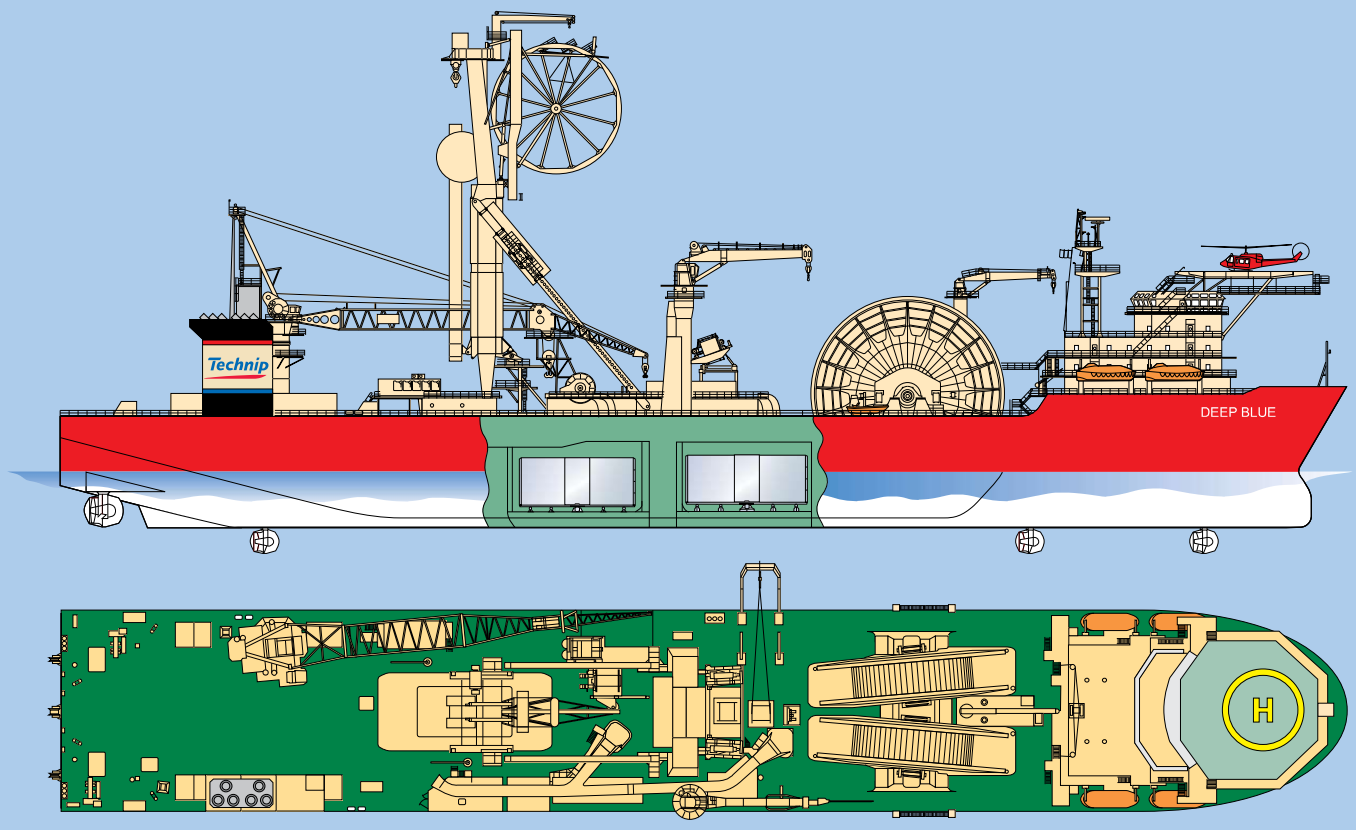
Deep Blue

One of the most advanced pipelay and construction vessels of the subsea industry and the flagship of the Technip Fleet

Technip

take it further®

Deep Blue



The Deep Blue is one of the most advanced pipelay and construction vessels of the subsea industry and the flagship of the Technip Fleet. The vessel combines the highest technology for reel-lay, J-lay and flexi-lay operations. She supports Technip's operations in the most demanding environments and offers clients unique and cost effective solutions for the development of deep and ultra deepwater fields.

Deep Blue is a versatile and highly capable vessel. For the first time ever, a vessel is able to combine the installation of all types of flexible and rigid risers (reeled and J-Lay), flowlines and umbilicals, and support developments in water depths up to 3,000m (9,842ft) at an optimised cost.

The Deep Blue has been designed to offer the best technical solutions to the needs of our clients wishing to develop deep and ultra deep fields at optimised costs.

The Deep Blue is particularly well adapted to Gulf of Mexico, West African or Brazilian requirements thanks to her unique tensioning capacity, the large range of pipe products and payload (10,000 Te of products) she can carry / install.

Deep Blue references

World records and Industry firsts

CLIENT	PROJECT	SCOPE OF WORK	WATER DEPTH	YEAR
Shell	Perdido (Gulf of Mexico)	**World records:** - deepest installed reeled pipe - deepest installed reeled in-line structure (PLET)	2,957m (9,701ft) 2,850m (9,350ft)	2009
Shell	Na Kika (GoM)	**World records:** - deepest Pipe-in-Pipe (PiP) reel-lay - deepest PiP J-lay - deepest PiP Steel Catenary Riser	2,115m (6,940ft) 1,912m (6,272ft) 1,938m (6,360ft)	2005
		Industry firsts: - First reeled PiP in-line sleds - First reeled flowline shorter than water depth - First internal buckle arrestors used in PiP - First subsea Remotely Operated Vehicle SCR transfer operation - First reeled FSHR		

Most challenging and technically advanced projects

CLIENT	PROJECT	SCOPE OF WORK	WATER DEPTH	YEAR
Anadarko	Caesar Tonga (GoM)	EPCI contract for installation of 2 Steel Lazy Wave Risers (2km each) with 1st End Transfer to Spar - first time in GoM	1300m - 1560m (4,256ft - 5,118ft)	2012
Total	Pazflor (Angola)	EPCI contract for 50km of production PiP (12"/16") with flextails, 18km of 11" production line with flextails and 10 in-line structures, 28km of 10" water injection with flexible riser and 2x10" Integrated Production Bundles (IPBs)	600m - 1,200m (1,968ft - 3,936ft)	2011
BP	Block 31 PSVM (Angola)	EPCI contract for 45km of 12" water injection line with a 15mm thick HDPE liner and 20km of gas injection line	1,800m - 2,100m (5,905ft - 6,889ft)	2010
Tullow	Jubilee (Ghana)	EPCI contract for 31km of 12" production line, 5km of 10" gas injection line, 11km of 12" water injection line, 7 anchoring piles, 2 riser base manifolds (220 Te each) and 8 production and injection manifolds	900m - 1,700m (2,952ft - 5,577ft)	2010
Petrobras	Cascade Chinook (GoM)	EPCI contract for 10km of 9" production line, 84km of 6" gas export line, 9 anchoring piles, 2 manifolds, 2 pump stations, 5 reel laid FSHRs	2,400m - 2,700m (7,873ft - 8,858ft)	2009
Shell	Perdido (GoM)	EPCI contract for 13km of 6" circulation line with SCR connected to Perdido DVA spar	2,250m - 2,957m (7,381ft - 9,701ft)	2009
Petrobras	PDET (Brazil)	EPCI contract for 56km of 18" insulated gas export line installed by the J-lay method and one 18" J-Lay FSHR	100m - 1,800m (329ft - 5,900ft)	2007
Total	Dalia SURF (Angola)	EPCI contract for 86km of steel production, water and gas injection flowlines, 70km of steel tube umbilicals and 25km of flexible risers First use of the Integrated Production Bundle, an innovative and proprietary technology	1,200m - 1,500m (3,937ft - 4,922ft)	2006
Burullus Gas	Simian Sapphire (Egypt)	EPCI contract for 390km of rigid pipelines (diameter range 4" to 26") using both reel and J-lay methods. subsea control system including 250km of electro-hydraulic umbilicals	90m - 1,100m (295ft - 3,609ft)	2006
Shell	Nakika (GoM)	EPCI contract for 26km of production PiP (8" x 12") with SCR, reel-lay installation, 46km of 8" flowline with SCR, 12km of gas injection flowline and production PiP (10" x 16") installed by J-Lay	1,861m - 2,115m (6,105ft - 6,9401ft)	2005
Williams Field Services	Boomvang & Nansen Spars (GoM)	Pipeline system design and EPIC contract for 2 export lines. Engineering and installation of: - 195km of 12", 16" and 18" rigid pipelines and SCRs - 15 risers	1,054m - 1,121m (3,460ft - 3,678ft)	2001

A unique multipurpose installation and construction vessel

Deep Blue mobilising at the Technip Spoolbase in Mobile, Alabama

Deep Blue on the Boomvang and Nansen project in the Gulf of Mexico

Pipelay equipment

Reel-lay: 550 Te, a unique tensioning capacity to reel-lay the largest range of deep lines

The Deep Blue's laying system is designed around a powerful tiltable tower, equipped with two quad track tensioners capable of sustaining 550 Te. What makes the Deep Blue really unique is her ability to lay both flexible (up to 24" outer diameter) and rigid reeled lines (from 4" to 18" overall diameter, including PiP) down to 3,000 meters water depth (9,842 ft).

The moonpool-fitted tower is fed either by two reels for laying rigid pipe or by two carousels for flexible lines (vertically).

The tensioners are designed to handle both products. This allows her to lay flexible and rigid lines within the same trip with a maximum load of 10,000 Te of product.

A key feature is also her capability to lay Reeled Steel Catenary Risers (RSCRs) and Hybrid Catenary Risers (HCRs).

J-Lay: 770 Te tensioning capacity

The Deep Blue also incorporates a J-Lay system. This allows the laying of lines up to 28" O.D., which may be required as part of a large field development, or laying the non reelable portion of specific rigid lines of a more complex design, such as internally clad SCRs. The J-Lay configuration provides headclamps capable of taking pipe with or without collars or friction pads. The range of laying angles for the tower varies between 90° and 58°.

Storage capabilities

The Deep Blue is fitted with twin reels of 2,800 Te capacity each which are used for the storage of reeled rigid pipeline.

Two built-in under deck carousels are used as the main storage capability for flexible pipeline.

Finally, the Deep Blue has been designed with a large multi-purpose working deck which can either be used for transport of subsea structures to be installed in any offshore development or additional flexible product stored on portable reels. During J-lay operations, the deck is fitted with two bins, each capable of storing 2,000 Te of quads.

Cranage & deck winches

The vessel's main crane has been designed for offshore lifts ranging from 60 Te at 55m (180ft) radius up to 400 Te at 18m (59ft) radius enabling efficient subsea equipment installation through its active heave compensation system. In addition to the main deck crane, a number of smaller utility cranes ranging from 10 to 40 Te capacity are provided in way of the pipelaying equipment.

Two large winches are provided in support of pipelay operations. These are:

- 327 Te SWL (360 Te dynamic) Traction and Storage Winch are provided for abandonment and recovery of pipelines with tensions 150 Te<T<350 Te.
- 150 Te Initiation/A&R Winch is provided for initiation of pipelines using primarily Suction Piles, diverless latch and pipe transfer, etc. Also for abandonment and recovery of pipelines with tensions up to 150 Te.
- 15 Te Fast Winch with 3500m wire for quick and reliable light load deployment to seabed.
- 550 Te Pipe Follower for abandonment and recovery of pipelines with tensions 360 Te<T<550 Te. This is a flexible used as A&R equipment through the two tower tensioners.

Deep Blue mobilising at the Technip spoolbase in Dande, Angola

Deep Blue bridge

Remotely Operated Vehicles (ROVs)

Pipelay and construction activities are supported by two identical Triton® XLX advanced workclass ROVs. Both systems are 3,000 m (10,000 ft) rated. One vehicle is deployed through the moonpool on the vessel centre line and the other over the vessel side via a customised heavy duty A-frame. Both systems are cursor deployed.

The ROVs are deployed in powered cages complete with tether management systems and have 1000 m (3,280 ft) extended tethers fitted. State-of-the-art manipulators, sensors and tooling are permanently fitted. Client-supplied tooling is easily interfaced via dedicated valve packs and hydraulic systems. Both the ROVs and powered cages are fitted with survey quality, North-seeking fibre optic gyros and bathymetric systems. Each system is configured with a 150 hp power train and can accommodate any industry standard work package. The ROVs are operated from a dedicated control room built into the vessel and customised workshop and storage facilities are also provided.

Station keeping

The vessel is dynamically positioned during pipelay operations. Two main azimuthing propeller units are provided aft for propulsion and DP. Additionally, four further retractable azimuthing thruster units and two tunnel thrusters are provided for DP. A total of 25.6 MW (34,000 hp) thruster power is provided.

Integrated Vessel Management System (IVMS)

A fully integrated Kongsberg control system is installed. This monitors and, where applicable, controls all machinery for power generation and propulsion. Integral with the IVMS is a Kongsberg Simrad SDP-22 Dual redundant dynamic positioning system.

Machinery / propulsion

The vessel's main machinery consists of six diesel driven alternators (split between two separate machinery spaces) providing a total of 33.6 MW (45,000 hp) to the vessels electrically driven propulsion systems and various other consumers.

Transit speed

The transit speed of the vessel allows short transit time between spoolbase and field locations and shorter international transit between projects.

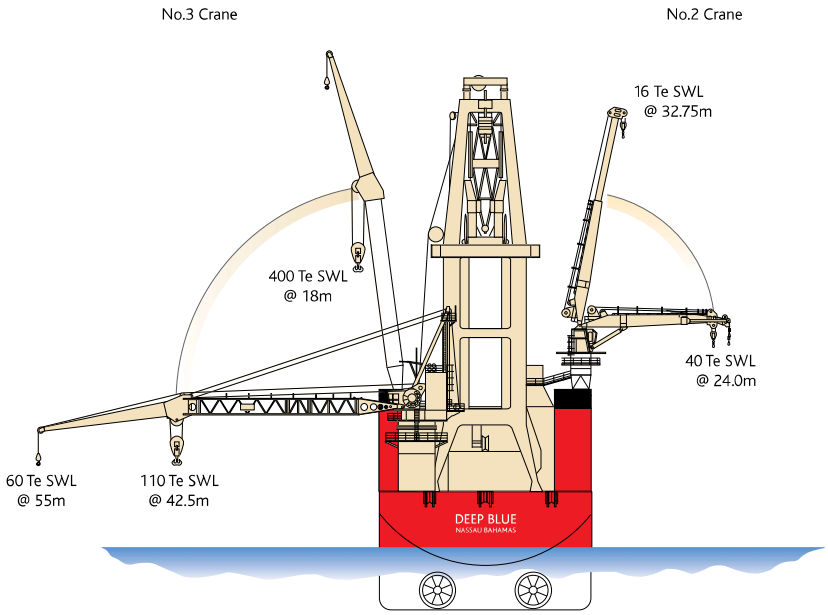
Hydrotest system

A dedicated hydrotest system provides high and low pressure technical fresh water at outlets adjacent to the main reels, carousels and moonpool for testing pipelines. The test pumping system provides for:

- a single low pressure supply of 800 ltrs/min @ 10 bar (211 gpm @ 145 psi)
- a dual high pressure with supplies of 120 ltrs/min @ 220 bar or 25 ltrs/min @ 600 bar (32 gpm @ 3,190 psi or 6.6 gpm @ 8,700 psi).

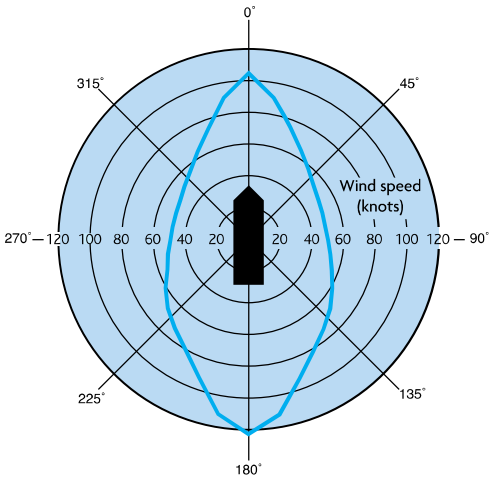
Key features

- Maximum water depth: 3,000 m (9,842 ft)
- Maximum pipe diameter range:
  - Rigid reeled: 4" to 18" O.D.
  - Flexible: up to 24" O.D.
  - Rigid J-Lay: 4" to 28" O.D.
  - Umbilicals: 70mm to 250mm (2 3/4" to 9 13/16")
- Maximum pipe payload: 10,000 Te (11,023 short tons), can consist of the combination of:
  - Rigid lines (2 reels): 5,600 Te (6,170 short tons)
  - Flexible lines/umbilicals (2 carousels): 2,000 Te and 1,540 Te (2,240 short tons and 1,698 short tons)
  - Portable reels (8 reels): 8 x 300 Te (330 short tons)
  - Rigid pipe quads: 4,000 Te (4,409 short tons)
  - Subsea structure: 3,000 Te (3,307 short tons)
- Heavy lift capability: 400 Te
- Moonpool: clear opening for 7.5 m wide x 15 m long (24 ft x 49 ft)
- Worktable over moonpool: clear opening for 5 x 5 m (16'4" sq) footprint equipment with 770 Te swl holding capacity
- Tower equipped with:
  - 2 stacked quad-track tensioners and centraliser modules, the total traction capacity is 550 Te (2 x 275 Te) dynamic loading. Tensioners to allow clear passage of 1.8m (5'10") diameter pipe attachments.
  - Rigid pipe straightener
  - Top module with crane, winch and crown block transfer assembly
  - Rigid pipe aligner
  - Flexible pipe aligner
  - J-Lay system on aft face of the pipe tower
  - Hinged at deck level and capable of jacking from 32° (measured from horizontal) to 90°. Rigid pipelay takes place between 60° and 85°, J-Lay 58° to 90° and flexible pipelines generally laid at 90°.
- PLET handling system



DP Footprint

Considered Available Power: 100% Thrusters capacity
Considered Current: Nil
Considered Pipelay force: 55 tons horizontal pulling from the stern



Specifications

Principal dimensions

Length Overall	206.5 m (677'6")
Length B.P.	191.8 m (629'3")
Breadth, Moulded	32.0 m (105')
Depth, Moulded	17.8 m (58'5")

Operating draft

Typically 9 m (29'6")
Maximum 10 m (32'9")

Displacement

50,122 Te, at 10 m draft (55,234 short tons)

Gross tonnage

33,791 Te

Pipelaying systems

Operational water depth - 72 m to 3,000 m (236 ft to 8,200 ft)
Rigid Pipe (Reeling) - 4" to 18" O.D. - up to 5,600 Te* (6,170 short tons)
Rigid Pipe (J-Lay) - 4" to 28" O.D. - up to 4,000 Te* (4,400 short tons)
Flexible Pipe - up to 24" O.D. - up to 5,900 Te (6,490 short tons)

* Deadweight and stability restrictions apply for combined loading

Cranage

Crane # 1
Type - Telescopic box boom, ram luffing
Location - Between main reels on centreline forward
Reach and Capacity 12 Te @ 15 m, 8 Te @ 23 m (13.2 short tons @ 49', 8.8 short tons @ 75')

Crane # 2
Type - Telescopic box boom, ram luffing
Location - Starboard side aft of main reels
Reach and Capacity:
40 Te @ 24.0 m (44 short tons @ 79ft) (harbour use)
16 Te @ 32.75 m (18 short tons @ 107ft) (harbour use)

Crane # 3
Type - Lattice boom, rope luffing with 15 m flying jib and active heave compensation system.
Location - Port side aft of main moonpool
Reach and Capacity:
400 Te @ 18 m (441 short tons @ 59') (harbour condition)
110 Te @ 42.5 m (121 short tons @ 139') (harbour condition)
60 Te @ 55m (66 short tons @ 180') (harbour condition)

Capacities

Fuel (including day tanks)	4,054 m^3	(25,498 bbl)
Lube and Hydraulic Oil	235 m^3	(1,478 bbl)
Fresh water	892 m^3	(5,610 bbl)
Technical water	1,444 m^3	(9,082 bbl)
Ballast	19,242 m^3	(121,028 bbl)
Flume tank	1,661 m^3	(10,447 bbl)

Deck services

Deck loading
- Upper deck aft of moonpool 10 Te/m^2 (14 lb/in^2)
- Moonpool covers 3 Te/m^2 (4 lb/in^2)
- Rest of upper deck 5 Te/m^2 (7 lb/in^2)
- Free deck area (aft of moonpool) Approx. 690 m^2 (7,400 sq.ft)

DP system

(Dynpos AUTR - Class II)
A Kongsberg Simrad SDP22 dual redundant dynamic positioning system is fitted. Reference systems provided include the following:
3 x Robertson RGC11 gyro compasses
1 x MRU 5 vertical reference unit
2 x MRU 2 vertical reference units
3 x DEIF879 wind sensors
3 x Sercel DGPS and 2 x C.NAV DGPS
2 x Hydro-acoustic systems (HIPAP)
1 x KS mark 8 light weight taut wire (300 m max)
ERN 99.99.99
1 x fan beam

Power plant

Total installed normal power
33.6 MW at 6.6 kV (45,000 hp)
Emergency power 1 MW at 440V
Transit thrust power
11 MW (2 thrusters in use)
14 MW (3 thrusters in use)
DP thrust power
25.6 MW (8 thrusters in use)

Propulsion

Vessel is equipped with eight (8) thrusters as follows:
- 2 x 5.5 MW (7,000 hp) KaMeWa type UUC 7001 non-retracting azimuthing thrusters aft for propulsion and DP (each unit has thrust of 87 Te in bollard condition).
- 1 x 3 MW (4,000 hp) KaMeWa type UL 4001 retractable azimuthing thruster aft for propulsion and DP.
- 3 x 3 MW (4,000 hp) KaMeWa type UL 4001 retractable azimuthing thrusters forward below keel for DP (each unit has thrust of 49 Te in bollard condition).
- 2 x 1.3 MW (1,740 hp) KaMeWa type TT2200-BMS-CP tunnel thrusters in the bow used for DP and maneuvering.

All azimuthing thrusters have a fixed pitch propeller (FPP) and variable speed.
The tunnel thrusters have a controllable pitch propeller (CPP) and fixed speed.

Endurance (& Fuel Consumption)

Transit	51 days (67 m^3/day)
DP operations	100 days (34 m^3/day)
Standby conditions	170 days (20 m3/day)

Transit speed

10 knots

Helideck

Sikorsky S61N type helicopters

Accommodation

Hotel accommodation is provided for a total complement of 160 persons, comprising:
4 x Executive, single occupancy cabins
18 x Single person cabins
59 x 2-person cabins
6 x 4-person cabins

Lifesaving appliances

4 x 80 man TEMPSC located two port and two starboard of accommodation.
Inflatable life rafts are installed on upper deck with 100% POB capacity port and starboard.

Flag

Bahamas

Call sign

C6RM8

Classification

+ 1A1 DYNPOS-AUTR, EO, ICS, ISM, SBM, HELDK

Year built / builder

2001 / Hyundai Mipo Dockyard, Korea

Owners

Technip

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75773 Paris Cedex 16
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take it further®

SIEM STINGRAY

SIEM OFFSHORE

VARD™
a Fincantieri company

Offshore Subsea Construction Vessel

VARD™
a Fincantieri company

SIEM STINGRAY

BUILT BY: Vard Brattvaag

OWNER: Siem Offshore Rederi AS

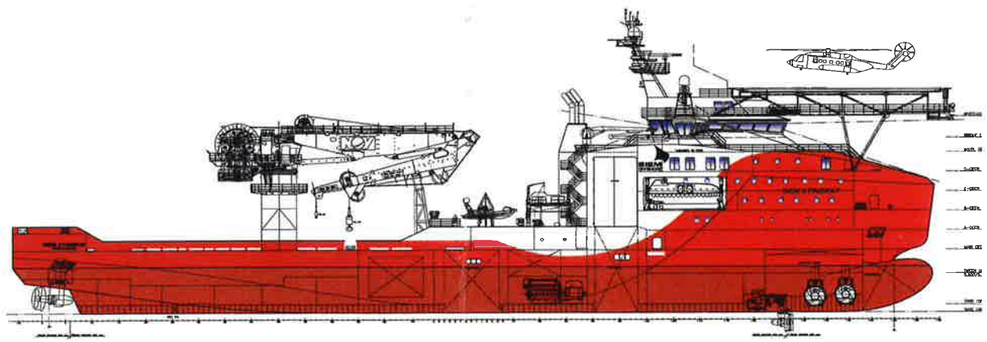
YARD NO: 821

DELIVERY: July 2014

DESIGN: VARD 3 03

The vessel is designed as a vessel for world wide operations with the following special features:

- The vessel is specially designed and equipped for Subsea operation duties with a high focus on good sea-keeping abilities and excellent station keeping performances.
- Environmental friendly design, and low emission
- Large, high standard and comfortable accommodation with low noise levels
- The vessel is environmental friedly with focus on low fuel consumption and precautions equivalent to DNV's CLEAN DESIGN requirements are incorporated in the design.
- Large working deck
- 250 T AHC Knuckle boom offshore crane
- Work Moonpool 7,2m x 7,2m
- ROV moonpool 4,8m x 5,5m
- Helicopter landing platform (Helideck),



SPECIFICATIONS

MAIN PARTICULARS:

Length overall	120.80 m
Length between p.p.	110.80 m
Breadth moulded	23.00 m
Depth main deck	9.00 m
Max. scantling draught	7.00 m
Max. load line draught	6.60 m

CLASS:

Det Norske Veritas DNV with classification and notations +1A1, E0, DYNPOS-AUTR, DK(+), HELDK-SH, ICE-1B (hull only), ICE-C, SF, BIS, CLEAN DESIGN, RECYCLABLE, NAUT-AW, COMF V(3)-C(3), SPS, CRANE

DNV Id. Nr. 32971

ACCOMMODATION:

Accommodation and equipment for 110 persons
(34 single cabins and 38 double cabins)

CAPACITIES:

Cargo deck area	1 300 m^2
Fuel oil	1 643 m^3
Ballast water	5 394 m^3
Fresh water	1 010 m^3
Technical fresh water	34 m^3
MEG	310 m^3
Gross tonnage	8 878 t
Net tonnage	2 664 t
Urea	109 m^3

MAIN ENGINES & GENERATOR SETS:

4 off Wartsila 6L32, 2880 kW , 720 rpm
4 off generators AEM SE 710, 2 760 ekW / 3 066 kVA

HARBOUR GENERATOR SET:

Nogva/Cummings KTA38-D(M1), 970 kw, 1 800 rpm

EMERGENCY GENERATOR SET:

Nogva/Scania DI12 62M, 285 kW, 1 800 rpm

BOW THRUSTERS:

1 off Rolls-Royce TCNS 92/M-220 FP Swing Up,1 500 kW
2 off Rolls-Royce TT2650 DPN CP , 1 900 kW
1 off ABB El-motors ABB AMI450L4L BAFTMH, 1 500 kW
2 off ABB El-motors ABB AMI500L8L VAFTMH, 1 900 kW

MAIN PROPULSION:

2 off Rolls-Royce Azimuth Thruster CONTAZ 25, 3 000 kW
2 off ABB el-motors ABB AMI 560L6L BAFTMH, 3 000 kW

DYNPOS, NAVIGATION AND COMMUNICATION:

Kongsberg Maritime Dynamic Positioning System
1 off KPOS DP-21
Nav.Com according to DNV NAUT-AW.
SAM / L3Valmarine radar and nautical equipment.

AUTOMATION:

VARD:
Main switchboards
IAS automation system
Power management system
Tank sounding system including sensors generators
frequency converters for thrusters and main propulsion
el-motors for thrusters and main propulsion
Distribution transformers
Bridge and engine control room consoles
Centralized alarm system and bridge watch system
DP mode selector switch

POWER MANAGEMENT AND IAS:

Vard Electro, Power & Automation

SWITCHBOARDS/BRIDGE ARRANGEMENT:

VARD bridge consoles and bridge arrangement
1 off main switchboards 690 V/60Hz
1 off main switchboard 440 V/60Hz
1 off main switchboards 230 V/60Hz
2 off Heavy Consumer switchboards 690V/440V/230V/60Hz
1 off emergency/harbour switchboard 690/230 V

ROV-LAUNCHING AND RECOVERY SYSTEM:

2 off Umbilical wire winches, Active heave compensated
1 off A-frame, SB
1 off Moon pool LARS

DECK EQUIPMENT:

Anchor/mooring winches from Seaonics
1 Offshore crane, 250T AHC, from National Oilwell Varco
2 off deck crane, 3T 15M, from Seaonics
1 off foldable deck crane in ROV hangar, 1t 15m, from Seaonics

LIFESAVING EQUIPMENT:

MOB boat	Weedo 700
MOB davit	Hydramarine
Lifeboats, B-deck (one off on each side) (90pers)	Norsafe JYN100
Lifeboat davit, B-deck (one off on each side)	Norsafe LH-140
Lifeboats, A-deck (one off on each side) (20 pers)	Norsafe JYN57
Lifeboat davit, A-deck (one off on each side)	Norsafe, LE-55
Liferafts	Viking life rafts

HULL:

Steel hull built by Vard Tulcea, Romania

Attachment 3: Modeling report

BP CONFIDENTIAL

ATLANTIS PROJECT

OFFSHORE AND COASTAL NAAQS AIR QUALITY MODELING REPORT

40 Shattuck Road
Andover, MA 01810
800-426-4262

woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

232126.00
BP Exploration & Production
June 2021

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APPENDICES

Appendix A: EMISSIONS DATA
Appendix B: SAMPLE MODELING FILES: CALPUFF / CALPOST

EXECUTIVE SUMMARY

BP Exploration & Production Inc. (BP) is submitting a project update to the Initial Development Operations Coordination Document (DOCD) for the Atlantis project, including the Atlantis semisubmersible Floating Production Unit (FPU). The Atlantis FPU is located in the Gulf of Mexico (GOM) Green Canyon (GC) Area Block 787 in more than 7,000 feet of water, approximately 122 miles to the nearest shoreline (119 miles from nearest shoreline receptor). The project's nearest well from shore is approximately 115 miles from the nearest shoreline receptor (as taken conservatively from the northeast corner of block GC743). As part of the DOCD, BP has performed and is submitting air quality dispersion modeling analysis of Nitrogen Dioxide (NO_2) emissions associated with the Atlantis facility. This report presents the proposed air emission sources associated with the project and their potential impact.

To determine the potential air quality impacts resulting from the maximum annual emissions profile for activities associated with the Atlantis project, the CALPUFF modeling system (specifically CALPUFF v5.8.5, and CALPOST v6.292) was applied with five years of meteorological data (2010-2014) supplied by the Bureau of Ocean Energy Management (BOEM). For these analyses, the chemistry package in CALPUFF was invoked to determine how much of the emitted nitrogen oxides would be converted to nitrates over the long path of the plume from emission point to receptors and thereby removed from the gas concentration. For both annual and hourly impacts at modeled receptors, 100% of the predicted NOx concentration was conservatively assumed to be converted to NO_2.

The CALPUFF modeling analyses have been performed assuming a maximum hourly emission rate of 5,997 pounds per hour to determine potential impacts. Consistent with the Environmental Protection Agency (EPA) methodology and recently approved BP projects, this emission rate does not include flare, lifeboat, or fast rescue craft emissions and conservatively assumes that diesel fuel is combusted in all dual-fuel turbines on the production platform instead of natural gas (the normal operating fuel). In addition, following the BOEM air quality reporting spreadsheet appropriations, only sources identified as "facility" emissions were modeled. Annual average emissions were scaled to 23.9% of 5,997 pounds per hour or 6,283 tons per year. In addition, all five years were averaged at each receptor location maintaining spatial consistency with 5-year averages found for both annual and hourly impacts. The CALPUFF model results are summarized in the following table:

Table ES-1: NO_2 CALPUFF Model Results, All Concentrations are in µg/m³.

Year	2010		2011		2012		2013		2014		5-year Average	5-year Max
Averaging Period	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**
Rank	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max
Shoreline Predicted Impacts*	9.44	0.03	9.14	0.04	7.44	0.02	14.07	0.04	7.89	0.03	8.16	0.04
Significance Level	-	1	-	1	-	1	-	1	-	1	-	1

* Assumed 100% conversion of Nox to NO2

** Annual modeled results scaled according to the ratio of estimated annual emissions to maximum annual emissions. See data below.

max hourly emissions	5,996.64	lb/hr
max annual emissions	26,265	ton/yr
estimated annual emissions	6,282.72	ton/yr
scaling ratio	23.9%	[estimated / max]

To determine the total potential 1-hour impact at the shore, a background concentration is needed. Kenner, Louisiana is the nearest monitor to the modeling domain considered. The background NO_2 design concentration from this monitor was obtained and a 3-year average (2018-2020) of the 98th percentile of measured one-hour concentrations data was calculated to be 67.10 µg/m³. When added to the 5-year average modeled maximum 1-hour concentrations (8.16 µg/m³), the resulting maximum concentration at the shoreline is calculated to be 75.26 µg/m³. This impact is well below the NAAQS of 188 µg/m³. Further, as shown on the table above, the 5-year maximum of the annual average impact concentrations of the project at the shore (0.04 µg/m³) is below the annual average modeling Significant Impact Level (SIL) (1.0 µg/m³) and requires no further analysis. These modeling analyses demonstrate that the proposed project worst case operating emissions will have insignificant annual impacts at the nearest shoreline, will not interfere with the attainment of the NO_2 NAAQSs, and will meet the applicable BOEM air quality analyses requirements.

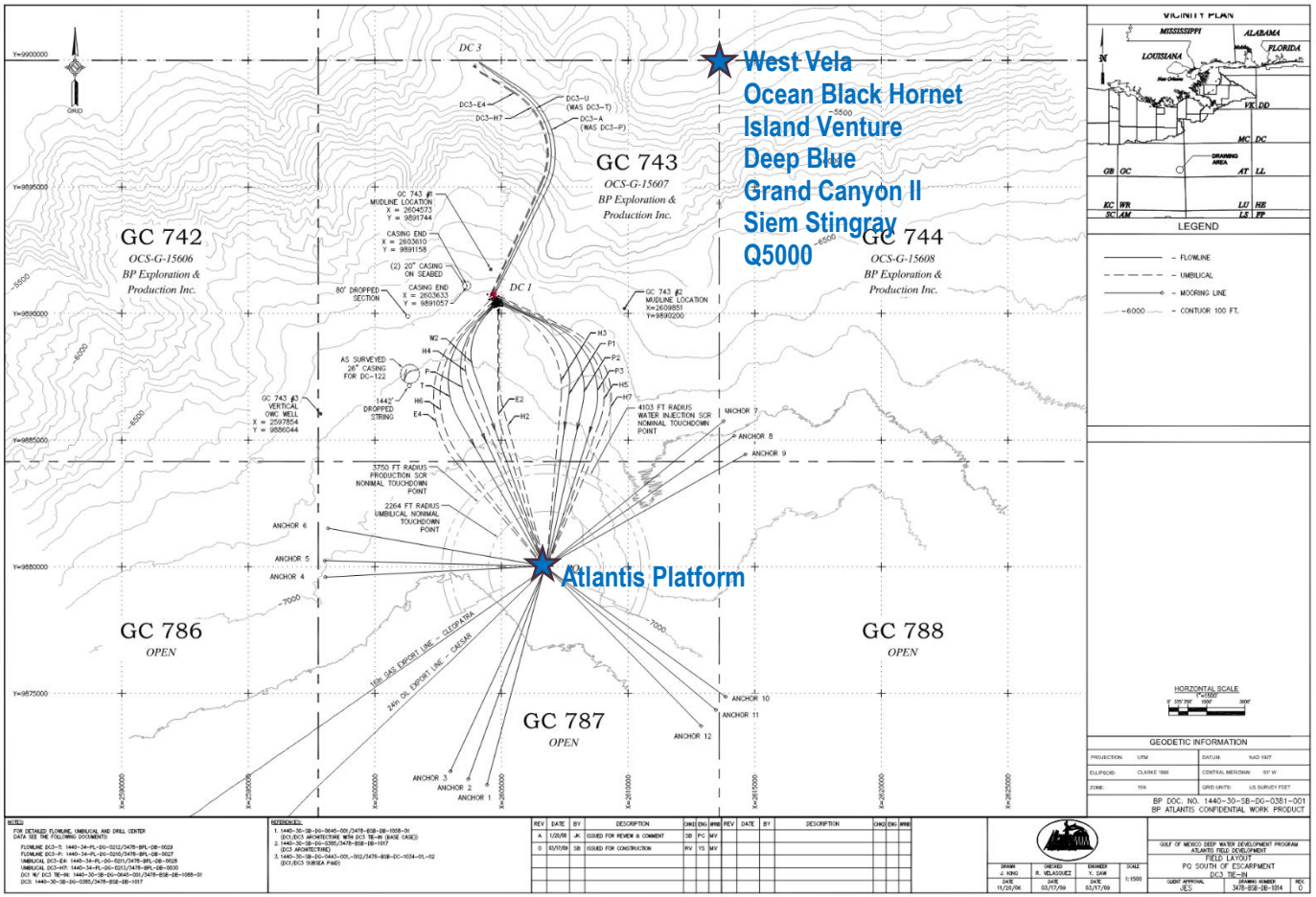
1. INTRODUCTION

BP Exploration & Production Inc. (BP) is submitting a project update to the Initial Development Operations Coordination Document (DOCD) for the Atlantis project, including the Atlantis semisubmersible Floating Production Unit (FPU). The relative locations of the Atlantis FPU, the associated wells, and modeled locations of the Mobile Offshore Drill Units (MODU) and other vessels are illustrated in Figure 1-1. The Atlantis FPU is located in block GC787 in the Green Canyon area, all other project activity will be located north of the FPU in block GC743.

Exploration activities on the Outer Continental Shelf (OCS) are regulated by the Bureau of Ocean Energy Management (BOEM) under the authority of the Secretary of the Interior. The regulations that govern the activities on the OCS and prescribe the requirements for potential sources of air emissions associated with exploration and drilling activities are codified in the Code of Federal Regulations at 30 CFR Part 550. These regulations require the submission of projected air emissions for criteria pollutants including sulfur dioxide (SO_2), particulate matter (PM), nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC) that will be generated by activities associated with the project. Considering the distance of the proposed activity from shore, the size of the facility, the number and operational status of sources planned for the facility, and the air quality status of the onshore area, the BOEM Regional Supervisor may review DOCD plans to determine whether the planned activity should be subject to review under Section 550.303. Review under this section provides for a screening level exemption from further air quality impact analyses based on distance to shore and projected emissions (30 CFR 550.303 (d)) and establishes the criteria for determining whether the expected emissions may result in significant air quality impacts (30 CFR 550.303 (e)).

The purpose of this report is to present the model results in support of Atlantis project-associated activities, including the modeling methods and procedures and the data used to demonstrate that the project will operate in compliance with applicable requirements and will not interfere with the attainment of ambient air quality standards on shore. The following sections summarize the data, methods and emission sources that were included in the modeling analyses to make the appropriate demonstrations of compliance.

Figure 1-1: Locations of Modeled Sources



2. PROJECT DESCRIPTION

2.1 Project Location

The Atlantis FPU is located approximately 119 miles south of the nearest shoreline receptor (122 miles from the nearest shoreline) in the Green Canyon area. Figure 1-1 illustrates the location of the Atlantis FPU and the other emission sources' location used for this modeling. Figure 2-1 and Figure 2-2 illustrate the relative location of the project sources and coastal receptors.

2.2 Project Emissions

BOEM has developed an Excel spreadsheet document (BOEM-139.XLS) to standardize the way potential air emissions for a DOCD are calculated and approved by BOEM. BOEM-139.XLS has been populated with the project's emissions scenarios and is provided in Appendix A. These tables list the equipment associated with each operation, the fuel feed rate and the calculated maximum short term (hourly) and annual mass emission rates. The final page of the spreadsheet includes a calculation of the modeling exemption thresholds based on project information. A summary of the Air Quality Review (AQR) projected annual emissions for each year and pollutant are provided in Table 2-1.

The data presented in Summary Table 2-1 indicate that the calculated emissions for the project are below the exemption thresholds for all BOEM listed pollutants, except NO_x. The calculated NO_x emissions for the years 2021 through 2030 are projected to be above the exemption formula threshold (shown as "Allowable" row in the table), thus requiring further analyses of potential emissions impacts. Year 2021 is projected to represent the maximum annual emissions and served as the highest evaluation year for the analyses described herein.

2.3 Modeling Scenarios

Based on the threshold analysis shown in Summary Table 2-1, the only substance that is subject to further air quality modeling analysis is NO_x. The scenario modeled is based on the maximum hourly emission rate of any year during the operating period considered along with the most conservative location of sources during the 2021 period (maximum emissions year). The short term hourly maximum emission rates were used to model potential hourly impacts at all receptors. It was assumed that upset flares, fast rescue craft, lifeboats, and support vessels associated with the project are not continuously emitting sources and therefore do not need to be included in the modeling for annual concentrations or the 5-year period covered by the 1-hour NAAQS. However, flares, rescue craft and lifeboat emissions were conservatively included with other facility emissions to scale the annual concentrations for the compliance demonstration. It was conservatively assumed that the dual-fuel ZAN-5000 series turbines on the Atlantis FPU will run on diesel fuel and thus will have higher hourly NO_x emission rates than if using natural gas, which is the ZAN turbines' normal operating fuel. Applying these assumptions, the total maximum NO_x hourly emission rate was calculated for the peak operating year 2021 (see Table 2-1) which, as shown in Table 2-2, is 5,997 lbs/hr. This maximum emission rate was used as input to the model to determine both the 1-hour and annual average concentrations at all receptors.

The predicted annual modeled impact was subsequently scaled to reflect the maximum annual emission rate (23.9% of 5,997 lbs/hr or 6,282.72 tons/year), including the annual emissions from the upset flare, rescue craft, lifeboats, and the ZAN turbines fueled with both diesel and natural gas, for the maximum year of the operating period (2021, see Table 2-1).

The twenty-eight (28) emission sources listed in Table 2-2 were allocated to the two locations highlighted in Figures 1-1, 2-1, and 2-2. The Atlantis FPU and all associated emissions on the FPU were modeled at the FPU's current and proposed permanent location. The other Atlantis project sources (construction & installation) were located at the northeast corner of the block associated with their operations (closest block corner to shoreline receptors) during the maximum emission year 2021.

Figure 2-1: Project Location

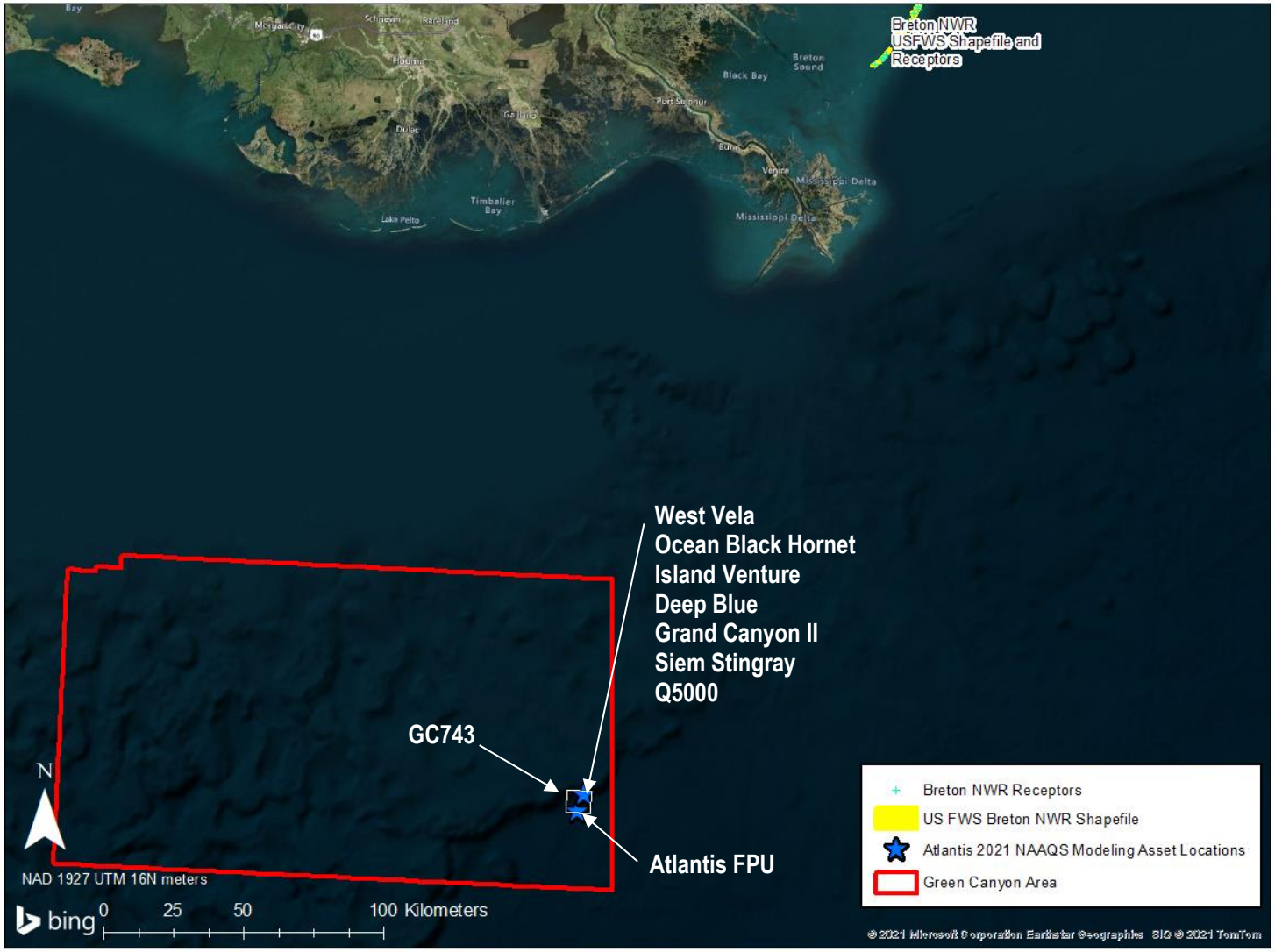


Figure 2-2: Project Distances to Receptors (Statute Miles)

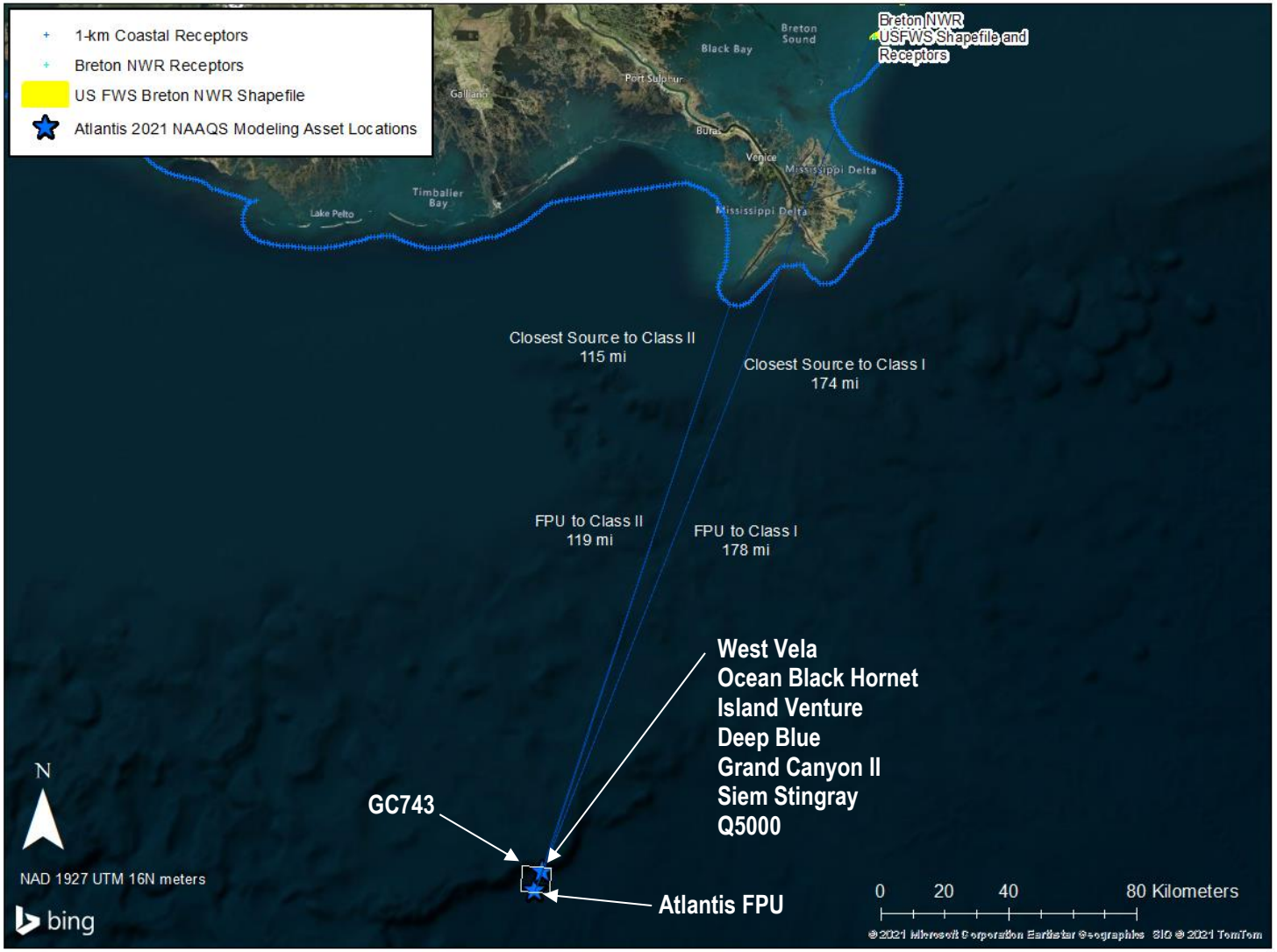


Table 2-1: Summary of Proposed Emissions by Year

(maximum year highlighted in yellow)

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
BP Exploration & Production Inc.	Green Canyon	GC734 Unit Agreement #754305003	OCS-G 15604 - 15608	Atlantis	

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	210.25	149.56	146.59	7.37	6282.72	554.02	0.02	1677.60	1.14
2022	185.16	134.42	131.90	7.01	5681.58	536.73	0.02	1583.32	0.97
2023	182.50	132.82	130.35	6.97	5617.84	534.90	0.01	1573.32	0.95
2024	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2025	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2026	180.06	131.35	128.92	6.93	5559.42	533.22	0.01	1564.16	0.93
2027	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2028	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2029	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2030	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
Allowable	4062.60			4062.60	4062.60	4062.60		83634.50	

Table 2-2: Proposed NOx Emission Sources and Rates Included in the Modeling Analysis

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS											
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #17443	OCS-G 19404	Atlantis						Rachel Owen (Air Quality Reviewer)		907-331-9034 (281-896-5129)													
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR										ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																					
	Nat. Gas Engines		HP	SCF/HR	SCF/D																					
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																										
DRILLING: West Vela Drillship	**Average Daily Fuel Usage / Maximum Daily Fuel Usage**				**14182 / 31389**																					
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.4689	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	52	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.89	0.05	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
Black Hornet	**Average Daily Fuel Usage / Maximum Daily Fuel Usage**				**13210 / 34818**																					
Main Engines: Hyundai Himsen 9H32/40 and 18H32/40V	VESSELS- Drilling / Well Intervention		60354	3104.9719	34818	24	61	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	14.56	8.79	8.52	0.21	348.91	10.03	0.00	54.73	0.10
Egen: Cummins 1900 kW	VESSELS – Drilling Prime Engine, Auxiliary		2458	126.45427	3034.90	2	9	1.73	1.05	1.01	0.03	41.55	1.19	0.00	6.52	0.01	0.02	0.01	0.01	0.00	0.37	0.01	0.00	0.06	0.00
Temporary Large/ Small Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	61	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.29	0.78	0.76	0.02	30.93	0.89	0.00	4.85	0.01
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																										
Island Venture (Rigless Well Intervention activity)																										
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.7878	33546.91	24	153	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	35.19	21.23	20.60	0.51	843.18	24.24	0.00	132.25	0.25
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	153	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.24	1.95	1.90	0.05	77.58	2.23	0.00	12.17	0.02
Deep Blue	**DP Fuel Usage / Transit Fuel Usage**				**8982 / 17700**																					
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage / Transit Fuel Usage**				**5812 / 13209**																					
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.8035	13209.00	24	73	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	6.61	3.99	3.87	0.10	158.40	4.55	0.00	24.85	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	42	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.89	0.54	0.52	0.01	21.30	0.61	0.00	3.34	0.01
Siem Stingray	**DP Fuel Usage / Transit Fuel Usage**				**3302 / 15566**																					
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.73781	15566.00	24	48	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	5.12	3.09	3.00	0.07	122.74	3.53	0.00	19.25	0.04
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	48	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																										
Q5000	**DP Fuel Usage / Transit Fuel Usage**				**8365 / 12827**																					
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.5006	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																										
Crane 1: CAT 3408 DITA 525 hp	RECIP <600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP <600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP <600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP <600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP <600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP <600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.305332	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP <600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP <600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP >600hp Diesel	831-CD-002	2691	138.44119	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP >600hp Diesel	831-CD-003	2669	137.30937	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP >600hp Diesel	831-CD-001	2669	137.30937	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.9615	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.9615	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.9615	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.86	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.86	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.86	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		BPD	SCF/HR	COUNT																					
	STORAGE TANK		[redacted]	[redacted]	38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke		[redacted]	389988	[redacted]	24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT		[redacted]	[redacted]	2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES		[redacted]	[redacted]	25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR		[redacted]	[redacted]	1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2021	**Facility Total Emissions**							**237.05**	**147.08**	**143.17**	**5.21**	**6,328.94**	**255.58**	**0.02**	**1,153.79**	**1.49**	**210.25**	**149.56**	**146.59**	**7.37**	**6,282.72**	**554.02**	**0.02**	**1,677.60**	**1.14**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**					**Modeled Rates**		---	---	---	---	**5996.64**	---	---	---	---	**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0											(grey cells excluded from modeling)													
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	153	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.33	5.63	5.46	0.14	223.44	6.42	0.00	35.05	0.07
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	61	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.72	2.24	2.18	0.05	88.98	2.56	0.00	13.97	0.03
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	37	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.25	1.36	1.32	0.03	54.03	1.55	0.00	8.48	0.02
	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	24	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.46	0.88	0.86	0.02	35.05	1.01	0.00	5.50	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.7878	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.4112	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2021	**Non-Facility Total Emissions**							**92.04**	**55.53**	**53.87**	**1.34**	**2,205.30**	**63.41**	**0.01**	**345.90**	**0.64**	**74.46**	**44.92**	**43.58**	**1.08**	**1,784.05**	**51.30**	**0.01**	**279.82**	**0.52**

3. MODEL SELECTION AND INPUTS

For the project air pollutant emissions exceeding the exemption formulas, e.g., NO_x, air quality dispersion modeling was conducted following BOEM's GOMR Dispersion Modeling Guidelines and the U.S. EPA "Guideline on Air Quality Models (Revised)" (the EPA Guideline) (Appendix W to 40 CFR 51, U.S. EPA, 2017), as applicable. For the proposed project, only NO_x exceeds the exemption formula calculations and is subject to further air quality dispersion modeling. The BOEM Guideline recommends:

- *Modeling be conducted when emissions exceed the exemption thresholds.*
- *Only those pollutants exceeding the exemption thresholds are subject to a modeling compliance demonstration.*
- *CALPUFF is used to model source at distances greater than 50 km.*

The distance of the nearest modeled source in the project is located approximately 115 miles (187 km) from shore receptors. The approved long-range transport model in the BOEM Guideline is the CALPUFF modeling system. The modeling approach for the Atlantis project is described in the following section regarding Dispersion Modeling Inputs.

3.1 Dispersion Modeling Inputs

CALPUFF modeling runs were conducted to determine compliance with the modeling significance level for nitrogen oxides/nitrogen dioxide (NO_x/NO_2) and compliance with the one-hour average and annual NO_2 NAAQS.

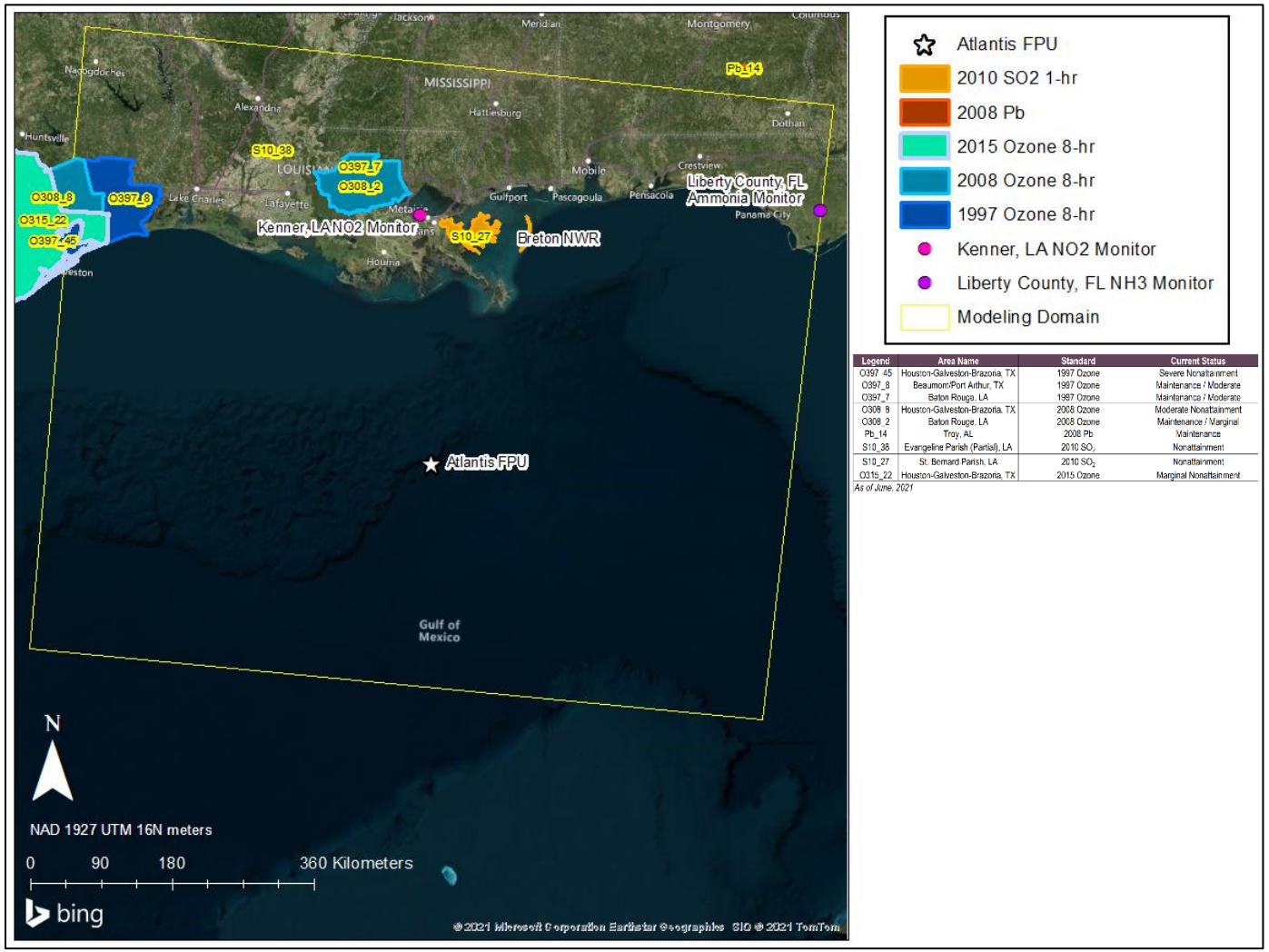
The CALPUFF air quality modeling analysis focused on the long-range transport of emissions from the Atlantis project-related sources to receptors located onshore in Louisiana, Mississippi, Alabama and Florida. The version of CALPUFF used in this study (version 5.8.5) is listed on the EPA alternative model for long-range transport and is the most recent model version to be approved for long-range transport by the EPA. The CALPUFF modeling system is comprised of a meteorological model, CALMET (not used in this study), a dispersion model, CALPUFF, and a post-processor of the output files, CALPOST (Scire et al, 2000a and 2000b).

3.1.1 Modeling Domain

The modeling domain spanned a 956 by 800-kilometer area, processed to 4-km resolution and encompassing the Atlantis Project and Breton National Wildlife Refuge with a sufficient buffer zone to allow for potential re-circulation or flow reversal effects to be evaluated. The grid was based on the BOEM Central Region meteorological data Lambert Conformal Projection defined with origin longitude and latitude at 97.0° W and 40.0° N, respectively, and first and second latitude parallels at 33.0° N and 45.0° N. The horizontal grid consisted of 239 by 200, 4-km grid cells. Ten vertical layers were employed with cell face heights of 0, 20, 40, 80, 160, 320, 640, 1000, 1500, 2000, and 3000 m.

Twelve EPA designated nonattainment or maintenance areas exist inside of the modeling domain for Ozone (O_3), Lead (Pb), and sulfur dioxide (SO_2). Figure 3-1 describes the modeling domain, nonattainment/maintenance areas nearby, and location of monitors used for background concentration (see Section 3.1.5 for discussion of ammonia and ozone background development; see section 4 for discussion of NO_2 background monitor).

Figure 3-1: Modeling Domain, Nonattainment/Maintenance Areas, and Monitor Locations



Legend	Area Name	Standard	Current Status
O397_45	Houston-Galveston-Brazoria, TX	1997 Ozone	Severe Nonattainment
O397_8	Beaumont/Port Arthur, TX	1997 Ozone	Maintenance / Moderate
O397_7	Baton Rouge, LA	1997 Ozone	Maintenance / Moderate
O308_8	Houston-Galveston-Brazoria, TX	2008 Ozone	Moderate Nonattainment
O308_2	Baton Rouge, LA	2008 Ozone	Maintenance / Marginal
Pb_14	Troy, AL	2008 Pb	Maintenance
S10_38	Evangeline Parish (Partial), LA	2010 SO_2	Nonattainment
S10_27	St. Bernard Parish, LA	2010 SO_2	Nonattainment
O315_22	Houston-Galveston-Brazoria, TX	2015 Ozone	Marginal Nonattainment

As of June, 2021

Note: NAA shapefiles from EPA Greenbook GIS database; accessed June 2021.

3.1.2 Meteorology

Gridded CALPUFF-ready meteorological data for the central GOM region was supplied by BOEM for the five years 2010-2014. This data was produced and evaluated through the BOEM Outer Continental Shelf Study BOEM-2019-057, Air Quality Modeling in the Gulf of Mexico Region, via retrospective prognostic modeling that incorporated reanalysis and observational data during the five-year period.

3.1.3 CALPUFF Modeling

CALPUFF was run using the five years of meteorological data to predict concentration values. MESOPUFF II chemistry was selected, therefore in-transit nitrate formation was also predicted. A sample CALPUFF input file (year 2010) used in the modeling is included in this report's Appendix B.

3.1.4 CALPUFF Emissions

The CALPUFF modeling analyses were based on emissions estimates corresponding to the 2021 operating scenario that are expected to produce the highest impacts throughout the modeling domain (see Table 2-2).

3.1.5 Background Ammonia and Ozone

CALPUFF model options include chemical conversion of NOx to nitric acid and nitrate using the MESOPUFF II chemistry algorithms and turbulence-based dispersion with a probability density function (PDF) for convective conditions. The partial penetration algorithm for buoyant plumes interacting with elevated inversions was used in the modeling. Monitored ammonia and ozone concentrations were used in the CALPUFF chemical conversion mechanism. Monthly average ammonia concentrations from within the modeling domain were used to create monthly average ammonia background data. The ammonia values were based on data observed at the Liberty County, Florida FL23 monitor (period of record January 2015 to December 2020, see Figure 3-1 for location), which is part of the Ammonia Monitoring Network (AMoN). The monthly ammonia averages that were used in this study are presented in Table 3-1.

Hourly gridded ozone data concurrent with the gridded meteorological data was provided by BOEM for input to CALPUFF.

Table 3-1: Monthly Ammonia Averages (ppb) and Inputs

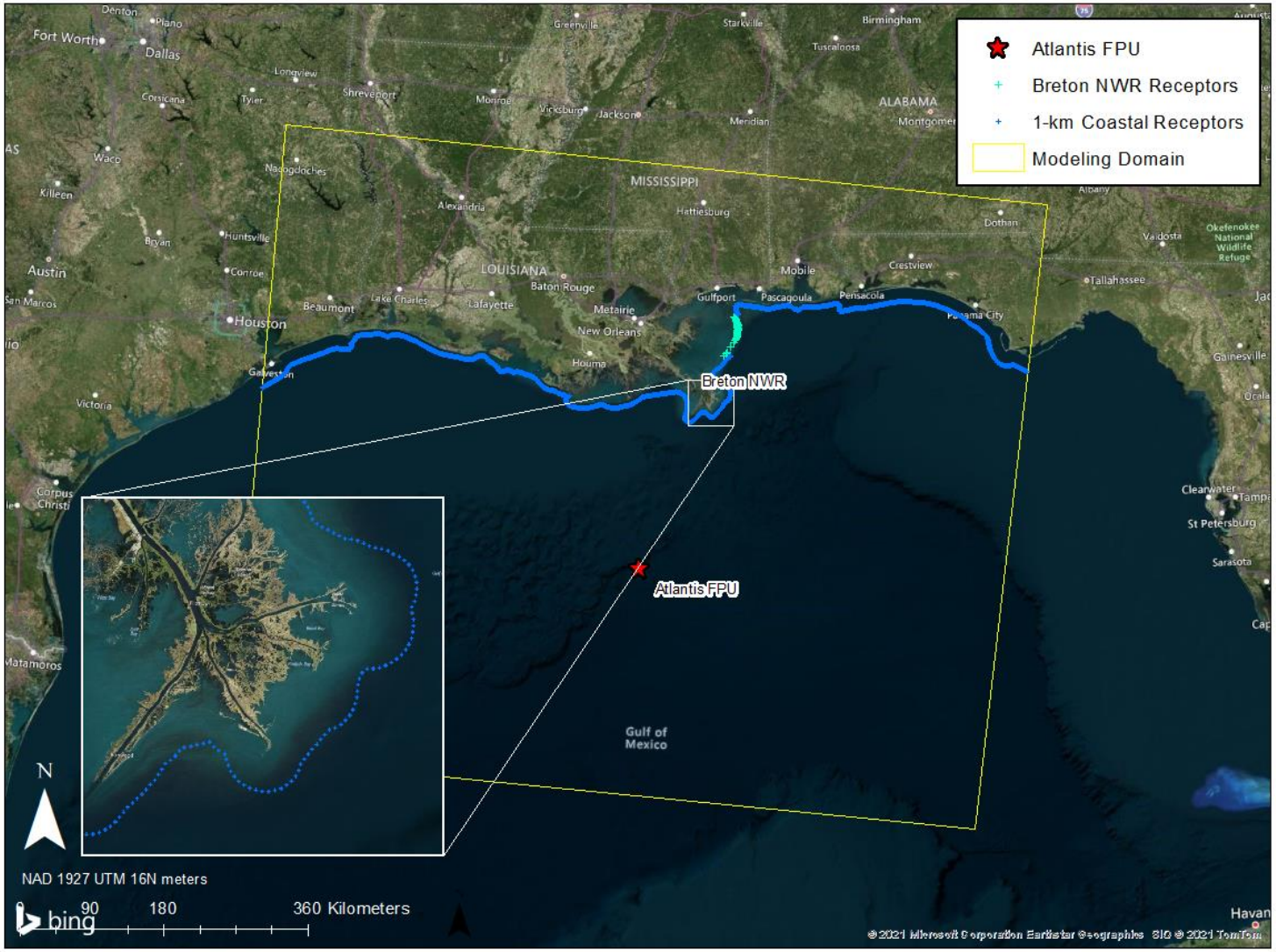
Month	Ammonia Average (ppb)
January	0.59
February	0.57
March	0.62
April	0.58
May	0.74
June	0.65
July	0.73
August	0.67
September	0.54
October	0.46
November	0.45
December	0.42

Source:
* Ammonia from Liberty County, Florida Monitor FL23; EPA Ammonia Monitoring Network (Jan 2015 - Dec 2020).

3.1.6 Receptors

CALPUFF model receptor locations were selected along the shoreline and in Breton National Wildlife Refuge. A high-resolution 1-km receptor set was developed using the BOEM-defined coastline — which is defined to be approximately 3.5 miles off the coast and thus conservative —combined with the National Parks Service receptors for Breton. Where appropriate, Breton receptors were used in place of the 1-km coastline receptors. In total, 1,260 discrete receptors were placed along the gulf coast, as shown in Figure 3-2.

Figure 3-2: Project Coastal Receptors



3.1.7 CALPOST Processing

The CALPOST processor (version 6.292) was used to develop the CALPUFF hourly concentration results for comparison to specific significance or threshold values. A sample CALPOST input file (year 2010) used in the modeling is included in this report's Appendix B.

3.1.8 Model Stack Parameters

Stack parameters for modeled sources were taken from Atlantis project emission inventory sheets, vessel drawings, and developed from the BOEM Gulfwide Offshore Activity Data System (GOADS) Frequently Asked Questions about GOADS-2017 guidance document. Table 3-2 below describes the stack parameters used in the modeling. All sources were conservatively modeled as stacks with horizontal releases (CALPUFF setting FMFAC=0) with the exception of the Ocean Black Hornet, which were modeled as vertical stack releases (FMFAC=1) per vessel arrangement drawings.

Table 3-2: Modeled Stack Parameters

Operational Year 2020	SRC ID	NAD27 UTM 15N		NWS-84 LCC		Emission Rate	Stack Height	Stack Temp.	Stack Diam.	Stack Vel.	Platform Height
		m	m	km	km	g/s	m	K	m	m/s	m
Description of Asset and Associated Sources		X	Y	X	Y	Q	Sh	ST	Sd	SV	ZP
DRILLING: West Vela Drillship (substitution likely)											
Main Engines: 6 x 10877 hp, STX-MAN 16V32	WVMAIN	796,627	3,017,526	701.2288	-1391.9895	139.0	26.6	755.4	0.9	44.1	0
E-Gen: 1 x MTU. 2145 hp	WVEGEN	796,627	3,017,526	701.2288	-1391.9895	4.6	11.1	755.4	0.3	84.4	0
Small/large Auxiliary Engines	WVAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	11.1	755.4	0.3	19.7	0
DRILLING: Black Hornet (substitution likely)											
Main Engines: 8 Hyundai Himsen engines: 6x9H32/40 and 2x18H32/40V (60,346 total	OBHMAIN	796,627	3,017,526	701.2288	-1391.9895	128.5	29.0	755.4	0.9	30.3	0
Egen: Cummins 1900 kW (2548 hp)	OBHEGEN	796,627	3,017,526	701.2288	-1391.9895	5.2	29.0	755.4	0.9	10.2	0
Small/Large Auxiliary Engines (various horspower)	OBHAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	29.0	755.4	0.9	2.0	0
PIPELINE INSTALLATION/SUBSEA INTERVENTION: Example Vessels											
Island Venture											
Island Venture: (4 x CAT C280-16, 3800kW ea. and 2 x CAT 280-8, 2530 kW ea.)	IVMAIN	796,627	3,017,526	701.2288	-1391.9895	57.9	29.0	755.4	0.3	267.3	0
Small/Large Auxiliary Engines	IVAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	29.0	755.4	0.3	19.7	0
Deep Blue											
Deep Blue Main Engines: 45000 hp	DBMAIN	796,627	3,017,526	701.2288	-1391.9895	95.8	23.3	755.4	0.8	38.7	0
Small/Large Auxiliary Engines	DBAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	7.8	755.4	0.3	19.7	0
Grand Canyon II											
Grand Canyon II: 6 x 3000 kW (4023 hp ea.)	GCMAIN	796,627	3,017,526	701.2288	-1391.9895	51.4	18.0	755.4	0.5	70.4	0
Small/Large Auxiliary Engines	GCAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	7.6	755.4	0.3	19.7	0
Siem Stingray											
Siem Stingray Main Engines: 4 x Wartsila (2880 kW ea)	SSMAIN	796,627	3,017,526	701.2288	-1391.9895	32.9	18.0	755.4	0.5	67.6	0
Small/Large Auxiliary Engines	SSAUX	796,627	3,017,526	701.2288	-1391.9895	5.3	7.6	755.4	0.3	19.7	0
CONSTRUCTION/MAINTENANCE/MULTIPURPOSE: Example Vessels											
Q5000											
Main Engines: 8 x 5230 hp, Wartsila W12V226F	Q5MAIN	796,627	3,017,526	701.2288	-1391.9895	89.1	22.0	755.4	0.3	205.8	10
Small/Large Auxiliary Engines	Q5AUX	796,627	3,017,526	701.2288	-1391.9895	5.3	18.0	755.4	0.3	19.7	10
PRODUCTION											
Crane 1: CAT 3408 DITA 525 hp	FPUCRN1	794,540	3,011,411	699.4489	-1398.3175	2.1	42.6	755.4	0.3	20.7	17
Crane 2: CAT 3408 DITA 525 hp	FPUCRN2	794,540	3,011,411	699.4489	-1398.3175	2.1	42.6	755.4	0.3	20.7	17
Crane 3: CAT 3408 DITA 525 hp	FPUCRN3	794,540	3,011,411	699.4489	-1398.3175	2.1	42.6	755.4	0.3	20.7	17
Ultra High Pressure water Blaster, 275 hp	FPUWB	794,540	3,011,411	699.4489	-1398.3175	1.1	42.6	755.4	0.3	10.8	17
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	FPUCOMP	794,540	3,011,411	699.4489	-1398.3175	1.3	42.6	755.4	0.3	13.2	17
Small/Large Auxiliary Engines	FPUAUX1	794,540	3,011,411	699.4489	-1398.3175	9.8	42.6	755.4	0.3	98.4	17
Fire Water Pump: 3516B, 2691 hp (2007 kW)	FPUFWP	794,540	3,011,411	699.4489	-1398.3175	8.1	42.6	755.4	0.3	105.9	17
Emergency Generator, CAT 3516, 2669 hp	FPUEGEN	794,540	3,011,411	699.4489	-1398.3175	8.1	56.6	755.4	2.1	2.2	17
Auxiliary Generator, CAT 3516, 2669 hp	FPUAUX2	794,540	3,011,411	699.4489	-1398.3175	8.1	56.6	755.4	2.1	2.2	17
Turbine Generator 1 (ZAN-5000) - diesel	FPUGDS1	794,540	3,011,411	699.4489	-1398.3175	23.7	56.6	755.4	2.1	25.8	17
Turbine Generator 2 (ZAN-5030) - diesel	FPUGDS2	794,540	3,011,411	699.4489	-1398.3175	23.7	56.6	755.4	2.1	25.8	17
Turbine Generator 3 (ZAN-5060) - diesel	FPUGDS3	794,540	3,011,411	699.4489	-1398.3175	23.7	56.6	755.4	2.1	25.8	17

4. MODEL OUTPUT ANALYSIS

CALPUFF predictions were compared with the NO_2 Significance Level appearing in 30 CFR 550.303(e), and the 98th percentile of the 5-year average of the daily maximum 1-hour concentration. The predicted impact for the 1-hour average was added to the background concentration for comparison to the NAAQS. Predicted annual impacts were compared directly to the applicable Significant Impact Level (SIL). The results are summarized in Table 4-1. Maximum hourly emissions of 5,997 pounds per hour were used which did not include flare, lifeboat, or fast rescue craft emissions. Diesel was conservatively used for the dual-fuel turbines on the production platform instead of natural gas. Annual average emissions were scaled at 23.9% of maximum hourly emissions, or 6,283 tons per year. For both hourly and annual impacts, 100% of the predicted NOx concentration was conservatively assumed to be NO_2.

Table 4-1: Summary of CALPUFF Model Results: NO_2 Concentrations (µg/m³)

Year	2010		2011		2012		2013		2014		5-year Average	5-year Max
Averaging Period	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**	1-Hour	Annual**
Rank	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max	High 8th High	Max
Shoreline RAW Predicted Impacts		0.11		0.15		0.08		0.16		0.12		0.16
Shoreline Predicted Impacts*	9.44	0.03	9.14	0.04	7.44	0.02	14.07	0.04	7.89	0.03	8.16	**0.04**
Background***	67.10		67.10		67.10		67.10		67.10		67.10	
Model Max + Background	76.54		76.24		74.54		81.17		74.99		**75.26**	
Significance Level	-	1	-	1	-	1	-	1	-	1	-	1
NAAQS	188	100	188	100	188	100	188	100	188	100	188	100
Passes?	Passes NAAQS	Passes SIL	Passes NAAQS	Passes SIL	Passes NAAQS	Passes SIL	Passes NAAQS	Passes SIL	Passes NAAQS	Passes SIL	Passes NAAQS	Passes SIL

* Assumed 100% conversion of NOx to NO_2.

** Annual modeled results scaled according to the ratio of estimated annual emissions to maximum annual emissions. See data below.

max hourly emissions	5,997	lb/hr
max annual emissions	26,265	ton/yr
estimated annual emissions	6,283	ton/yr
scaling ratio	23.9%	[estimated / max]

*** Three-year average of 98th percentile one-hour concentrations (2018-2020) monitored at Kenner, LA.

The model results for the eighth-highest maximum daily 1-hour value from the project contributions range from 7.44 µg/m³ to 14.07 µg/m³ over the five years. When averaged at each receptor maintaining spatial consistency over the four years, the maximum 1-hour value from the project is 8.16 µg/m³. To assess the impact of the project on the 1-hour NAAQS, it is necessary to add the background concentration to the model results. The nearest and only NO_2 monitor along the Gulf coast is at Kenner, Louisiana (see Figure 3-1). Kenner is an urban/suburban area west of New Orleans and is near the airport. The concentrations at Kenner are likely to be substantially higher than at a more rural location along the shore. Nevertheless, the Guidance suggests that the 98th percentile of this measured data be added to the project impact to test for compliance with the NAAQS. The EPA Air Quality System (AQS) website was used to download NO_2 background data from the Kenner monitor for the years 2001 to 2020. The 98th percentile for each year was evaluated and is shown on Table 4-2.

The most recent three years of data with all four quarters available (2018, 2019, and 2020) were used to calculate a three-year average background concentration of 67.10 µg/m³. This value was adopted as the background concentration despite its probable over-prediction of the true ambient background concentration. When combined with the spatially consistent 5-year average of the highest eighth-high maximum daily 1-hour modeled concentration in the five years (8.16 µg/m³), the maximum total impact is calculated to be 75.26 µg/m³ which is well below the NAAQS (188 µg/m³). Likewise, the maximum single-year modeled concentration combined with the maximum single-year background concentration (14.07 µg/m³ + 67.10 µg/m³ = 81.17 µg/m³) is well below the NAAQS.

Further, as shown on the table above, the 5-year maximum of the annual average impact concentrations of the project at the shore (0.04 µg/m³) is below the annual average modeling Significant Impact Level (SIL) (1.0 µg/m³) and requires no further analysis.

Table 4-2: NO_2 Monitored Data at Kenner

YEAR	98th Percentile Daily Max (ppb)	98th Percentile Daily Max (µg/m^3)	Days Missing	4 Quarters Available?
2001	53	99.71	5	YES
2002	46	86.54	4	YES
2003	47	88.42	1	YES
2004	46	86.54	10	YES
2005	50	94.07	22	YES
2006	53	99.71	13	YES
2007	55	103.47	7	YES
2008	49	92.19	63	NO
2009	48	90.30	14	YES
2010	47	88.42	8	YES
2011	51	95.95	32	YES
2012	46	86.54	9	YES
2013	46	86.54	14	YES
2014	42	79.02	12	YES
2015	45	84.66	24	YES
2016	39	73.37	7	YES
2017	37	69.61	4	YES
2018	37	69.61	10	YES
2019	36	67.73	5	YES
2020	34	63.97	6	YES
3-year average	**35.67**	**67.10**		

Source: Kenner, LA Monitor ID 220511001, EPA Air Quality Systen Data Mart; accessed April 2021.

The project therefore will not interfere with attainment of the 1-hour average NAAQS. Additionally, the CALPUFF modeling shows that predicted concentrations due to the project will not exceed the BOEM modeling Significance Impact Level (30 CFR 550.303(e)) for the annual average at the shoreline receptors.

Digital copies of the CALPUFF model input and output files in support of this demonstration are provided in a separate data file.

5. SUMMARY

The modeling analyses performed with the CALPUFF modeling system and summarized in Table 4-1 demonstrate that the Atlantis facility with the projected emissions sources operating at their assumed maximum emission rates will comply with the applicable NO_2 NAAQS at the coastline receptors and will not exceed the annual NO_2 Significant Impact Level at any modeled receptor location.

6. REFERENCES

Earth Tech 2006: Development of the Next Generation Air Quality Models for Outer Continental Shelf (OCS) Applications. Three volume set of reports prepared for the Minerals Management Service (MMS), Herndon, VA by Earth Tech, Inc (http://www.src.com/calpuff/download/MMS_Files/MMS2006_Volume1_Technical.pdf; http://www.src.com/calpuff/download/MMS_Files/MMS2006_Volume2_CALMET_Preprocessors.pdf; http://www.src.com/calpuff/download/MMS_Files/MMS2006_Volume3_CALPUFF_Postprocessors.pdf).

Scire et al, 2000a: Scire, J.S., F.R. Robe, M.E. Fernau and R.J. Yamartino, 2000: A User's Guide for the CALMET Meteorological Model. (Version 5.0). Earth Tech., Inc. Concord, MA. (http://www.src.com/calpuff/download/CALMET_UsersGuide.pdf).

Scire et al, 2000b: Scire, J.S., D.G. Strimaitis and R.J. Yamartino, 2000: A User's Guide for the CALPUFF Dispersion Model. (Version 5.0). Earth Tech, Inc., Concord, MA. (http://www.src.com/calpuff/download/CALPUFF_UsersGuide.pdf).

The Guideline: U.S. EPA Guideline on Air Quality Models (Revised); Appendix W to 40 CFR 51, U.S. EPA, 2017.

APPENDIX A: EMISSIONS DATA

COMPANY	BP Exploration & Production Inc.
AREA	Green Canyon
BLOCK	GC734 Unit Agreement #754305003
LEASE	OCS-G 15604 - 15608
FACILITY	Atlantis
WELL	
COMPANY CONTACT	Rachel Owen (Air Quality Review)/Catherine Nesbit
TELEPHONE NO.	907-331-9034 /281-896-5128
REMARKS	

LEASE TERM PIPELINE CONSTRUCTION INFORMATION:

YEAR	NUMBER OF PIPELINES	TOTAL NUMBER OF CONSTRUCTION DAYS
2021		see OSC Plan Info Form 0137
2022		
2023		
2024		
2025		
2026		
2027		
2028		
2029		
2030		

AIR EMISSIONS COMPUTATION FACTORS

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

Equipment/Emission Factors	units	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	REF.	DATE	Reference Links
Natural Gas Turbine	g/hp-hr		0.0086	0.0086	0.0026	1.4515	0.0095	N/A	0.3719	N/A	AP42 3.1-1& 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
RECIP. 2 Cycle Lean Natural Gas	g/hp-hr		0.1293	0.1293	0.0020	6.5998	0.4082	N/A	1.2009	N/A	AP42 3.2-1	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Lean Natural Gas	g/hp-hr		0.0002	0.0002	0.0020	2.8814	0.4014	N/A	1.8949	N/A	AP42 3.2-2	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
RECIP. 4 Cycle Rich Natural Gas	g/hp-hr		0.0323	0.0323	0.0020	7.7224	0.1021	N/A	11.9408	N/A	AP42 3.2-3	7/00	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s02.pdf
Diesel Recip. < 600 hp	g/hp-hr	1	1	1	0.0279	14.1	1.04	N/A	3.03	N/A	AP42 3.3-1	10/96	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s03.pdf
Diesel Recip. > 600 hp	g/hp-hr	0.32	0.182	0.178	0.0055	10.9	0.29	N/A	2.5	N/A	AP42 3.4-1 & 3.4-2	10/96	https://www3.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf
Diesel Boiler	lbs/bbl	0.0840	0.0420	0.0105	0.0089	1.0080	0.0084	5.14E-05	0.2100	0.0336	AP42 1.3-6; Pb and NH3: WebFIRE (08/2018)	9/98 and 5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf https://cfpub.epa.gov/webfire/
Diesel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0013	4.45E-05	0.0105	N/A	AP42 3.1-1 & 3.1-2a	4/00	https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s01.pdf
Dual Fuel Turbine	g/hp-hr	0.0381	0.0137	0.0137	0.0048	2.7941	0.0095	4.45E-05	0.3719	0.0000	AP42 3.1-1& 3.1-2a; AP42 3.1-1 & 3.1-2a	4/00	https://cfpub.epa.gov/webfire/
Vessels – Propulsion	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data
Vessels – Drilling Prime Engine, Auxiliary	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Vessels – Diesel Boiler	g/hp-hr	0.0466	0.1491	0.1417	0.4400	1.4914	0.0820	3.73E-05	0.1491	0.0003	USEPA 2017 NEI;TSP (units converted) refer to Diesel Boiler Reference	3/19	
Vessels – Well Stimulation	g/hp-hr	0.320	0.1931	0.1873	0.0047	7.6669	0.2204	2.24E-05	1.2025	0.0022	USEPA 2017 NEI;TSP refer to Diesel Recip. > 600 hp reference	3/19	
Natural Gas Heater/Boiler/Burner	lbs/MMscf	7.60	1.90	1.90	0.60	190.00	5.50	5.00E-04	84.00	3.2	AP42 1.4-1 & 1.4-2; Pb and NH3: WebFIRE (08/2018)	7/98 and 8/18	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf https://cfpub.epa.gov/webfire/
Combustion Flare (no smoke)	lbs/MMscf	0.00	0.00	0.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	https://www3.epa.gov/ttn/chief/ap42/ch13/final/C13S05_02-05-18.pdf
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	
Combustion Flare (heavy smoke)	lbs/MMscf	21.00	21.00	21.00	0.57	71.40	35.93	N/A	325.5	N/A	AP42 13.5-1, 13.5-2	2/18	
Liquid Flaring	lbs/bbl	0.42	0.0966	0.0651	5.964	0.84	0.01428	5.14E-05	0.21	0.0336	AP42 1.3-1 through 1.3-3 and 1.3-5	5/10	https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s03.pdf
Storage Tank	tons/yr/tank						4.300				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Fugitives	lbs/hr/component						0.0005				API Study	12/93	https://www.apiwebstore.org/publications/item.cgi?9879d38a-8bc0-4abe-bb5c-9b623870125d
Glycol Dehydrator	tons/yr/dehydrator						19.240				2011 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2014	https://www.boem.gov/environment/environmental-studies/2011-gulfwide-emission-inventory
Cold Vent	tons/yr/vent						44.747				2014 Gulfwide Inventory; Avg emiss (upper bound of 95% CI)	2017	https://www.boem.gov/environment/environmental-studies/2014-gulfwide-emission-inventory
Waste Incinerator	lb/ton		15.0	15.0	2.5	2.0	N/A	N/A	20.0	N/A	AP 42 2.1-12	10/96	https://www3.epa.gov/ttnchie1/ap42/ch02/final/c02s01.pdf
On-Ice – Loader	lbs/gal	0.043	0.043	0.043	0.040	0.604	0.049	N/A	0.130	0.003	USEPA NONROAD2008 model; TSP (units converted) refer to Diesel Recip. <600 reference	2009	https://www.epa.gov/moves/nonroad2008a-installation-and-updates
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	
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	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	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

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

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

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT	PHONE	REMARKS												
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Reviewer)	907-331-9034 /281-896-5128													
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	52	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.89	0.05	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
Black Hornet	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**13210** **34818**																				
Main Engines: Hyundai Himsen 9H32/40 and 18H32/40V	VESSELS- Drilling / Well Intervention		60354	3104.97189	34818	24	61	42.58	25.69	24.92	0.62	1020.15	29.33	0.00	160.01	0.30	14.56	8.79	8.52	0.21	348.91	10.03	0.00	54.73	0.10
Egen: Cummins 1900 kW	VESSELS – Drilling Prime Engine, Auxiliary		2458	126.454268	3034.90	2	9	1.73	1.05	1.01	0.03	41.55	1.19	0.00	6.52	0.01	0.02	0.01	0.01	0.00	0.37	0.01	0.00	0.06	0.00
Temporary Large/ Small Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	61	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.29	0.78	0.76	0.02	30.93	0.89	0.00	4.85	0.01
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	153	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	35.19	21.23	20.60	0.51	843.18	24.24	0.00	132.25	0.25
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	153	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.24	1.95	1.90	0.05	77.58	2.23	0.00	12.17	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	73	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	6.61	3.99	3.87	0.10	158.40	4.55	0.00	24.85	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	42	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.89	0.54	0.52	0.01	21.30	0.61	0.00	3.34	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	48	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	5.12	3.09	3.00	0.07	122.74	3.53	0.00	19.25	0.04
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	48	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.02	0.61	0.59	0.01	24.34	0.70	0.00	3.82	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2021 Facility Total Emissions								**237.05**	**147.08**	**143.17**	**5.21**	**6,328.94**	**255.58**	**0.02**	**1,153.79**	**1.49**	**210.25**	**149.56**	**146.59**	**7.37**	**6,282.72**	**554.02**	**0.02**	**1,677.60**	**1.14**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**					**Modeled Rates**		**---**	**---**	**---**	**---**	**5996.64**	**---**	**---**	**---**	**---**	**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0							**(grey cells excluded from modeling)**																	
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	153	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.33	5.63	5.46	0.14	223.44	6.42	0.00	35.05	0.07
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	61	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	3.72	2.24	2.18	0.05	89.08	2.56	0.00	13.97	0.03
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	37	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.26	1.36	1.32	0.03	54.03	1.55	0.00	8.48	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	24	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.46	0.88	0.86	0.02	35.05	1.01	0.00	5.50	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2021 Non-Facility Total Emissions								**92.04**	**55.53**	**53.87**	**1.34**	**2,205.30**	**63.41**	**0.01**	**345.90**	**0.64**	**74.46**	**44.92**	**43.58**	**1.08**	**1,784.05**	**51.30**	**0.01**	**279.82**	**0.52**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	151	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	34.73	20.95	20.33	0.51	832.15	23.93	0.00	130.52	0.24
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	151	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	3.20	1.93	1.87	0.05	76.57	2.20	0.00	12.01	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	28	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	2.54	1.53	1.48	0.04	60.76	1.75	0.00	9.53	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	28	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.59	0.36	0.35	0.01	14.20	0.41	0.00	2.23	0.00
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	14	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	1.49	0.90	0.87	0.02	35.80	1.03	0.00	5.62	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	14	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.30	0.18	0.17	0.00	7.10	0.20	0.00	1.11	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2022	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**185.16**	**134.42**	**131.90**	**7.01**	**5,681.58**	**536.73**	**0.02**	**1,583.32**	**0.97**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	151	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	9.20	5.55	5.39	0.13	220.52	6.34	0.00	34.59	0.06
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	14	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.85	0.51	0.50	0.01	20.45	0.59	0.00	3.21	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	7	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.43	0.26	0.25	0.01	10.22	0.29	0.00	1.60	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2022	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**63.31**	**38.20**	**37.05**	**0.92**	**1,516.80**	**43.61**	**0.00**	**237.91**	**0.44**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage**				**14182**																				
	Maximum Daily Fuel Usage				**31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage**				**8982**																				
	Transit Fuel Usage				**17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage**				**5812**																				
	Transit Fuel Usage				**13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	59	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	5.34	3.22	3.13	0.08	128.03	3.68	0.00	20.08	0.04
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	59	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	1.25	0.75	0.73	0.02	29.92	0.86	0.00	4.69	0.01
Siem Stingray	**DP Fuel Usage**				**3302**																				
	Transit Fuel Usage				**15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	27	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.88	1.74	1.69	0.04	69.04	1.99	0.00	10.83	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	27	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.57	0.34	0.33	0.01	13.69	0.39	0.00	2.15	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage**				**8365**																				
	Transit Fuel Usage				**12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2023	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**182.50**	**132.82**	**130.35**	**6.97**	**5,617.84**	**534.90**	**0.01**	**1,573.32**	**0.95**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	30	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.83	1.10	1.07	0.03	43.81	1.26	0.00	6.87	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	14	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.85	0.51	0.50	0.01	20.45	0.59	0.00	3.21	0.01
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2023	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.82**	**37.90**	**36.76**	**0.91**	**1,505.12**	**43.28**	**0.00**	**236.07**	**0.44**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship or similar	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	366	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.77	47.52	46.10	1.15	1887.27	54.26	0.01	296.01	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	366	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.21	24.21	24.21	0.68	341.32	25.18	--	73.35	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	366	--	--	--	--	--	37.20	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	366	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.98	61.38	--	556.10	--
	COLD VENT				2	24	366	--	--	--	--	--	20.38	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	366	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.90	--	--	--
	GLYCOL DEHYDRATOR				1	24	366	--	--	--	--	--	4.38	--	--	--	--	--	--	--	--	19.24	--	--	--
2024	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.67**	**0.02**	**980.64**	**1.16**	**180.38**	**131.60**	**129.17**	**6.95**	**5,569.95**	**533.82**	**0.01**	**1,567.71**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	366	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.31	13.46	13.06	0.32	534.50	15.37	0.00	83.84	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2024	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.21**	**37.53**	**36.41**	**0.91**	**1,490.51**	**42.86**	**0.00**	**233.78**	**0.43**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2025	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2025	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2026	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.06**	**131.35**	**128.92**	**6.93**	**5,559.42**	**533.22**	**0.01**	**1,564.16**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2026	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS - 1ST YEAR

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2027	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2027	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	366	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.77	47.52	46.10	1.15	1887.27	54.26	0.01	296.01	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	366	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.75	4.67	4.53	0.11	185.59	5.34	0.00	29.11	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	366	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.08	5.08	5.08	0.14	71.68	5.29	--	15.40	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	366	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.21	24.21	24.21	0.68	341.32	25.18	--	73.35	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	366	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.55	2.55	0.76	429.71	2.82	--	110.11	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	366	--	--	--	--	--	37.20	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	366	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.98	61.38	--	556.10	--
	COLD VENT				2	24	366	--	--	--	--	--	20.38	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	366	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.90	--	--	--
	GLYCOL DEHYDRATOR				1	24	366	--	--	--	--	--	4.38	--	--	--	--	--	--	--	--	19.24	--	--	--
2028	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.67**	**0.02**	**980.64**	**1.16**	**180.38**	**131.60**	**129.17**	**6.95**	**5,569.95**	**533.82**	**0.01**	**1,567.71**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	366	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.31	13.46	13.06	0.32	534.50	15.37	0.00	83.84	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2028	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.21**	**37.53**	**36.41**	**0.91**	**1,490.51**	**42.86**	**0.00**	**233.78**	**0.43**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	EQUIPMENT	EQUIPMENT ID	RATING	MAX. FUEL	ACT. FUEL	RUN TIME		MAXIMUM POUNDS PER HOUR									ESTIMATED TONS								
	Diesel Engines		HP	GAL/HR	GAL/D																				
	Nat. Gas Engines		HP	SCF/HR	SCF/D																				
	Burners		MMBTU/HR	SCF/HR	SCF/D	HR/D	D/YR	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2029	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2029	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

COMPANY	AREA		BLOCK	LEASE	FACILITY	WELL					CONTACT		PHONE		REMARKS										
BP Exploration & Production Inc.	Green Canyon		GC734 Unit Agreement #75430	OCS-G 15604	Atlantis						Rachel Owen (Air Quality Review		907-331-9034 /281-896-5128												
OPERATIONS	**EQUIPMENT**	**EQUIPMENT ID**	**RATING**	**MAX. FUEL**	**ACT. FUEL**	**RUN TIME**		**MAXIMUM POUNDS PER HOUR**									**ESTIMATED TONS**								
	Diesel Engines		**HP**	**GAL/HR**	**GAL/D**																				
	Nat. Gas Engines		**HP**	**SCF/HR**	**SCF/D**																				
	Burners		**MMBTU/HR**	**SCF/HR**	**SCF/D**	**HR/D**	**D/YR**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**	**TSP**	**PM10**	**PM2.5**	**SOx**	**NOx**	**VOC**	**Pb**	**CO**	**NH3**
DRILLING (Substitution likely with similar drillship/DP Semi-submersibles of same or lower horsepower)																									
DRILLING: West Vela Drillship	**Average Daily Fuel Usage** **Maximum Daily Fuel Usage**				**14182** **31389**																				
Main Engines: 6 x STX-MAN 16V32/40, 10877 hp ea.	VESSELS- Drilling - Propulsion Engine - Diesel		65262	3357.46886	31389	24	365	46.04	27.78	26.94	0.67	1103.10	31.72	0.00	173.02	0.32	78.55	47.39	45.97	1.14	1882.11	54.11	0.01	295.20	0.55
E-Gen: 1 x Leroy Somer, 2145 hp	VESSELS – Drilling Prime Engine, Auxiliary		2145	110.35167	2648.44	2	53	1.51	0.91	0.89	0.02	36.26	1.04	0.00	5.69	0.01	0.08	0.05	0.05	0.00	1.92	0.06	0.00	0.30	0.00
Small/Large Auxiliary Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	365	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	7.73	4.66	4.52	0.11	185.08	5.32	0.00	29.03	0.05
PIPELINE INSTALLATION / SUBSEA INTERVENTION (Substitution likely with similar vessels of same/lower hourpower)																									
Island Venture (Rigless Well Intervention activity)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Well Intervention		27170	1397.78782	33546.91	24	120	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	27.60	16.65	16.15	0.40	661.31	19.01	0.00	103.73	0.19
Small/Large Aux Engines	VESSELS – Drilling Prime Engine, Auxiliary		2500	128.615	3086.76	24	120	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	2.54	1.53	1.49	0.04	60.85	1.75	0.00	9.54	0.02
Deep Blue	**DP Fuel Usage** **Transit Fuel Usage**				**8982** **17700**																				
Deep Blue Main Engines: 45000 hp	VESSELS - Pipeline / Well Intervention		45000	2315.07	17700.00	24	40	31.75	19.15	18.58	0.46	760.62	21.87	0.00	119.30	0.22	4.85	2.93	2.84	0.07	116.31	3.34	0.00	18.24	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	40	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.85	0.51	0.50	0.01	20.28	0.58	0.00	3.18	0.01
Grand Canyon II	**DP Fuel Usage** **Transit Fuel Usage**				**5812** **13209**																				
Grand Canyon II: 6 x 3000 kW (4023 hp each)	VESSELS - Pipeline / Well Intervention		24138	1241.80355	13209.00	24	45	17.03	10.27	9.97	0.25	408.00	11.73	0.00	63.99	0.12	4.08	2.46	2.39	0.06	97.65	2.81	0.00	15.32	0.03
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	45	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.95	0.57	0.56	0.01	22.82	0.66	0.00	3.58	0.01
Siem Stingray	**DP Fuel Usage** **Transit Fuel Usage**				**3302** **15566**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Pipeline / Well Intervention		15448	794.737809	15566.00	24	20	10.90	6.58	6.38	0.16	261.11	7.51	0.00	40.95	0.08	2.13	1.29	1.25	0.03	51.14	1.47	0.00	8.02	0.01
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	20	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.42	0.26	0.25	0.01	10.14	0.29	0.00	1.59	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE (Substitution likely with similar vessels of same/lower hourpower)																									
Q5000	**DP Fuel Usage** **Transit Fuel Usage**				**8365** **12827**																				
Main Engines: 4 x 2880 kW Wartsila	VESSELS - Multi-purpose / Construction		41840	2152.50064	12827.00	24	30	29.52	17.81	17.27	0.43	707.21	20.33	0.00	110.92	0.21	2.64	1.59	1.54	0.04	63.22	1.82	0.00	9.92	0.02
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION																									
Crane 1: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8100 Comp	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 2: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8110 Prod	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Crane 3: CAT 3408 DITA 525 hp	RECIP.<600hp Diesel	AT -ZZZ-8120 Gen	525	27.00915	648.22	24	365	1.16	1.16	1.16	0.03	16.32	1.20	--	3.51	--	5.07	5.07	5.07	0.14	71.48	5.27	--	15.36	--
Ultra High Pressure water Blaster, 275 hp	RECIP.<600hp Diesel		275	14.14765	339.54	24	100	0.61	0.61	0.61	0.02	8.55	0.63	--	1.84	--	0.73	0.73	0.73	0.02	10.26	0.76	--	2.20	--
Air Compressor Ingersoll Rand, HP 935-WCV-T1, 335 hp	RECIP.<600hp Diesel		335	17.23441	413.63	24	100	0.74	0.74	0.74	0.02	10.41	0.77	--	2.24	--	0.89	0.89	0.89	0.02	12.50	0.92	--	2.69	--
Lifeboat x 4: 35.5 hp each	RECIP.<600hp Diesel	LB -01, LB-02, LB-03, LB-04	142	7.30533201	175.33	1	52	0.31	0.31	0.31	0.01	4.41	0.33	--	0.95	--	0.01	0.01	0.01	0.00	0.11	0.01	--	0.02	--
Fast Rescue Craft: 212 hp	RECIP.<600hp Diesel		212	10.906552	261.76	1	52	0.47	0.47	0.47	0.01	6.59	0.49	--	1.42	--	0.01	0.01	0.01	0.00	0.17	0.01	--	0.04	--
Small/Large Auxiliary Engines	RECIP.<600hp Diesel		2500	128.615	3086.76	24	365	5.51	5.51	5.51	0.15	77.71	5.73	--	16.70	--	24.14	24.14	24.14	0.67	340.38	25.11	--	73.15	--
Fire Water Pump: 3516B, 2691 hp (2007 kW)	RECIP.>600hp Diesel	831-CD-002	2691	138.441186	3322.59	2	52	1.90	1.08	1.06	0.03	64.67	1.72	--	14.83	--	0.10	0.06	0.05	0.00	3.36	0.09	--	0.77	--
Emergency Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-003	2669	137.309374	3295.42	2	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	0.10	0.06	0.05	0.00	3.34	0.09	--	0.76	--
Auxiliary Generator, CAT 3516, 2669 hp	RECIP.>600hp Diesel	831-CD-001	2669	137.309374	3295.42	24	52	1.88	1.07	1.05	0.03	64.14	1.71	--	14.71	--	1.17	0.67	0.65	0.02	40.02	1.06	--	9.18	--
Turbine Generator 1 (ZAN-5000) - diesel	Dual Fuel Turbine	AT-ZAN-5000	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 2 (ZAN-5030) - diesel	Dual Fuel Turbine	AT-ZAN-5030	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 3 (ZAN-5060) - diesel	Dual Fuel Turbine	AT-ZAN-5060	30575	1572.96145	37751.07	24	50	2.57	0.92	0.92	0.32	188.34	0.64	0.00	25.07	0.00	1.54	0.55	0.55	0.19	113.01	0.39	0.00	15.04	0.00
Turbine Generator 1 (ZAN-5000) - nat gas	Natural Gas Turbine	AT-ZAN-5000	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 2 (ZAN-5030) - nat gas	Natural Gas Turbine	AT-ZAN-5030	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
Turbine Generator 3 (ZAN-5060) - nat gas	Natural Gas Turbine	AT-ZAN-5060	30575	218392.857	5241428.57	24	365	--	0.58	0.58	0.17	97.84	0.64	--	25.07	--	--	2.54	2.54	0.76	428.54	2.81	--	109.81	--
	MISC.		**BPD**	**SCF/HR**	**COUNT**																				
	STORAGE TANK				38	24	365	--	--	--	--	--	37.30	--	--	--	--	--	--	--	--	163.38	--	--	--
	COMBUSTION FLARE - no smoke			388988		24	365	0.00	0.00	0.00	0.22	27.77	13.98	--	126.62	--	0.00	0.00	0.00	0.97	121.65	61.22	--	554.58	--
	COLD VENT				2	24	365	--	--	--	--	--	20.43	--	--	--	--	--	--	--	--	89.49	--	--	--
	FUGITIVES				25000	24	365	--	--	--	--	--	12.50	--	--	--	--	--	--	--	--	54.75	--	--	--
	GLYCOL DEHYDRATOR				1	24	365	--	--	--	--	--	4.39	--	--	--	--	--	--	--	--	19.24	--	--	--
2030	**Facility Total Emissions**							**190.97**	**119.28**	**116.20**	**4.54**	**5,224.99**	**223.84**	**0.02**	**980.64**	**1.16**	**180.04**	**131.33**	**128.91**	**6.93**	**5,558.91**	**533.21**	**0.01**	**1,564.08**	**0.93**
EXEMPTION CALCULATION	**DISTANCE FROM LAND IN MILES**																**4,062.60**			**4,062.60**	**4,062.60**	**4,062.60**		**83,634.50**	
	122.0																								
DRILLING - Offshore support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	365	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	22.25	13.42	13.02	0.32	533.04	15.33	0.00	83.61	0.16
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	120	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	7.31	4.41	4.28	0.11	175.25	5.04	0.00	27.49	0.05
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	40	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	2.44	1.47	1.43	0.04	58.42	1.68	0.00	9.16	0.02
PIPELINE INSTALLATION / SUBSEA INTERVENTIONS - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	20	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.22	0.74	0.71	0.02	29.21	0.84	0.00	4.58	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	23	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	1.40	0.85	0.82	0.02	33.59	0.97	0.00	5.27	0.01
	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	10	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.61	0.37	0.36	0.01	14.60	0.42	0.00	2.29	0.00
FACILITY INSTALLATION/ CONSTRUCTION/ MAINTENANCE/ MULTI-PURPOSE - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	15	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	0.91	0.55	0.54	0.01	21.91	0.63	0.00	3.44	0.01
FLOTEL- Island Venture (Substitution likely with similar vessel of same/lower hourpower)																									
4 x CAT C280-16, 3800kW ea. + 2 x CAT 280-8, 2530 kW ea.	VESSELS- Flotel		27170	1397.78782	33546.91	24	30	19.17	11.56	11.22	0.28	459.25	13.20	0.00	72.03	0.13	6.90	4.16	4.04	0.10	165.33	4.75	0.00	25.93	0.05
Small/Large Aux Engines	VESSELS – Auxiliary		2500	128.615	3086.76	24	30	1.76	1.06	1.03	0.03	42.26	1.21	0.00	6.63	0.01	0.63	0.38	0.37	0.01	15.21	0.44	0.00	2.39	0.00
PRODUCTION - Offshore Support Vessels	VESSELS - Supply Diesel		7200	370.411201	8889.87	24	183	5.08	3.06	2.97	0.07	121.70	3.50	0.00	19.09	0.04	11.15	6.73	6.53	0.16	267.25	7.68	0.00	41.92	0.08
2030	**Non-Facility Total Emissions**							**76.81**	**46.34**	**44.95**	**1.12**	**1,840.20**	**52.91**	**0.01**	**288.63**	**0.54**	**62.15**	**37.50**	**36.37**	**0.90**	**1,489.05**	**42.81**	**0.00**	**233.55**	**0.43**

AIR EMISSIONS CALCULATIONS

COMPANY	AREA	BLOCK	LEASE	FACILITY	WELL
BP Exploration & Production Inc.	Green Canyon	GC734 Unit Agreement #754305003	OCS-G 15604 - 15608	Atlantis	

Year	Facility Emitted Substance								
	TSP	PM10	PM2.5	SOx	NOx	VOC	Pb	CO	NH3
2021	210.25	149.56	146.59	7.37	6282.72	554.02	0.02	1677.60	1.14
2022	185.16	134.42	131.90	7.01	5681.58	536.73	0.02	1583.32	0.97
2023	182.50	132.82	130.35	6.97	5617.84	534.90	0.01	1573.32	0.95
2024	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2025	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2026	180.06	131.35	128.92	6.93	5559.42	533.22	0.01	1564.16	0.93
2027	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2028	180.38	131.60	129.17	6.95	5569.95	533.82	0.01	1567.71	0.93
2029	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
2030	180.04	131.33	128.91	6.93	5558.91	533.21	0.01	1564.08	0.93
Allowable	4062.60			4062.60	4062.60	4062.60		83634.50	

APPENDIX B: SAMPLE MODELING FILES: CALPUFF / CALPOST

Example CALPUFF Input File

```
CALPUFF.INP


---------------- Run title (3 lines) ----------------------------------------

                    CALPUFF MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names

--------------
Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    * METDAT =             *
    or
ISCMET.DAT    input    * ISCDAT =             *
    or
PLMMET.DAT    input    * PLMDAT =             *
    or
PROFILE.DAT   input    * PRFDAT =             *
SURFACE.DAT   input    * SFCDAT =             *
RESTARTB.DAT  input    * RSTARTB=             *
------------------------------------------------------------------------------
CALPUFF.LST   output   ! PUFLST = calpuff_atlantis_2010.lst !
CONC.DAT      output   ! CONDAT = calpuff_atlantis_2010.conc !
DFLX.DAT      output   * DFDAT  =             *
WFLX.DAT      output   * WFDAT  =             *

VISB.DAT      output   * VISDAT =             *
TK2D.DAT      output   * T2DDAT =             *
RHO2D.DAT     output   * RHODAT =             *
RESTARTE.DAT  output   * RSTARTE=             *
------------------------------------------------------------------------------
Emission Files
--------------
PTEMARB.DAT   input    * PTDAT  =             *
VOLEMARB.DAT  input    * VOLDAT =             *
BAEMARB.DAT   input    * ARDAT  =             *
LNEMARB.DAT   input    * LNDAT  =             *
------------------------------------------------------------------------------
Other Files
-----------
OZONE.DAT     input    ! OZDAT = ..\..\..\ozone\2010_rev2.dat !
VD.DAT        input    * VDDAT  =             *
CHEM.DAT      input    * CHEMDAT=             *
H2O2.DAT      input    * H2O2DAT=             *
HILL.DAT      input    * HILDAT=             *
HILLRCT.DAT   input    * RCTDAT=             *
COASTLN.DAT   input    * CSTDAT=             *
FLUXBDY.DAT   input    * BDYDAT=             *
BCON.DAT      input    * BCNDAT=             *
DEBUG.DAT     output   * DEBUG =             *
MASSFLX.DAT   output   * FLXDAT=             *
MASSBAL.DAT   output   * BALDAT=             *
FOG.DAT       output   * FOGDAT=             *
------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = T !
```

```
         F = UPPER CASE
NOTE: (1) file/path names can be up to 70 characters in length


Provision for multiple input files
----------------------------------

     Number of CALMET.DAT files for run (NMETDAT)
                                     Default: 1       ! NMETDAT = 13 !

     Number of PTEMARB.DAT files for run (NPTDAT)
                                     Default: 0       ! NPTDAT =  0  !

     Number of BAEMARB.DAT files for run (NARDAT)
                                     Default: 0       ! NARDAT =  0  !

     Number of VOLEMARB.DAT files for run (NVOLDAT)
                                     Default: 0       ! NVOLDAT =  0  !

!END!

-------------
Subgroup (0a)
-------------

  The following CALMET.DAT filenames are processed in sequence if NMETDAT>1

Default Name  Type          File Name
------------  ----          ---------
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-01.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-02.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-03.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-04.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-05.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-06.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-07.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-08.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-09.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-10.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-11.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2010-12.cst.met ! !END!
 none         input    ! METDAT = ..\..\..\..\..\BOEM MMIF CALPUFF 2010-2014\official
website\MET\CENTRAL\calpuff.central.2011-01.cst.met ! !END!

-------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------
```

Example CALPUFF Input File

```
Option to run all periods found
in the met. file     (METRUN)   Default: 0       ! METRUN =   0  !

     METRUN = 0 - Run period explicitly defined below
     METRUN = 1 - Run all periods in met. file

 Starting date:   Year (IBYR) -- No default       ! IBYR =  2010  !
 (used only if   Month (IBMO) -- No default       ! IBMO =  1  !
  METRUN = 0)      Day (IBDY) -- No default       ! IBDY =  1  !
                  Hour (IBHR) -- No default       ! IBHR =  1  !

 Note: IBHR is the time at the END of the first hour of the simulation
       (IBHR=1, the first hour of a day, runs from 00:00 to 01:00)

 Base time zone        (XBTZ) -- No default       ! XBTZ = 6.0  !
 The zone is the number of hours that must be
 ADDED to the time to obtain UTC (or GMT)
 Examples: PST = 8., MST = 7.
           CST = 6., EST = 5.

 Length of run (hours) (IRLG) -- No default       ! IRLG =  8760  !

 Number of chemical species (NSPEC)
                                  Default: 5       ! NSPEC =  14 !

 Number of chemical species
 to be emitted  (NSE)             Default: 3       ! NSE =  12  !

 Flag to stop run after
 SETUP phase (ITEST)              Default: 2       ! ITEST =  2   !
 (Used to allow checking
 of the model inputs, files, etc.)
       ITEST = 1 - STOPS program after SETUP phase
       ITEST = 2 - Continues with execution of program
                   after SETUP

 Restart Configuration:

    Control flag (MRESTART)       Default: 0       ! MRESTART =  0   !

       0 = Do not read or write a restart file
       1 = Read a restart file at the beginning of
           the run
       2 = Write a restart file during run
       3 = Read a restart file at beginning of run
           and write a restart file during run

    Number of periods in Restart
    output cycle (NRESPD)         Default: 0       ! NRESPD =  0   !

       0 = File written only at last period
      >0 = File updated every NRESPD periods

 Meteorological Data Format (METFM)
                                  Default: 1       ! METFM =  1   !

       METFM = 1 - CALMET binary file (CALMET.MET)
       METFM = 2 - ISC ASCII file (ISCMET.MET)
       METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
       METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                   surface parameters file (SURFACE.DAT)
```

```
            METFM = 5 - AERMET tower file (PROFILE.DAT) and
                        surface parameters file (SURFACE.DAT)

     Meteorological Profile Data Format (MPRFFM)
            (used only for METFM = 1, 2, 3)
                                    Default: 1       ! MPRFFM =  1   !

            MPRFFM = 1 - CTDM plus tower file (PROFILE.DAT)
            MPRFFM = 2 - AERMET tower file (PROFILE.DAT)

     PG sigma-y is adjusted by the factor (AVET/PGTIME)**0.2
     Averaging Time (minutes) (AVET)
                                    Default: 60.0    ! AVET = 60. !
     PG Averaging Time (minutes) (PGTIME)
                                    Default: 60.0    ! PGTIME = 60. !


!END!


------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------


     Vertical distribution used in the
     near field (MGAUSS)                   Default: 1     ! MGAUSS =  1   !
        0 = uniform
        1 = Gaussian

     Terrain adjustment method
     (MCTADJ)                              Default: 3     ! MCTADJ =  3   !
        0 = no adjustment
        1 = ISC-type of terrain adjustment
        2 = simple, CALPUFF-type of terrain
            adjustment
        3 = partial plume path adjustment

     Subgrid-scale complex terrain
     flag (MCTSG)                          Default: 0     ! MCTSG =  0   !
        0 = not modeled
        1 = modeled

     Near-field puffs modeled as
     elongated slugs? (MSLUG)              Default: 0     ! MSLUG =  0   !
        0 = no
        1 = yes (slug model used)

     Transitional plume rise modeled?
     (MTRANS)                              Default: 1     ! MTRANS =  1   !
        0 = no  (i.e., final rise only)
        1 = yes (i.e., transitional rise computed)

     Stack tip downwash? (MTIP)            Default: 1     ! MTIP =  1  !
        0 = no  (i.e., no stack tip downwash)
        1 = yes (i.e., use stack tip downwash)

     Method used to simulate building
     downwash? (MBDW)                      Default: 1     ! MBDW =   1  !
        1 = ISC method
```

```
   2 = PRIME method

Vertical wind shear modeled above
stack top? (MSHEAR)                  Default: 0     ! MSHEAR =  0  !
   0 = no  (i.e., vertical wind shear not modeled)
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)     Default: 0     ! MSPLIT =  0  !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)      Default: 1     ! MCHEM =  1   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 1, or 3)       Default: 0     ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
   1 = transformation rates adjusted
       for aqueous phase reactions

Wet removal modeled ? (MWET)         Default: 1     ! MWET = 0 !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)      Default: 1     ! MDRY = 0 !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)


Gravitational settling (plume tilt)
modeled ? (MTILT)                    Default: 0     ! MTILT =  0   !
   0 = no
   1 = yes
   (puff center falls at the gravitational
    settling velocity for 1 particle species)

Restrictions:
    - MDRY  = 1
    - NSPEC = 1  (must be particle species as well)
    - sg    = 0  GEOMETRIC STANDARD DEVIATION in Group 8 is
                 set to zero for a single particle diameter

Method used to compute dispersion
coefficients (MDISP)                 Default: 3     ! MDISP =  2   !

   1 = dispersion coefficients computed from measured values
       of turbulence, sigma v, sigma w
   2 = dispersion coefficients from internally calculated
       sigma v, sigma w using micrometeorological variables
```

```
        (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
        the ISCST multi-segment approximation) and MP coefficients in
        urban areas
   4 = same as 3 except PG coefficients computed using
        the MESOPUFF II eqns.
   5 = CTDM sigmas used for stable and neutral conditions.
        For unstable conditions, sigmas are computed as in
        MDISP = 3, described above.  MDISP = 5 assumes that
        measured values are read

Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
(Used only if MDISP = 1 or 5)         Default: 3     ! MTURBVW =  3  !
   1 = use sigma-v or sigma-theta measurements
        from PROFILE.DAT to compute sigma-y
        (valid for METFM = 1, 2, 3, 4, 5)
   2 = use sigma-w measurements
        from PROFILE.DAT to compute sigma-z
        (valid for METFM = 1, 2, 3, 4, 5)
   3 = use both sigma-(v/theta) and sigma-w
        from PROFILE.DAT to compute sigma-y and sigma-z
        (valid for METFM = 1, 2, 3, 4, 5)
   4 = use sigma-theta measurements
        from PLMMET.DAT to compute sigma-y
        (valid only if METFM = 3)

Back-up method used to compute dispersion
when measured turbulence data are
missing (MDISP2)                      Default: 3     ! MDISP2 =  3  !
(used only if MDISP = 1 or 5)
   2 = dispersion coefficients from internally calculated
        sigma v, sigma w using micrometeorological variables
        (u*, w*, L, etc.)
   3 = PG dispersion coefficients for RURAL areas (computed using
        the ISCST multi-segment approximation) and MP coefficients in
        urban areas
   4 = same as 3 except PG coefficients computed using
        the MESOPUFF II eqns.

[DIAGNOSTIC FEATURE]
Method used for Lagrangian timescale for Sigma-y
(used only if MDISP=1,2 or MDISP2=1,2)
(MTAULY)                              Default: 0     ! MTAULY =  0  !
   0 = Draxler default 617.284 (s)
   1 = Computed as Lag. Length / (.75 q) -- after SCIPUFF
  10 < Direct user input (s)             -- e.g., 306.9


[DIAGNOSTIC FEATURE]
Method used for Advective-Decay timescale for Turbulence
(used only if MDISP=2 or MDISP2=2)
(MTAUADV)                             Default: 0     ! MTAUADV =  0  !
   0 = No turbulence advection
   1 = Computed (OPTION NOT IMPLEMENTED)
  10 < Direct user input (s)   -- e.g., 300


Method used to compute turbulence sigma-v &
sigma-w using micrometeorological variables
(Used only if MDISP = 2 or MDISP2 = 2)
(MCTURB)                              Default: 1     ! MCTURB =  1  !
```

```
   1 = Standard CALPUFF subroutines
   2 = AERMOD subroutines

PG sigma-y,z adj. for roughness?      Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of          Default: 1     ! MPARTL =  1  !
elevated inversion?
(MPARTL)
   0 = no
   1 = yes

Strength of temperature inversion     Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                      Default: 0     ! MPDF =  1  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                      Default: 0     ! MSGTIBL = 0  !
(MSGTIBL)
   0 = no
   1 = yes

Boundary conditions (concentration) modeled?
                                      Default: 0     ! MBCON = 0  !
(MBCON)
   0 = no
   1 = yes, using formatted BCON.DAT file
   2 = yes, using unformatted CONC.DAT file

Note:  MBCON > 0 requires that the last species modeled
       be 'BCON'.  Mass is placed in species BCON when
       generating boundary condition puffs so that clean
       air entering the modeling domain can be simulated
       in the same way as polluted air.  Specify zero
       emission of species BCON for all regular sources.

Individual source contributions saved?
                                      Default: 0     ! MSOURCE = 0  !
(MSOURCE)
   0 = no
   1 = yes


Analyses of fogging and icing impacts due to emissions from
arrays of mechanically-forced cooling towers can be performed
using CALPUFF in conjunction with a cooling tower emissions
processor (CTEMISS) and its associated postprocessors.  Hourly
emissions of water vapor and temperature from each cooling tower
cell are computed for the current cell configuration and ambient
conditions by CTEMISS. CALPUFF models the dispersion of these
emissions and provides cloud information in a specialized format
```

```
     for further analysis. Output to FOG.DAT is provided in either
     'plume mode' or 'receptor mode' format.

     Configure for FOG Model output?
                                          Default: 0     ! MFOG =  0   !
     (MFOG)
        0 = no
        1 = yes  - report results in PLUME Mode format
        2 = yes  - report results in RECEPTOR Mode format


     Test options specified to see if
     they conform to regulatory
     values? (MREG)                       Default: 1     ! MREG =  0   !

        0 = NO checks are made
        1 = Technical options must conform to USEPA
            Long Range Transport (LRT) guidance
                       METFM    1 or 2
                       AVET     60. (min)
                       PGTIME   60. (min)
                       MGAUSS   1
                       MCTADJ   3
                       MTRANS   1
                       MTIP     1
                       MCHEM    1 or 3 (if modeling SOx, NOx)
                       MWET     1
                       MDRY     1
                       MDISP    2 or 3
                       MPDF     0 if MDISP=3
                                1 if MDISP=2
                       MROUGH   0
                       MPARTL   1
                       SYTDEP   550. (m)
                       MHFTSZ   0
                       SVMIN    0.5 (m/s)


!END!


------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          SO2 !         !END!
! CSPEC =          SO4 !         !END!
! CSPEC =          NOX !         !END!
! CSPEC =         HNO3 !         !END!
! CSPEC =          NO3 !         !END!
! CSPEC =        PM800 !         !END!
! CSPEC =        PM425 !         !END!
! CSPEC =        PM187 !         !END!
! CSPEC =        PM112 !         !END!
```

```
! CSPEC =        PM081 !         !END!
! CSPEC =        PM056 !         !END!
! CSPEC =           EC !         !END!
! CSPEC =           CO !         !END!
! CSPEC =          VOC !         !END!

                                                     Dry                OUTPUT GROUP
    SPECIES          MODELED          EMITTED       DEPOSITED              NUMBER
     NAME         (0=NO, 1=YES)    (0=NO, 1=YES)    (0=NO,                (0=NONE,
   (Limit: 12                                         1=COMPUTED-GAS       1=1st CGRUP,
    Characters                                        2=COMPUTED-PARTICLE  2=2nd CGRUP,
    in length)                                        3=USER-SPECIFIED)    3= etc.)

!          SO2  =         1,               1,           0,                 0   !
!          SO4  =         1,               1,           0,                 0   !
!          NOX  =         1,               1,           0,                 0   !
!         HNO3  =         1,               0,           0,                 0   !
!          NO3  =         1,               0,           0,                 0   !
!        PM800  =         1,               1,           0,                 0   !
!        PM425  =         1,               1,           0,                 0   !
!        PM187  =         1,               1,           0,                 0   !
!        PM112  =         1,               1,           0,                 0   !
!        PM081  =         1,               1,           0,                 0   !
!        PM056  =         1,               1,           0,                 0   !
!           EC  =         1,               1,           0,                 0   !
!           CO  =         1,               1,           0,                 0   !
!          VOC  =         1,               1,           0,                 0   !

!END!

  Note:  The last species in (3a) must be 'BCON' when using the
         boundary condition option (MBCON > 0).  Species BCON should
         typically be modeled as inert (no chem transformation or
         removal).


-------------
Subgroup (3b)
-------------
  The following names are used for Species-Groups in which results
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.



-------------------------------------------------------------------------------


INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM    ! PMAP = LCC  !

         UTM :  Universal Transverse Mercator
```

```
    TTM :  Tangential Transverse Mercator
    LCC :  Lambert Conformal Conic
     PS :  Polar Stereographic
     EM :  Equatorial Mercator
   LAZA :  Lambert Azimuthal Equal Area

False Easting and Northing (km) at the projection origin
(Used only if PMAP= TTM, LCC, or LAZA)
(FEAST)                    Default=0.0     ! FEAST  = 0.000  !
(FNORTH)                   Default=0.0     ! FNORTH = 0.000  !

UTM zone (1 to 60)
(Used only if PMAP=UTM)
(IUTMZN)                   No Default      ! IUTMZN =  0   !

Hemisphere for UTM projection?
(Used only if PMAP=UTM)
(UTMHEM)                   Default: N      ! UTMHEM = N  !
    N   :  Northern hemisphere projection
    S   :  Southern hemisphere projection

Latitude and Longitude (decimal degrees) of projection origin
(Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
(RLAT0)                    No Default      ! RLAT0 = 40.000N !
(RLON0)                    No Default      ! RLON0 = 97.000W !

    TTM :  RLON0 identifies central (true N/S) meridian of projection
           RLAT0 selected for convenience
    LCC :  RLON0 identifies central (true N/S) meridian of projection
           RLAT0 selected for convenience
    PS  :  RLON0 identifies central (grid N/S) meridian of projection
           RLAT0 selected for convenience
    EM  :  RLON0 identifies central meridian of projection
           RLAT0 is REPLACED by 0.0N (Equator)
    LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
           RLAT0 identifies latitude of tangent-point of mapping plane

Matching parallel(s) of latitude (decimal degrees) for projection
(Used only if PMAP= LCC or PS)
(XLAT1)                    No Default      ! XLAT1 =  33.000N  !
(XLAT2)                    No Default      ! XLAT2 =  45.000N  !

    LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
    PS  :  Projection plane slices through Earth at XLAT1
           (XLAT2 is not used)

----------
Note:  Latitudes and longitudes should be positive, and include a
       letter N,S,E, or W indicating north or south latitude, and
       east or west longitude.  For example,
       35.9  N Latitude  =  35.9N
       118.7 E Longitude = 118.7E


Datum-region
------------

The Datum-Region for the coordinates is identified by a character
string.  Many mapping products currently available use the model of the
Earth known as the World Geodetic System 1984 (WGS-84).  Other local
models may be in use, and their selection in CALMET will make its output
```

```
     consistent with local mapping products.  The list of Datum-Regions with
     official transformation parameters is provided by the National Imagery and
     Mapping Agency (NIMA).

     NIMA Datum - Regions(Examples)
     ------------------------------------------------------------------------------
     WGS-84    WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
     NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
     NAR-C     NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
     NWS-84    NWS 6370KM Radius, Sphere
     ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

     Datum-region for output coordinates
     (DATUM)                    Default: WGS-84    ! DATUM = NWS-84  !


METEOROLOGICAL Grid:

     Rectangular grid defined for projection PMAP,
     with X the Easting and Y the Northing coordinate

            No. X grid cells (NX)      No default     ! NX =  239   !
            No. Y grid cells (NY)      No default     ! NY =  200   !
         No. vertical layers (NZ)      No default     ! NZ =  10   !

           Grid spacing (DGRIDKM)      No default     ! DGRIDKM = 4.0 !
                                       Units: km

                Cell face heights
                    (ZFACE(nz+1))      No defaults
                                       Units: m
! ZFACE = 0., 20.,   40.00,   80.00,  160.00,  320.00,  640.00, 1200.00, 2000.00, 3000.00,
4000.00 !

            Reference Coordinates
           of SOUTHWEST corner of
                 grid cell(1, 1):

            X coordinate (XORIGKM)     No default     ! XORIGKM =   204.000 !
            Y coordinate (YORIGKM)     No default     ! YORIGKM = -1684.000 !
                                      Units: km


COMPUTATIONAL Grid:

     The computational grid is identical to or a subset of the MET. grid.
     The lower left (LL) corner of the computational grid is at grid point
     (IBCOMP, JBCOMP) of the MET. grid.  The upper right (UR) corner of the
     computational grid is at grid point (IECOMP, JECOMP) of the MET. grid.
     The grid spacing of the computational grid is the same as the MET. grid.

        X index of LL corner (IBCOMP)      No default     ! IBCOMP =  1   !
                  (1 <= IBCOMP <= NX)

        Y index of LL corner (JBCOMP)      No default     ! JBCOMP =  1   !
                  (1 <= JBCOMP <= NY)


        X index of UR corner (IECOMP)      No default     ! IECOMP =  239 !
                  (1 <= IECOMP <= NX)
```

```
        Y index of UR corner (JECOMP)      No default     ! JECOMP =  200 !
                  (1 <= JECOMP <= NY)


SAMPLING Grid (GRIDDED RECEPTORS):

     The lower left (LL) corner of the sampling grid is at grid point
     (IBSAMP, JBSAMP) of the MET. grid.  The upper right (UR) corner of the
     sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.
     The sampling grid must be identical to or a subset of the computational
     grid.  It may be a nested grid inside the computational grid.
     The grid spacing of the sampling grid is DGRIDKM/MESHDN.

        Logical flag indicating if gridded
        receptors are used (LSAMP)         Default: T     ! LSAMP = F !
        (T=yes, F=no)

        X index of LL corner (IBSAMP)      No default     ! IBSAMP =  1   !
         (IBCOMP <= IBSAMP <= IECOMP)

        Y index of LL corner (JBSAMP)      No default     ! JBSAMP =  1   !
         (JBCOMP <= JBSAMP <= JECOMP)


        X index of UR corner (IESAMP)      No default     ! IESAMP =  239 !
         (IBCOMP <= IESAMP <= IECOMP)

        Y index of UR corner (JESAMP)      No default     ! JESAMP =  200 !
         (JBCOMP <= JESAMP <= JECOMP)


       Nesting factor of the sampling
        grid (MESHDN)                      Default: 1     ! MESHDN =  1  !
        (MESHDN is an integer >= 1)

!END!


------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------
                                                *                          *
     FILE                        DEFAULT VALUE             VALUE THIS RUN
     ----                        -------------             --------------

   Concentrations (ICON)               1                   !  ICON =  1   !
   Dry Fluxes (IDRY)                   1                   !  IDRY =  0   !
   Wet Fluxes (IWET)                   1                   !  IWET =  0   !
   2D Temperature (IT2D)               0                   !  IT2D =  0   !
   2D Density (IRHO)                   0                   !  IRHO =  0   !
   Relative Humidity (IVIS)            1                   !  IVIS =  0   !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                            Default: T         ! LCOMPRS = T !

   *
```

```
0 = Do not create file, 1 = create file


QA PLOT FILE OUTPUT OPTION:

   Create a standard series of output files (e.g.
   locations of sources, receptors, grids ...)
   suitable for plotting?
   (IQAPLOT)                       Default: 1         !  IQAPLOT =  1   !
     0 = no
     1 = yes

DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

   Mass flux across specified boundaries
   for selected species reported?
   (IMFLX)                         Default: 0         ! IMFLX =  0  !
     0 = no
     1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
              are specified in Input Group 0)

   Mass balance for each species
   reported?
   (IMBAL)                         Default: 0         ! IMBAL =  0  !
     0 = no
     1 = yes (MASSBAL.DAT filename is
          specified in Input Group 0)


LINE PRINTER OUTPUT OPTIONS:

   Print concentrations (ICPRT)    Default: 0         ! ICPRT =  0   !
   Print dry fluxes (IDPRT)        Default: 0         ! IDPRT =  0   !
   Print wet fluxes (IWPRT)        Default: 0         ! IWPRT =  0   !
   (0 = Do not print, 1 = Print)

   Concentration print interval
   (ICFRQ) in timesteps            Default: 1         ! ICFRQ =  1   !
   Dry flux print interval
   (IDFRQ) in timesteps            Default: 1         ! IDFRQ =  1   !
   Wet flux print interval
   (IWFRQ) in timesteps            Default: 1         ! IWFRQ =  1   !

   Units for Line Printer Output
   (IPRTU)                         Default: 1         ! IPRTU =  3   !
                  for            for
             Concentration    Deposition
       1 =       g/m**3         g/m**2/s
       2 =      mg/m**3        mg/m**2/s
       3 =      ug/m**3        ug/m**2/s
       4 =      ng/m**3        ng/m**2/s
       5 =     Odour Units

   Messages tracking progress of run
   written to the screen ?
   (IMESG)                         Default: 2         ! IMESG =  2   !
     0 = no
     1 = yes (advection step, puff ID)
     2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)
```

```
     SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                 ---- CONCENTRATIONS ----   ------ DRY FLUXES ------   ------ WET FLUXES -----
-   -- MASS FLUX --
   SPECIES
   /GROUP        PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON
DISK?   SAVED ON DISK?
   -------       ------------------------   ------------------------   -----------------------
-   ---------------
!          SO2 =     0,           1,           0,           1,           0,           1,
0   !
!          SO4 =     0,           1,           0,           1,           0,           1,
0   !
!          NOX =     0,           1,           0,           1,           0,           1,
0   !
!         HNO3 =     0,           1,           0,           1,           0,           1,
0   !
!          NO3 =     0,           1,           0,           1,           0,           1,
0   !
!        PM800 =     0,           1,           0,           1,           0,           1,
0   !
!        PM425 =     0,           1,           0,           1,           0,           1,
0   !
!        PM187 =     0,           1,           0,           1,           0,           1,
0   !
!        PM112 =     0,           1,           0,           1,           0,           1,
0   !
!        PM081 =     0,           1,           0,           1,           0,           1,
0   !
!        PM056 =     0,           1,           0,           1,           0,           1,
0   !
!           EC =     0,           1,           0,           1,           0,           1,
0   !
!           CO =     0,           1,           0,           1,           0,           1,
0   !
!          VOC =     0,           1,           0,           1,           0,           1,
0   !

  Note:  Species BCON (for MBCON > 0) does not need to be saved on disk.


     OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

       Logical for debug output
       (LDEBUG)                                  Default: F     ! LDEBUG = F !

       First puff to track
       (IPFDEB)                                  Default: 1     ! IPFDEB =  1  !

       Number of puffs to track
       (NPFDEB)                                  Default: 1     ! NPFDEB =  1  !

       Met. period to start output
       (NN1)                                     Default: 1     ! NN1 =  1   !

       Met. period to end output
       (NN2)                                     Default: 10    ! NN2 =  10  !

!END!
```

```
------------------------------------------------------------------------------


INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)       Default: 0     ! NHILL =  0   !

       Number of special complex terrain
       receptors  (NCTREC)                      Default: 0     ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                  No Default     ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = 1.0 !
       to meters (MHILL=1)

       Factor to convert vertical dimensions    Default: 1.0   ! ZHILL2M = 1.0 !
       to meters (MHILL=1)

       X-origin of CTDM system relative to      No Default     ! XCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

       Y-origin of CTDM system relative to      No Default     ! YCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                      1 **
     HILL information


HILL           XC        YC       THETAH  ZGRID  RELIEF    EXPO 1    EXPO 2   SCALE 1    SCALE
2    AMAX1     AMAX2
 NO.          (km)      (km)      (deg.)   (m)     (m)      (m)       (m)       (m)        (m)
(m)       (m)
----          ----      ----      ------  -----  ------    ------    ------   -------    -----
--    -----     -----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                      XRCT         YRCT        ZRCT          XHH
                      (km)         (km)         (m)
```

```
                    ------        -----      ------         ----


-------------------
1
     Description of Complex Terrain Variables:
          XC, YC  = Coordinates of center of hill
          THETAH  = Orientation of major axis of hill (clockwise from
                    North)
          ZGRID   = Height of the  0  of the grid above mean sea
                    level
          RELIEF  = Height of the crest of the hill above the grid elevation
          EXPO 1  = Hill-shape exponent for the major axis
          EXPO 2  = Hill-shape exponent for the major axis
          SCALE 1 = Horizontal length scale along the major axis
          SCALE 2 = Horizontal length scale along the minor axis
          AMAX    = Maximum allowed axis length for the major axis
          BMAX    = Maximum allowed axis length for the major axis

          XRCT, YRCT = Coordinates of the complex terrain receptors
          ZRCT    = Height of the ground (MSL) at the complex terrain
                    Receptor
          XHH     = Hill number associated with each complex terrain receptor
                    (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
     NOTE: DATA for each hill and CTSG receptor are treated as a separate
           input subgroup and therefore must end with an input group terminator.

-------------------------------------------------------------------------------


INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases
--------------

      SPECIES     DIFFUSIVITY      ALPHA STAR      REACTIVITY    MESOPHYLL RESISTANCE
HENRY'S LAW COEFFICIENT
       NAME        (cm**2/s)                                            (s/cm)
(dimensionless)
      -------     -----------      ----------      ----------    --------------------     ----
-------------------

!          SO2 =      .1509,        1000.0,           8.0,                .0,
.04 !
!          NOX =      .1656,           1.0,           8.0,               5.0,
3.5 !
!         HNO3 =      .1628,           1.0,          18.0,                .0,
.0000001 !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 8 -- Size parameters for dry deposition of particles
--------------

     For SINGLE SPECIES, the mean and standard deviation are used to
     compute a deposition velocity for NINT (see group 9) size-ranges,
     and these are then averaged to obtain a mean deposition velocity.
```

```
     For GROUPED SPECIES, the size distribution should be explicitly
     specified (by the 'species' in the group), and the standard deviation
     for each should be entered as 0.  The model will then use the
     deposition velocity for the stated mean diameter.

      SPECIES      GEOMETRIC MASS MEAN        GEOMETRIC STANDARD
       NAME             DIAMETER                  DEVIATION
                        (microns)                 (microns)
      -------      -------------------        -----------------
!          SO4 =           .48,                      2.0   !
!          NO3 =           .48,                      2.0   !
!        PM800 =           8.0,                       .0   !
!        PM425 =          4.25,                       .0   !
!        PM187 =         1.875,                       .0   !
!        PM112 =         1.125,                       .0   !
!        PM081 =         .8125,                       .0   !
!        PM056 =         .5625,                       .0   !
!           EC =           .48,                      2.0   !

!END!


--------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
--------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                          Default: 30    !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                            Default: 10    !    RGR = 10.0 !
     Reference pollutant reactivity
     (REACTR)                         Default: 8     ! REACTR = 8.0 !

     Number of particle-size intervals used to
     evaluate effective particle deposition velocity
     (NINT)                           Default: 9     !   NINT =  9  !

     Vegetation state in unirrigated areas
     (IVEG)                           Default: 1     !   IVEG =  1   !
        IVEG=1 for active and unstressed vegetation
        IVEG=2 for active and stressed vegetation
        IVEG=3 for inactive vegetation

!END!


--------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------


                      Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------
!          SO2 =         3.0E-05,              0.0E00 !
```

```
!          SO4 =         1.0E-04,             3.0E-05 !
!         HNO3 =         6.0E-05,              0.0E00 !
!          NO3 =         1.0E-04,             3.0E-05 !
!        PM800 =         1.0E-04,             3.0E-05 !
!        PM425 =         1.0E-04,             3.0E-05 !
!        PM187 =         1.0E-04,             3.0E-05 !
!        PM112 =         1.0E-04,             3.0E-05 !
!        PM081 =         1.0E-04,             3.0E-05 !
!        PM056 =         1.0E-04,             3.0E-05 !
!           EC =         1.0E-04,             3.0E-05 !

!END!


------------------------------------------------------------------------------


INPUT GROUP: 11 -- Chemistry Parameters
---------------

     Ozone data input option (MOZ)     Default: 1            ! MOZ =  1   !
     (Used only if MCHEM = 1, 3, or 4)
        0 = use a monthly background ozone value
        1 = read hourly ozone concentrations from
            the OZONE.DAT data file

     Monthly ozone concentrations
     (Used only if MCHEM = 1, 3, or 4 and
      MOZ = 0 or MOZ = 1 and all hourly O3 data missing)
     (BCKO3) in ppb                    Default: 12*80.
     *  BCKO3 =   *

     Monthly ammonia concentrations
     (Used only if MCHEM = 1, or 3)
     (BCKNH3) in ppb                   Default: 12*10.
     !  BCKNH3 = 0.59, 0.57, 0.62, 0.58, 0.74, 0.65, 0.73, 0.67, 0.54, 0.46, 0.45, 0.42 !


     Nighttime SO2 loss rate (RNITE1)
     in percent/hour                   Default: 0.2          ! RNITE1 = .2 !

     Nighttime NOx loss rate (RNITE2)
     in percent/hour                   Default: 2.0          ! RNITE2 = 2.0 !

     Nighttime HNO3 formation rate (RNITE3)
     in percent/hour                   Default: 2.0          ! RNITE3 = 2.0 !

     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

     Monthly H2O2 concentrations
     (Used only if MQACHEM = 1 and
      MH2O2 = 0 or MH2O2 = 1 and all hourly H2O2 data missing)
     (BCKH2O2) in ppb                  Default: 12*1.
     !  BCKH2O2 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !


 --- Data for SECONDARY ORGANIC AEROSOL (SOA) Option
```

```
     (used only if MCHEM = 4)

     The SOA module uses monthly values of:
          Fine particulate concentration in ug/m^3 (BCKPMF)
          Organic fraction of fine particulate     (OFRAC)
          VOC / NOX ratio (after reaction)         (VCNX)
     to characterize the air mass when computing
     the formation of SOA from VOC emissions.
     Typical values for several distinct air mass types are:

        Month    1    2    3    4    5    6    7    8    9   10   11   12
                Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

     Clean Continental
        BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
        OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
        VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Clean Marine (surface)
        BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
        OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
        VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Urban - low biogenic (controls present)
        BCKPMF  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
        OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
        VCNX     4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

     Urban - high biogenic (controls present)
        BCKPMF  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
        OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
        VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

     Regional Plume
        BCKPMF  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
        OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
        VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

     Urban - no controls present
        BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
        OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
        VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

     Default: Clean Continental
     !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
     !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
     !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00,
50.00 !


!END!


------------------------------------------------------------------------------


INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

     Horizontal size of puff (m) beyond which
     time-dependent dispersion equations (Heffter)
```

```
are used to determine sigma-y and
sigma-z (SYTDEP)                          Default: 550.   ! SYTDEP = 5.5E02 !

Switch for using Heffter equation for sigma z
as above (0 = Not use Heffter; 1 = use Heffter
(MHFTSZ)                                  Default: 0      ! MHFTSZ =  0   !

Stability class used to determine plume
growth rates for puffs above the boundary
layer (JSUP)                              Default: 5      ! JSUP =  5   !

Vertical dispersion constant for stable
conditions (k1 in Eqn. 2.7-3)  (CONK1)    Default: 0.01   ! CONK1 = .01 !

Vertical dispersion constant for neutral/
unstable conditions (k2 in Eqn. 2.7-4)
(CONK2)                                   Default: 0.1    ! CONK2 = .1 !

Factor for determining Transition-point from
Schulman-Scire to Huber-Snyder Building Downwash
scheme (SS used for Hs < Hb + TBD * HL)
(TBD)                                     Default: 0.5    ! TBD = .5 !
   TBD < 0   ==> always use Huber-Snyder
   TBD = 1.5 ==> always use Schulman-Scire
   TBD = 0.5 ==> ISC Transition-point

Range of land use categories for which
urban dispersion is assumed
(IURB1, IURB2)                            Default: 10     ! IURB1 =  10  !
                                                   19     ! IURB2 =  19  !

Site characterization parameters for single-point Met data files ---------
(needed for METFM = 2,3,4,5)

   Land use category for modeling domain
   (ILANDUIN)                             Default: 20     ! ILANDUIN =  20  !

   Roughness length (m) for modeling domain
   (Z0IN)                                 Default: 0.25   ! Z0IN = .25 !

   Leaf area index for modeling domain
   (XLAIIN)                               Default: 3.0    ! XLAIIN = 3.0 !

   Elevation above sea level (m)
   (ELEVIN)                               Default: 0.0    ! ELEVIN = .0 !

   Latitude (degrees) for met location
   (XLATIN)                               Default: -999.  ! XLATIN = -999.0 !

   Longitude (degrees) for met location
   (XLONIN)                               Default: -999.  ! XLONIN = -999.0 !

Specialized information for interpreting single-point Met data files -----

   Anemometer height (m) (Used only if METFM = 2,3)
   (ANEMHT)                               Default: 10.    ! ANEMHT = 10.0 !

   Form of lateral turbulance data in PROFILE.DAT file
   (Used only if METFM = 4,5 or MTURBVW = 1 or 3)
   (ISIGMAV)                              Default: 1      ! ISIGMAV =  1  !
       0 = read sigma-theta
```

```
            1 = read sigma-v

         Choice of mixing heights (Used only if METFM = 4)
         (IMIXCTDM)                              Default: 0      ! IMIXCTDM =  0  !
             0 = read PREDICTED mixing heights
             1 = read OBSERVED mixing heights

      Maximum length of a slug (met. grid units)
      (XMXLEN)                                   Default: 1.0    ! XMXLEN = 1.0 !

      Maximum travel distance of a puff/slug (in
      grid units) during one sampling step
      (XSAMLEN)                                  Default: 1.0    ! XSAMLEN = 1.0 !

      Maximum Number of slugs/puffs release from
      one source during one time step
      (MXNEW)                                    Default: 99     ! MXNEW =  99   !

      Maximum Number of sampling steps for
      one puff/slug during one time step
      (MXSAM)                                    Default: 99     ! MXSAM =  99   !

      Number of iterations used when computing
      the transport wind for a sampling step
      that includes gradual rise (for CALMET
      and PROFILE winds)
      (NCOUNT)                                   Default: 2      ! NCOUNT =  2   !

      Minimum sigma y for a new puff/slug (m)
      (SYMIN)                                    Default: 1.0    ! SYMIN = 1.0  !

      Minimum sigma z for a new puff/slug (m)
      (SZMIN)                                    Default: 1.0    ! SZMIN = 1.0  !

      Default minimum turbulence velocities sigma-v and sigma-w
      for each stability class over land and over water (m/s)
      (SVMIN(12) and SWMIN(12))

                      ----------  LAND  ----------       ---------  WATER  ----------
         Stab Class :  A    B    C    D    E    F         A    B    C    D    E    F
                      ---  ---  ---  ---  ---  ---       ---  ---  ---  ---  ---  ---
      Default SVMIN : .50, .50, .50, .50, .50, .50,      .37, .37, .37, .37, .37, .37
      Default SWMIN : .20, .12, .08, .06, .03, .016,     .20, .12, .08, .06, .03, .016

           ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370,
0.370, 0.370!
           ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060,
0.030, 0.016!

      Divergence criterion for dw/dz across puff
      used to initiate adjustment for horizontal
      convergence (1/s)
      Partial adjustment starts at CDIV(1), and
      full adjustment is reached at CDIV(2)
      (CDIV(2))                                  Default: 0.0,0.0  ! CDIV = .0, .0 !

      Minimum wind speed (m/s) allowed for
      non-calm conditions. Also used as minimum
      speed returned when using power-law
      extrapolation toward surface
      (WSCALM)                                   Default: 0.5    ! WSCALM = .5 !
```

```
Maximum mixing height (m)
(XMAXZI)                                  Default: 3000.  ! XMAXZI = 3000.0 !

Minimum mixing height (m)
(XMINZI)                                  Default: 50.    ! XMINZI = 50.0 !

Default wind speed classes --
5 upper bounds (m/s) are entered;
the 6th class has no upper limit
(WSCAT(5))                      Default   :
                                ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                         Wind Speed Class :  1     2     3     4     5
                                             ---   ---   ---   ---   ---
                                  ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

Default wind speed profile power-law
exponents for stabilities 1-6
(PLX0(6))                       Default   : ISC RURAL values
                                ISC RURAL : .07, .07, .10, .15, .35, .55
                                ISC URBAN : .15, .15, .20, .25, .30, .30

                          Stability Class :  A     B     C     D     E     F
                                             ---   ---   ---   ---   ---   ---
                                     ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

Default potential temperature gradient
for stable classes E, F (degK/m)
(PTG0(2))                       Default: 0.020, 0.035
                                     ! PTG0 = 0.020,   0.035 !

Default plume path coefficients for
each stability class (used when option
for partial plume height terrain adjustment
is selected -- MCTADJ=3)
(PPC(6))                  Stability Class :  A     B     C     D     E     F
                             Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                             ---   ---   ---   ---   ---   ---
                                     !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

Slug-to-puff transition criterion factor
equal to sigma-y/length of slug
(SL2PF)                                Default: 10.        ! SL2PF = 10.0 !

Puff-splitting control variables ------------------------

  VERTICAL SPLIT
  --------------

  Number of puffs that result every time a puff
  is split - nsplit=2 means that 1 puff splits
  into 2
  (NSPLIT)                             Default:   3        ! NSPLIT =  3  !

  Time(s) of a day when split puffs are eligible to
  be split once again; this is typically set once
  per day, around sunset before nocturnal shear develops.
  24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
  0=do not re-split    1=eligible for re-split
  (IRESPLIT(24))                       Default:  Hour 17 = 1
```

```
  !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

  Split is allowed only if last hour's mixing
  height (m) exceeds a minimum value
  (ZISPLIT)                          Default: 100.       ! ZISPLIT = 100.0 !

  Split is allowed only if ratio of last hour's
  mixing ht to the maximum mixing ht experienced
  by the puff is less than a maximum value (this
  postpones a split until a nocturnal layer develops)
  (ROLDMAX)                          Default: 0.25       ! ROLDMAX = 0.25 !


  HORIZONTAL SPLIT
  ----------------

  Number of puffs that result every time a puff
  is split - nsplith=5 means that 1 puff splits
  into 5
  (NSPLITH)                          Default:   5        ! NSPLITH =  5  !

  Minimum sigma-y (Grid Cells Units) of puff
  before it may be split
  (SYSPLITH)                         Default:  1.0       ! SYSPLITH = 1.0 !

  Minimum puff elongation rate (SYSPLITH/hr) due to
  wind shear, before it may be split
  (SHSPLITH)                         Default:  2.        ! SHSPLITH = 2.0 !

  Minimum concentration (g/m^3) of each
  species in puff before it may be split
  Enter array of NSPEC values; if a single value is
  entered, it will be used for ALL species
  (CNSPLITH)                         Default:  1.0E-07   ! CNSPLITH = 1.0E-07 !

Integration control variables ------------------------

  Fractional convergence criterion for numerical SLUG
  sampling integration
  (EPSSLUG)                          Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

  Fractional convergence criterion for numerical AREA
  source integration
  (EPSAREA)                          Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

  Trajectory step-length (m) used for numerical rise
  integration
  (DSRISE)                           Default:   1.0      ! DSRISE = 1.0 !

  Boundary Condition (BC) Puff control variables ------------------------

  Minimum height (m) to which BC puffs are mixed as they are emitted
  (MBCON=2 ONLY).  Actual height is reset to the current mixing height
  at the release point if greater than this minimum.
  (HTMINBC)                          Default:   500.     ! HTMINBC = 500.0 !

  Search radius (km) about a receptor for sampling nearest BC puff.
  BC puffs are typically emitted with a spacing of one grid cell
  length, so the search radius should be greater than DGRIDKM.
  (RSAMPBC)                          Default:   10.      ! RSAMPBC = 10.0 !
```

```
       Near-Surface depletion adjustment to concentration profile used when
       sampling BC puffs?
       (MDEPBC)                           Default:   1        ! MDEPBC =  1  !
          0 = Concentration is NOT adjusted for depletion
          1 = Adjust Concentration for depletion

!END!


------------------------------------------------------------------------------


INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
--------------------------------

---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  ! NPT1 = 28 !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 =  0  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !

     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                       a
          POINT SOURCE: CONSTANT DATA
          ----------------------------
                                                                          b          c
  Source       X         Y       Stack    Base     Stack    Exit  Exit    Bldg.  Emission
   No.     Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.   Dwash   Rates
              (km)      (km)       (m)      (m)       (m)  (m/s) (deg. K)
  ------   ---------- ---------- ------  ------   -------- ----- -------- ----- --------
! SRCNAM   =  WVMAIN !
 ! X =  701.229, -1391.990, 26.60, 0.000, 0.950, 44.069, 755.372, 0.0, 0.0, 0.0, 138.989,
0.0,  0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
```

```
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  WVEGEN !
 ! X =  701.229, -1391.990, 11.10, 0.000, 0.305, 84.418, 755.372, 0.0, 0.0, 0.0, 4.568,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  WVAUX !
 ! X =  701.229, -1391.990, 11.10, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  IVMAIN !
 ! X =  701.229, -1391.990, 28.96, 0.000, 0.305, 267.324, 755.372, 0.0, 0.0, 0.0, 57.864,
0.0,  0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  IVAUX !
 ! X =  701.229, -1391.990, 28.96, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  OBHMAIN !
 ! X =  701.229, -1391.990, 29.00, 0.000, 0.925, 30.263, 755.372, 0.0, 0.0, 0.0, 128.536,
0.0,  0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  1.0 !
! END !

! SRCNAM   =  OBHEGEN !
 ! X =  701.229, -1391.990, 29.00, 0.000, 0.925, 10.222, 755.372, 0.0, 0.0, 0.0, 5.235,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  1.0 !
! END !

! SRCNAM   =  OBHAUX !
 ! X =  701.229, -1391.990, 29.00, 0.000, 0.925, 2.006, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  1.0 !
! END !
```

```
! SRCNAM   =  DBMAIN !
 ! X =  701.229, -1391.990, 23.30, 0.000, 0.842, 38.679, 755.372, 0.0, 0.0, 0.0, 95.837,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  DBAUX !
 ! X =  701.229, -1391.990, 7.80, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  GCMAIN !
 ! X =  701.229, -1391.990, 18.01, 0.000, 0.457, 70.368, 755.372, 0.0, 0.0, 0.0, 51.407,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  GCAUX !
 ! X =  701.229, -1391.990, 7.62, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  SSMAIN !
 ! X =  701.229, -1391.990, 18.01, 0.000, 0.457, 67.552, 755.372, 0.0, 0.0, 0.0, 32.900,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  SSAUX !
 ! X =  701.229, -1391.990, 7.62, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  0.0 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  Q5MAIN !
 ! X =  701.229, -1391.990, 22.00, 0.000, 0.305, 205.830, 755.372, 0.0, 0.0, 0.0, 89.107,
0.0,  0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  9.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  Q5AUX !
 ! X =  701.229, -1391.990, 18.00, 0.000, 0.305, 19.678, 755.372, 0.0, 0.0, 0.0, 5.324,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  9.5 !
```

```
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUCRN1 !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 20.662, 755.372, 0.0, 0.0, 0.0, 2.056,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUCRN2 !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 20.662, 755.372, 0.0, 0.0, 0.0, 2.056,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUCRN3 !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 20.662, 755.372, 0.0, 0.0, 0.0, 2.056,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUWB !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 10.823, 755.372, 0.0, 0.0, 0.0, 1.077,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUCOMP !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 13.184, 755.372, 0.0, 0.0, 0.0, 1.312,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUAUX1 !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 98.389, 755.372, 0.0, 0.0, 0.0, 9.792,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUFWP !
 ! X =  699.449, -1398.318, 42.59, 0.000, 0.305, 105.906, 755.372, 0.0, 0.0, 0.0, 8.148,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUEGEN !
```

```
 ! X =  699.449, -1398.318, 56.61, 0.000, 2.083, 2.250, 755.372, 0.0, 0.0, 0.0, 8.081,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUAUX2 !
 ! X =  699.449, -1398.318, 56.61, 0.000, 2.083, 2.250, 755.372, 0.0, 0.0, 0.0, 8.081,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUGDS1 !
 ! X =  699.449, -1398.318, 56.61, 0.000, 2.083, 25.770, 755.372, 0.0, 0.0, 0.0, 23.731,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUGDS2 !
 ! X =  699.449, -1398.318, 56.61, 0.000, 2.083, 25.770, 755.372, 0.0, 0.0, 0.0, 23.731,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !

! SRCNAM   =  FPUGDS3 !
 ! X =  699.449, -1398.318, 56.61, 0.000, 2.083, 25.770, 755.372, 0.0, 0.0, 0.0, 23.731,  0.0,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 !
 ! SIGYZI   =  0.0, 0.0 !
 ! ZPLTFM   =  17.5 !
 ! FMFAC    =  0.0 !
! END !
--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

     SRCNAM  is a 12-character name for a source
             (No default)
     X       is an array holding the source data listed by the column headings
             (No default)
     SIGYZI  is an array holding the initial sigma-y and sigma-z (m)
             (Default: 0.,0.)
     FMFAC   is a vertical momentum flux factor (0. or 1.0) used to represent
             the effect of rain-caps or other physical configurations that
             reduce momentum rise associated with the actual exit velocity.
             (Default: 1.0  -- full momentum used)
     ZPLTFM  is the platform height (m) for sources influenced by an isolated
             structure that has a significant open area between the surface
             and the bulk of the structure, such as an offshore oil platform.
             The Base Elevation is that of the surface (ground or ocean),
             and the Stack Height is the release height above the Base (not
             above the platform).  Building heights entered in Subgroup 13c
             must be those of the buildings on the platform, measured from
```

```
              the platform deck.  ZPLTFM is used only with MBDW=1 (ISC
              downwash method) for sources with building downwash.
              (Default: 0.0)

    b
     0. = No building downwash modeled
     1. = Downwash modeled for buildings resting on the surface
     2. = Downwash modeled for buildings raised above the surface (ZPLTFM > 0.)
     NOTE: must be entered as a REAL number (i.e., with decimal point)

    c
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IPTU
     (e.g. 1 for g/s).

---------------
Subgroup (13c)
---------------

           BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH
           -------------------------------------------------------
Source                                                                  a
 No.       Effective building height, width, length and X/Y offset (in meters)
           every 10 degrees.  LENGTH, XBADJ, and YBADJ are only needed for
           MBDW=2 (PRIME downwash option)
------     ---------------------------------------------------------------


--------

    a
     Building height, width, length, and X/Y offset from the source are treated
     as a separate input subgroup for each source and therefore must end with
     an input group terminator.  The X/Y offset is the position, relative to the
     stack, of the center of the upwind face of the projected building, with the
     x-axis pointing along the flow direction.

---------------
Subgroup (13d)
---------------
                                                a
          POINT SOURCE: VARIABLE EMISSIONS DATA
          -------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 13b.  Factors entered multiply the rates in 13b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
```

```
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------


INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters
--------------------------------

---------------
Subgroup (14a)
---------------

     Number of polygon area sources with
     parameters specified below (NAR1)       No default  !  NAR1 =  0   !

     Units used for area source
     emissions below            (IARU)       Default: 1  !  IARU =   1  !
           1 =        g/m**2/s
           2 =       kg/m**2/hr
           3 =       lb/m**2/hr
           4 =     tons/m**2/yr
           5 =     Odour Unit * m/s  (vol. flux/m**2 of odour compound)
           6 =     Odour Unit * m/min
           7 =     metric tons/m**2/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (14d)        (NSAR1) Default: 0  !  NSAR1 =  0  !

     Number of buoyant polygon area sources
     with variable location and emission
     parameters (NAR2)                      No default  !  NAR2 =  0   !
     (If NAR2 > 0, ALL parameter data for
     these sources are read from the file: BAEMARB.DAT)

!END!

---------------
Subgroup (14b)
---------------
                                    a
          AREA SOURCE: CONSTANT DATA
          ----------------------------
                                                          b
Source           Effect.    Base      Initial    Emission
 No.             Height   Elevation   Sigma z     Rates
                   (m)       (m)        (m)
-------          ------    ------     --------   ---------
```

```
--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IARU
     (e.g. 1 for g/m**2/s).

---------------
Subgroup (14c)
---------------

           COORDINATES (km) FOR EACH VERTEX(4) OF EACH POLYGON
           -------------------------------------------------------
Source                                                              a
 No.       Ordered list of X followed by list of Y, grouped by source
------     ------------------------------------------------------------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.


---------------
Subgroup (14d)
---------------
                                              a
          AREA SOURCE: VARIABLE EMISSIONS DATA
          ------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 14b.  Factors entered multiply the rates in 14b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
```

```
     and therefore must end with an input group terminator.


------------------------------------------------------------------------------

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters
---------------------------

---------------
Subgroup (15a)
---------------

     Number of buoyant line sources
     with variable location and emission
     parameters (NLN2)                              No default  !  NLN2 =  0   !

     (If NLN2 > 0, ALL parameter data for
      these sources are read from the file: LNEMARB.DAT)

     Number of buoyant line sources (NLINES)        No default   ! NLINES =  0  !

     Units used for line source
     emissions below                (ILNU)          Default: 1  !  ILNU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (15c)        (NSLN1) Default: 0  !  NSLN1 =  0  !

     Maximum number of segments used to model
     each line (MXNSEG)                             Default: 7   ! MXNSEG =  7  !

     The following variables are required only if NLINES > 0.  They are
     used in the buoyant line source plume rise calculations.

        Number of distances at which                Default: 6   ! NLRISE =  6  !
        transitional rise is computed

        Average building length (XL)                No default   ! XL = .0 !
                                                    (in meters)

        Average building height (HBL)               No default   ! HBL = .0 !
                                                    (in meters)

        Average building width (WBL)                No default   ! WBL = .0 !
                                                    (in meters)

        Average line source width (WML)             No default   ! WML = .0 !
                                                    (in meters)

        Average separation between buildings (DXL)  No default   ! DXL = .0 !
                                                    (in meters)

        Average buoyancy parameter (FPRIMEL)        No default   ! FPRIMEL = .0 !
```

```
                                                  (in m**4/s**3)

!END!

---------------
Subgroup (15b)
---------------

          BUOYANT LINE SOURCE: CONSTANT DATA
          ----------------------------------
                                                                                  a
Source     Beg. X      Beg. Y      End. X    End. Y     Release    Base        Emission
 No.     Coordinate  Coordinate  Coordinate Coordinate  Height    Elevation      Rates
            (km)        (km)        (km)       (km)       (m)       (m)
------   ----------  ----------  ---------  ----------  -------   ---------    ---------

--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by ILNTU
     (e.g. 1 for g/s).

---------------
Subgroup (15c)
---------------
                                                     a
          BUOYANT LINE SOURCE: VARIABLE EMISSIONS DATA
          --------------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 15b.  Factors entered multiply the rates in 15b.
     Skip sources here that have constant emissions.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.
```

```
------------------------------------------------------------------------------


INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters
---------------------------

---------------
Subgroup (16a)
---------------

     Number of volume sources with
     parameters provided in 16b,c (NVL1)     No default  !  NVL1 =  0   !

     Units used for volume source
     emissions below in 16b       (IVLU)     Default: 1  !  IVLU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (16c)      (NSVL1)    Default: 0  !  NSVL1 =  0  !

     Number of volume sources with
     variable location and emission
     parameters                   (NVL2)     No default  !  NVL2 =   0   !

     (If NVL2 > 0, ALL parameter data for
      these sources are read from the VOLEMARB.DAT file(s) )

!END!

---------------
Subgroup (16b)
---------------
                                        a
           VOLUME SOURCE: CONSTANT DATA
           ----------------------------
                                                                        b
         X           Y        Effect.    Base     Initial    Initial    Emission
     Coordinate  Coordinate   Height   Elevation  Sigma y    Sigma z     Rates
        (km)       (km)         (m)       (m)        (m)       (m)
     ----------  ----------   ------    ------    --------   --------   --------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IVLU
```

```
     (e.g. 1 for g/s).

---------------
Subgroup (16c)
---------------
                                                a
          VOLUME SOURCE: VARIABLE EMISSIONS DATA
          --------------------------------------

     Use this subgroup to describe temporal variations in the emission
     rates given in 16b.  Factors entered multiply the rates in 16b.
     Skip sources here that have constant emissions.  For more elaborate
     variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

     IVARY determines the type of variation, and is source-specific:
     (IVARY)                                Default: 0
           0 =       Constant
           1 =       Diurnal cycle (24 scaling factors: hours 1-24)
           2 =       Monthly cycle (12 scaling factors: months 1-12)
           3 =       Hour & Season (4 groups of 24 hourly scaling factors,
                                    where first group is DEC-JAN-FEB)
           4 =       Speed & Stab. (6 groups of 6 scaling factors, where
                                    first group is Stability Class A,
                                    and the speed classes have upper
                                    bounds (m/s) defined in Group 12
           5 =       Temperature   (12 scaling factors, where temperature
                                    classes have upper bounds (C) of:
                                    0, 5, 10, 15, 20, 25, 30, 35, 40,
                                    45, 50, 50+)



--------
    a
     Data for each species are treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------

INPUT GROUPS: 17a & 17b -- Non-gridded (discrete) receptor information
-----------------------

---------------
Subgroup (17a)
---------------

     Number of non-gridded receptors (NREC)  No default  !  NREC =  1260   !

!END!

---------------
Subgroup (17b)
---------------
                                                a
           NON-GRIDDED (DISCRETE) RECEPTOR DATA
           ------------------------------------

                   X            Y          Ground        Height   b
Receptor       Coordinate   Coordinate    Elevation   Above Ground
  No.             (km)         (km)          (m)           (m)
```

```
--------       ----------   ----------    ---------   ------------
CLASS I RECEPTORS
! X = 777.7039, -1118.0505, 0.000, 0.000 !  !END!
! X = 779.9654, -1115.9758, 0.000, 0.000 !  !END!
! X = 780.6904, -1114.9743, 0.000, 0.000 !  !END!
! X = 781.4172, -1113.9716, 0.000, 0.000 !  !END!
! X = 785.6012, -1106.1012, 0.000, 0.000 !  !END!
! X = 789.2220, -1101.0911, 0.000, 0.000 !  !END!
! X = 789.7776, -1098.2301, 0.000, 0.000 !  !END!
! X = 791.2238, -1096.2256, 0.000, 0.000 !  !END!
! X = 791.1404, -1095.2968, 0.000, 0.000 !  !END!
! X = 791.7797, -1093.3648, 0.000, 0.000 !  !END!
! X = 791.6953, -1092.4352, 0.000, 0.000 !  !END!
! X = 792.3342, -1090.5033, 0.000, 0.000 !  !END!
! X = 792.2505, -1089.5747, 0.000, 0.000 !  !END!
! X = 792.1661, -1088.6451, 0.000, 0.000 !  !END!
! X = 792.0830, -1087.7165, 0.000, 0.000 !  !END!
! X = 791.9991, -1086.7859, 0.000, 0.000 !  !END!
! X = 791.9147, -1085.8574, 0.000, 0.000 !  !END!
! X = 791.7479, -1083.9983, 0.000, 0.000 !  !END!
! X = 792.5531, -1083.9259, 0.000, 0.000 !  !END!
! X = 792.4692, -1082.9974, 0.000, 0.000 !  !END!
! X = 791.5797, -1082.1404, 0.000, 0.000 !  !END!
! X = 792.3860, -1082.0679, 0.000, 0.000 !  !END!
! X = 791.4965, -1081.2109, 0.000, 0.000 !  !END!
! X = 792.3014, -1081.1375, 0.000, 0.000 !  !END!
! X = 791.4127, -1080.2815, 0.000, 0.000 !  !END!
! X = 791.3283, -1079.3522, 0.000, 0.000 !  !END!
! X = 790.4407, -1078.4961, 0.000, 0.000 !  !END!
! X = 791.2453, -1078.4237, 0.000, 0.000 !  !END!
! X = 790.3570, -1077.5667, 0.000, 0.000 !  !END!
! X = 791.1615, -1077.4944, 0.000, 0.000 !  !END!
! X = 790.2725, -1076.6375, 0.000, 0.000 !  !END!
! X = 790.1888, -1075.7081, 0.000, 0.000 !  !END!
! X = 790.1052, -1074.7798, 0.000, 0.000 !  !END!
! X = 789.2174, -1073.9229, 0.000, 0.000 !  !END!
! X = 789.1338, -1072.9936, 0.000, 0.000 !  !END!
! X = 788.2462, -1072.1377, 0.000, 0.000 !  !END!
! X = 788.1627, -1071.2074, 0.000, 0.000 !  !END!
! X = 787.2746, -1070.3506, 0.000, 0.000 !  !END!
! X = 786.3874, -1069.4946, 0.000, 0.000 !  !END!
! X = 785.4997, -1068.6377, 0.000, 0.000 !  !END!
CLASS II RECEPTORS
! X = 205.5269, -1215.1966, 0.000, 0.000 !  !END!
! X = 206.3315, -1214.5994, 0.000, 0.000 !  !END!
! X = 207.1362, -1214.0022, 0.000, 0.000 !  !END!
! X = 207.9408, -1213.4049, 0.000, 0.000 !  !END!
! X = 208.7453, -1212.8077, 0.000, 0.000 !  !END!
! X = 209.5705, -1212.2398, 0.000, 0.000 !  !END!
! X = 210.3958, -1211.6719, 0.000, 0.000 !  !END!
! X = 211.2211, -1211.1039, 0.000, 0.000 !  !END!
! X = 212.0447, -1210.5331, 0.000, 0.000 !  !END!
! X = 212.8660, -1209.9594, 0.000, 0.000 !  !END!
! X = 213.6873, -1209.3857, 0.000, 0.000 !  !END!
! X = 214.5044, -1208.8063, 0.000, 0.000 !  !END!
! X = 215.3158, -1208.2183, 0.000, 0.000 !  !END!
! X = 216.1272, -1207.6303, 0.000, 0.000 !  !END!
! X = 216.9386, -1207.0422, 0.000, 0.000 !  !END!
! X = 217.7505, -1206.4551, 0.000, 0.000 !  !END!
! X = 218.5772, -1205.8898, 0.000, 0.000 !  !END!
! X = 219.4037, -1205.3235, 0.000, 0.000 !  !END!
```

```
! X = 220.2302, -1204.7572, 0.000, 0.000 !  !END!
! X = 221.0568, -1204.1908, 0.000, 0.000 !  !END!
! X = 221.8832, -1203.6245, 0.000, 0.000 !  !END!
! X = 222.7098, -1203.0591, 0.000, 0.000 !  !END!
! X = 223.5221, -1202.4717, 0.000, 0.000 !  !END!
! X = 224.3323, -1201.8825, 0.000, 0.000 !  !END!
! X = 225.1425, -1201.2933, 0.000, 0.000 !  !END!
! X = 225.9527, -1200.7030, 0.000, 0.000 !  !END!
! X = 226.7301, -1200.0723, 0.000, 0.000 !  !END!
! X = 227.4810, -1199.4087, 0.000, 0.000 !  !END!
! X = 228.2319, -1198.7441, 0.000, 0.000 !  !END!
! X = 228.9658, -1198.0618, 0.000, 0.000 !  !END!
! X = 229.6770, -1197.3553, 0.000, 0.000 !  !END!
! X = 230.3882, -1196.6487, 0.000, 0.000 !  !END!
! X = 231.0994, -1195.9412, 0.000, 0.000 !  !END!
! X = 231.6694, -1195.1174, 0.000, 0.000 !  !END!
! X = 232.2252, -1194.2817, 0.000, 0.000 !  !END!
! X = 232.7808, -1193.4451, 0.000, 0.000 !  !END!
! X = 233.2447, -1192.5573, 0.000, 0.000 !  !END!
! X = 233.6709, -1191.6477, 0.000, 0.000 !  !END!
! X = 234.0971, -1190.7381, 0.000, 0.000 !  !END!
! X = 234.4246, -1189.7902, 0.000, 0.000 !  !END!
! X = 234.7197, -1188.8301, 0.000, 0.000 !  !END!
! X = 235.0146, -1187.8690, 0.000, 0.000 !  !END!
! X = 235.4957, -1187.0059, 0.000, 0.000 !  !END!
! X = 236.1059, -1186.2096, 0.000, 0.000 !  !END!
! X = 236.7163, -1185.4132, 0.000, 0.000 !  !END!
! X = 237.3265, -1184.6169, 0.000, 0.000 !  !END!
! X = 237.9648, -1183.8523, 0.000, 0.000 !  !END!
! X = 238.8223, -1183.3350, 0.000, 0.000 !  !END!
! X = 239.6798, -1182.8176, 0.000, 0.000 !  !END!
! X = 240.5374, -1182.3012, 0.000, 0.000 !  !END!
! X = 241.4100, -1181.8107, 0.000, 0.000 !  !END!
! X = 242.2979, -1181.3480, 0.000, 0.000 !  !END!
! X = 243.1858, -1180.8852, 0.000, 0.000 !  !END!
! X = 244.0737, -1180.4235, 0.000, 0.000 !  !END!
! X = 244.9616, -1179.9607, 0.000, 0.000 !  !END!
! X = 245.8495, -1179.4979, 0.000, 0.000 !  !END!
! X = 246.7372, -1179.0350, 0.000, 0.000 !  !END!
! X = 247.6333, -1178.5886, 0.000, 0.000 !  !END!
! X = 248.5349, -1178.1537, 0.000, 0.000 !  !END!
! X = 249.4365, -1177.7187, 0.000, 0.000 !  !END!
! X = 250.3381, -1177.2838, 0.000, 0.000 !  !END!
! X = 251.2369, -1176.8430, 0.000, 0.000 !  !END!
! X = 252.1340, -1176.3983, 0.000, 0.000 !  !END!
! X = 253.0312, -1175.9546, 0.000, 0.000 !  !END!
! X = 253.9373, -1175.5292, 0.000, 0.000 !  !END!
! X = 254.8445, -1175.1057, 0.000, 0.000 !  !END!
! X = 255.7528, -1174.6851, 0.000, 0.000 !  !END!
! X = 256.6639, -1174.2702, 0.000, 0.000 !  !END!
! X = 257.5749, -1173.8554, 0.000, 0.000 !  !END!
! X = 258.4861, -1173.4405, 0.000, 0.000 !  !END!
! X = 259.3992, -1173.0304, 0.000, 0.000 !  !END!
! X = 260.3122, -1172.6203, 0.000, 0.000 !  !END!
! X = 261.2254, -1172.2102, 0.000, 0.000 !  !END!
! X = 262.1404, -1171.8039, 0.000, 0.000 !  !END!
! X = 263.0560, -1171.3996, 0.000, 0.000 !  !END!
! X = 263.9717, -1170.9952, 0.000, 0.000 !  !END!
! X = 264.8798, -1170.5733, 0.000, 0.000 !  !END!
! X = 265.7879, -1170.1524, 0.000, 0.000 !  !END!
! X = 266.6959, -1169.7305, 0.000, 0.000 !  !END!
```

```
! X = 267.6023, -1169.3056, 0.000, 0.000 !  !END!
! X = 268.5076, -1168.8778, 0.000, 0.000 !  !END!
! X = 269.4131, -1168.4510, 0.000, 0.000 !  !END!
! X = 270.3184, -1168.0231, 0.000, 0.000 !  !END!
! X = 271.2230, -1167.5943, 0.000, 0.000 !  !END!
! X = 272.1276, -1167.1654, 0.000, 0.000 !  !END!
! X = 273.0322, -1166.7365, 0.000, 0.000 !  !END!
! X = 273.9411, -1166.3163, 0.000, 0.000 !  !END!
! X = 274.8531, -1165.9038, 0.000, 0.000 !  !END!
! X = 275.7651, -1165.4903, 0.000, 0.000 !  !END!
! X = 276.6771, -1165.0778, 0.000, 0.000 !  !END!
! X = 277.5730, -1164.6304, 0.000, 0.000 !  !END!
! X = 278.4674, -1164.1801, 0.000, 0.000 !  !END!
! X = 279.3620, -1163.7307, 0.000, 0.000 !  !END!
! X = 280.2564, -1163.2803, 0.000, 0.000 !  !END!
! X = 281.1553, -1162.8396, 0.000, 0.000 !  !END!
! X = 282.0613, -1162.4133, 0.000, 0.000 !  !END!
! X = 282.9673, -1161.9870, 0.000, 0.000 !  !END!
! X = 283.8693, -1161.5520, 0.000, 0.000 !  !END!
! X = 284.7705, -1161.1160, 0.000, 0.000 !  !END!
! X = 285.6717, -1160.6799, 0.000, 0.000 !  !END!
! X = 286.5731, -1160.2438, 0.000, 0.000 !  !END!
! X = 287.4801, -1159.8203, 0.000, 0.000 !  !END!
! X = 288.4001, -1159.4249, 0.000, 0.000 !  !END!
! X = 289.3201, -1159.0304, 0.000, 0.000 !  !END!
! X = 290.2418, -1158.6397, 0.000, 0.000 !  !END!
! X = 291.1793, -1158.2890, 0.000, 0.000 !  !END!
! X = 292.1167, -1157.9372, 0.000, 0.000 !  !END!
! X = 293.0862, -1157.7269, 0.000, 0.000 !  !END!
! X = 294.0823, -1157.6332, 0.000, 0.000 !  !END!
! X = 295.0785, -1157.5394, 0.000, 0.000 !  !END!
! X = 296.0749, -1157.4658, 0.000, 0.000 !  !END!
! X = 297.0726, -1157.5406, 0.000, 0.000 !  !END!
! X = 298.0705, -1157.6164, 0.000, 0.000 !  !END!
! X = 299.0683, -1157.6911, 0.000, 0.000 !  !END!
! X = 300.0661, -1157.7668, 0.000, 0.000 !  !END!
! X = 301.0652, -1157.8232, 0.000, 0.000 !  !END!
! X = 302.0647, -1157.8714, 0.000, 0.000 !  !END!
! X = 303.0643, -1157.9197, 0.000, 0.000 !  !END!
! X = 304.0639, -1157.9679, 0.000, 0.000 !  !END!
! X = 305.0634, -1158.0120, 0.000, 0.000 !  !END!
! X = 306.0596, -1157.9170, 0.000, 0.000 !  !END!
! X = 307.0558, -1157.8210, 0.000, 0.000 !  !END!
! X = 308.0389, -1157.6554, 0.000, 0.000 !  !END!
! X = 309.0011, -1157.3797, 0.000, 0.000 !  !END!
! X = 309.9634, -1157.1039, 0.000, 0.000 !  !END!
! X = 310.9258, -1156.8281, 0.000, 0.000 !  !END!
! X = 311.2473, -1156.0490, 0.000, 0.000 !  !END!
! X = 311.2805, -1155.0435, 0.000, 0.000 !  !END!
! X = 311.3138, -1154.0381, 0.000, 0.000 !  !END!
! X = 311.3470, -1153.0327, 0.000, 0.000 !  !END!
! X = 311.2147, -1152.0480, 0.000, 0.000 !  !END!
! X = 310.9427, -1151.0795, 0.000, 0.000 !  !END!
! X = 310.6709, -1150.1122, 0.000, 0.000 !  !END!
! X = 311.0349, -1149.4261, 0.000, 0.000 !  !END!
! X = 311.9296, -1148.9757, 0.000, 0.000 !  !END!
! X = 312.8171, -1148.5179, 0.000, 0.000 !  !END!
! X = 313.2888, -1147.6317, 0.000, 0.000 !  !END!
! X = 313.7603, -1146.7445, 0.000, 0.000 !  !END!
! X = 314.2319, -1145.8573, 0.000, 0.000 !  !END!
! X = 314.6268, -1144.9410, 0.000, 0.000 !  !END!
```

```
! X = 314.8700, -1143.9653, 0.000, 0.000 !  !END!
! X = 315.1132, -1142.9906, 0.000, 0.000 !  !END!
! X = 315.3563, -1142.0150, 0.000, 0.000 !  !END!
! X = 315.5994, -1141.0393, 0.000, 0.000 !  !END!
! X = 315.9594, -1140.1637, 0.000, 0.000 !  !END!
! X = 316.8783, -1139.7664, 0.000, 0.000 !  !END!
! X = 317.7969, -1139.3681, 0.000, 0.000 !  !END!
! X = 318.7330, -1139.0206, 0.000, 0.000 !  !END!
! X = 319.6992, -1138.7591, 0.000, 0.000 !  !END!
! X = 320.6652, -1138.4976, 0.000, 0.000 !  !END!
! X = 321.6369, -1138.2608, 0.000, 0.000 !  !END!
! X = 322.6168, -1138.0576, 0.000, 0.000 !  !END!
! X = 323.5967, -1137.8543, 0.000, 0.000 !  !END!
! X = 324.5766, -1137.6510, 0.000, 0.000 !  !END!
! X = 325.5587, -1137.4606, 0.000, 0.000 !  !END!
! X = 326.5484, -1137.3129, 0.000, 0.000 !  !END!
! X = 327.5381, -1137.1651, 0.000, 0.000 !  !END!
! X = 328.5279, -1137.0184, 0.000, 0.000 !  !END!
! X = 329.5178, -1136.8705, 0.000, 0.000 !  !END!
! X = 330.5070, -1136.7197, 0.000, 0.000 !  !END!
! X = 331.4932, -1136.5500, 0.000, 0.000 !  !END!
! X = 332.4794, -1136.3792, 0.000, 0.000 !  !END!
! X = 333.4656, -1136.2094, 0.000, 0.000 !  !END!
! X = 334.4486, -1136.0217, 0.000, 0.000 !  !END!
! X = 335.4291, -1135.8211, 0.000, 0.000 !  !END!
! X = 336.4096, -1135.6205, 0.000, 0.000 !  !END!
! X = 337.3926, -1135.4327, 0.000, 0.000 !  !END!
! X = 338.3788, -1135.2618, 0.000, 0.000 !  !END!
! X = 339.3647, -1135.0898, 0.000, 0.000 !  !END!
! X = 340.3577, -1134.9657, 0.000, 0.000 !  !END!
! X = 341.3512, -1134.8445, 0.000, 0.000 !  !END!
! X = 342.3448, -1134.7243, 0.000, 0.000 !  !END!
! X = 343.3419, -1134.6442, 0.000, 0.000 !  !END!
! X = 344.3413, -1134.5911, 0.000, 0.000 !  !END!
! X = 345.3408, -1134.5380, 0.000, 0.000 !  !END!
! X = 346.3403, -1134.5111, 0.000, 0.000 !  !END!
! X = 347.3402, -1134.5549, 0.000, 0.000 !  !END!
! X = 348.3402, -1134.5987, 0.000, 0.000 !  !END!
! X = 349.3150, -1134.7924, 0.000, 0.000 !  !END!
! X = 350.2734, -1135.0827, 0.000, 0.000 !  !END!
! X = 351.2319, -1135.3729, 0.000, 0.000 !  !END!
! X = 352.1904, -1135.6632, 0.000, 0.000 !  !END!
! X = 353.1305, -1136.0088, 0.000, 0.000 !  !END!
! X = 354.0653, -1136.3690, 0.000, 0.000 !  !END!
! X = 355.0079, -1136.6659, 0.000, 0.000 !  !END!
! X = 356.0015, -1136.5434, 0.000, 0.000 !  !END!
! X = 356.9952, -1136.4218, 0.000, 0.000 !  !END!
! X = 357.9494, -1136.2020, 0.000, 0.000 !  !END!
! X = 358.7500, -1135.5975, 0.000, 0.000 !  !END!
! X = 359.5506, -1134.9941, 0.000, 0.000 !  !END!
! X = 360.3512, -1134.3906, 0.000, 0.000 !  !END!
! X = 361.1564, -1133.7968, 0.000, 0.000 !  !END!
! X = 362.1301, -1133.5628, 0.000, 0.000 !  !END!
! X = 363.1038, -1133.3298, 0.000, 0.000 !  !END!
! X = 364.0776, -1133.0967, 0.000, 0.000 !  !END!
! X = 365.0513, -1132.8626, 0.000, 0.000 !  !END!
! X = 366.0394, -1132.8142, 0.000, 0.000 !  !END!
! X = 367.0375, -1132.8931, 0.000, 0.000 !  !END!
! X = 368.0356, -1132.9720, 0.000, 0.000 !  !END!
! X = 369.0338, -1133.0509, 0.000, 0.000 !  !END!
! X = 370.0240, -1133.1801, 0.000, 0.000 !  !END!
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! X = 370.9980, -1133.4140, 0.000, 0.000 !  !END!
! X = 371.9720, -1133.6478, 0.000, 0.000 !  !END!
! X = 372.9460, -1133.8816, 0.000, 0.000 !  !END!
! X = 373.9211, -1134.1113, 0.000, 0.000 !  !END!
! X = 374.8976, -1134.3337, 0.000, 0.000 !  !END!
! X = 375.8742, -1134.5572, 0.000, 0.000 !  !END!
! X = 376.8495, -1134.7848, 0.000, 0.000 !  !END!
! X = 377.8246, -1135.0144, 0.000, 0.000 !  !END!
! X = 378.7982, -1135.2492, 0.000, 0.000 !  !END!
! X = 379.7461, -1135.5745, 0.000, 0.000 !  !END!
! X = 380.6940, -1135.8997, 0.000, 0.000 !  !END!
! X = 381.6483, -1136.2031, 0.000, 0.000 !  !END!
! X = 382.6192, -1136.4503, 0.000, 0.000 !  !END!
! X = 383.5902, -1136.6975, 0.000, 0.000 !  !END!
! X = 384.5586, -1136.9540, 0.000, 0.000 !  !END!
! X = 385.5200, -1137.2364, 0.000, 0.000 !  !END!
! X = 386.4815, -1137.5199, 0.000, 0.000 !  !END!
! X = 387.4406, -1137.8096, 0.000, 0.000 !  !END!
! X = 388.3937, -1138.1191, 0.000, 0.000 !  !END!
! X = 389.3468, -1138.4297, 0.000, 0.000 !  !END!
! X = 390.2841, -1138.7832, 0.000, 0.000 !  !END!
! X = 391.2085, -1139.1703, 0.000, 0.000 !  !END!
! X = 392.1330, -1139.5584, 0.000, 0.000 !  !END!
! X = 393.0576, -1139.9466, 0.000, 0.000 !  !END!
! X = 393.9806, -1140.3389, 0.000, 0.000 !  !END!
! X = 394.8913, -1140.7587, 0.000, 0.000 !  !END!
! X = 395.8019, -1141.1785, 0.000, 0.000 !  !END!
! X = 396.7136, -1141.5962, 0.000, 0.000 !  !END!
! X = 397.6292, -1142.0054, 0.000, 0.000 !  !END!
! X = 398.5449, -1142.4146, 0.000, 0.000 !  !END!
! X = 399.4606, -1142.8238, 0.000, 0.000 !  !END!
! X = 400.3762, -1143.2330, 0.000, 0.000 !  !END!
! X = 401.3013, -1143.6201, 0.000, 0.000 !  !END!
! X = 402.2326, -1143.9924, 0.000, 0.000 !  !END!
! X = 403.1638, -1144.3636, 0.000, 0.000 !  !END!
! X = 404.0879, -1144.7528, 0.000, 0.000 !  !END!
! X = 405.0046, -1145.1609, 0.000, 0.000 !  !END!
! X = 405.9213, -1145.5680, 0.000, 0.000 !  !END!
! X = 406.8379, -1145.9751, 0.000, 0.000 !  !END!
! X = 407.7602, -1146.3694, 0.000, 0.000 !  !END!
! X = 408.6874, -1146.7522, 0.000, 0.000 !  !END!
! X = 409.6147, -1147.1340, 0.000, 0.000 !  !END!
! X = 410.5421, -1147.5167, 0.000, 0.000 !  !END!
! X = 411.4708, -1147.8953, 0.000, 0.000 !  !END!
! X = 412.4087, -1148.2507, 0.000, 0.000 !  !END!
! X = 413.3466, -1148.6061, 0.000, 0.000 !  !END!
! X = 414.2915, -1148.9406, 0.000, 0.000 !  !END!
! X = 415.2528, -1149.2270, 0.000, 0.000 !  !END!
! X = 416.2139, -1149.5133, 0.000, 0.000 !  !END!
! X = 417.1713, -1149.8121, 0.000, 0.000 !  !END!
! X = 418.1201, -1150.1371, 0.000, 0.000 !  !END!
! X = 419.0691, -1150.4620, 0.000, 0.000 !  !END!
! X = 420.0268, -1150.7578, 0.000, 0.000 !  !END!
! X = 420.9927, -1151.0284, 0.000, 0.000 !  !END!
! X = 421.9586, -1151.2981, 0.000, 0.000 !  !END!
! X = 422.9246, -1151.5677, 0.000, 0.000 !  !END!
! X = 423.9007, -1151.7958, 0.000, 0.000 !  !END!
! X = 424.8814, -1152.0053, 0.000, 0.000 !  !END!
! X = 425.8621, -1152.2147, 0.000, 0.000 !  !END!
! X = 426.8485, -1152.3912, 0.000, 0.000 !  !END!
! X = 427.8426, -1152.5223, 0.000, 0.000 !  !END!
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! X = 428.8368, -1152.6534, 0.000, 0.000 !  !END!
! X = 429.8309, -1152.7845, 0.000, 0.000 !  !END!
! X = 430.8261, -1152.9054, 0.000, 0.000 !  !END!
! X = 431.8233, -1153.0119, 0.000, 0.000 !  !END!
! X = 432.8203, -1153.1174, 0.000, 0.000 !  !END!
! X = 433.8187, -1153.2105, 0.000, 0.000 !  !END!
! X = 434.8196, -1153.2700, 0.000, 0.000 !  !END!
! X = 435.8205, -1153.3295, 0.000, 0.000 !  !END!
! X = 436.8215, -1153.3900, 0.000, 0.000 !  !END!
! X = 437.8224, -1153.4524, 0.000, 0.000 !  !END!
! X = 438.8231, -1153.5159, 0.000, 0.000 !  !END!
! X = 439.8239, -1153.5794, 0.000, 0.000 !  !END!
! X = 440.8223, -1153.6684, 0.000, 0.000 !  !END!
! X = 441.8176, -1153.7911, 0.000, 0.000 !  !END!
! X = 442.8130, -1153.9147, 0.000, 0.000 !  !END!
! X = 443.8084, -1154.0374, 0.000, 0.000 !  !END!
! X = 444.8047, -1154.1528, 0.000, 0.000 !  !END!
! X = 445.8014, -1154.2652, 0.000, 0.000 !  !END!
! X = 446.7982, -1154.3765, 0.000, 0.000 !  !END!
! X = 447.7890, -1154.5330, 0.000, 0.000 !  !END!
! X = 448.7792, -1154.6925, 0.000, 0.000 !  !END!
! X = 449.7694, -1154.8530, 0.000, 0.000 !  !END!
! X = 450.7597, -1155.0135, 0.000, 0.000 !  !END!
! X = 451.7513, -1155.1658, 0.000, 0.000 !  !END!
! X = 452.7435, -1155.3129, 0.000, 0.000 !  !END!
! X = 453.7358, -1155.4610, 0.000, 0.000 !  !END!
! X = 454.7280, -1155.6081, 0.000, 0.000 !  !END!
! X = 455.7203, -1155.7562, 0.000, 0.000 !  !END!
! X = 456.7126, -1155.9033, 0.000, 0.000 !  !END!
! X = 457.7124, -1155.8713, 0.000, 0.000 !  !END!
! X = 458.7135, -1155.8087, 0.000, 0.000 !  !END!
! X = 459.7147, -1155.7461, 0.000, 0.000 !  !END!
! X = 460.7157, -1155.6825, 0.000, 0.000 !  !END!
! X = 461.6801, -1155.4270, 0.000, 0.000 !  !END!
! X = 462.6335, -1155.1147, 0.000, 0.000 !  !END!
! X = 463.5870, -1154.8014, 0.000, 0.000 !  !END!
! X = 464.5404, -1154.4891, 0.000, 0.000 !  !END!
! X = 465.4735, -1154.1342, 0.000, 0.000 !  !END!
! X = 466.3034, -1153.5685, 0.000, 0.000 !  !END!
! X = 467.1330, -1153.0019, 0.000, 0.000 !  !END!
! X = 467.9626, -1152.4351, 0.000, 0.000 !  !END!
! X = 468.7923, -1151.8694, 0.000, 0.000 !  !END!
! X = 469.6219, -1151.3026, 0.000, 0.000 !  !END!
! X = 470.5168, -1150.8510, 0.000, 0.000 !  !END!
! X = 471.4228, -1150.4186, 0.000, 0.000 !  !END!
! X = 472.3288, -1149.9861, 0.000, 0.000 !  !END!
! X = 473.2807, -1149.7192, 0.000, 0.000 !  !END!
! X = 474.2786, -1149.6170, 0.000, 0.000 !  !END!
! X = 475.2766, -1149.5148, 0.000, 0.000 !  !END!
! X = 476.2746, -1149.4136, 0.000, 0.000 !  !END!
! X = 477.2726, -1149.3113, 0.000, 0.000 !  !END!
! X = 478.2513, -1149.4632, 0.000, 0.000 !  !END!
! X = 479.2226, -1149.7172, 0.000, 0.000 !  !END!
! X = 480.1937, -1149.9701, 0.000, 0.000 !  !END!
! X = 480.9621, -1150.5967, 0.000, 0.000 !  !END!
! X = 481.6996, -1151.2809, 0.000, 0.000 !  !END!
! X = 482.4372, -1151.9653, 0.000, 0.000 !  !END!
! X = 483.0436, -1152.7618, 0.000, 0.000 !  !END!
! X = 483.5990, -1153.6019, 0.000, 0.000 !  !END!
! X = 484.1545, -1154.4421, 0.000, 0.000 !  !END!
! X = 484.7958, -1155.1917, 0.000, 0.000 !  !END!
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! X = 485.6598, -1155.7045, 0.000, 0.000 !  !END!
! X = 486.5239, -1156.2183, 0.000, 0.000 !  !END!
! X = 487.4495, -1156.5933, 0.000, 0.000 !  !END!
! X = 488.4049, -1156.9026, 0.000, 0.000 !  !END!
! X = 489.3602, -1157.2118, 0.000, 0.000 !  !END!
! X = 490.1464, -1157.8265, 0.000, 0.000 !  !END!
! X = 490.9093, -1158.4821, 0.000, 0.000 !  !END!
! X = 491.6860, -1159.1141, 0.000, 0.000 !  !END!
! X = 492.6279, -1159.4631, 0.000, 0.000 !  !END!
! X = 493.5699, -1159.8122, 0.000, 0.000 !  !END!
! X = 494.5117, -1160.1602, 0.000, 0.000 !  !END!
! X = 495.2545, -1160.7611, 0.000, 0.000 !  !END!
! X = 495.8039, -1161.6061, 0.000, 0.000 !  !END!
! X = 496.3533, -1162.4501, 0.000, 0.000 !  !END!
! X = 496.8900, -1163.3035, 0.000, 0.000 !  !END!
! X = 497.4012, -1164.1716, 0.000, 0.000 !  !END!
! X = 497.9124, -1165.0407, 0.000, 0.000 !  !END!
! X = 498.5083, -1165.8204, 0.000, 0.000 !  !END!
! X = 499.3945, -1166.2947, 0.000, 0.000 !  !END!
! X = 500.2809, -1166.7689, 0.000, 0.000 !  !END!
! X = 501.1748, -1167.2090, 0.000, 0.000 !  !END!
! X = 502.1769, -1167.1485, 0.000, 0.000 !  !END!
! X = 503.1789, -1167.0881, 0.000, 0.000 !  !END!
! X = 504.1584, -1166.9518, 0.000, 0.000 !  !END!
! X = 505.0274, -1166.4471, 0.000, 0.000 !  !END!
! X = 505.8966, -1165.9423, 0.000, 0.000 !  !END!
! X = 506.7585, -1165.4261, 0.000, 0.000 !  !END!
! X = 507.5766, -1164.8422, 0.000, 0.000 !  !END!
! X = 508.3948, -1164.2573, 0.000, 0.000 !  !END!
! X = 509.2129, -1163.6734, 0.000, 0.000 !  !END!
! X = 510.1483, -1163.7258, 0.000, 0.000 !  !END!
! X = 511.1204, -1163.9784, 0.000, 0.000 !  !END!
! X = 512.0900, -1164.2373, 0.000, 0.000 !  !END!
! X = 512.9358, -1164.7813, 0.000, 0.000 !  !END!
! X = 513.7817, -1165.3262, 0.000, 0.000 !  !END!
! X = 514.6700, -1165.7595, 0.000, 0.000 !  !END!
! X = 515.6597, -1165.9312, 0.000, 0.000 !  !END!
! X = 516.6493, -1166.1019, 0.000, 0.000 !  !END!
! X = 517.6324, -1166.2073, 0.000, 0.000 !  !END!
! X = 518.5688, -1165.8437, 0.000, 0.000 !  !END!
! X = 519.5053, -1165.4800, 0.000, 0.000 !  !END!
! X = 520.4416, -1165.1163, 0.000, 0.000 !  !END!
! X = 521.4216, -1164.9237, 0.000, 0.000 !  !END!
! X = 522.4171, -1164.7914, 0.000, 0.000 !  !END!
! X = 523.3995, -1164.7669, 0.000, 0.000 !  !END!
! X = 524.3349, -1165.1345, 0.000, 0.000 !  !END!
! X = 525.2704, -1165.5021, 0.000, 0.000 !  !END!
! X = 526.2323, -1165.7717, 0.000, 0.000 !  !END!
! X = 527.2247, -1165.9256, 0.000, 0.000 !  !END!
! X = 528.2172, -1166.0806, 0.000, 0.000 !  !END!
! X = 529.1902, -1166.3075, 0.000, 0.000 !  !END!
! X = 530.1233, -1166.6813, 0.000, 0.000 !  !END!
! X = 531.0564, -1167.0552, 0.000, 0.000 !  !END!
! X = 532.0259, -1167.2611, 0.000, 0.000 !  !END!
! X = 533.0290, -1167.3104, 0.000, 0.000 !  !END!
! X = 534.0322, -1167.3597, 0.000, 0.000 !  !END!
! X = 535.0006, -1167.6042, 0.000, 0.000 !  !END!
! X = 535.9582, -1167.9086, 0.000, 0.000 !  !END!
! X = 536.9161, -1168.2140, 0.000, 0.000 !  !END!
! X = 537.8737, -1168.5184, 0.000, 0.000 !  !END!
! X = 538.8315, -1168.8237, 0.000, 0.000 !  !END!
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! X = 539.7689, -1169.1849, 0.000, 0.000 !  !END!
! X = 540.6998, -1169.5650, 0.000, 0.000 !  !END!
! X = 541.6307, -1169.9451, 0.000, 0.000 !  !END!
! X = 542.5616, -1170.3251, 0.000, 0.000 !  !END!
! X = 543.4925, -1170.7052, 0.000, 0.000 !  !END!
! X = 544.4235, -1171.0852, 0.000, 0.000 !  !END!
! X = 545.3385, -1171.4943, 0.000, 0.000 !  !END!
! X = 546.1602, -1172.0760, 0.000, 0.000 !  !END!
! X = 546.9818, -1172.6567, 0.000, 0.000 !  !END!
! X = 547.7545, -1173.2981, 0.000, 0.000 !  !END!
! X = 548.4687, -1174.0083, 0.000, 0.000 !  !END!
! X = 549.1830, -1174.7185, 0.000, 0.000 !  !END!
! X = 549.8984, -1175.4286, 0.000, 0.000 !  !END!
! X = 550.6141, -1176.1377, 0.000, 0.000 !  !END!
! X = 551.3298, -1176.8468, 0.000, 0.000 !  !END!
! X = 552.0457, -1177.5569, 0.000, 0.000 !  !END!
! X = 552.7614, -1178.2660, 0.000, 0.000 !  !END!
! X = 553.4856, -1178.9662, 0.000, 0.000 !  !END!
! X = 554.2598, -1179.6106, 0.000, 0.000 !  !END!
! X = 555.0341, -1180.2550, 0.000, 0.000 !  !END!
! X = 555.8082, -1180.8995, 0.000, 0.000 !  !END!
! X = 556.6377, -1181.4511, 0.000, 0.000 !  !END!
! X = 557.5662, -1181.8386, 0.000, 0.000 !  !END!
! X = 558.4948, -1182.2260, 0.000, 0.000 !  !END!
! X = 559.4233, -1182.6124, 0.000, 0.000 !  !END!
! X = 560.3724, -1182.9409, 0.000, 0.000 !  !END!
! X = 561.3377, -1183.2231, 0.000, 0.000 !  !END!
! X = 562.3031, -1183.5053, 0.000, 0.000 !  !END!
! X = 563.2684, -1183.7875, 0.000, 0.000 !  !END!
! X = 564.2404, -1184.0385, 0.000, 0.000 !  !END!
! X = 565.2345, -1184.1888, 0.000, 0.000 !  !END!
! X = 566.2285, -1184.3392, 0.000, 0.000 !  !END!
! X = 567.2226, -1184.4894, 0.000, 0.000 !  !END!
! X = 568.2238, -1184.5395, 0.000, 0.000 !  !END!
! X = 569.2290, -1184.5343, 0.000, 0.000 !  !END!
! X = 570.2311, -1184.5527, 0.000, 0.000 !  !END!
! X = 571.1994, -1184.8243, 0.000, 0.000 !  !END!
! X = 572.1677, -1185.0959, 0.000, 0.000 !  !END!
! X = 573.1362, -1185.3675, 0.000, 0.000 !  !END!
! X = 573.9820, -1185.8971, 0.000, 0.000 !  !END!
! X = 574.7996, -1186.4854, 0.000, 0.000 !  !END!
! X = 575.6309, -1187.0439, 0.000, 0.000 !  !END!
! X = 576.6096, -1187.2758, 0.000, 0.000 !  !END!
! X = 577.5883, -1187.5067, 0.000, 0.000 !  !END!
! X = 578.5672, -1187.7385, 0.000, 0.000 !  !END!
! X = 579.5528, -1187.9332, 0.000, 0.000 !  !END!
! X = 580.5485, -1188.0749, 0.000, 0.000 !  !END!
! X = 581.5441, -1188.2157, 0.000, 0.000 !  !END!
! X = 582.5399, -1188.3574, 0.000, 0.000 !  !END!
! X = 583.5354, -1188.4982, 0.000, 0.000 !  !END!
! X = 584.5247, -1188.6619, 0.000, 0.000 !  !END!
! X = 585.4443, -1189.0723, 0.000, 0.000 !  !END!
! X = 586.3638, -1189.4817, 0.000, 0.000 !  !END!
! X = 587.2834, -1189.8910, 0.000, 0.000 !  !END!
! X = 587.4985, -1190.5724, 0.000, 0.000 !  !END!
! X = 587.0876, -1191.4944, 0.000, 0.000 !  !END!
! X = 586.6769, -1192.4165, 0.000, 0.000 !  !END!
! X = 586.2661, -1193.3396, 0.000, 0.000 !  !END!
! X = 586.2244, -1194.3414, 0.000, 0.000 !  !END!
! X = 586.2232, -1195.3524, 0.000, 0.000 !  !END!
! X = 586.2222, -1196.3634, 0.000, 0.000 !  !END!
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! X = 586.3075, -1197.3444, 0.000, 0.000 !  !END!
! X = 586.9135, -1198.1523, 0.000, 0.000 !  !END!
! X = 587.5196, -1198.9591, 0.000, 0.000 !  !END!
! X = 588.1256, -1199.7660, 0.000, 0.000 !  !END!
! X = 588.8265, -1200.4557, 0.000, 0.000 !  !END!
! X = 589.7404, -1200.8780, 0.000, 0.000 !  !END!
! X = 590.6544, -1201.3014, 0.000, 0.000 !  !END!
! X = 591.5684, -1201.7237, 0.000, 0.000 !  !END!
! X = 592.5475, -1201.9535, 0.000, 0.000 !  !END!
! X = 593.5284, -1202.1791, 0.000, 0.000 !  !END!
! X = 594.5117, -1202.3912, 0.000, 0.000 !  !END!
! X = 595.5069, -1202.5390, 0.000, 0.000 !  !END!
! X = 596.5021, -1202.6869, 0.000, 0.000 !  !END!
! X = 597.5003, -1202.7867, 0.000, 0.000 !  !END!
! X = 598.5059, -1202.7606, 0.000, 0.000 !  !END!
! X = 599.5114, -1202.7336, 0.000, 0.000 !  !END!
! X = 600.5169, -1202.7015, 0.000, 0.000 !  !END!
! X = 601.5221, -1202.6602, 0.000, 0.000 !  !END!
! X = 602.5273, -1202.6189, 0.000, 0.000 !  !END!
! X = 603.5331, -1202.6252, 0.000, 0.000 !  !END!
! X = 604.5389, -1202.6417, 0.000, 0.000 !  !END!
! X = 605.5449, -1202.6592, 0.000, 0.000 !  !END!
! X = 606.5508, -1202.6767, 0.000, 0.000 !  !END!
! X = 607.5542, -1202.6283, 0.000, 0.000 !  !END!
! X = 608.5555, -1202.5303, 0.000, 0.000 !  !END!
! X = 609.5567, -1202.4313, 0.000, 0.000 !  !END!
! X = 610.5580, -1202.3333, 0.000, 0.000 !  !END!
! X = 611.5593, -1202.2352, 0.000, 0.000 !  !END!
! X = 612.5537, -1202.0951, 0.000, 0.000 !  !END!
! X = 613.5328, -1201.8630, 0.000, 0.000 !  !END!
! X = 614.5120, -1201.6309, 0.000, 0.000 !  !END!
! X = 615.4912, -1201.3998, 0.000, 0.000 !  !END!
! X = 616.4703, -1201.1676, 0.000, 0.000 !  !END!
! X = 617.4369, -1200.8930, 0.000, 0.000 !  !END!
! X = 618.3830, -1200.5492, 0.000, 0.000 !  !END!
! X = 619.3293, -1200.2064, 0.000, 0.000 !  !END!
! X = 620.2756, -1199.8636, 0.000, 0.000 !  !END!
! X = 621.2217, -1199.5198, 0.000, 0.000 !  !END!
! X = 622.1687, -1199.1789, 0.000, 0.000 !  !END!
! X = 623.1167, -1198.8409, 0.000, 0.000 !  !END!
! X = 624.0647, -1198.5029, 0.000, 0.000 !  !END!
! X = 625.0021, -1198.1375, 0.000, 0.000 !  !END!
! X = 625.9192, -1197.7223, 0.000, 0.000 !  !END!
! X = 626.8362, -1197.3070, 0.000, 0.000 !  !END!
! X = 627.8013, -1197.0454, 0.000, 0.000 !  !END!
! X = 628.7905, -1196.8607, 0.000, 0.000 !  !END!
! X = 629.7797, -1196.6769, 0.000, 0.000 !  !END!
! X = 630.7688, -1196.4921, 0.000, 0.000 !  !END!
! X = 631.7580, -1196.3073, 0.000, 0.000 !  !END!
! X = 632.7472, -1196.1225, 0.000, 0.000 !  !END!
! X = 633.7120, -1196.2196, 0.000, 0.000 !  !END!
! X = 634.6543, -1196.5753, 0.000, 0.000 !  !END!
! X = 635.5965, -1196.9299, 0.000, 0.000 !  !END!
! X = 636.5389, -1197.2855, 0.000, 0.000 !  !END!
! X = 637.4926, -1197.6023, 0.000, 0.000 !  !END!
! X = 638.4770, -1197.8123, 0.000, 0.000 !  !END!
! X = 639.4615, -1198.0233, 0.000, 0.000 !  !END!
! X = 640.4460, -1198.2332, 0.000, 0.000 !  !END!
! X = 641.4304, -1198.4432, 0.000, 0.000 !  !END!
! X = 642.4267, -1198.5807, 0.000, 0.000 !  !END!
! X = 643.4267, -1198.6955, 0.000, 0.000 !  !END!
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! X = 644.4267, -1198.8102, 0.000, 0.000 !  !END!
! X = 645.4267, -1198.9250, 0.000, 0.000 !  !END!
! X = 646.4186, -1198.8737, 0.000, 0.000 !  !END!
! X = 647.4027, -1198.6626, 0.000, 0.000 !  !END!
! X = 648.3868, -1198.4515, 0.000, 0.000 !  !END!
! X = 649.3708, -1198.2403, 0.000, 0.000 !  !END!
! X = 650.3564, -1198.0360, 0.000, 0.000 !  !END!
! X = 651.3434, -1197.8387, 0.000, 0.000 !  !END!
! X = 652.3304, -1197.6414, 0.000, 0.000 !  !END!
! X = 653.2999, -1197.3788, 0.000, 0.000 !  !END!
! X = 654.2538, -1197.0566, 0.000, 0.000 !  !END!
! X = 655.2079, -1196.7355, 0.000, 0.000 !  !END!
! X = 656.1497, -1196.3810, 0.000, 0.000 !  !END!
! X = 657.0804, -1195.9971, 0.000, 0.000 !  !END!
! X = 658.0111, -1195.6121, 0.000, 0.000 !  !END!
! X = 658.9457, -1195.2379, 0.000, 0.000 !  !END!
! X = 659.8808, -1194.8647, 0.000, 0.000 !  !END!
! X = 660.8159, -1194.4914, 0.000, 0.000 !  !END!
! X = 661.7509, -1194.1171, 0.000, 0.000 !  !END!
! X = 662.6961, -1193.7763, 0.000, 0.000 !  !END!
! X = 663.6761, -1193.5469, 0.000, 0.000 !  !END!
! X = 664.6561, -1193.3174, 0.000, 0.000 !  !END!
! X = 665.6362, -1193.0878, 0.000, 0.000 !  !END!
! X = 666.5598, -1192.7064, 0.000, 0.000 !  !END!
! X = 667.4497, -1192.2349, 0.000, 0.000 !  !END!
! X = 668.3398, -1191.7633, 0.000, 0.000 !  !END!
! X = 669.2298, -1191.2918, 0.000, 0.000 !  !END!
! X = 670.1117, -1190.8057, 0.000, 0.000 !  !END!
! X = 670.9572, -1190.2583, 0.000, 0.000 !  !END!
! X = 671.8027, -1189.7099, 0.000, 0.000 !  !END!
! X = 672.6480, -1189.1614, 0.000, 0.000 !  !END!
! X = 673.4473, -1188.5526, 0.000, 0.000 !  !END!
! X = 674.1998, -1187.8814, 0.000, 0.000 !  !END!
! X = 674.9521, -1187.2093, 0.000, 0.000 !  !END!
! X = 675.7043, -1186.5381, 0.000, 0.000 !  !END!
! X = 676.4510, -1185.8604, 0.000, 0.000 !  !END!
! X = 677.1962, -1185.1818, 0.000, 0.000 !  !END!
! X = 677.9413, -1184.5022, 0.000, 0.000 !  !END!
! X = 678.6864, -1183.8226, 0.000, 0.000 !  !END!
! X = 679.4205, -1183.1319, 0.000, 0.000 !  !END!
! X = 680.1246, -1182.4097, 0.000, 0.000 !  !END!
! X = 680.8287, -1181.6874, 0.000, 0.000 !  !END!
! X = 681.5980, -1181.0693, 0.000, 0.000 !  !END!
! X = 682.5482, -1180.7366, 0.000, 0.000 !  !END!
! X = 683.4986, -1180.4049, 0.000, 0.000 !  !END!
! X = 684.4489, -1180.0731, 0.000, 0.000 !  !END!
! X = 685.3991, -1179.7413, 0.000, 0.000 !  !END!
! X = 686.3601, -1179.4450, 0.000, 0.000 !  !END!
! X = 687.3356, -1179.1970, 0.000, 0.000 !  !END!
! X = 688.3112, -1178.9500, 0.000, 0.000 !  !END!
! X = 689.2866, -1178.7020, 0.000, 0.000 !  !END!
! X = 690.2622, -1178.4549, 0.000, 0.000 !  !END!
! X = 691.2376, -1178.2068, 0.000, 0.000 !  !END!
! X = 692.2133, -1177.9597, 0.000, 0.000 !  !END!
! X = 693.1888, -1177.7125, 0.000, 0.000 !  !END!
! X = 694.1642, -1177.4643, 0.000, 0.000 !  !END!
! X = 695.1398, -1177.2171, 0.000, 0.000 !  !END!
! X = 696.1152, -1176.9689, 0.000, 0.000 !  !END!
! X = 697.0908, -1176.7216, 0.000, 0.000 !  !END!
! X = 698.0663, -1176.4744, 0.000, 0.000 !  !END!
! X = 699.0418, -1176.2261, 0.000, 0.000 !  !END!
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! X = 700.0173, -1175.9787, 0.000, 0.000 !  !END!
! X = 700.9927, -1175.7304, 0.000, 0.000 !  !END!
! X = 701.9683, -1175.4830, 0.000, 0.000 !  !END!
! X = 702.9438, -1175.2356, 0.000, 0.000 !  !END!
! X = 703.9192, -1174.9872, 0.000, 0.000 !  !END!
! X = 704.8947, -1174.7397, 0.000, 0.000 !  !END!
! X = 705.8703, -1174.4922, 0.000, 0.000 !  !END!
! X = 706.8456, -1174.2437, 0.000, 0.000 !  !END!
! X = 707.8211, -1173.9962, 0.000, 0.000 !  !END!
! X = 708.7966, -1173.7486, 0.000, 0.000 !  !END!
! X = 709.7720, -1173.5000, 0.000, 0.000 !  !END!
! X = 710.7475, -1173.2524, 0.000, 0.000 !  !END!
! X = 711.7229, -1173.0038, 0.000, 0.000 !  !END!
! X = 712.6983, -1172.7561, 0.000, 0.000 !  !END!
! X = 713.6739, -1172.5084, 0.000, 0.000 !  !END!
! X = 714.6492, -1172.2597, 0.000, 0.000 !  !END!
! X = 715.6247, -1172.0119, 0.000, 0.000 !  !END!
! X = 716.6002, -1171.7642, 0.000, 0.000 !  !END!
! X = 717.5755, -1171.5154, 0.000, 0.000 !  !END!
! X = 718.5510, -1171.2676, 0.000, 0.000 !  !END!
! X = 719.5267, -1171.0207, 0.000, 0.000 !  !END!
! X = 720.5058, -1170.7877, 0.000, 0.000 !  !END!
! X = 721.4850, -1170.5547, 0.000, 0.000 !  !END!
! X = 722.4639, -1170.3206, 0.000, 0.000 !  !END!
! X = 723.4445, -1170.1291, 0.000, 0.000 !  !END!
! X = 724.4377, -1170.2932, 0.000, 0.000 !  !END!
! X = 725.4310, -1170.4573, 0.000, 0.000 !  !END!
! X = 726.4213, -1170.6360, 0.000, 0.000 !  !END!
! X = 727.4017, -1170.8654, 0.000, 0.000 !  !END!
! X = 728.3822, -1171.0939, 0.000, 0.000 !  !END!
! X = 729.3167, -1171.4481, 0.000, 0.000 !  !END!
! X = 730.2094, -1171.9166, 0.000, 0.000 !  !END!
! X = 731.1020, -1172.3850, 0.000, 0.000 !  !END!
! X = 731.9947, -1172.8535, 0.000, 0.000 !  !END!
! X = 732.8873, -1173.3209, 0.000, 0.000 !  !END!
! X = 733.6386, -1173.9424, 0.000, 0.000 !  !END!
! X = 734.1685, -1174.8027, 0.000, 0.000 !  !END!
! X = 734.6984, -1175.6640, 0.000, 0.000 !  !END!
! X = 735.2283, -1176.5244, 0.000, 0.000 !  !END!
! X = 735.7601, -1177.3845, 0.000, 0.000 !  !END!
! X = 736.2942, -1178.2424, 0.000, 0.000 !  !END!
! X = 736.8284, -1179.1003, 0.000, 0.000 !  !END!
! X = 737.3624, -1179.9583, 0.000, 0.000 !  !END!
! X = 737.6189, -1180.9215, 0.000, 0.000 !  !END!
! X = 737.7786, -1181.9203, 0.000, 0.000 !  !END!
! X = 737.9386, -1182.9201, 0.000, 0.000 !  !END!
! X = 738.0983, -1183.9190, 0.000, 0.000 !  !END!
! X = 738.2583, -1184.9189, 0.000, 0.000 !  !END!
! X = 738.3793, -1185.9228, 0.000, 0.000 !  !END!
! X = 738.4473, -1186.9323, 0.000, 0.000 !  !END!
! X = 738.5153, -1187.9419, 0.000, 0.000 !  !END!
! X = 738.5834, -1188.9525, 0.000, 0.000 !  !END!
! X = 738.6514, -1189.9621, 0.000, 0.000 !  !END!
! X = 738.7194, -1190.9717, 0.000, 0.000 !  !END!
! X = 738.7818, -1191.9820, 0.000, 0.000 !  !END!
! X = 738.7678, -1192.9941, 0.000, 0.000 !  !END!
! X = 738.7538, -1194.0062, 0.000, 0.000 !  !END!
! X = 738.7397, -1195.0184, 0.000, 0.000 !  !END!
! X = 738.4243, -1195.9766, 0.000, 0.000 !  !END!
! X = 738.0871, -1196.9298, 0.000, 0.000 !  !END!
! X = 737.7499, -1197.8841, 0.000, 0.000 !  !END!
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! X = 737.4379, -1198.8430, 0.000, 0.000 !  !END!
! X = 737.3213, -1199.8487, 0.000, 0.000 !  !END!
! X = 737.2046, -1200.8544, 0.000, 0.000 !  !END!
! X = 737.0880, -1201.8601, 0.000, 0.000 !  !END!
! X = 737.4297, -1202.7977, 0.000, 0.000 !  !END!
! X = 737.8308, -1203.7272, 0.000, 0.000 !  !END!
! X = 738.2318, -1204.6567, 0.000, 0.000 !  !END!
! X = 738.9561, -1205.3204, 0.000, 0.000 !  !END!
! X = 739.7829, -1205.8992, 0.000, 0.000 !  !END!
! X = 740.6098, -1206.4789, 0.000, 0.000 !  !END!
! X = 741.5060, -1206.8590, 0.000, 0.000 !  !END!
! X = 742.5112, -1206.9283, 0.000, 0.000 !  !END!
! X = 743.5164, -1206.9966, 0.000, 0.000 !  !END!
! X = 744.4973, -1206.9473, 0.000, 0.000 !  !END!
! X = 745.3929, -1206.4843, 0.000, 0.000 !  !END!
! X = 746.2887, -1206.0212, 0.000, 0.000 !  !END!
! X = 747.1641, -1205.5337, 0.000, 0.000 !  !END!
! X = 747.7899, -1204.7404, 0.000, 0.000 !  !END!
! X = 748.4158, -1203.9470, 0.000, 0.000 !  !END!
! X = 749.0416, -1203.1547, 0.000, 0.000 !  !END!
! X = 749.6674, -1202.3613, 0.000, 0.000 !  !END!
! X = 750.2931, -1201.5680, 0.000, 0.000 !  !END!
! X = 750.9267, -1200.7820, 0.000, 0.000 !  !END!
! X = 751.5627, -1199.9967, 0.000, 0.000 !  !END!
! X = 752.1982, -1199.2115, 0.000, 0.000 !  !END!
! X = 752.7512, -1198.3656, 0.000, 0.000 !  !END!
! X = 753.3042, -1197.5198, 0.000, 0.000 !  !END!
! X = 753.8624, -1196.6775, 0.000, 0.000 !  !END!
! X = 754.4448, -1195.8520, 0.000, 0.000 !  !END!
! X = 755.0272, -1195.0265, 0.000, 0.000 !  !END!
! X = 755.6096, -1194.2010, 0.000, 0.000 !  !END!
! X = 756.1920, -1193.3755, 0.000, 0.000 !  !END!
! X = 757.0884, -1193.0445, 0.000, 0.000 !  !END!
! X = 758.0788, -1192.8614, 0.000, 0.000 !  !END!
! X = 759.0692, -1192.6772, 0.000, 0.000 !  !END!
! X = 760.0597, -1192.4940, 0.000, 0.000 !  !END!
! X = 761.0501, -1192.3108, 0.000, 0.000 !  !END!
! X = 762.0406, -1192.1276, 0.000, 0.000 !  !END!
! X = 762.9907, -1192.0473, 0.000, 0.000 !  !END!
! X = 763.5944, -1192.8585, 0.000, 0.000 !  !END!
! X = 764.1982, -1193.6697, 0.000, 0.000 !  !END!
! X = 764.8020, -1194.4809, 0.000, 0.000 !  !END!
! X = 765.4559, -1195.2370, 0.000, 0.000 !  !END!
! X = 766.3112, -1195.7724, 0.000, 0.000 !  !END!
! X = 767.1664, -1196.3079, 0.000, 0.000 !  !END!
! X = 768.0219, -1196.8443, 0.000, 0.000 !  !END!
! X = 768.8839, -1197.3515, 0.000, 0.000 !  !END!
! X = 769.8878, -1197.2675, 0.000, 0.000 !  !END!
! X = 770.8916, -1197.1824, 0.000, 0.000 !  !END!
! X = 771.8956, -1197.0983, 0.000, 0.000 !  !END!
! X = 772.8070, -1196.8122, 0.000, 0.000 !  !END!
! X = 773.5226, -1196.1005, 0.000, 0.000 !  !END!
! X = 774.2382, -1195.3879, 0.000, 0.000 !  !END!
! X = 774.9537, -1194.6763, 0.000, 0.000 !  !END!
! X = 775.5601, -1193.8794, 0.000, 0.000 !  !END!
! X = 776.0609, -1193.0009, 0.000, 0.000 !  !END!
! X = 776.5614, -1192.1225, 0.000, 0.000 !  !END!
! X = 777.0621, -1191.2451, 0.000, 0.000 !  !END!
! X = 777.5627, -1190.3667, 0.000, 0.000 !  !END!
! X = 778.0631, -1189.4883, 0.000, 0.000 !  !END!
! X = 778.5637, -1188.6100, 0.000, 0.000 !  !END!
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! X = 779.2434, -1187.8725, 0.000, 0.000 !  !END!
! X = 779.9671, -1187.1682, 0.000, 0.000 !  !END!
! X = 780.6908, -1186.4648, 0.000, 0.000 !  !END!
! X = 781.3234, -1185.6916, 0.000, 0.000 !  !END!
! X = 781.8123, -1184.8063, 0.000, 0.000 !  !END!
! X = 782.3013, -1183.9220, 0.000, 0.000 !  !END!
! X = 782.7903, -1183.0377, 0.000, 0.000 !  !END!
! X = 783.2642, -1182.1469, 0.000, 0.000 !  !END!
! X = 783.4987, -1181.1622, 0.000, 0.000 !  !END!
! X = 783.7332, -1180.1786, 0.000, 0.000 !  !END!
! X = 783.9675, -1179.1939, 0.000, 0.000 !  !END!
! X = 784.2018, -1178.2093, 0.000, 0.000 !  !END!
! X = 784.5279, -1177.2995, 0.000, 0.000 !  !END!
! X = 785.4347, -1176.8598, 0.000, 0.000 !  !END!
! X = 786.3416, -1176.4211, 0.000, 0.000 !  !END!
! X = 787.2483, -1175.9813, 0.000, 0.000 !  !END!
! X = 788.0486, -1175.3868, 0.000, 0.000 !  !END!
! X = 788.7784, -1174.6899, 0.000, 0.000 !  !END!
! X = 789.5081, -1173.9939, 0.000, 0.000 !  !END!
! X = 790.1313, -1173.2258, 0.000, 0.000 !  !END!
! X = 790.4806, -1172.2769, 0.000, 0.000 !  !END!
! X = 790.8299, -1171.3280, 0.000, 0.000 !  !END!
! X = 791.0805, -1170.3652, 0.000, 0.000 !  !END!
! X = 791.0022, -1169.3557, 0.000, 0.000 !  !END!
! X = 790.9241, -1168.3473, 0.000, 0.000 !  !END!
! X = 790.8708, -1167.3373, 0.000, 0.000 !  !END!
! X = 790.9043, -1166.3263, 0.000, 0.000 !  !END!
! X = 790.9378, -1165.3153, 0.000, 0.000 !  !END!
! X = 790.9711, -1164.3033, 0.000, 0.000 !  !END!
! X = 790.8728, -1163.3114, 0.000, 0.000 !  !END!
! X = 790.5479, -1162.3536, 0.000, 0.000 !  !END!
! X = 790.2232, -1161.3959, 0.000, 0.000 !  !END!
! X = 789.8983, -1160.4382, 0.000, 0.000 !  !END!
! X = 789.1115, -1159.8417, 0.000, 0.000 !  !END!
! X = 788.2663, -1159.2911, 0.000, 0.000 !  !END!
! X = 787.4211, -1158.7405, 0.000, 0.000 !  !END!
! X = 786.5475, -1158.2580, 0.000, 0.000 !  !END!
! X = 785.5672, -1158.0279, 0.000, 0.000 !  !END!
! X = 784.5868, -1157.7968, 0.000, 0.000 !  !END!
! X = 783.6066, -1157.5666, 0.000, 0.000 !  !END!
! X = 782.6270, -1157.3333, 0.000, 0.000 !  !END!
! X = 781.6475, -1157.0990, 0.000, 0.000 !  !END!
! X = 780.6682, -1156.8657, 0.000, 0.000 !  !END!
! X = 779.6884, -1156.6324, 0.000, 0.000 !  !END!
! X = 778.7088, -1156.3990, 0.000, 0.000 !  !END!
! X = 777.7292, -1156.1657, 0.000, 0.000 !  !END!
! X = 776.7802, -1155.8416, 0.000, 0.000 !  !END!
! X = 775.8587, -1155.4342, 0.000, 0.000 !  !END!
! X = 774.9371, -1155.0258, 0.000, 0.000 !  !END!
! X = 774.2280, -1154.3346, 0.000, 0.000 !  !END!
! X = 773.5832, -1153.5574, 0.000, 0.000 !  !END!
! X = 772.9384, -1152.7801, 0.000, 0.000 !  !END!
! X = 772.2386, -1152.0544, 0.000, 0.000 !  !END!
! X = 771.5269, -1151.3381, 0.000, 0.000 !  !END!
! X = 770.8154, -1150.6228, 0.000, 0.000 !  !END!
! X = 770.1608, -1149.8598, 0.000, 0.000 !  !END!
! X = 769.6011, -1149.0188, 0.000, 0.000 !  !END!
! X = 769.0413, -1148.1777, 0.000, 0.000 !  !END!
! X = 768.4816, -1147.3367, 0.000, 0.000 !  !END!
! X = 768.0882, -1146.4151, 0.000, 0.000 !  !END!
! X = 767.7816, -1145.4518, 0.000, 0.000 !  !END!
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! X = 767.4750, -1144.4886, 0.000, 0.000 !  !END!
! X = 767.1684, -1143.5254, 0.000, 0.000 !  !END!
! X = 766.8619, -1142.5622, 0.000, 0.000 !  !END!
! X = 766.5552, -1141.5981, 0.000, 0.000 !  !END!
! X = 766.7745, -1140.6863, 0.000, 0.000 !  !END!
! X = 767.2574, -1139.7997, 0.000, 0.000 !  !END!
! X = 767.7404, -1138.9130, 0.000, 0.000 !  !END!
! X = 768.2232, -1138.0264, 0.000, 0.000 !  !END!
! X = 768.8261, -1137.2624, 0.000, 0.000 !  !END!
! X = 769.7136, -1136.7865, 0.000, 0.000 !  !END!
! X = 770.6010, -1136.3117, 0.000, 0.000 !  !END!
! X = 771.4884, -1135.8358, 0.000, 0.000 !  !END!
! X = 772.3758, -1135.3609, 0.000, 0.000 !  !END!
! X = 773.1482, -1134.7172, 0.000, 0.000 !  !END!
! X = 773.9098, -1134.0573, 0.000, 0.000 !  !END!
! X = 774.6717, -1133.3974, 0.000, 0.000 !  !END!
! X = 775.4335, -1132.7385, 0.000, 0.000 !  !END!
! X = 776.0069, -1131.9144, 0.000, 0.000 !  !END!
! X = 776.5504, -1131.0641, 0.000, 0.000 !  !END!
! X = 777.0939, -1130.2137, 0.000, 0.000 !  !END!
! X = 777.6373, -1129.3633, 0.000, 0.000 !  !END!
! X = 778.2254, -1128.5449, 0.000, 0.000 !  !END!
! X = 778.8425, -1127.7477, 0.000, 0.000 !  !END!
! X = 779.4595, -1126.9495, 0.000, 0.000 !  !END!
! X = 780.0766, -1126.1524, 0.000, 0.000 !  !END!
! X = 780.6935, -1125.3542, 0.000, 0.000 !  !END!
! X = 781.3106, -1124.5571, 0.000, 0.000 !  !END!
! X = 781.9275, -1123.7589, 0.000, 0.000 !  !END!
! X = 782.5443, -1122.9618, 0.000, 0.000 !  !END!
! X = 783.1613, -1122.1636, 0.000, 0.000 !  !END!
! X = 783.7781, -1121.3654, 0.000, 0.000 !  !END!
! X = 784.4334, -1120.5998, 0.000, 0.000 !  !END!
! X = 785.0891, -1119.8341, 0.000, 0.000 !  !END!
! X = 785.7448, -1119.0684, 0.000, 0.000 !  !END!
! X = 786.4004, -1118.3027, 0.000, 0.000 !  !END!
! X = 791.0814, -1065.6474, 0.000, 0.000 !  !END!
! X = 790.4036, -1064.9023, 0.000, 0.000 !  !END!
! X = 789.7786, -1064.1121, 0.000, 0.000 !  !END!
! X = 789.1535, -1063.3208, 0.000, 0.000 !  !END!
! X = 788.6130, -1062.4759, 0.000, 0.000 !  !END!
! X = 788.1585, -1061.5763, 0.000, 0.000 !  !END!
! X = 787.7038, -1060.6756, 0.000, 0.000 !  !END!
! X = 787.2492, -1059.7749, 0.000, 0.000 !  !END!
! X = 786.7946, -1058.8753, 0.000, 0.000 !  !END!
! X = 786.4341, -1057.9434, 0.000, 0.000 !  !END!
! X = 786.2641, -1056.9486, 0.000, 0.000 !  !END!
! X = 786.0941, -1055.9538, 0.000, 0.000 !  !END!
! X = 785.9241, -1054.9591, 0.000, 0.000 !  !END!
! X = 785.7540, -1053.9644, 0.000, 0.000 !  !END!
! X = 786.5204, -1053.5682, 0.000, 0.000 !  !END!
! X = 787.4881, -1053.2999, 0.000, 0.000 !  !END!
! X = 788.4559, -1053.0325, 0.000, 0.000 !  !END!
! X = 789.4524, -1052.9193, 0.000, 0.000 !  !END!
! X = 790.4515, -1052.8200, 0.000, 0.000 !  !END!
! X = 791.4506, -1052.7207, 0.000, 0.000 !  !END!
! X = 792.4497, -1052.6214, 0.000, 0.000 !  !END!
! X = 793.4488, -1052.5220, 0.000, 0.000 !  !END!
! X = 794.4527, -1052.5267, 0.000, 0.000 !  !END!
! X = 795.4568, -1052.5354, 0.000, 0.000 !  !END!
! X = 796.4607, -1052.5430, 0.000, 0.000 !  !END!
! X = 797.4642, -1052.5284, 0.000, 0.000 !  !END!
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! X = 798.4658, -1052.4591, 0.000, 0.000 !  !END!
! X = 799.4676, -1052.3908, 0.000, 0.000 !  !END!
! X = 800.4692, -1052.3215, 0.000, 0.000 !  !END!
! X = 801.4670, -1052.3977, 0.000, 0.000 !  !END!
! X = 802.4636, -1052.5227, 0.000, 0.000 !  !END!
! X = 803.4602, -1052.6477, 0.000, 0.000 !  !END!
! X = 804.4567, -1052.7717, 0.000, 0.000 !  !END!
! X = 805.4566, -1052.8587, 0.000, 0.000 !  !END!
! X = 806.4597, -1052.9028, 0.000, 0.000 !  !END!
! X = 807.4630, -1052.9479, 0.000, 0.000 !  !END!
! X = 808.4661, -1052.9919, 0.000, 0.000 !  !END!
! X = 809.4695, -1053.0369, 0.000, 0.000 !  !END!
! X = 810.4733, -1053.0148, 0.000, 0.000 !  !END!
! X = 811.4772, -1052.9907, 0.000, 0.000 !  !END!
! X = 812.4810, -1052.9665, 0.000, 0.000 !  !END!
! X = 813.4849, -1052.9434, 0.000, 0.000 !  !END!
! X = 814.4849, -1053.0363, 0.000, 0.000 !  !END!
! X = 815.4850, -1053.1293, 0.000, 0.000 !  !END!
! X = 816.4850, -1053.2222, 0.000, 0.000 !  !END!
! X = 817.4851, -1053.3151, 0.000, 0.000 !  !END!
! X = 818.4851, -1053.4079, 0.000, 0.000 !  !END!
! X = 819.4812, -1053.5276, 0.000, 0.000 !  !END!
! X = 820.4639, -1053.7370, 0.000, 0.000 !  !END!
! X = 821.4465, -1053.9464, 0.000, 0.000 !  !END!
! X = 822.4292, -1054.1558, 0.000, 0.000 !  !END!
! X = 823.4142, -1054.3435, 0.000, 0.000 !  !END!
! X = 824.4184, -1054.3485, 0.000, 0.000 !  !END!
! X = 825.4228, -1054.3545, 0.000, 0.000 !  !END!
! X = 826.4231, -1054.3244, 0.000, 0.000 !  !END!
! X = 827.4027, -1054.1025, 0.000, 0.000 !  !END!
! X = 828.3823, -1053.8807, 0.000, 0.000 !  !END!
! X = 829.3354, -1053.5763, 0.000, 0.000 !  !END!
! X = 830.2602, -1053.1837, 0.000, 0.000 !  !END!
! X = 831.1851, -1052.7909, 0.000, 0.000 !  !END!
! X = 832.1102, -1052.3992, 0.000, 0.000 !  !END!
! X = 833.0361, -1052.0094, 0.000, 0.000 !  !END!
! X = 833.9617, -1051.6186, 0.000, 0.000 !  !END!
! X = 834.8873, -1051.2277, 0.000, 0.000 !  !END!
! X = 835.8130, -1050.8369, 0.000, 0.000 !  !END!
! X = 836.7388, -1050.4470, 0.000, 0.000 !  !END!
! X = 837.6644, -1050.0561, 0.000, 0.000 !  !END!
! X = 838.6494, -1049.8750, 0.000, 0.000 !  !END!
! X = 839.6415, -1049.7196, 0.000, 0.000 !  !END!
! X = 840.6335, -1049.5631, 0.000, 0.000 !  !END!
! X = 841.6175, -1049.3709, 0.000, 0.000 !  !END!
! X = 842.5802, -1049.0845, 0.000, 0.000 !  !END!
! X = 843.5430, -1048.7981, 0.000, 0.000 !  !END!
! X = 844.5059, -1048.5126, 0.000, 0.000 !  !END!
! X = 845.4678, -1048.2232, 0.000, 0.000 !  !END!
! X = 846.4162, -1047.8926, 0.000, 0.000 !  !END!
! X = 847.3645, -1047.5610, 0.000, 0.000 !  !END!
! X = 848.3143, -1047.2343, 0.000, 0.000 !  !END!
! X = 849.2772, -1046.9487, 0.000, 0.000 !  !END!
! X = 850.2399, -1046.6622, 0.000, 0.000 !  !END!
! X = 851.2157, -1046.4757, 0.000, 0.000 !  !END!
! X = 852.2195, -1046.5044, 0.000, 0.000 !  !END!
! X = 853.2234, -1046.5332, 0.000, 0.000 !  !END!
! X = 854.1205, -1046.8363, 0.000, 0.000 !  !END!
! X = 854.8761, -1047.5020, 0.000, 0.000 !  !END!
! X = 855.6317, -1048.1676, 0.000, 0.000 !  !END!
! X = 856.4094, -1048.7994, 0.000, 0.000 !  !END!
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! X = 857.3123, -1049.2430, 0.000, 0.000 !  !END!
! X = 858.2152, -1049.6857, 0.000, 0.000 !  !END!
! X = 859.1280, -1050.1029, 0.000, 0.000 !  !END!
! X = 860.0960, -1050.3729, 0.000, 0.000 !  !END!
! X = 861.0640, -1050.6430, 0.000, 0.000 !  !END!
! X = 862.0321, -1050.9130, 0.000, 0.000 !  !END!
! X = 863.0358, -1050.9345, 0.000, 0.000 !  !END!
! X = 864.0400, -1050.9498, 0.000, 0.000 !  !END!
! X = 865.0443, -1050.9660, 0.000, 0.000 !  !END!
! X = 865.9210, -1050.4965, 0.000, 0.000 !  !END!
! X = 866.7867, -1049.9855, 0.000, 0.000 !  !END!
! X = 867.5823, -1049.3877, 0.000, 0.000 !  !END!
! X = 868.2598, -1048.6432, 0.000, 0.000 !  !END!
! X = 868.9374, -1047.8986, 0.000, 0.000 !  !END!
! X = 869.6770, -1047.2510, 0.000, 0.000 !  !END!
! X = 870.6299, -1046.9325, 0.000, 0.000 !  !END!
! X = 871.5829, -1046.6151, 0.000, 0.000 !  !END!
! X = 872.5459, -1046.3422, 0.000, 0.000 !  !END!
! X = 873.5434, -1046.2249, 0.000, 0.000 !  !END!
! X = 874.5409, -1046.1087, 0.000, 0.000 !  !END!
! X = 875.5384, -1045.9914, 0.000, 0.000 !  !END!
! X = 876.5395, -1045.9143, 0.000, 0.000 !  !END!
! X = 877.5421, -1045.8553, 0.000, 0.000 !  !END!
! X = 878.5447, -1045.7963, 0.000, 0.000 !  !END!
! X = 879.5473, -1045.7383, 0.000, 0.000 !  !END!
! X = 880.5503, -1045.6843, 0.000, 0.000 !  !END!
! X = 881.5531, -1045.6302, 0.000, 0.000 !  !END!
! X = 882.5560, -1045.5752, 0.000, 0.000 !  !END!
! X = 883.5568, -1045.4939, 0.000, 0.000 !  !END!
! X = 884.5567, -1045.3995, 0.000, 0.000 !  !END!
! X = 885.5566, -1045.3051, 0.000, 0.000 !  !END!
! X = 886.5520, -1045.1847, 0.000, 0.000 !  !END!
! X = 887.5243, -1044.9328, 0.000, 0.000 !  !END!
! X = 888.4964, -1044.6799, 0.000, 0.000 !  !END!
! X = 889.4674, -1044.4230, 0.000, 0.000 !  !END!
! X = 890.4282, -1044.1297, 0.000, 0.000 !  !END!
! X = 891.3890, -1043.8363, 0.000, 0.000 !  !END!
! X = 892.3507, -1043.5469, 0.000, 0.000 !  !END!
! X = 893.3196, -1043.2820, 0.000, 0.000 !  !END!
! X = 894.2886, -1043.0171, 0.000, 0.000 !  !END!
! X = 895.2574, -1042.7512, 0.000, 0.000 !  !END!
! X = 896.2265, -1042.4872, 0.000, 0.000 !  !END!
! X = 897.1980, -1042.2322, 0.000, 0.000 !  !END!
! X = 898.1692, -1041.9761, 0.000, 0.000 !  !END!
! X = 899.1405, -1041.7200, 0.000, 0.000 !  !END!
! X = 900.1119, -1041.4638, 0.000, 0.000 !  !END!
! X = 901.0793, -1041.1938, 0.000, 0.000 !  !END!
! X = 902.0466, -1040.9229, 0.000, 0.000 !  !END!
! X = 903.0138, -1040.6519, 0.000, 0.000 !  !END!
! X = 903.9691, -1040.3456, 0.000, 0.000 !  !END!
! X = 904.9044, -1039.9785, 0.000, 0.000 !  !END!
! X = 905.8399, -1039.6124, 0.000, 0.000 !  !END!
! X = 906.7745, -1039.2434, 0.000, 0.000 !  !END!
! X = 907.7090, -1038.8743, 0.000, 0.000 !  !END!
! X = 908.6560, -1038.5435, 0.000, 0.000 !  !END!
! X = 909.6241, -1038.2763, 0.000, 0.000 !  !END!
! X = 910.5924, -1038.0090, 0.000, 0.000 !  !END!
! X = 911.5518, -1037.7133, 0.000, 0.000 !  !END!
! X = 912.5016, -1037.3861, 0.000, 0.000 !  !END!
! X = 913.4515, -1037.0589, 0.000, 0.000 !  !END!
! X = 914.0036, -1037.7875, 0.000, 0.000 !  !END!
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! X = 914.4995, -1038.6665, 0.000, 0.000 !  !END!
! X = 914.9814, -1039.5491, 0.000, 0.000 !  !END!
! X = 915.0862, -1040.5531, 0.000, 0.000 !  !END!
! X = 915.1911, -1041.5571, 0.000, 0.000 !  !END!
! X = 915.2959, -1042.5612, 0.000, 0.000 !  !END!
! X = 915.4320, -1043.5588, 0.000, 0.000 !  !END!
! X = 915.7447, -1044.5179, 0.000, 0.000 !  !END!
! X = 916.0575, -1045.4779, 0.000, 0.000 !  !END!
! X = 916.3703, -1046.4370, 0.000, 0.000 !  !END!
! X = 916.6832, -1047.3971, 0.000, 0.000 !  !END!
! X = 917.4701, -1047.3761, 0.000, 0.000 !  !END!
! X = 918.4136, -1047.0301, 0.000, 0.000 !  !END!
! X = 919.3583, -1046.6881, 0.000, 0.000 !  !END!
! X = 920.3135, -1046.3764, 0.000, 0.000 !  !END!
! X = 921.2687, -1046.0646, 0.000, 0.000 !  !END!
! X = 922.2239, -1045.7529, 0.000, 0.000 !  !END!
! X = 923.1772, -1045.4352, 0.000, 0.000 !  !END!
! X = 924.1304, -1045.1175, 0.000, 0.000 !  !END!
! X = 925.0865, -1044.8096, 0.000, 0.000 !  !END!
! X = 926.0513, -1044.5293, 0.000, 0.000 !  !END!
! X = 927.0162, -1044.2498, 0.000, 0.000 !  !END!
! X = 927.9809, -1043.9694, 0.000, 0.000 !  !END!
! X = 928.9353, -1043.6555, 0.000, 0.000 !  !END!
! X = 929.8894, -1043.3407, 0.000, 0.000 !  !END!
! X = 930.8379, -1043.0102, 0.000, 0.000 !  !END!
! X = 931.7695, -1042.6337, 0.000, 0.000 !  !END!
! X = 932.7012, -1042.2573, 0.000, 0.000 !  !END!
! X = 933.6545, -1041.9465, 0.000, 0.000 !  !END!
! X = 934.6269, -1041.6945, 0.000, 0.000 !  !END!
! X = 935.5993, -1041.4425, 0.000, 0.000 !  !END!
! X = 936.5718, -1041.1905, 0.000, 0.000 !  !END!
! X = 937.5542, -1040.9993, 0.000, 0.000 !  !END!
! X = 938.5560, -1040.9248, 0.000, 0.000 !  !END!
! X = 939.5576, -1040.8503, 0.000, 0.000 !  !END!
! X = 940.5593, -1040.7757, 0.000, 0.000 !  !END!
! X = 941.5492, -1040.6070, 0.000, 0.000 !  !END!
! X = 942.5382, -1040.4312, 0.000, 0.000 !  !END!
! X = 943.5271, -1040.2554, 0.000, 0.000 !  !END!
! X = 944.5084, -1040.0419, 0.000, 0.000 !  !END!
! X = 945.4861, -1039.8114, 0.000, 0.000 !  !END!
! X = 946.4636, -1039.5799, 0.000, 0.000 !  !END!
! X = 947.4414, -1039.3494, 0.000, 0.000 !  !END!
! X = 948.4134, -1039.0961, 0.000, 0.000 !  !END!
! X = 949.3847, -1038.8399, 0.000, 0.000 !  !END!
! X = 950.3560, -1038.5836, 0.000, 0.000 !  !END!
! X = 951.3272, -1038.3273, 0.000, 0.000 !  !END!
! X = 952.2916, -1038.0464, 0.000, 0.000 !  !END!
! X = 953.2535, -1037.7565, 0.000, 0.000 !  !END!
! X = 954.2155, -1037.4667, 0.000, 0.000 !  !END!
! X = 955.1769, -1037.1758, 0.000, 0.000 !  !END!
! X = 956.1314, -1036.8624, 0.000, 0.000 !  !END!
! X = 957.0859, -1036.5489, 0.000, 0.000 !  !END!
! X = 958.0402, -1036.2344, 0.000, 0.000 !  !END!
! X = 958.9905, -1035.9092, 0.000, 0.000 !  !END!
! X = 959.9408, -1035.5829, 0.000, 0.000 !  !END!
! X = 960.8912, -1035.2576, 0.000, 0.000 !  !END!
! X = 961.8426, -1034.9352, 0.000, 0.000 !  !END!
! X = 962.7968, -1034.6206, 0.000, 0.000 !  !END!
! X = 963.7512, -1034.3070, 0.000, 0.000 !  !END!
! X = 964.7053, -1033.9924, 0.000, 0.000 !  !END!
! X = 965.6596, -1033.6787, 0.000, 0.000 !  !END!
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! X = 966.6152, -1033.3690, 0.000, 0.000 !  !END!
! X = 967.5717, -1033.0621, 0.000, 0.000 !  !END!
! X = 968.5283, -1032.7553, 0.000, 0.000 !  !END!
! X = 969.4848, -1032.4484, 0.000, 0.000 !  !END!
! X = 970.4399, -1032.1366, 0.000, 0.000 !  !END!
! X = 971.3949, -1031.8258, 0.000, 0.000 !  !END!
! X = 972.3500, -1031.5140, 0.000, 0.000 !  !END!
! X = 973.3061, -1031.2060, 0.000, 0.000 !  !END!
! X = 974.2623, -1030.8981, 0.000, 0.000 !  !END!
! X = 975.2186, -1030.5911, 0.000, 0.000 !  !END!
! X = 976.1748, -1030.2831, 0.000, 0.000 !  !END!
! X = 977.1316, -1029.9771, 0.000, 0.000 !  !END!
! X = 978.0991, -1029.7074, 0.000, 0.000 !  !END!
! X = 979.0667, -1029.4377, 0.000, 0.000 !  !END!
! X = 980.0341, -1029.1680, 0.000, 0.000 !  !END!
! X = 981.0015, -1028.8972, 0.000, 0.000 !  !END!
! X = 981.9722, -1028.6403, 0.000, 0.000 !  !END!
! X = 982.9474, -1028.4001, 0.000, 0.000 !  !END!
! X = 983.9227, -1028.1599, 0.000, 0.000 !  !END!
! X = 984.8986, -1027.9227, 0.000, 0.000 !  !END!
! X = 985.8763, -1027.6933, 0.000, 0.000 !  !END!
! X = 986.8539, -1027.4630, 0.000, 0.000 !  !END!
! X = 987.8316, -1027.2326, 0.000, 0.000 !  !END!
! X = 988.8093, -1027.0031, 0.000, 0.000 !  !END!
! X = 989.7910, -1026.7916, 0.000, 0.000 !  !END!
! X = 990.7750, -1026.5909, 0.000, 0.000 !  !END!
! X = 991.7590, -1026.3901, 0.000, 0.000 !  !END!
! X = 992.7458, -1026.2043, 0.000, 0.000 !  !END!
! X = 993.7377, -1026.0473, 0.000, 0.000 !  !END!
! X = 994.7296, -1025.8914, 0.000, 0.000 !  !END!
! X = 995.7216, -1025.7343, 0.000, 0.000 !  !END!
! X = 996.7137, -1025.5783, 0.000, 0.000 !  !END!
! X = 997.7127, -1025.4794, 0.000, 0.000 !  !END!
! X = 998.7130, -1025.3914, 0.000, 0.000 !  !END!
! X = 999.7134, -1025.3035, 0.000, 0.000 !  !END!
! X = 1000.7139, -1025.2165, 0.000, 0.000 !  !END!
! X = 1001.7176, -1025.2225, 0.000, 0.000 !  !END!
! X = 1002.7218, -1025.2407, 0.000, 0.000 !  !END!
! X = 1003.7260, -1025.2589, 0.000, 0.000 !  !END!
! X = 1004.7302, -1025.2760, 0.000, 0.000 !  !END!
! X = 1005.7323, -1025.3319, 0.000, 0.000 !  !END!
! X = 1006.7324, -1025.4266, 0.000, 0.000 !  !END!
! X = 1007.7324, -1025.5203, 0.000, 0.000 !  !END!
! X = 1008.7325, -1025.6140, 0.000, 0.000 !  !END!
! X = 1009.7332, -1025.5887, 0.000, 0.000 !  !END!
! X = 1010.7342, -1025.5075, 0.000, 0.000 !  !END!
! X = 1011.7352, -1025.4263, 0.000, 0.000 !  !END!
! X = 1012.7359, -1025.3431, 0.000, 0.000 !  !END!
! X = 1013.7300, -1025.2007, 0.000, 0.000 !  !END!
! X = 1014.7241, -1025.0582, 0.000, 0.000 !  !END!
! X = 1015.7181, -1024.9147, 0.000, 0.000 !  !END!
! X = 1016.7122, -1024.7722, 0.000, 0.000 !  !END!
! X = 1017.7139, -1024.7254, 0.000, 0.000 !  !END!
! X = 1018.7181, -1024.7097, 0.000, 0.000 !  !END!
! X = 1019.7223, -1024.6929, 0.000, 0.000 !  !END!
! X = 1020.7260, -1024.7158, 0.000, 0.000 !  !END!
! X = 1021.7294, -1024.7580, 0.000, 0.000 !  !END!
! X = 1022.7329, -1024.8012, 0.000, 0.000 !  !END!
! X = 1023.7364, -1024.8444, 0.000, 0.000 !  !END!
! X = 1024.7384, -1024.9081, 0.000, 0.000 !  !END!
! X = 1025.7373, -1025.0147, 0.000, 0.000 !  !END!
```

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! X = 1026.7361, -1025.1203, 0.000, 0.000 !  !END!
! X = 1027.7351, -1025.2268, 0.000, 0.000 !  !END!
! X = 1028.7339, -1025.3324, 0.000, 0.000 !  !END!
! X = 1029.7312, -1025.4503, 0.000, 0.000 !  !END!
! X = 1030.7188, -1025.6352, 0.000, 0.000 !  !END!
! X = 1031.7064, -1025.8202, 0.000, 0.000 !  !END!
! X = 1032.6941, -1026.0051, 0.000, 0.000 !  !END!
! X = 1033.6816, -1026.1900, 0.000, 0.000 !  !END!
! X = 1034.6671, -1026.3863, 0.000, 0.000 !  !END!
! X = 1035.6506, -1026.5910, 0.000, 0.000 !  !END!
! X = 1036.6342, -1026.7966, 0.000, 0.000 !  !END!
! X = 1037.6176, -1027.0042, 0.000, 0.000 !  !END!
! X = 1038.6008, -1027.2109, 0.000, 0.000 !  !END!
! X = 1039.5842, -1027.4185, 0.000, 0.000 !  !END!
! X = 1040.5674, -1027.6251, 0.000, 0.000 !  !END!
! X = 1041.5484, -1027.8431, 0.000, 0.000 !  !END!
! X = 1042.5288, -1028.0642, 0.000, 0.000 !  !END!
! X = 1043.5092, -1028.2842, 0.000, 0.000 !  !END!
! X = 1044.4896, -1028.5053, 0.000, 0.000 !  !END!
! X = 1045.4685, -1028.7326, 0.000, 0.000 !  !END!
! X = 1046.4412, -1028.9850, 0.000, 0.000 !  !END!
! X = 1047.4139, -1029.2373, 0.000, 0.000 !  !END!
! X = 1048.3868, -1029.4906, 0.000, 0.000 !  !END!
! X = 1049.3563, -1029.7555, 0.000, 0.000 !  !END!
! X = 1050.3232, -1030.0308, 0.000, 0.000 !  !END!
! X = 1051.2899, -1030.3051, 0.000, 0.000 !  !END!
! X = 1052.2567, -1030.5803, 0.000, 0.000 !  !END!
! X = 1053.2225, -1030.8587, 0.000, 0.000 !  !END!
! X = 1054.1793, -1031.1676, 0.000, 0.000 !  !END!
! X = 1055.1360, -1031.4765, 0.000, 0.000 !  !END!
! X = 1056.0928, -1031.7853, 0.000, 0.000 !  !END!
! X = 1057.0494, -1032.0942, 0.000, 0.000 !  !END!
! X = 1058.0062, -1032.4030, 0.000, 0.000 !  !END!
! X = 1058.9536, -1032.7392, 0.000, 0.000 !  !END!
! X = 1059.8968, -1033.0881, 0.000, 0.000 !  !END!
! X = 1060.8401, -1033.4370, 0.000, 0.000 !  !END!
! X = 1061.7832, -1033.7849, 0.000, 0.000 !  !END!
! X = 1062.7162, -1034.1603, 0.000, 0.000 !  !END!
! X = 1063.6398, -1034.5581, 0.000, 0.000 !  !END!
! X = 1064.5635, -1034.9559, 0.000, 0.000 !  !END!
! X = 1065.4753, -1035.3814, 0.000, 0.000 !  !END!
! X = 1066.3865, -1035.8070, 0.000, 0.000 !  !END!
! X = 1067.2977, -1036.2336, 0.000, 0.000 !  !END!
! X = 1068.2090, -1036.6601, 0.000, 0.000 !  !END!
! X = 1069.1203, -1037.0867, 0.000, 0.000 !  !END!
! X = 1070.0286, -1037.5186, 0.000, 0.000 !  !END!
! X = 1070.9210, -1037.9839, 0.000, 0.000 !  !END!
! X = 1071.8133, -1038.4481, 0.000, 0.000 !  !END!
! X = 1072.7056, -1038.9133, 0.000, 0.000 !  !END!
! X = 1073.5979, -1039.3785, 0.000, 0.000 !  !END!
! X = 1074.4290, -1039.9401, 0.000, 0.000 !  !END!
! X = 1075.2253, -1040.5574, 0.000, 0.000 !  !END!
! X = 1076.0215, -1041.1747, 0.000, 0.000 !  !END!
! X = 1076.8241, -1041.7822, 0.000, 0.000 !  !END!
! X = 1077.6486, -1042.3607, 0.000, 0.000 !  !END!
! X = 1078.4732, -1042.9382, 0.000, 0.000 !  !END!
! X = 1079.2979, -1043.5167, 0.000, 0.000 !  !END!
! X = 1080.1561, -1044.0396, 0.000, 0.000 !  !END!
! X = 1081.0390, -1044.5231, 0.000, 0.000 !  !END!
! X = 1081.9221, -1045.0065, 0.000, 0.000 !  !END!
! X = 1082.8050, -1045.4890, 0.000, 0.000 !  !END!
```

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! X = 1083.7093, -1045.9284, 0.000, 0.000 !  !END!
! X = 1084.6303, -1046.3343, 0.000, 0.000 !  !END!
! X = 1085.5513, -1046.7392, 0.000, 0.000 !  !END!
! X = 1086.4723, -1047.1441, 0.000, 0.000 !  !END!
! X = 1087.4106, -1047.5044, 0.000, 0.000 !  !END!
! X = 1088.3617, -1047.8317, 0.000, 0.000 !  !END!
! X = 1089.3128, -1048.1599, 0.000, 0.000 !  !END!
! X = 1090.2576, -1048.5041, 0.000, 0.000 !  !END!
! X = 1091.1973, -1048.8642, 0.000, 0.000 !  !END!
! X = 1092.1368, -1049.2232, 0.000, 0.000 !  !END!
! X = 1092.9677, -1049.7704, 0.000, 0.000 !  !END!
! X = 1093.7411, -1050.4165, 0.000, 0.000 !  !END!
! X = 1094.5145, -1051.0617, 0.000, 0.000 !  !END!
! X = 1095.2881, -1051.7079, 0.000, 0.000 !  !END!
! X = 1096.0667, -1052.3474, 0.000, 0.000 !  !END!
! X = 1096.8562, -1052.9735, 0.000, 0.000 !  !END!
! X = 1097.6457, -1053.5996, 0.000, 0.000 !  !END!
! X = 1098.4352, -1054.2256, 0.000, 0.000 !  !END!
! X = 1099.2248, -1054.8517, 0.000, 0.000 !  !END!
! X = 1100.0511, -1055.4278, 0.000, 0.000 !  !END!
! X = 1100.8797, -1056.0006, 0.000, 0.000 !  !END!
! X = 1101.7082, -1056.5734, 0.000, 0.000 !  !END!
! X = 1102.5401, -1057.1418, 0.000, 0.000 !  !END!
! X = 1103.3725, -1057.7080, 0.000, 0.000 !  !END!
! X = 1104.2050, -1058.2753, 0.000, 0.000 !  !END!
! X = 1104.8950, -1058.9493, 0.000, 0.000 !  !END!
! X = 1105.1921, -1059.9140, 0.000, 0.000 !  !END!
! X = 1105.4893, -1060.8797, 0.000, 0.000 !  !END!
! X = 1105.7864, -1061.8455, 0.000, 0.000 !  !END!
! X = 1106.0610, -1062.8169, 0.000, 0.000 !  !END!
! X = 1106.3215, -1063.7940, 0.000, 0.000 !  !END!
! X = 1106.5817, -1064.7702, 0.000, 0.000 !  !END!
! X = 1106.8549, -1065.7418, 0.000, 0.000 !  !END!
! X = 1107.1850, -1066.6968, 0.000, 0.000 !  !END!
! X = 1107.5152, -1067.6519, 0.000, 0.000 !  !END!
! X = 1107.8453, -1068.6069, 0.000, 0.000 !  !END!
! X = 1108.1754, -1069.5610, 0.000, 0.000 !  !END!
! X = 1108.5490, -1070.5000, 0.000, 0.000 !  !END!
! X = 1108.9357, -1071.4334, 0.000, 0.000 !  !END!
! X = 1109.3221, -1072.3659, 0.000, 0.000 !  !END!
! X = 1109.7088, -1073.2994, 0.000, 0.000 !  !END!
! X = 1110.1180, -1074.2232, 0.000, 0.000 !  !END!
! X = 1110.5678, -1075.1271, 0.000, 0.000 !  !END!
! X = 1111.0177, -1076.0321, 0.000, 0.000 !  !END!
! X = 1111.4788, -1076.9308, 0.000, 0.000 !  !END!
! X = 1111.9522, -1077.8229, 0.000, 0.000 !  !END!
! X = 1112.4256, -1078.7151, 0.000, 0.000 !  !END!
! X = 1112.9010, -1079.6061, 0.000, 0.000 !  !END!
! X = 1113.4578, -1080.4481, 0.000, 0.000 !  !END!
! X = 1114.0146, -1081.2911, 0.000, 0.000 !  !END!
! X = 1114.5715, -1082.1332, 0.000, 0.000 !  !END!
! X = 1115.1703, -1082.9450, 0.000, 0.000 !  !END!
! X = 1115.8024, -1083.7317, 0.000, 0.000 !  !END!
! X = 1116.4345, -1084.5194, 0.000, 0.000 !  !END!
! X = 1117.0932, -1085.2827, 0.000, 0.000 !  !END!
! X = 1117.7855, -1086.0178, 0.000, 0.000 !  !END!
! X = 1118.4777, -1086.7519, 0.000, 0.000 !  !END!
! X = 1119.1973, -1087.4563, 0.000, 0.000 !  !END!
! X = 1119.9748, -1088.0993, 0.000, 0.000 !  !END!
! X = 1120.7524, -1088.7412, 0.000, 0.000 !  !END!
! X = 1121.5301, -1089.3841, 0.000, 0.000 !  !END!
```

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! X = 1122.4132, -1089.8664, 0.000, 0.000 !  !END!
! X = 1123.3030, -1090.3398, 0.000, 0.000 !  !END!
! X = 1124.1926, -1090.8122, 0.000, 0.000 !  !END!
! X = 1125.0868, -1091.2738, 0.000, 0.000 !  !END!
! X = 1126.0571, -1091.5426, 0.000, 0.000 !  !END!
! X = 1127.0273, -1091.8113, 0.000, 0.000 !  !END!
! X = 1127.9976, -1092.0800, 0.000, 0.000 !  !END!
! X = 1128.9678, -1092.3477, 0.000, 0.000 !  !END!
! X = 1129.9670, -1092.4441, 0.000, 0.000 !  !END!
! X = 1130.9709, -1092.5115, 0.000, 0.000 !  !END!
! X = 1131.9739, -1092.5362, 0.000, 0.000 !  !END!
! X = 1132.9743, -1092.4309, 0.000, 0.000 !  !END!
! X = 1133.9747, -1092.3256, 0.000, 0.000 !  !END!
! X = 1134.9549, -1092.1096, 0.000, 0.000 !  !END!
! X = 1135.9277, -1091.8527, 0.000, 0.000 !  !END!
! X = 1136.9005, -1091.5967, 0.000, 0.000 !  !END!
! X = 1137.8234, -1091.2020, 0.000, 0.000 !  !END!
! X = 1138.7354, -1090.7759, 0.000, 0.000 !  !END!
! X = 1139.6475, -1090.3508, 0.000, 0.000 !  !END!
! X = 1140.5782, -1090.0457, 0.000, 0.000 !  !END!
! X = 1141.5761, -1090.1756, 0.000, 0.000 !  !END!
! X = 1142.5739, -1090.3054, 0.000, 0.000 !  !END!
! X = 1143.5718, -1090.4353, 0.000, 0.000 !  !END!
! X = 1144.5236, -1090.7423, 0.000, 0.000 !  !END!
! X = 1145.4573, -1091.1197, 0.000, 0.000 !  !END!
! X = 1146.3911, -1091.4970, 0.000, 0.000 !  !END!
! X = 1147.3259, -1091.8721, 0.000, 0.000 !  !END!
! X = 1148.2632, -1092.2408, 0.000, 0.000 !  !END!
! X = 1149.2004, -1092.6095, 0.000, 0.000 !  !END!
! X = 1150.1378, -1092.9782, 0.000, 0.000 !  !END!
! X = 1151.0750, -1093.3469, 0.000, 0.000 !  !END!
! X = 1151.9870, -1093.7703, 0.000, 0.000 !  !END!
! X = 1152.8754, -1094.2464, 0.000, 0.000 !  !END!
! X = 1153.7638, -1094.7224, 0.000, 0.000 !  !END!
! X = 1154.6521, -1095.1974, 0.000, 0.000 !  !END!
! X = 1155.5954, -1095.5297, 0.000, 0.000 !  !END!
! X = 1156.5714, -1095.7778, 0.000, 0.000 !  !END!
! X = 1157.5471, -1096.0248, 0.000, 0.000 !  !END!
! X = 1158.5229, -1096.2729, 0.000, 0.000 !  !END!
! X = 1159.5176, -1096.3803, 0.000, 0.000 !  !END!
! X = 590.0362, -1189.4344, 0.000, 0.000 !  !END!
! X = 589.0676, -1189.7055, 0.000, 0.000 !  !END!
! X = 588.0991, -1189.9766, 0.000, 0.000 !  !END!
-------------
    a
     Data for each receptor are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     Receptor height above ground is optional.  If no value is entered,
     the receptor is placed on the ground.
```

Example CALPOST Input File

```
CALPOST.INP     2.2


---------------- Run title (3 lines) ------------------------------------------

                    CALPOST MODEL CONTROL FILE
                    --------------------------

------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Input Files
-----------

File                       Default File Name
----                       -----------------
Conc/Dep Flux File         MODEL.DAT          ! MODDAT = ..\..\..\05 calpuff\atlantis-naaqs-
2021-v2\run_2010\calpuff_atlantis_2010.conc !
Relative Humidity File     VISB.DAT           * VISDAT =   *
Background Data File       BACK.DAT           * BACKDAT =   *
Transmissometer or         VSRN.DAT           * VSRDAT =   *
Nephelometer Data File      or
DATSAV Weather Data File    or
Prognostic Weather  File

Single-point Met File      SURFACE.DAT        * MET1DAT =   *
 (Used ONLY to identify CALM hours for plume model
  output averaging when MCALMPRO option is used)


Output Files
------------

File                       Default File Name
----                       -----------------
List File                  CALPOST.LST        ! PSTLST = calpost_atlantis_2010.lst !

Pathname for Timeseries Files   (blank)       * TSPATH =   *
(activate with exclamation points only if
providing NON-BLANK character string)

Pathname for Plot Files   (blank)             * PLPATH =   *
(activate with exclamation points only if
 providing NON-BLANK character string)

User Character String (U) to augment default filenames
(activate with exclamation points only if
 providing NON-BLANK character string)

Timeseries          TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT
Peak Value          PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT

                                              * TSUNAM =   *

Top Nth Rank Plot   RANK(ALL)_ASPEC_ttHR_CONC_TUNAM.DAT
                 or RANK(ii)_ASPEC_ttHR_CONC_TUNAM.GRD

                                              ! TUNAM = ATL_2010  !
```

```
Exceedance Plot      EXCEED_ASPEC_ttHR_CONC_XUNAM.DAT
                 or  EXCEED_ASPEC_ttHR_CONC_XUNAM.GRD

                                          * XUNAM =   *

Echo Plot
(Specific Days)
           yyyy_Mmm_Ddd_hhmm(UTCszzzz)_L00_ASPEC_ttHR_CONC.DAT
     or    yyyy_Mmm_Ddd_hhmm(UTCszzzz)_L00_ASPEC_ttHR_CONC.GRD


Visibility Plot      DAILY_VISIB_VUNAM.DAT   * VUNAM =   *
(Daily Peak Summary)


Auxiliary Output Files
----------------------

File                       Default File Name
----                       -----------------
Visibility Change          DELVIS.DAT         * DVISDAT =   *

-------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case               ! LCFILES = T !
         F = UPPER CASE
NOTE: (1) file/path names can be up to 132 characters in length
NOTE: (2) User-supplied character string can be up to 24 characters in
          length (20 if 3D concentrations are processed as these
          include the 4-character level text)
NOTE: (3) Filenames for ALL PLOT and TIMESERIES FILES are constructed
          using a template that includes a pathname, user-supplied
          character(s), and context-specific strings, where
             ASPEC = Species Name
              CONC = CONC Or WFLX Or DFLX Or TFLX
                tt = Averaging Period (e.g. 03)
                ii = Rank (e.g. 02)
              hhmm = Time (at start) in LST
             szzzz = LST time zone shift (EST is -0500)
              yyyy = Year(LST)
                mm = Month(LST)
                dd = day of month (LST)
          are determined internally based on selections made below.
          If a path or user-supplied character(s) are supplied, each
          must contain at least 1 non-blank character.

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

     Option to run all periods found
     in the met. file(s)  (METRUN)        Default: 0   ! METRUN =   1  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in CALPUFF data file(s)

     Starting date:    Year   (ISYR)  --    No default   ! ISYR  =  1990  !
```

```
                    Month  (ISMO)  --    No default   ! ISMO  =  0  !
                    Day    (ISDY)  --    No default   ! ISDY  =  0  !
     Starting time:  Hour   (ISHR)  --    No default   ! ISHR  =  0  !
                    Minute (ISMIN) --    No default   ! ISMIN =  0  !
                    Second (ISSEC) --    No default   ! ISSEC =  0  !

     Ending date:    Year   (IEYR)  --    No default   ! IEYR  =  0  !
                    Month  (IEMO)  --    No default   ! IEMO  =  0  !
                    Day    (IEDY)  --    No default   ! IEDY  =  0  !
     Ending time:    Hour   (IEHR)  --    No default   ! IEHR  =  0  !
                    Minute (IEMIN) --    No default   ! IEMIN =  0  !
                    Second (IESEC) --    No default   ! IESEC =  0  !

     (These are only used if METRUN = 0)

     Base Time Zone for the CALPUFF simulation:
     (character*8)           (ABTZ)  --    No default   ! ABTZ= UTC-0600 !

     All times are in the base time zone of the CALPUFF simulation.
     CALPUFF Dataset Version 2.1 contains the zone, but earlier versions
     do not, and the zone must be specified here.
     Examples:
         Los Angeles, USA          = UTC-0800
         New York, USA             = UTC-0500
         Santiago, Chile           = UTC-0400
         Greenwich Mean Time (GMT) = UTC+0000
         Rome, Italy               = UTC+0100
         Cape Town, S.Africa       = UTC+0200
         Sydney, Australia         = UTC+1000

     Process every period of data?
                               (NREP) -- Default: 1   ! NREP  =  1  !
      (1 = every period processed,
       2 = every 2nd period processed,
       5 = every 5th period processed, etc.)

     Selectively process data only within certain hours?
       (This feature is NOT used with Visibility or CALM Processing)
       Provide 24 values.  The first value is for the hour
       between 0000 and 0100, the second is for the hour
       between 0100 and 0200, (etc.) and the last is for the hour
       between 2300 And 2400.
                              (HRPROC) -- Default: 24*1, or
       Hour:    1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
       Default: 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1

     ! HRPROC = 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1 !

       0 = data within hour are NOT processed
       1 = data within hour are processed

Species & Concentration/Deposition Information
----------------------------------------------

      Multiple species-levels contained in a single CALPUFF output file
      can be processed in 1 application.  These are identified by name
      (ASPEC) in Group 4, along with several related inputs.  For
      visibility there must be only 1 species listed and it must be
      called VISIB.

      Number of species (NSPEC)        -- Default: 1   ! NSPEC =   1  !
```

```
      Add Hourly Background Concentrations/Fluxes?
      - Current implementation allows hourly data for 1 species, and
        is restricted to NSPEC=1
      - Units must be mass-based and the conversion factor to either
        g/m**3 or g/m**2/s must be provided in the header of the file
      - Option cannot be used with volume-based (e.g. ppb) units
                              (LBACK)  -- Default: F   ! LBACK =  F !


NO2 Configuration
-----------------

      Source of NO2 when ASPEC=NO2 (Group 4) or LVNO2=T (Group 2) may be
      from CALPUFF NO2 concentrations OR from a fraction of CALPUFF NOx
      concentrations.  Specify the fraction of NOx that is treated as NO2
      either as a constant or as a table of fractions that depend on the
      magnitude of the NOx concentration:
                            (NO2CALC) -- Default: 1   ! NO2CALC =   1  !
         0 =  Use NO2 directly (NO2 must be in file)
         1 =  Specify a single NO2/NOx ratio (RNO2NOX)
         2 =  Specify table of NO2/NOx ratios for short-term and long-term
              concentration averages: Short -Term(TNO2NOX_S)
                                      Long-Term  (TNO2NOX_L)
              (NOTE: Scaling Factors must NOT be used with NO2CALC=2)

      Single NO2/NOx ratio (0.0 to 1.0) for treating some
      or all NOx as NO2, where [NO2] = [NOX] * RNO2NOX
      (used only if NO2CALC = 1)
                            (RNO2NOX) -- Default: 1.0 ! RNO2NOX = 0.75 !

      Table of NO2/NOx ratios that vary with NOx concentration.
      Provide a series of NOx concentrations (ppb) and the corresponding
      NO2/NOx ratio, with NOx increasing in magnitude.  The ratio used
      for a particular NOx concentration is interpolated from the values
      provided in the table.  The ratio for the smallest tabulated NOx
      concentration (the first) is used for all NOx concentrations less
      than the smallest tabulated value, and the ratio for the largest
      tabulated NOx concentration (the last) is used for all NOx
      concentrations greater than the largest tabulated value.
      (used only if NO2CALC = 2)

      (a) NOx concentration conversion factor from ppb to ug/m3
          (1.0 ppb NOx = PPB_UGM3 ug/m3 NOx)
          Default value assumes T=25.0 C
                                P=1.0 atm
                                MW = 46.0
                          (PPB_UGM3)  -- Default: 1.880    ! PPB_UGM3 = 1.88 !

      (b) Short-Term Average Conversion Table

          NOx concentration (CNOX_S) -- No Default (ppb)
          NO2/NOx ratio for each NOx concentration
                         (TNO2NOX_S) -- No Default

         ! CNOX_S = 0.531915, 1.06383, 1.595745, 2.12766, 2.659575, 3.191489, 3.723404,
4.255319,
                     4.787234, 5.319149, 5.851064, 6.382979, 6.914894, 7.446808 !

         ! TNO2NOX_S = 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,
                       1.0, 1.0, 1.0, 1.0, 1.0, 1.0 !
```

```
      (c) Long-Term Average Conversion Table

          NOx concentration (CNOX_L) -- No Default (ppb)
          NO2/NOx ratio for each NOx concentration
                         (TNO2NOX_L) -- No Default

         ! CNOX_L = 0.531915, 1.06383, 1.595745, 2.12766, 2.659575, 3.191489, 3.723404,
4.255319,
                    4.787234, 5.319149, 5.851064, 6.382979, 6.914894, 7.446808 !

         ! TNO2NOX_L = 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0,
                       1.0, 1.0, 1.0, 1.0, 1.0, 1.0 !

      (d) Minimum number of hours in average
          for using the long-term average
          conversion table
                            (MINHR_L)  -- Default: 8000  ! MINHR_L =  8000  !


Source information
------------------

  Option to process source contributions:
         0 =  Process only total reported contributions
         1 =  Sum all individual source contributions and process
         2 =  Run in TRACEBACK mode to identify source
              contributions at a SINGLE receptor
                             (MSOURCE) -- Default: 0   ! MSOURCE =  0  !


Plume Model Output Processing Options
-------------------------------------

  Output from models other than CALPUFF and CALGRID can be written in
  the CONC.DAT format and processed by CALPOST.  Plume models such as
  AERMOD typically do not treat CALM hours, and do not include such hours
  in multiple-hour averages, with specific rules about how many calm hours
  can be removed from an average.  This treatment is known as CALM
  PROCESSING.  Calm periods are identified from wind speeds in the
  meteorological data file for the application, which must be identified
  in Input Group 0 as the single-point meteorological data file MET1DAT.
         0 =  Option is not used for CALPUFF/CALGRID output files
         1 =  Apply CALM processing procedures to multiple-hour averages
                           (MCALMPRO) -- Default: 0   ! MCALMPRO =  0  !

  Format of Single-point Met File
         1 =  AERMOD/AERMET SURFACE file
                            (MET1FMT) -- Default: 1   ! MET1FMT =  1  !


Receptor information
--------------------

  Gridded receptors processed?    (LG) -- Default: F   ! LG  = F  !
  Discrete receptors processed?   (LD) -- Default: F   ! LD  = T  !
  CTSG Complex terrain receptors processed?
                                  (LCT) -- Default: F   ! LCT = F  !

--Report results by DISCRETE receptor RING?
  (only used when LD = T)     (LDRING) -- Default: F   ! LDRING = F  !
```

```
--Select range of DISCRETE receptors (only used when LD = T):

  Select ALL DISCRETE receptors by setting NDRECP flag to -1;
                              OR
  Select SPECIFIC DISCRETE receptors by entering a flag (0,1) for each
     0 = discrete receptor not processed
     1 = discrete receptor processed
  using repeated value notation to select blocks of receptors:
     23*1, 15*0, 12*1
  Flag for all receptors after the last one assigned is set to 0
  (NDRECP) -- Default: -1
                                            ! NDRECP =  -1  !


--Select range of GRIDDED receptors (only used when LG = T):

       X index of LL corner (IBGRID) -- Default: -1     ! IBGRID = -1  !
           (-1 OR 1 <= IBGRID <= NX)

       Y index of LL corner (JBGRID) -- Default: -1     ! JBGRID = -1  !
           (-1 OR 1 <= JBGRID <= NY)

       X index of UR corner (IEGRID) -- Default: -1     ! IEGRID = -1  !
           (-1 OR 1 <= IEGRID <= NX)

       Y index of UR corner (JEGRID) -- Default: -1     ! JEGRID = -1  !
           (-1 OR 1 <= JEGRID <= NY)

  Note: Entire grid is processed if IBGRID=JBGRID=IEGRID=JEGRID=-1


--Specific gridded receptors can also be excluded from CALPOST
  processing by filling a processing grid array with 0s and 1s.  If the
  processing flag for receptor index (i,j) is 1 (ON), that receptor
  will be processed if it lies within the range delineated by IBGRID,
  JBGRID,IEGRID,JEGRID and if LG=T. If it is 0 (OFF), it will not be
  processed in the run.  By default, all array values are set to 1 (ON).

  Number of gridded receptor rows provided in Subgroup (1a) to
  identify specific gridded receptors to process
                           (NGONOFF) -- Default: 0      ! NGONOFF =  0  !

!END!


--------------
Subgroup (1a) -- Specific gridded receptors included/excluded
--------------

    Specific gridded receptors are excluded from CALPOST processing
    by filling a processing grid array with 0s and 1s.  A total of
    NGONOFF lines are read here.  Each line corresponds to one 'row'
    in the sampling grid, starting with the NORTHERNMOST row that
    contains receptors that you wish to exclude, and finishing with
    row 1 to the SOUTH (no intervening rows may be skipped).  Within
    a row, each receptor position is assigned either a 0 or 1,
    starting with the westernmost receptor.
       0 = gridded receptor not processed
       1 = gridded receptor processed
```

```
    Repeated value notation may be used to select blocks of receptors:
       23*1, 15*0, 12*1

    Because all values are initially set to 1, any receptors north of
    the first row entered, or east of the last value provided in a row,
    remain ON.

    (NGXRECP) -- Default: 1


-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Visibility Parameters (ASPEC = VISIB)
--------------

    Test visibility options specified to see
    if they conform to FLAG 2010 configuration?
                           (MVISCHECK) -- Default: 1   ! MVISCHECK =   0  !
         0 =  NO checks are made
         1 =  Technical options must conform to FLAG 2010 visibility guidance
                ASPEC = VISIB
                LVNO2 = T
                NO2CALC = 1
                RNO2NOX = 1.0
                MVISBK = 8
                M8_MODE = 5

    Some of the data entered for use with the FLAG 2010 configuration
    are specific to the Class I area being evaluated. These values can
    be checked within the CALPOST user interface when the name of the
    Class I area is provided.

    Name of Class I Area (used for QA purposes only)
                            (AREANAME) -- Default: User  ! AREANAME =  USER !

    Particle growth curve f(RH) for hygroscopic species
                                (MFRH) -- Default: 4   ! MFRH   =  2  !

         1 =  IWAQM (1998) f(RH) curve (originally used with MVISBK=1)
         2 =  FLAG (2000) f(RH) tabulation
         3 =  EPA (2003) f(RH) tabulation
         4 =  IMPROVE (2006) f(RH) tabulations for sea salt, and for small and
              large SULFATE and NITRATE particles;
              Used in Visibility Method 8 (MVISBK = 8 with M8_MODE = 1, 2, or 3)

    Maximum relative humidity (%) used in particle growth curve
                              (RHMAX) -- Default: 98  ! RHMAX  = 98 !

    Modeled species to be included in computing the light extinction
     Include SULFATE?          (LVSO4) -- Default: T   ! LVSO4  = T  !
     Include NITRATE?          (LVNO3) -- Default: T   ! LVNO3  = T  !
     Include ORGANIC CARBON?   (LVOC)  -- Default: T   ! LVOC   = F  !
     Include COARSE PARTICLES? (LVPMC) -- Default: T   ! LVPMC  = F  !
     Include FINE PARTICLES?   (LVPMF) -- Default: T   ! LVPMF  = F  !
     Include ELEMENTAL CARBON? (LVEC)  -- Default: T   ! LVEC   = T  !
     Include NO2 absorption?   (LVNO2) -- Default: F   ! LVNO2  = T  !
              With Visibility Method 8 -- Default: T
                                          FLAG (2010)

    And, when ranking for TOP-N, TOP-50, and Exceedance tables,
     Include BACKGROUND?       (LVBK)  -- Default: T   ! LVBK   = T  !
```

```
    Species name used for particulates in MODEL.DAT file
                   COARSE    (SPECPMC) -- Default: PMC ! SPECPMC = PMC !
                   FINE      (SPECPMF) -- Default: PMF ! SPECPMF = PMF !

Extinction Efficiency (1/Mm per ug/m**3)
----------------------------------------
    MODELED particulate species:
               PM  COARSE      (EEPMC) -- Default: 0.6   ! EEPMC  = 0.6 !
               PM  FINE        (EEPMF) -- Default: 1.0   ! EEPMF  = 1 !
    BACKGROUND particulate species:
               PM  COARSE    (EEPMCBK) -- Default: 0.6   ! EEPMCBK = 0.6 !
    Other species:
              AMMONIUM SULFATE (EESO4) -- Default: 3.0   ! EESO4  = 3 !
              AMMONIUM NITRATE (EENO3) -- Default: 3.0   ! EENO3  = 3 !
              ORGANIC CARBON   (EEOC)  -- Default: 4.0   ! EEOC   = 4 !
              SOIL             (EESOIL)-- Default: 1.0   ! EESOIL = 1 !
              ELEMENTAL CARBON (EEEC)  -- Default: 10.   ! EEEC   = 10 !
              NO2 GAS          (EENO2) -- Default: .1755 ! EENO2  = 0.17 !
    Visibility Method 8:
              AMMONIUM SULFATE (EESO4S)   Set Internally (small)
              AMMONIUM SULFATE (EESO4L)   Set Internally (large)
              AMMONIUM NITRATE (EENO3S)   Set Internally (small)
              AMMONIUM NITRATE (EENO3L)   Set Internally (large)
              ORGANIC CARBON   (EEOCS)    Set Internally (small)
              ORGANIC CARBON   (EEOCL)    Set Internally (large)
              SEA SALT         (EESALT)   Set Internally

Background Extinction Computation
---------------------------------

    Method used for the 24h-average of percent change of light extinction:
    Hourly ratio of source light extinction / background light extinction
    is averaged?               (LAVER) -- Default: F   ! LAVER = F  !


    Method used for background light extinction
                             (MVISBK) -- Default: 8   ! MVISBK =  2  !
                                         FLAG (2010)

         1 =  Supply single light extinction and hygroscopic fraction
              - Hourly F(RH) adjustment applied to hygroscopic background
                and modeled sulfate and nitrate
         2 =  Background extinction from speciated PM concentrations (A)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - F(RH) factor is capped at F(RHMAX)
         3 =  Background extinction from speciated PM concentrations (B)
              - Hourly F(RH) adjustment applied to observed and modeled sulfate
                and nitrate
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         4 =  Read hourly transmissometer background extinction measurements
              - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
              - Hour excluded if measurement invalid (missing, interference,
                or large RH)
              - Receptor-hour excluded if RH>RHMAX
              - Receptor-day excluded if fewer than 6 valid receptor-hours
         5 =  Read hourly nephelometer background extinction measurements
              - Rayleigh extinction value (BEXTRAY) added to measurement
              - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
```

```
          - Hour excluded if measurement invalid (missing, interference,
            or large RH)
          - Receptor-hour excluded if RH>RHMAX
          - Receptor-day excluded if fewer than 6 valid receptor-hours
     6 =  Background extinction from speciated PM concentrations
          - FLAG (2000) monthly RH adjustment factor applied to observed and
            and modeled sulfate and nitrate
     7 =  Use observed weather or prognostic weather information for
          background extinction during weather events; otherwise, use Method 2
          - Hourly F(RH) adjustment applied to modeled sulfate and nitrate
          - F(RH) factor is capped at F(RHMAX)
          - During observed weather events, compute Bext from visual range
            if using an observed weather data file, or
          - During prognostic weather events, use Bext from the prognostic
            weather file
          - Use Method 2 for hours without a weather event
     8 =  Background extinction from speciated PM concentrations using
          the IMPROVE (2006) variable extinction efficiency formulation
          (MFRH must be set to 4)
          - Split between small and large particle concentrations of
            SULFATES, NITRATES, and ORGANICS is a function of concentration
            and different extinction efficiencies are used for each
          - Source-induced change in visibility includes the increase in
            extinction of the background aerosol due to the change in the
            extinction efficiency that now depends on total concentration.
          - Fsmall(RH) and Flarge(RH) adjustments for small and large
            particles are applied to observed and modeled sulfate and
            nitrate concentrations
          - Fsalt(RH) adjustment for sea salt is applied to background
            sea salt concentrations
          - F(RH) factors are capped at F(RHMAX)
          - RH for Fsmall(RH), Flarge(RH), and Fsalt(RH) may be obtained
            from hourly data as in Method 2 or from the FLAG monthly RH
            adjustment factor used for Method 6 where EPA F(RH) tabulation
            is used to infer RH, or monthly Fsmall, Flarge, and Fsalt RH
            adjustment factors can be directly entered.
            Furthermore, a monthly RH factor may be applied to either hourly
            concentrations or daily concentrations to obtain the 24-hour
            extinction.
            These choices are made using the M8_MODE selection.

Additional inputs used for MVISBK = 1:
--------------------------------------
 Background light extinction (1/Mm)
                         (BEXTBK) -- No default   ! BEXTBK = 12 !
 Percentage of particles affected by relative humidity
                         (RHFRAC) -- No default   ! RHFRAC = 10 !

Additional inputs used for MVISBK = 6,8:
----------------------------------------
 Extinction coefficients for hygroscopic species (modeled and
 background) are computed using a monthly RH adjustment factor
 in place of an hourly RH factor (VISB.DAT file is NOT needed).
 Enter the 12 monthly factors here (RHFAC).  Month 1 is January.

 (RHFAC)  -- No default     ! RHFAC = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !

Additional inputs used for MVISBK = 7:
--------------------------------------
```

```
 The weather data file (DATSAV abbreviated space-delimited) that
 is identified as VSRN.DAT may contain data for more than one
 station.  Identify the stations that are needed in the order in
 which they will be used to obtain valid weather and visual range.
 The first station that contains valid data for an hour will be
 used.  Enter up to MXWSTA (set in PARAMS file) integer station IDs
 of up to 6 digits each as variable IDWSTA, and enter the corresponding
 time zone for each, as variable TZONE (= UTC-LST).

 A prognostic weather data file with Bext for weather events may be used
 in place of the observed weather file.  Identify this as the VSRN.DAT
 file and use a station ID of IDWSTA = 999999, and TZONE = 0.

 NOTE:  TZONE identifies the time zone used in the dataset.  The
        DATSAV abbreviated space-delimited data usually are prepared
        with UTC time rather than local time, so TZONE is typically
        set to zero.

 (IDWSTA)   -- No default   * IDWSTA = 000000 *
 (TZONE)    -- No default   * TZONE =      0. *

Additional inputs used for MVISBK = 2,3,6,7,8:
----------------------------------------------
 Background extinction coefficients are computed from monthly
 CONCENTRATIONS of ammonium sulfate (BKSO4), ammonium nitrate (BKNO3),
 coarse particulates (BKPMC), organic carbon (BKOC), soil (BKSOIL), and
 elemental carbon (BKEC).  Month 1 is January.
 (ug/m**3)

 (BKSO4)  -- No default     ! BKSO4 = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !
 (BKNO3)  -- No default     ! BKNO3 = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !
 (BKPMC)  -- No default     ! BKPMC = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !
 (BKOC)   -- No default     ! BKOC  = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !
 (BKSOIL) -- No default     ! BKSOIL= 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !
 (BKEC)   -- No default     ! BKEC  = 0, 0, 0, 0,
                                      0, 0, 0, 0,
                                      0, 0, 0, 0 !

Additional inputs used for MVISBK = 8:
--------------------------------------
 Extinction coefficients for hygroscopic species (modeled and
 background) may be computed using hourly RH values and hourly
 modeled concentrations, or using monthly RH values inferred from
 the RHFAC adjustment factors and either hourly or daily modeled
 concentrations, or using monthly RHFSML, RHFLRG, and RHFSEA adjustment
 factors and either hourly or daily modeled concentrations.

 (M8_MODE) -- Default: 5     ! M8_MODE=  3   !
              FLAG (2010)

      1 = Use hourly RH values from VISB.DAT file with hourly
```

```
                modeled and monthly background concentrations.
            2 = Use monthly RH from monthly RHFAC and EPA (2003) f(RH) tabulation
                with hourly modeled and monthly background concentrations.
                (VISB.DAT file is NOT needed).
            3 = Use monthly RH from monthly RHFAC with EPA (2003) f(RH) tabulation
                with daily modeled and monthly background concentrations.
                (VISB.DAT file is NOT needed).
            4 = Use monthly RHFSML, RHFLRG, and RHFSEA with hourly modeled
                and monthly background concentrations.
                (VISB.DAT file is NOT needed).
            5 = Use monthly RHFSML, RHFLRG, and RHFSEA with daily modeled
                and monthly background concentrations.
                (VISB.DAT file is NOT needed).

     Background extinction coefficients are computed from monthly
     CONCENTRATIONS of sea salt (BKSALT).  Month 1 is January.
     (ug/m**3)

     (BKSALT) -- No default     ! BKSALT= 0, 0, 0, 0,
                                          0, 0, 0, 0,
                                          0, 0, 0, 0 !

     Extinction coefficients for hygroscopic species (modeled and
     background) can be computed using monthly RH adjustment factors
     in place of an hourly RH factor (VISB.DAT file is NOT needed).
     Enter the 12 monthly factors here (RHFSML,RHFLRG,RHFSEA).
     Month 1 is January.  (Used if M8_MODE = 4 or 5)

     Small ammonium sulfate and ammonium nitrate particle sizes
     (RHFSML) -- No default     ! RHFSML= 0, 0, 0, 0,
                                          0, 0, 0, 0,
                                          0, 0, 0, 0 !

     Large ammonium sulfate and ammonium nitrate particle sizes
     (RHFLRG) -- No default     ! RHFLRG= 0, 0, 0, 0,
                                          0, 0, 0, 0,
                                          0, 0, 0, 0 !

     Sea salt particles
     (RHFSEA) -- No default     ! RHFSEA= 0, 0, 0, 0,
                                          0, 0, 0, 0,
                                          0, 0, 0, 0 !

    Additional inputs used for MVISBK = 2,3,5,6,7,8:
    ------------------------------------------------
     Extinction due to Rayleigh scattering is added (1/Mm)
                            (BEXTRAY) -- Default: 10.0 ! BEXTRAY = 10 !

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output options
--------------

Documentation
-------------

    Documentation records contained in the header of the
    CALPUFF output file may be written to the list file.
    Print documentation image?
                                (LDOC) -- Default: F   !  LDOC = F !
```

```
Types of tabulations reported
-----------------------------

   1) Visibility: daily visibility tabulations are always reported
                  for the selected receptors when ASPEC = VISIB.
                  In addition, any of the other tabulations listed
                  below may be chosen to characterize the light
                  extinction coefficients.
                  [List file or Plot/Analysis File]


   2) Top 50 table for each averaging time selected
      [List file only]
                          (LT50) -- Default: T   !   LT50 = F  !

   3) Top 'N' table for each averaging time selected
      [List file or Plot file]
                        (LTOPN) -- Default: F   !  LTOPN = T  !

        -- Number of 'Top-N' values at each receptor
           selected (NTOP must be <= 4)
                          (NTOP) -- Default: 4   ! NTOP =  2   !

        -- Specific ranks of 'Top-N' values reported
           (NTOP values must be entered)
                  (ITOP(4) array) -- Default:     ! ITOP =  1, 8  !
                                     1,2,3,4

        -- Screen applied to values before updating stored ranks
                        (ITOPS) -- Default: 0   ! ITOPS =  1   !

           0 = No screen: all values at each receptor are ranked
                         (rank 1 and rank 2 may be in same day)
           1 = Day screen: only peak value in day at each receptor
                          is ranked
                         (rank 1 and rank 2 may not be in same day)


   4) Threshold exceedance counts for each receptor and each averaging
      time selected
      [List file or Plot file]
                        (LEXCD) -- Default: F   !  LEXCD = F  !


        -- Counts for the shortest averaging period selected can be
           tallied daily, and receptors that experience more than NCOUNT
           counts over any NDAY period will be reported.  This type of
           exceedance violation output is triggered only if NDAY > 0.

           Accumulation period(Days)
                          (NDAY) -- Default: 0   !    NDAY =  0  !
           Number of exceedances allowed
                         (NCOUNT) -- Default: 1   !  NCOUNT =  1  !


   5) Selected day table(s)

      Echo Option -- Many records are written each averaging period
      selected and output is grouped by day
```

```
      [List file or Plot file]
                          (LECHO) -- Default: F   !  LECHO = F  !

      Timeseries Option -- Averages at all selected receptors for
      each selected averaging period are written to timeseries files.
      Each file contains one averaging period, and all receptors are
      written to a single record each averaging time.
      [TSERIES_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                          (LTIME) -- Default: F   !  LTIME = F  !

      Peak Value Option -- Averages at all selected receptors for
      each selected averaging period are screened and the peak value
      each period is written to timeseries files.
      Each file contains one averaging period.
      [PEAKVAL_ASPEC_ttHR_CONC_TSUNAM.DAT files]
                          (LPEAK) -- Default: F   !  LPEAK = F  !

        -- Days selected for output
                      (IECHO(366)) -- Default: 366*0
           ! IECHO  = 366*0  !
           (366 values must be entered)

Plot output options
-------------------

     Plot files can be created for the Top-N, Exceedance, and Echo
     tables selected above.  Several formats for these files are available:
      - Tabular listings for ALL selected receptors, reporting the (x,y)
        location and value(s) in columns
          .DAT -- Columns are formatted for direct viewing in text editors
          .CSV -- Columns are delimited by commas
      - Raster formats in which results at GRIDDED receptors ONLY are
        written using a compact representation.
          .GRD -- SURFER(R) plotting software format
          .ASC -- ESRI ASCII Grid format
     The CSV (comma-separated-variable) format is useful for importing
     results into software that automatically recognizes CSV files.
     The SURFER and ESRI raster formats are similar, but are specific
     to the type of software indicated.  GRD files can be read directly
     into SURFER.  ASC files can be read into ArcMap/ArcGIS systems.

     Generate Plot file output in addition to writing tables
     to List file (ECHO goes to either List or Plot)?
                                 (LPLT) -- Default: F   ! LPLT  = T !

     Plot cumulative values in addition to incremental values?
                                 (LCUM) -- Default: F   ! LCUM = F !

     Plot file format?         (PLOTFM) -- Default: 1   ! PLOTFM =  2  !

          1 = .DAT  CALVIEW/SURFER (formatted columns)
          2 = .CSV  ArcMap/ArcGIS  (comma-separated-variable columns)
          3 = .GRD  CALVIEW/SURFER (SURFER 2D grid raster format)
          4 = .ASC  ArcMap/ArcGIS  (ESRI ASCII 2D grid raster format)


Auxiliary Output Files (for subsequent analyses)
-----------------------------------------------

      Visibility
```

```
      A separate output file may be requested that contains the change
      in visibility at each selected receptor when ASPEC = VISIB.  This
      file can be processed to construct visibility measures that are
      not available in CALPOST.

      Output file with the visibility change at each receptor?
                              (MDVIS) -- Default: 0   ! MDVIS  =  0  !

           0 =  Do Not create file
           1 =  Create file of DAILY (24 hour) Delta-Deciview
           2 =  Create file of DAILY (24 hour) Extinction Change (%)
           3 =  Create file of HOURLY Delta-Deciview
           4 =  Create file of HOURLY Extinction Change (%)


Additional Debug Output
-----------------------

   Output selected information to List file
    for debugging?
                               (LDEBUG) -- Default: F  ! LDEBUG  = F !

   Output hourly extinction information to REPORT.HRV?
    (Visibility Method 7)
                              (LVEXTHR) -- Default: F  ! LVEXTHR = F !

!END!
-------------------------------------------------------------------------------

INPUT GROUP: 4 -- Species processing information
--------------

Definitions:
------------

      Species to process        (ASPEC) -- No default
      Notes --
        a. ASPEC = VISIB for visibility processing

      Layer/deposition code    (ILAYER) -- Default: 1
        '1'  for CALPUFF concentrations,
        '-1' for dry deposition fluxes,
        '-2' for wet deposition fluxes,
        '-3' for wet+dry deposition fluxes.
      Notes --
        a. Use actual model layer when processing
           3D gridded concentration data

      Units for Output          (IPRTU) -- Default: 0
                Concentration Deposition
                -------------    ----------
      -4 =         ppt                        parts per trillion
      -3 =         ppb                        parts per billion
      -2 =         ppm                        parts per million
      -1 =         %                          percent
       0 =        (data)         (data)       use units from data file
       1 =         g/m**3         g/m**2/s
       2 =        mg/m**3        mg/m**2/s
       3 =        ug/m**3        ug/m**2/s
       4 =        ng/m**3        ng/m**2/s
       5 =      Odour Units
```

```
      11 =        TBq/m**3       TBq/m**2/s    TBq=terabecquerel
      12 =        GBq/m**3       GBq/m**2/s    GBq=gigabecquerel
      13 =         Bq/m**3        Bq/m**2/s    Bq=becquerel (disintegrations/s)
      Notes --
        a. Use IPRTU=0 to retain the units in the data file
        b. Mass concentration output units (e.g. ug/m**3) are allowed
           only if input data are in mass concentration units
        c. Volume concentration output units (e.g. ppb) are allowed
           only if input data are in volume concentration units
        d. Radiation output units (e.g. GBq/m**3) are allowed
           only if input data are in radiation units
        e. Visibility extinction expressed in 1/Mega-meters (IPRTU is ignored)

      Scaling of the form:  X(new) = X(old) * A + B
      Multiplicative Factor           (A) -- Default:  0.0
      Additive Term                   (B) -- Default:  0.0
      Notes --
        a. Scaling is NOT applied if A = B = 0.0
        b. Additive term B must be provided in the IPRTU output units

      Averaging time(s) reported
        1-pd averages           (L1PD) -- Default: T
        (pd = averaging period of model output)
        1-hr averages           (L1HR) -- Default: T
        3-hr averages           (L3HR) -- Default: T
        24-hr averages         (L24HR) -- Default: T
        Run-length averages    (LRUNL) -- Default: T
        User-specified averaging time in hours, minutes, seconds
        (results for averaging time are reported if it is not zero)
                               (NAVGH) -- Default: 0
                               (NAVGM) -- Default: 0
                               (NAVGS) -- Default: 0

      Threshold concentrations (output units)
      used to tally threshold exceedance counts for each averaging time
      (used only if LEXCD = T)
        Threshold for  1-hr averages   (THRESH1) -- Default: -1.0
        Threshold for  3-hr averages   (THRESH3) -- Default: -1.0
        Threshold for 24-hr averages  (THRESH24) -- Default: -1.0
        Threshold for NAVG-hr averages (THRESHN) -- Default: -1.0


Values:
-------

    Assign NSPEC comma-separated values on a line for each of the variables
    in this group to identify which species are processed, and to provide
    species-related inputs.
    Species names must have 12 non-blank characters or less.
    Visibility applications must have only 1 species, and it must be VISIB.

    Variable Default  Assignment (VARIABLE = v(1), v(2), ... v(NSPEC))
    -------- -------  ------------------------------------------------
    Species  (none)  !ASPEC   = NOX          !
    Layer      1     !ILAYER  = 1            !
    Units      1     !IPRTU   = 3            !
    Multiply  0.0    !A       = 0.00000E00   !
    Add       0.0    !B       = 0.00000E00   !
    Averages --
    1-pd       T     !L1PD    = F            !
    1-hr       T     !L1HR    = T            !
```

```
  3-hr       T     !L3HR    = F            !
  24-hr      T     !L24HR   = F            !
  Run-length T     !LRUNL   = T            !
  User-Hr    0     !NAVGH   = 0            !
  User-Min   0     !NAVGM   = 0            !
  User-Sec   0     !NAVGS   = 0            !
  Exceedance Thresholds --
  1-hr     -1.0    !THRESH1 = 1.00000E01   !
  3-hr     -1.0    !THRESH3 = -1.00000E00  !
  24-hr    -1.0    !THRESH24= -1.00000E00  !
  NAVG-hr  -1.0    !THRESHN = -1.00000E00  !

!END!
```

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COMMITMENT & INTEGRITY DRIVE RESULTS

Appendix F: Waste and Discharge Information

WASTE TABLE FOR DRILL SHIPS

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

Asset Name:	Auriga			Number of operational days per well / No. of wells:	days	wells	Total number of operational days:	360	4 wells, 90 days each for D&C, 360 d total
					90	4			
Well Name: ATP3	Projected generated waste		Solid and Liquid Wastes transportation	Waste Disposal					
Type of Waste	Composition		Transport Method	Name/Location of Facility	Quantity / Well	Units	Total Quantity	Units	Disposal Method
Will drilling occur ? If yes, fill in the muds and cuttings.									
Unused Synthetic-based drilling fluid	SBM from service - has not been downhole		Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	2377	bbls/well	9506	bbls	For Reclamation & re-use
Synthetic-based drilling mud solids and barite	SBM and barite from pit cleanout		Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fouchon, LA	600	bbls/well	2400	bbls	Landfill/ Deepwell injection on land
Contaminated Synthetic base mud	SBM interface		Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon, LA	333	bbls/well	1330	bbls	Landfill/ Deepwell injection on land
Used Synthetic base mud - from downhole	SBM from downhole - sent in to vendor for reuse		Liquid mud storage on workboat	Baroid / MI Swaco Fouchon LA	9653	bbls/well	38612	bbls	For Reclamation & re-use
Drilling mud contaminated absorbents	Absorbent pads contaminated with drilling muds		Barged in (Omega 2 yard boxes)	Omega Waste Management, Patterson, LA	2	tons/well	8	tons	Recycle
Excess barite	Excess barite from vessel tank cleaning		Barged in (supersacks)	River Birch Landfill, Avondale, LA	4	tons/well	14.98	tons	Reuse / Landfill
Excess cement	Excess cement from vessel tank cleaning		Barged in (supersacks)	River Birch Landfill, Avondale, LA	20	tons/well	80	tons	Reuse / Landfill
Rig Drilling washwater	Cleaning out of mud tanks		Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360, Fourchon LA	2400	bbls/well	9600	bbls	Landfill/ Deepwell injection on land
Contaminated Completion Fluids	Used Completion fluids		Barged in (15 or 25 barrel cutting boxes)	Ecoserv / R360 Fourchon LA	1000	bbls/well	4000	bbls	Landfill/ Deepwell injection on land
Completion Fluids	Used Completion fluids		Liquid storage tanks on workboat	Ecoserv / MI Swaco Fourchon LA	3000	bbls/well	12000	bbls	Landfill/ Deepwell injection on land

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

Asset Name:	Auriga			Number of operational days per well / No. of wells:	days 90	wells 4	Total number of operational days:	360	4 wells, 90 days each for D&C, 360 d total
Well Name: ATP3	Projected generated waste		Solid and Liquid Wastes transportation	Waste Disposal					
Type of Waste	Composition		Transport Method	Name/Location of Facility	Quantity / Well	Units	Total Quantity	Units	Disposal Method
Will you produce hydrocarbons? If yes fill in for produced sand.									
Will you have additional wastes that are not permitted for discharge? If yes, fill in the appropriate rows.									
Well Related Hazardous Waste	Rig lab titrations containing isopropanol alcohol, silver nitrate etc.		Barged in (5 gallon DOT containers)	Chemical Waste Management, Sulphur, LA	0.054	ton/well	0.216	tons	Incineration / Landfill
Rig Maintenance Wastes (painting, blasting)	Paint thinner, paint chips, blast media, aerosol cans		Barged in (drums or totes)	River Birch Landfill, Avondale, LA and Chemical Waste Management, Sulphur, LA	27	ton/well	108	tons	Incineration / Landfill
Rig Maintenance Wastes (non hazardous)	Oily rags, pads, oil filters etc.		Barged in (totes)	Omega Waste Management, Patterson, LA	12.6	ton/well	50.4	tons	Reuse / Landfill
Rig Used oil	Lube oil, hydraulic oil, glycol		Barged in (drums)	Omega Waste Management, Patterson, LA	5.4	bbls/well	21.6	bbls	Recycle
Domestic waste	Municipal trash		Barged in (supersacks)	River Birch Landfill, Avondale, LA	2.25	ton/well	9	tons	Incineration / Landfill
Scrap Metal	scrap piping, grating and other metals		Barged in (scrap baskets)	Southern Scrap, Houma, LA	20.7	ton/well	82.8	tons	Recycle
Universal Waste	Batteries		Barged in (DOT drums)	LEI, Hammond, LA	0.36	ton/well	1.44	tons	Recycle
Universal Waste	Fluorescent light bulbs		Barged in (DOT drums)	LEI, Hammond, LA	0.09	ton/well	0.36	tons	Recycle
Misc. unused chemical	Pills, spacers, additives etc.		Barged in (totes)	River Birch Landfill, Avondale, LA	306	bbls/well	1224	bbls	Recycle
Oily water	Washwater rig equipment		Transported in (15 barrel cuttings boxes)	Omega Waste Management, Patterson, LA	103.5	bbls/well	414	bbls	Recycle
Recyclyed materials	Plastic, paper, aluminum		Barged in (supersacks)	RTG/Hoover Ferguson, Iberia, LA	2.7	ton/well	10.8	tons	Recycle

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

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

ATP3 - Addition of 7 Well locations in Atlantis Field.

Basis: [Estimated 90 Days Per Well]

-Drilling & Completing 4 wells: 1) DC802 Drilling: 35 day/ DC802 Completions: 50 days; 2) DC803 Drilling: 35 days / DC803 Completions: 50 days; 3) DC227 Drilling: 40 days / DC227 Completions: 50 days, 4) DC228 Drilling: 40 days/ DC228 Completions: 50 days

-All wells slotted to be completed on the West Auriga

Type of Waste	Composition	Projected Amount	Projected ocean discharges: Discharge Rate	Discharge Method	Projected Downhole Disposal: Answer yes or no
Will drilling occur ? If yes, you should list muds and cuttings					
Water Based Fluid	Spent drilling fluid drilling riserless hole plus pad mud to fill the hole	65,000 bbl/well	90 days @ 722 bbl/day	Seafloor	No
Cuttings wetted with Water Based Fluid	Water base interval	4,865 bbl/well	90 days @ 54 bbl/day	Seafloor	No
Excess Cement Slurry	Excess mixed cement, including additives & waste from equipment wash down after a cement operation	50 bbl/well	4 cmt jobs @ 12.50 bbl/cmt job	Surface	No
Cuttings wetted with Synthetic Based Fluid	Drill cuttings, cement cuttings, & synthetic base mud retained on cuttings	3,786 bbl/well	90 days @ 42 bbl/day	Surface	No
Small Volume Drilling Fluid Discharges associated with Cuttings	Displaced interfaces, accumulated solids in sand traps, pit clean-out solids, & centrifuge discharges made while changing the mud weight	330 bbl/well	90 days @ 4 bbl/day	Surface	No
Cement transfer losses	Bulk transfer between vessels	750 sks/well	4 events @ 188 sks/event	Surface	No
Barite transfer losses	Bulk transfer between vessels	360 sks/well	4 events @ 90 sks/event	Surface	No
Will humans be there? If yes, expect conventional waste					
Domestic Waste / Gray Water	Food waste, drainage from dishwasher, shower, laundry, bath, & washbasin drains	21,412 bbl/well	90 days @ 238 bbl/day	Surface	No
Sanitary Waste	Treated human body waste discharged from toilets & urinals	8,910 bbl/well	90 days @ 99 bbl/day	Surface	No
Is there a deck? If yes, there will be Deck Drainage					
Deck Drainage	Deck washdown & rain water	25,418 bbl/well	90 days @ 282 bbl/day (avg)	Surface	No
Will you conduct well treatment, completion, or workover?					
Well Treatment Fluids	Stimulations fluids including acids, solvents & propping agents	1,500 bbl/well	1 events @ 750 bbl/event	Surface	No
Completion Fluids	Salt solutions, weighted brines, polymers & various additives	3,000 bbl/well	90 days @ 60 bbl/day	Surface	No
Workover Fluids - **If applicable**	Salt solutions, weighted brines, polymers, & other speciality additives	1,000 bbl/well	90 days @ 11 bbl/day	Surface	No
Miscellaneous discharges. If yes, only fill in those associated with your activity.					
Desalinization Unit Discharge	Wastewater associated with the process of creating freshwater from seawater	99,000 bbl/well	90 days @ 1100 bbl/day	Surface	No
Blowout Preventer Fluid	Fluid used to actuate the hydraulic equipment on the BOP	300 bbl/well	90 events @ 3.333333333 bbl/event	N/A	N/A
Uncontaminated Ballast Water	Uncontaminated seawater added or removed to maintain proper draft	247,500 bbl/well	90 days @ 2,750 bbl/day (avg)	Surface	No
Uncontaminated Bilge Water	Water that collects in the vessels bilge	1,980 bbl/well	90 days @ 22 bbl/day (avg)	Surface	N/A
Cement discharged at seafloor	Excess mixed cement slurry	1,893 bbl/well	4 event @ bbl/day	Seafloor	No
Fire Water	Uncontaminated seawater/freshwater used for fire control	19,800 bbl/well	90 days @ 1,540 bbl/week	Surface	No
Cooling Water / Utility Water	Uncontaminated seawater	69,300 bbl/well	90 days @ 770 bbl/day	Surface	No
Sea Water / Fresh Water that has been Chemically Treated	Biocide, corrosion inhibitors, or other chemicals used to prevent corrosion or fouling of piping or equipment	50 bbl/well	1 event @ 50 bbl/event	Surface	No
Sub Sea Fluid Discharges	Wellhead Preservation, Hydrate Control, Umbilical Steel Tube Storage, Leak Tracer, & Riser Tensioner Fluids	N/A bbl/well	N/A event @ #VALUE! bbl/event	N/A	N/A
Will you produce hydrocarbons? If yes fill in for produced water.					
Produced Water	Water brought up from hydrocarbon-bearing strata during extraction of oil & gas	17,641,800	90 days @ 0 bbl/day	N/A	N/A
Will you be covered by an individual or General NPDES permit ?		**GEG460000**			

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

Red = Drlg Eng, **Yellow** = Completion Eng, **Blue** = Waste Specialist, **Green = Calculator Tool**

Appendix G: Oil Spill Response Discussion

SPILL RESPONSE DISCUSSION

1) Worst Case Discharge Scenario

Under this Supplemental DOCD, BP Exploration & Production Inc. (BP) proposes to drill and complete four (4) wells (DC802, DC803, DC227, and DC228) in Southern Green Canyon, Block 743 using a Mobile Offshore Drilling Unit (MODU) or Drillship. Two wells, DC227 and DC228 are re-spud locations for two previously drilled wells which did not reach final target depth. Two wells, DC802 and DC802 are new wells intended to be water injectors for the Atlantis Field.

The proposed four wells and 3 contingency well locations do not result in a change to the worst case oil spill scenario described in the previous DOCD S-7530 dated (May 7, 2012), approved on July 13, 2012 (MS 5231). The worst case oil spill scenario described in DOCD S-7530 is based upon an uncontrolled blowout with a discharge rate determined in accordance with 30 CFR 254.47(b). The uncontrolled blowout scenario described in DOCD S-7530 is more particularly described below:

The uncontrolled blowout scenario is for a potential blowout of the DC312 development well (bottom hole location in GC-699) which BP calculates has the highest liquid hydrocarbons rate potential in the Atlantis Project area. The blowout scenario assumes that the pipe has been tripped out of the hole when a problem with the wellhead connector develops resulting in the removal of the BOP stack. Due to the loss of riser margin, the well flows unrestricted. Day 1, with a worst case discharge of approximately 179,400 bpd, shown with the calculation support package submitted with S-7530. The maximum duration of the blowout is estimated at 120-days (see relief well timing below). The rate profile associated with the well blowout over this 120-day period results in a potential worst case spill volume estimated at 18.8-mmbo.

The data and information presented in the following Sections 2) – 9) of this Oil Spill Discussion relate to well GC 743 covered under previous DOCD S-7530, which BP believes to be analogous to the proposed activities that are covered under this Supplemental DOCD for the 8 wells that will be drilled and completed in GC 743.

2) Facility Information:

- Type of Operation: Drilling and completion
- Facility Name: Atlantis
- Area and Block: Green Canyon Block 743
- Latitude: 27˚ 15’ 1.551”
- Longitude: -90˚ 02’ 2.89”
- Distance to Shore: 121 miles
- Water Depth: Approximately 5,400 ft
- API Gravity: 25.5°
- Total Storage capacity (on-board rig): 26,804 bbls

3) Worst Case Discharge Volume

Description	Barrels of Oil
24 hour uncontrolled blowout	179,400
Loss resulting from rupture in lease term pipeline	1,648
Total worst case discharge volume	181,048

BP will make every effort to respond to the Worst Case Discharge as effectively as practicable. A description of the response equipment to contain and recover the Worst Case Discharge is shown in **Figure 3**, which outlines contracted

equipment, personnel, materials and support vessels as well as temporary storage equipment to respond to the worst case discharge. The list estimates individual times needed for procurement, load out, travel time to the site, and deployment. **Figure 3** also indicates how operations would be supported.

Using the estimated chemical and physical characteristics of crude oil, an ADIOS weathering model was run on a similar product from the ADIOS oil database. The results indicate 8% or approximately 14,484 barrels of crude oil would be evaporated/dispersed within 24 hours, with approximately 166,564 barrels remaining.

Natural Weathering Data: GC 743, Well DC312	**Barrels of Oil**
WCD Volume	181,048
Less 8% natural evaporation/dispersion	14,484
Remaining volume	166,564

4) Land Segment and Resource Identification

In compliance with NTL 2012-N06, BP has determined the land areas that could be potentially impacted by a potential oil spill using the BOEM Oil Spill Risk Analysis Model (OSRAM) for the Central and Western Gulf of Mexico available on the BOEM website. The results are shown in **Figure 1** below. The BOEM OSRAM identifies a 3% probability of impact to the shorelines of Cameron Parish, Louisiana and/or Plaquemines Parish, Louisiana within 30 days. **Figure 2** contains a list of environmental sensitivities found in Cameron Parish and Plaquemines Parish.

Cameron Parish includes the east side of Sabine Lake, Sabine National Wildlife Refuge, Calcasieu Lake, Lacassine National Wildlife Refuge (inland) and Grand Lake. Cameron Parish also includes the area along the coastline from Sabine Pass to Big Constance Lake in Rockefeller Wildlife Refuge. This region is composed of open public beaches, marshlands and swamps. It serves as a habitat for numerous birds, finfish and other animals, including several rare, threatened and endangered species.

Plaquemines Parish includes Barataria Bay, the Mississippi River Delta, Breton Sound and the affiliated islands and bays. This region includes sensitive habitat and serves as a migratory, breeding, feeding and nursery habitat for numerous species of wildlife. Beaches in this area vary in grain particle size and can be classified as fine sand, shell or perched shell beaches. Sandy and muddy tidal flats are also abundant.

Shoreline Type	**Description**
Fine Sand Beaches	Beaches with low slopes and a grain-size of 0.625 to 0.200 mm. Low percentage of shells and hash. Major fine sand beaches on the delta plain are found at Southwest Pass, Pelican Island and Chandeleur Island.
Perched Shell Beaches	Shoreline type where a thin shell beach overlies a fresh or salt marsh with an eroded marsh platform outcropping in the surf zone. Organic debris is common to this shoreline type. Where the marsh platform outcrops on the shoreline, it can become re-vegetated by marsh grass.
Shell Beaches	Shoreline types comprised of almost entirely of shell. Shell material may be in the form of shell hash or whole shells. Shell beaches form extremely steep beach faces. Major shell beaches on the delta plain are found at Point Au Fer and Shell Island.
Muddy Tidal Flats	Shoreline types comprised of broad intertidal areas consisting of mud and minor amounts of shell hash. The grain-size is smaller than 0.0625 mm. Muddy tidal flats are typically found in association with prograding river mouths. Major muddy tidal flats on the delta plain are found at the Mississippi and Atchafalaya River mouths.
Sandy Tidal Flats	Shoreline types comprised of broad intertidal areas consisting of fine and coarse grain sand and minor amounts of shell hash. Mean grain size is between 0.0625 and 0.4 mm. Typically found in association with barrier island and tidal inlet systems. This type of flat is submerged during each tidal cycle and at low tide may be 100-200 m wide. Slight changes in water levels can produce significant shoreline changes. Low water

Shoreline Type	Description
	levels can expose extensive tidal flat areas to oiling. Major sandy tidal flats on the delta plain are found at Barataria Bay and the Mississippi River mouth.

FIGURE 1
TRAJECTORY BY LAND SEGMENT

Conditional probabilities of a spill in Green Canyon Block 743 (GC 743) contacting shoreline segments have been projected utilizing BP's WCD and information in the BOEM Oil Spill Risk Analysis Model (OSRAM) (Ji et al., 2004) for the Central and Western Gulf of Mexico available on the BOEM website using 3, 10, and 30 day impact. The results are tabulated below.

Location	Shoreline Segment	County/Parish, State	Conditional Probability [1](%)		
			3 Day	10 Day	30 day
GC 743, Well DC312	C08	Matagorda, TX	--	--	1
	C09	Brazoria, TX	--	--	1
	C10	Galveston, TX	--	--	2
121 miles from shore	C12	Jefferson, TX	--	--	1
	C13	**Cameron, LA**	--	--	**3**
OCS-G: G15607	C14	Vermilion, LA	--	--	1
	C17	Terrebonne, LA	--	--	1
Launch Area: C 46	C18	Lafourche, LA	--	--	1
	C20	**Plaquemines, LA**	--	--	**3**

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

Figure 2 – Environmental Sensitivities
Cameron Parish, Louisiana

Sensitive Areas	Descriptions	Wildlife	Access	Contact
Cameron Area	On the Calcasieu River and Ship Channel 2.5 miles north of the GOM shoreline. Only route for marine life to enter and/or leave Calcasieu Lake and River Basin.	**RTE:** **Brown pelican** **Others:** Waterfowl, long-billed curlew, peregrine falcon, marbled godwit, spotted sea trout, shrimp and blue crab, drum, southern flounder, gulf menhaden	Take TX Hwy 82 south and then east from Port Arthur to Cameron. Also accessible by boat from the Calcasieu Ship Channel from the GOM. Oil company landings, USCOE facility and helicopter landing/fueling facilities.	N/A
Louisiana Gulf Coast & Johnson's Bayou	GOM coastline from Louisiana Point (east of Sabine Pass) extending easterly to the west bank of Johnson's Bayou. Primarily composed of marshland and swamps.	**RTE:** **Bald eagle (winter), piping plover (spring-summer)** **Others:** Songbirds, shorebirds, gulls, ruddy duck and other waterfowl, finfish	Shoreline accessible by shallow draft vessels. Vehicle access is limited to 4-wheel drive vehicles via LA Hwy 82.	N/A

Sensitive Areas	Descriptions	Wildlife	Access	Contact
Louisiana Gulf Coast Mud Lake to White Lake Inland to GIWW	Shoreline on the GOM from Mud Lake to White Lake inland to the GIWW.	**RTE:** **None known** **Others:** Waterfowl, snowy egret, olivaceous cormorant, peregrine falcon, roseate spoonbill, white and brown shrimp, blue crab, finfish	LA Hwy 82 parallels the coast about 5 miles from the beach. The beach is marshy salt grass and accessible only by marsh buggy, helicopter or airboat.	N/A
Rockefeller State Wildlife Refuge	76,000 acres of brackish to saltwater marshes, shallow lakes and bayous in southwest LA. This area borders the Gulf of Mexico for 26.5 miles and extends inland toward the Grand Chenier ridge, a stranded beach ridge, six miles from the Gulf. Surveys indicate a wintering waterfowl population reaching 160,000.	**RTE:** **American alligator** **Others:** Egrets and herons, dabbling ducks, Canada goose and white-fronted goose, peregrine falcon, roseate spoonbill, eastern oyster, menhaden, redfish, flounder, speckled trout, white and brown shrimp and blue crabs, furbearers (breeding)	There are few roads on the refuge. Major access is by small boat, marsh buggy or amphibious vehicle. The best location for a remote command post is at headquarters located on LA Hwy 82 approximately 10 miles east of Grand Chenier, LA. Equipment available: 1 amphibious dragline with 0.5 yard bucket, 1 marsh buggy, small boats, air boats and farm tractors.	Rockefeller SWR 5476 Grand Chenier Hwy Grand Chenier, LA 70643 Phone: (337) 491-2593
Sabine Wildlife Refuge	125,000 acres of freshwater and brackish marshes interspersed with low prairie ridges. Calcasieu Lake transects the refuge on the east, and Sabine Lake adjoins it on the west.	**RTE:** **Bald eagle, brown pelican, Kemp's ridley sea turtle** **Others:** Canada goose, white-fronted goose and other waterfowl, peregrine falcon, shrimp, sunfish, bass, spotted sea trout, southern flounder, blue catfish, red drum, alligator gar, small mammals, snakes	By small boat, airboat, amphibious vehicle or marsh buggy. Launching facilities are at Johnson's Bayou landing for the southwest part of the refuge, at refuge headquarters for the west side of Calcasieu Lake, and on the east side of the Cameron Ferry crossing for the east side of Calcasieu Lake. Remote command post could be set up at the refuge headquarters. Equipment available: 1 airboat, 4 outboard boats.	Sabine NWR *Physical Location:* 3000 Holly Beach Hwy Hackberry, LA 70645 Phone: (337) 762-3816 *Office Address*: 1428 Highway 27 Bell City, LA 70630 Phone: (337) 598-2216

Areas of Socio-Economic Concern in Cameron Parish:

- Commercial fishing in Sabine Lake area
- Gas field in SNWR just north of Mud Lake
- Gulf States Utilities (GSU) water intake canal at the end of Old River Cove on the north end of Sabine Lake
- Heavy vessel traffic in Lake Charles
- Pleasure Island Marina
- Public beaches and recreational areas (Martin Beach, Gulfview Beach, Holly Peveto Beach, Rutherford Beach)
- Sabine Pass Battleground historical site

Protection Priorities for Cameron Parish:

- GSU intake canal
- Rockefeller Wildlife Refuge
- Sabine National Wildlife Refuge
- Other coastal marshlands

Plaquemines Parish, Louisiana

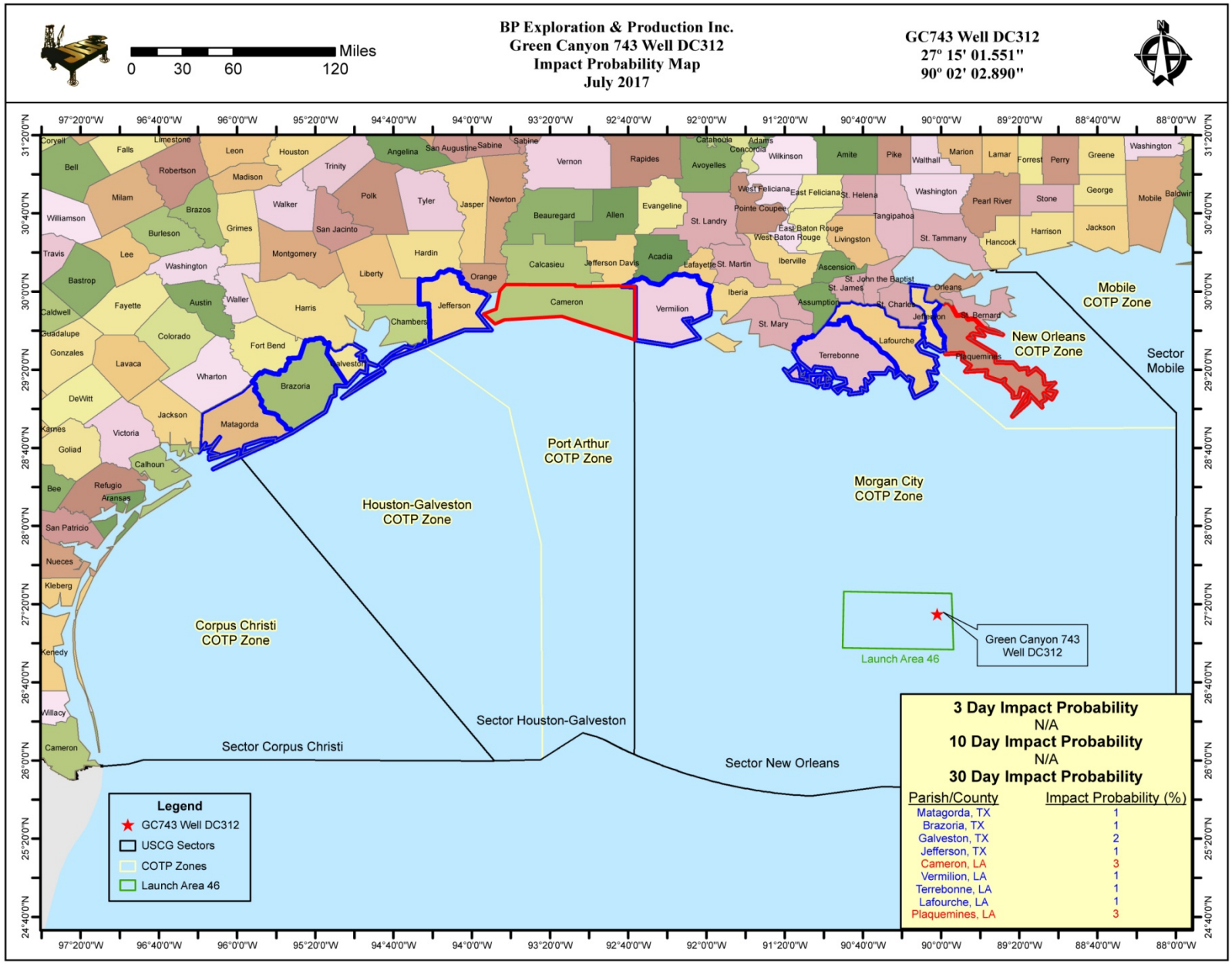
Sensitive Areas	Descriptions	Wildlife	Access	Contact
Delta National Wildlife Refuge	48,800 acres of marsh, shallow ponds, channels and bayous. Provides a winter sanctuary for migratory waterfowl such as snow geese and more than 18 species of ducks. Also the home of many other water birds and various wildlife species.	**RTE:** **Brown pelican, American alligator** **Others:** Waterfowl (winter), peregrine falcon, sea birds, shore birds, bass, bream, catfish, crappie, drum, garfish, redfish, speckled trout, flounder, nutria, mink, otter, muskrat, raccoon, white-tailed deer	By boat only.	Delta NWR Bayou Lacombe Centre 61389 Hwy 434 Lacombe, LA 70445 Phone: (985) 882-2000
Pass A Loutre Wildlife Management Area	66,000 acres characterized by river channels with attendant pass banks, natural bayous and man-made canals which are interspersed with intermediate and fresh marshes. Furbearers and alligators are fairly common in the marsh. Freshwater finfish flourish in the interior marsh ponds.	**RTE:** **Brown pelican, American alligator** **Others:** Waterfowl (winter), peregrine falcon, sea birds, shore birds, bass, bream, catfish, crappie, drum, watermouth, garfish, redfish, speckled trout, flounder, nutria, mink, otter, muskrat, raccoon, white-tailed deer	By boat only, however, the tributaries along the Mississippi River provide excellent traveling passages. The nearest public launches are in Venice.	Pass A Loutre WMA Hammond Field Office 42371 Phyllis Ann Drive Hammond, LA 70403 Phone (985) 543-4777
Breton National Wildlife Refuge	Breton Island and the adjoining Chandeleur Islands. Breton Island is 2 adjacent islands with a combined length of about 3 miles and a width of less than 1 mile. The Chandeleur Islands have a length of approximately 20 miles and a width of less than 1 mile. The islands are low with sandy beaches on the Gulf side and saltwater marshes on the Chandeleur Sound side. Shoals along the sound side provide wintering habitat for about 20,000 redhead ducks. Nesting colonies of thousands of birds are found on the islands in the summer. Dominant vegetation is black mangrove, groundsel bush and wax murtle. Shallow bay waters around the islands support beds of varying grasses.	**RTE:** **Brown pelican, least tern, piping plover** **Others:** Redhead ducks and other waterfowl (winter), wading birds, shorebirds and seabirds (including laughing gulls, sandwich terns and black skimmers), finfish	By boat only. Motorized land vehicles are prohibited.	Breton NWR c/o Southeast Louisiana Refuges 61389 Highway 434 Lacombe, LA 70445 Phone : (985) 882-2000

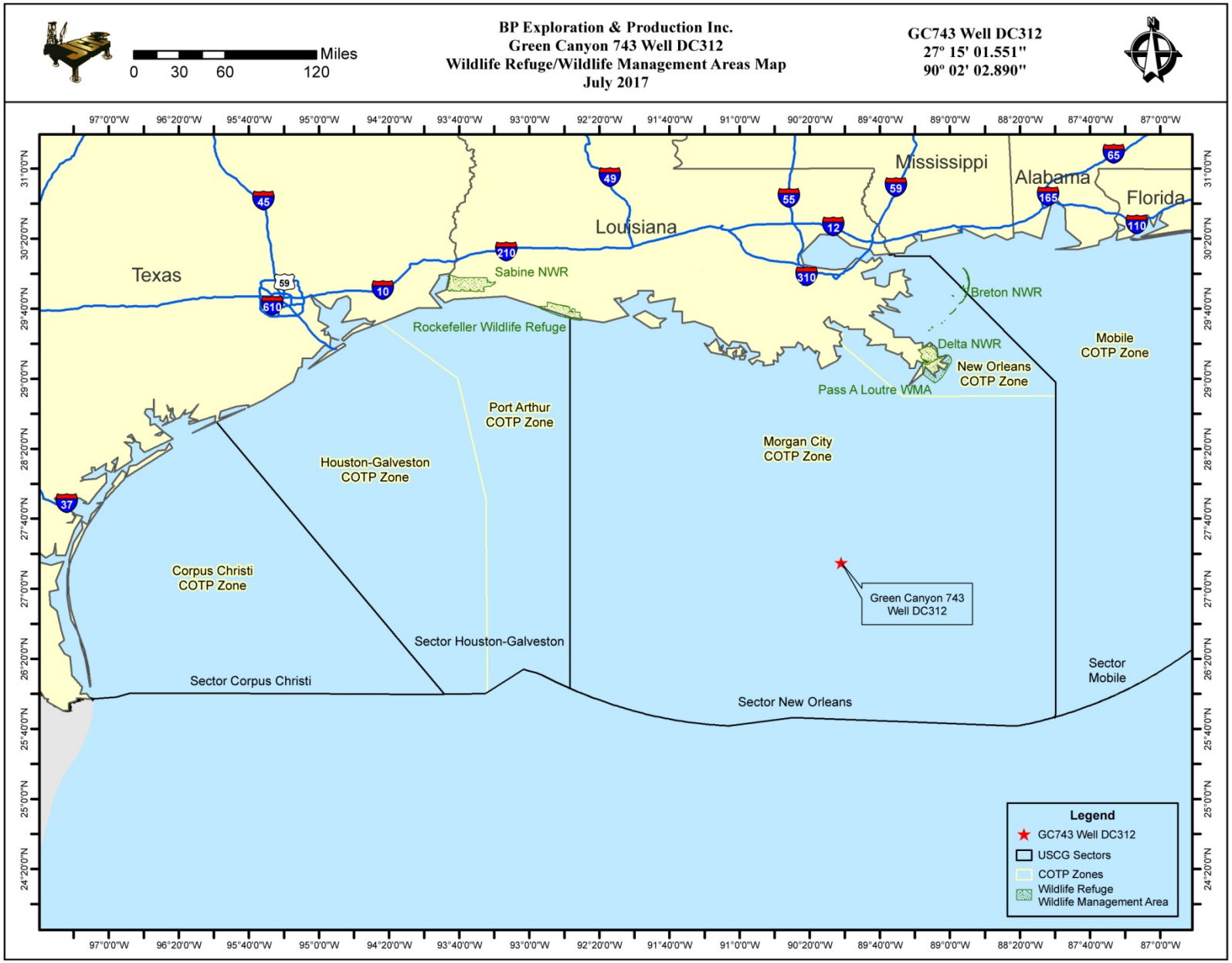
Areas of Socio-Economic Concern in Plaquemines Parish:

- Commercial fishing routes
  - South Pass
  - Tiger Pass
  - Barataria Waterway

Protection Priorities for Plaquemines Parish:

- Delta National Wildlife Refuge
- Pass-A-Loutre Wildlife Management Area
- Other coastal marshes


Miles
0 30 60 120
BP Exploration & Production Inc.
Green Canyon 743 Well DC312
Impact Probability Map
July 2017
GC743 Well DC312
27° 15' 01.551"
90° 02' 02.890"
Mobile COTP Zone
New Orleans COTP Zone
Sector Mobile
Port Arthur COTP Zone
Houston-Galveston COTP Zone
Morgan City COTP Zone
Corpus Christi COTP Zone
Launch Area 46
Green Canyon 743 Well DC312
Sector Houston-Galveston
Sector Corpus Christi
Sector New Orleans
Legend
GC743 Well DC312
USCG Sectors
COTP Zones
Launch Area 46
3 Day Impact Probability
N/A
10 Day Impact Probability
N/A
30 Day Impact Probability
Parish/County
Impact Probability (%)
Matagorda, TX 1
Brazoria, TX 1
Galveston, TX 2
Jefferson, TX 1
Cameron, LA 3
Vermilion, LA 1
Terrebonne, LA 1
Lafourche, LA 1
Plaquemines, LA 3


Miles
0 30 60 120
BP Exploration & Production Inc.
Green Canyon 743 Well DC312
Wildlife Refuge/Wildlife Management Areas Map
July 2017
GC743 Well DC312
27° 15' 01.551"
90° 02' 02.890"
Texas
Louisiana
Mississippi
Alabama
Florida
Sabine NWR
Rockefeller Wildlife Refuge
Breton NWR
Delta NWR
Pass A Loutre WMA
Mobile COTP Zone
New Orleans COTP Zone
Port Arthur COTP Zone
Morgan City COTP Zone
Houston-Galveston COTP Zone
Corpus Christi COTP Zone
Green Canyon 743 Well DC312
Sector Houston-Galveston
Sector Corpus Christi
Sector New Orleans
Sector Mobile
Legend
GC743 Well DC312
USCG Sectors
COTP Zones
Wildlife Refuge
Wildlife Management Area

5) General Considerations for all Oil Spill Recovery Operations

BP will use all appropriate measures possible to safely and efficiently recover oil spilled from its facilities. These include but are not limited to:

- Conducting detailed safety analyses on all operations and preparing/disseminating resulting safety plans to all response personnel
- Use of tactics described in the most current *MSRC Gulf Area Tactics Guide Book* and *CGA Equipment Guide Book and Tactic Manual* and any other appropriate tactics developed during the event
- Configuring surface recovery systems to achieve maximum throughput and recovery efficiency rates:
    - Maximization of the use of advanced and adverse weather recovery systems to increase oil to recovery system encounter rates
    - Use of vessels with the largest possible onboard recovered oil storage to minimize off-load times
    - Use of appropriate vessels to deploy ocean boom to form the widest practical width to maximize oil to recovery system encounter rate
    - Use of appropriate recovery systems to maximize recovery rate in all operable environmental conditions
- Deployment of CGA and MSRC spill response equipment to recover and store oil while minimizing rig/derig and transit time, maximizing onboard storage and on-station time
- Obtaining approval for decanting of oil to maximize storage capacity
- Use of most efficient, high volume pumps for oil recovery and decanting, offloading and lightering
- Use of advanced technology (such as thermal infrared and multi-spectral cameras) to detect oil on the water's surface and classify it as recoverable or non-recoverable. This will allow more efficient use of on-water recovery task forces, maximize recovery rates and expand operational windows. This advanced technology is effective in both day and night time surveillance activities depending upon atmospheric conditions
- Early consideration of advanced oil removal methods (e.g. dispersant application and in-situ burning) and coordination/consultation with the USCG and appropriate Regional Response Team for obtaining permission to proceed as necessary
- Providing effective communication systems to allow for the command and control of deployed resources to ensure safety, reduce response times, and collect information necessary to develop a comprehensive, timely, and accurate Common Operating Picture (COP)

6) Location Specific Worst Case Discharge Response

BP's Oil Spill Response Plan includes alternative response technologies such as dispersants and in-situ burn. Strategies will be decided by Unified Command based on an operations safety analysis, the size of the spill, weather and potential impacts. If the conditions are favorable for dispersant application and/or in-situ burning, once the proper approvals have been obtained and the proper planning is in place, dispersant application and/or in-situ burning of oil may be employed. Slick containment boom will be immediately called out and on scene as soon as possible. Offshore response strategies may include attempting to skim utilizing CGA, MSRC, and NRCC spill response equipment, with a total derated skimming capacity of 1,371,673 barrels. Temporary storage associated with skimming equipment equals 487,896 barrels. If additional storage is needed, various storage barges with a total capacity of 1.17 million+ barrels may be mobilized and centrally located to provide temporary storage and minimize off-loading time. **Safety is first priority. Air monitoring will be conducted and operations deemed safe prior to the commencement of any containment/skimming operations.**

If the spill went unabated, shoreline impact in Cameron Parish, Louisiana and/or Plaquemines Parish, Louisiana will depend upon existing environmental conditions. Shoreline protection will include the use of CGA, MSRC, and NRCC near shore and shallow water skimmers with a total derated skimming capacity of 409,892 barrels. Temporary storage associated with skimming equipment equals 10,873 barrels. If additional storage is needed, various storage barges with a total capacity of 441,000+ barrels may be mobilized and centrally located to provide temporary storage and minimize off-loading time. Onshore response may include the deployment of shoreline boom on beach areas, or protection and sorbent boom on vegetated areas. Contracts with AMPOL, MSRC, and NRCC will ensure access to 104,713 feet of 18" shoreline protection boom. **Figure 3** outlines individual times needed for procurement, load out, travel time to the site and deployment. Strategies will be based upon surveillance and real time trajectories that depict areas of potential impact given actual sea and weather conditions. Applicable Area Contingency Plans (ACPs), Geographic Response Plans (GRPs), federal and state agencies that oversee and manage some of the resources that may be at risk, and Unified Command (UC) will be consulted to ensure that environmental and special economic resources are correctly identified and prioritized to ensure optimal protection. BP's Spill Management Team has access to the applicable ACP(s) and GRP(s) Shoreline protection strategies depict the protection response modes applicable for oil spill clean-up operations. As a secondary resource, the State of Louisiana Initial Oil Spill Response Plan will be consulted as appropriate to provide detailed shoreline protection strategies and describe necessary action to keep the oil spill from entering Louisiana's coastal wetlands. The UC should take into consideration all appropriate items detailed in the Tactics discussion below. The UC and their personnel have the option to modify the deployment and operation of equipment to allow for a more effective response to site-specific circumstances.

Based on the anticipated worst case discharge scenario, BP can be onsite with contracted oil spill recovery equipment with adequate response capacity to contain and recover surface hydrocarbons, and prevent land impact, to the maximum extent practicable*, within an estimated 74 hours (based on the equipment's Effective Daily Recovery Capacity (EDRC) and expected travel time to spill site).*

7) Response Strategies

BP will take action to provide a safe, coordinated response to contain and recover spilled oil in a timely manner. Response actions will be designed to provide protection strategies meant to recover oil and protect the responders, the public, wildlife and environmentally sensitive areas. Safety will take precedence over all other considerations during these operations.

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

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

Offshore Response

Surveillance

- Aerial Observation:
  - Deployment of surveillance aircraft within two hours of QI notification, or at first light
  - Trained observer to provide on-site status reports
  - Aerial photography and visual confirmation
- Command and control platform at the site if needed
- Remote Sensing:
  - Use of thermal infrared and multi-spectral sensing systems or other technology to detect oil and classify it as recoverable or non-recoverable to enhance on-water recovery capability
  - Surveillance platforms should be appropriate for weather and atmospheric conditions to provide the greatest altitude (e.g. aircraft, aerostats or ship mounted)
  - Continued surveillance of oil movement by remote sensing systems
- Continuous monitoring of vessel assets using vessel monitoring systems

Dispersant application

- Place aerial dispersant providers on standby
- Depending on the scenario, a Modular Subsea Dispersant Application Unit (SDAU) may to be ordered and installed at or adjacent to the spill site.
- Conduct analysis to determine appropriateness of dispersant application (refer to Section 18 of approved Oil Spill Response Plan)
- Obtain regulatory approval for use of surface and subsea dispersants
- Confirm dispersant availability for current and long range operations
- Coordinate deployment of a Special Monitoring of Applied Response Technologies (SMART) team as required
- Coordinate movement of dispersants, aircraft, and support equipment and personnel
- Initiate orders for additional dispersant stocks required for expected operations

Containment boom

- Call out OSRO boom equipment early and expedite deployment
- Ensure boom handling and mooring equipment is deployed with boom
- Provide continuous reports to vessels to expedite their arrival at sites and provide for most effective containment
- Use support vessels to deploy and maintain boom

Dedicated off-shore skimming systems

- Determine if weather conditions allow for skimming operations
- Deployed to the highest concentration of oil
- Assets deployed at safe distance from aerial dispersant and in-situ burn operations
- Deploy OSRO's mechanical recovery equipment such as OSRVs, OSRBs, and VOSS
- Vessels should be organized into task forces or groups with consideration for effective communication and control
- The use of alternative spill surveillance technologies could be used to guide skimming vessels during night time operations

Storage Vessels

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

In-situ Burn Assets

- Determine appropriateness of in-situ burning in coordination with the FOSC and affected SOSC
- Determine availability of fire boom and selected ignition systems
- Determine assets to perform on-water operations
- Build operations into safety plan
- Initiate orders for additional fire boom stocks required for expected operations
- Conduct initial test burn to ensure effectiveness
- Conduct operations in accordance with an approved plan

Adverse Weather Operations:

During adverse weather conditions such as seas being $\geq$ 3 feet, the use of larger recovery and storage vessels, oleophilic skimmers, and large offshore boom will be maximized. Safety will be the overriding factor and operations will cease at the order of the Unified Command or vessel captain. In an emergency, "stop work" may be directed by any crew member

Near Shore Response Actions

Timing

- Put near shore assets on standby and deploy in accordance with planning based on the actual situation, real time trajectories and oil budgets
- Support vessel identification and training in advance of spill nearing shoreline if possible
- Outfitting of support vessels for specific missions
- Deployment of assets based on actual movement of oil

Considerations

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

Surveillance

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

Dispersant Use

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

Shoreline Protection Operations

Response Planning Considerations

- Review appropriate Area Contingency Plan(s)
- Locate and review appropriate Geographic Response and Site Specific Plans
- Refer to associated Environmentally Sensitive Area Maps
- Ensure capability of continuous analysis of trajectories run periodically during response
- Order personnel and equipment
- Perform aerial surveillance of oil movement
- Perform Pre-impact beach cleaning and debris removal
- Adhere to Shoreline Cleanup Assessment Team (SCAT) Plans
- Determine requirements and availability of boom types, sizes and lengths
- Consider need for in-situ burning in near shore areas
- Assess current wildlife situation, especially status of migratory birds and endangered species
- Check for archeological sites and arrange assistance for the appropriate state agency when planning operations may impact these areas

Placement of boom

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

Beach Preparation Considerations and Actions

- SCAT reports and recommendations
- Monitor tide tables and weather to determine extent of high tides
- Pre-clean beaches by moving waste above high tide lines to minimize waste
- Determine logistical requirements of waste removal and disposal
- Stage equipment and housing of response personnel as close to job site as possible to maximize on-site work time
- Tend to boom, repair, replace and secure as needed (use of local assets may be advantageous)
- Maintain constant awareness of weather and oil movement for resource re-deployment as necessary
- Consider earthen berms and shoreline protection boom to protect sensitive inland areas
- Requisition earth moving equipment
- Plan for efficient and safe use of personnel, ensuring:
- Assess remediation requirements, i.e., replacement of sands, rip rap, etc.
- Ensure availability of surface washing agents and associated protocol requirements for their use (see National Contingency Plan (NCP) Product Schedule for list of possible agents)
- Discuss with all stakeholders, i.e., land owners, refuge/park managers, and others as appropriate, covering the following:
    - Access to areas
    - Possible response measures and impact of property and ongoing operations
    - Determination of any specific safety concerns

    - Any special requirements or prohibitions
    - Area security requirements
    - Handling of waste
    - Remediation expectations
    - Vehicle traffic control
    - Domestic animal safety concerns
    - Wildlife or exotic game concerns/issues

Inland and Coastal Marsh Protection and Response Considerations and Actions

- All considered response methods will be weighed against the possible damage they may do to the marsh. Methods will be approved by Unified Command only after discussions with local Stakeholder, as identified above
    - In-situ burn may be considered when marshes have been impacted
- Passive clean-up of marshes should considered and appropriate stocks of sorbent boom and/or sweep obtained.
- Response personnel must be briefed on methods to traverse the marsh, i.e.,
    - use of appropriate vessel
    - use of temporary walkways or road ways
- Discuss and gain approval prior to cutting or moving vessels through vegetation
- Discuss use of vessels that may disturb wildlife, i.e, airboats
- Ensure safe movement of vessels through narrow cuts and blind curves
- Consider the possibility that no response in a marsh may be best
- In the deployment of any response asset, actions will be taken to ensure the safest, most efficient operations possible. This includes, but is not limited to:
    - Planning for stockage of high use items for expeditious replacement
    - Use of shallow water craft
    - Use of communication systems appropriate ensure command and control of assets
    - Use of appropriate boom in areas that can offer effective protection
    - Planning of waste collection and removal to maximize cleanup efficiency
- Consideration of on-site remediation of contaminated soils to minimize replacement operations and impact on the area

8) Equipment Limitations

The capability for any spill response equipment, whether a dedicated or portable system, to operate in differing weather conditions will be directly in relation to the capabilities of the vessel the system is placed on. Most importantly, however, the decision to operate will be based on the judgment of the Unified Command and/or the Captain of the vessel, who will ultimately have the final say in terminating operations. Skimming equipment listed below may have operational limits which exceed those safety thresholds.

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

9) Environmental Conditions in the GOM

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

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

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

WCD Scenario– <u>BASED ON WELL BLOWOUT DURING DRILLING OPERATIONS</u> (121 miles from shore)
166,564 bbls of crude oil (Volume considering natural weathering)
API Gravity 25.5°

FIGURE 3 – Equipment Response Time to GC 743, Well DC312

Surveillance Aircraft

Name/Type	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI (available through contract with CGA)						
Aero Commander	2	Houma, LA	2	2	0.8	4.8
T&T Marine (available through contract with CGA)						
CJ3 Citation	2	Houston/Galveston, TX	2	2	0.8	4.8

Dispersant Aircraft

Name/Type	Dispersant Capacity (gal)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to site	Total Hrs
ASI (available through contract with CGA)							
Basler 67T	2000	2	Houma, LA	2	2	0.8	4.8
DC 3	1200	2	Houma, LA	2	2	1.1	5.1
DC 3	1200	2	Houma, LA	2	2	1.1	5.1
MSRC							
C-130 Spray AC	3,250	2	Melbourne, FL	4	0	1.7	5.7
ASI (available through contract with NRCC)							
Convair 340 (3)	4500	6	Opa-Locka, FL	2	2	2.3	6.3

Offshore Response

Offshore Equipment Pre-Determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
CGA											
95' FRV	22885	249	NA	6	Leeville, LA	2	0	2	6.5	1	11.5
95' FRV	22885	249	NA	6	Venice, LA	2	0	3	6.5	1	12.5
95' FRV	22885	249	NA	6	Vermilion, LA	2	0	3	10	1	16
95' FRV	22885	249	NA	6	Galveston, TX	2	0	2	14.5	1	19.5
Boom Barge (CGA-300) 42" Auto Boom (25000')	NA	NA	1 Tug 50 Crew	4 (Barge) 2 (Per Crew)	Leeville, LA	8	0	4	18.5	2	32.5
HOSS Barge	76285	4000	3 Tugs	8	Harvey, LA	6	0	12	15.5	2	35.5

Offshore Equipment Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
MSRC											
Florida Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Miami, FL	2	0	2	50	1	55
Gulf Coast Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Lake Charles, LA	2	0	4	18	1	25
Louisiana Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Fort Jackson, LA	2	0	4	22.5	1	29.5
Mississippi Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Pascagoula, MS	2	0	2	17	1	22
Southern Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Ingleside, TX	2	0	2	29.5	1	34.5
S.T. Benz Responder LFF 100 Brush + OSRV *2,640' 67" Curtain Pressure Boom*	18086	4000	NA	10	Grand Isle, LA	3	0	1	9.5	1	14.5
Texas Responder Transrec 350 + OSRV *2,640' 67" Curtain Pressure Boom*	10567	4000	NA	10	Galveston, TX	2	0	1	21	1	25
MSRC 360 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	36000	3 Tugs + 1-2 Support Vessels	9	Tampa, FL	4	0	3	59	1	67
MSRC 402 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40300	3 Tugs + 1-2 Support Vessels	9	Pascagoula, MS	4	0	3	30	1	38
MSRC 403 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40300	3 Tugs + 1-2 Support Vessels	9	Ingleside, TX	4	0	3	51.5	1	59.5
MSRC 401 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	40000	3 Tugs + 1-2 Support Vessels	9	Fort Jackson, LA	4	0	6	39	1	50
MSRC 570 Offshore Barge 1 Crucial Disk 88/30 *2,640' 67" Curtain Pressure Boom*	11122	56900	3 Tugs + 1-2 Support Vessels	9	Galveston, TX	4	0	2	36.5	1	43.5

Offshore Equipment Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
NRCC											
OSRB Defender Marco Class XI AB Vikoma Cascade	24000 5520	16500	2 Tugs	4-6	Bayou La Batre, AL	4	2	0	37	1	44
OSRB Valiant Marco Class XI AB	24000	20300	2 Tugs	4-6	Aransas Pass, TX	4	2	0	58.5	1	65.5
OSRB Valor	NA	20000	2 Tugs	4-6	Tampa, FL	4	2	0	67	1	74
OSRV Admiral Marco Class XI AB Elastec X-150	24000 4526	300	NA	4-6	Galveston, TX	4	2	0	29	1	36
OSRV Energy Vikoma Sea 50	1509	300	NA	4-6	Grand Isle, LA	4	2	0	14	1	21

Offshore Recovered Oil Storage Pre-determined Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Required	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Spill Site	Hrs to Deploy	Total Hrs
Kirby Offshore (available through contract with CGA and/or MSRC)											
RO Barge	NA	80000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	100000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	100000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	100000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	100000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	110000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	130000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	140000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	150000+	1 Tug	6	Venice, LA	41	0	2	16	1	60
RO Barge	NA	160000+	1 Tug	6	Venice, LA	41	0	2	16	1	60

Staging Area: Fourchon

Offshore Equipment With Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
1500' Hydro-Fire Boom	NA	NA	8 Utility	40	Harvey, LA	0	24	3	11	6	44
MSRC											
67" Curtain Pressure Boom (53570')	NA	NA	80*	160	Houston, TX	1	2	11	11	1	26
1000' Fire Resistant Boom	NA	NA	3*	6	Galveston, TX	1	4	12	22	6	45
2000' Fire Resistant Boom	NA	NA	3*	6	Lake Charles, LA	1	4	7	22	6	40
16000' Fire Resistant Boom	NA	NA	3*	6	Houston, TX	1	4	11	22	6	44
NRCC											
42" Boom (2000')	NA	NA	1 Offshore Vessel	4-8	Aransas Pass, TX	4	4	17	11	1	37
42" Boom (2700')	NA	NA	2 Offshore Vessels	8-16	Bayou La Batre, AL	4	4	6	11	1	26
42" Boom (2000')	NA	NA	1 Offshore Vessel	4-8	Baytown, TX	4	4	10	11	1	30
42" Boom (2000')	NA	NA	1 Offshore Vessel	4-8	Grand Isle, LA	4	4	2	11	1	22
42" Boom (2200')	NA	NA	1 Offshore Vessel	4-8	Galveston, TX	4	4	12	11	1	32
42" Boom (4000')	NA	NA	2 Offshore Vessels	8-16	Corpus Christi, TX	4	4	17	11	1	37
42" Boom (1200')	NA	NA	1 Offshore Vessel	4-8	Lafitte, LA	4	4	3	11	1	23
42" Boom (2200')	NA	NA	1 Offshore Vessel	4-8	Tampa, FL	4	4	22	11	1	42
1000' Hydro-Fire Boom	NA	NA	6 Utility	20	Houston, TX	4	4	11	11	1	31

** Utility Boats, Crew Boats, Supply Boats, or Fishing Vessels*

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
CGA											
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Aransas Pass, TX	2	6	17	11	1	37
FRU (1) + 100 bbl Tank (2)	4251	200	1 Utility	6	Galveston, TX	2	6	12	11	1	32
FRU (3) + 100 bbl Tank (6)	12753	600	3 Utility	18	Leeville, LA	2	6	0.5	11	1	20.5
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Venice, LA	2	6	5	11	1	25
FRU (2) + 100 bbl Tank (4)	8502	400	2 Utility	12	Vermilion, LA	2	6	5.5	11	1	25.5

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
T&T Marine (available through direct contract with CGA)											
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Galveston, TX	4	12	12	11	2	41
Aqua Guard Triton RBS (1)	22323	2000	1 Utility	6	Harvey, LA	4	12	3	11	2	33
Koseq Skimming Arms (10) Lamor brush	228850	60000	10 OSV	60	Galveston, TX	24	24	12	11	2	73
Koseq Skimming Arms (6) Lamor brush	137310	36000	6 OSV	36	Harvey, LA	24	24	3	11	2	64
Koseq Skimming Arms (6) MariFlex 150 HF	108978	36000	6 OSV	36	Harvey, LA	24	24	3	11	2	64
MSRC											
Crucial Disk 56/30 Skimmer (1)	5671	1000	1 Utility	5-9	Belle Chasse, LA	1	2	3	11	1	18
Crucial Disk 56/30 Skimmer (1)	5671	1000	1 Utility	5-9	Ingleside, TX	1	2	17	11	1	32
Crucial Disk 56/30 Skimmer (1)	5671	1000	1 Utility	5-9	Tampa, FL	1	2	22	11	1	37
Crucial Disk 88/30 Skimmer (1)	11122	1000	1 Utility	5-9	Galveston, TX	1	2	12	11	1	27
Crucial Disk 88/30 Skimmer (1)	11122	1000	1 Utility	5-9	Pascagoula, MS	1	2	6	11	1	21
Crucial Disk 88/30 Skimmer (2) *1,320' 67" Curtain Pressure Boom*	22244	2000	2 PSV + 2-4 Support Vessels	18	Fort Jackson, LA	1	2	5	11	1	20
Desmi Skimmer (1)	3017	1000	1 Utility	5-9	Fort Jackson, LA	1	2	5	11	1	20
Desmi Skimmer (1)	3017	1000	1 Utility	5-9	Lake Charles, LA	1	2	7	11	1	22
Desmi Skimmer (1)	3017	1000	1 Utility	5-9	Miami, FL	1	2	28	11	1	43
Foilex 200 Skimmer (1)	1989	1000	1 Utility	5-9	Belle Chasse, LA	1	2	3	11	1	18
Foilex 250 Skimmer (1)	3977	1000	1 Utility	5-9	Belle Chasse, LA	1	2	3	11	1	18
Foilex 250 Skimmer (1)	3977	1000	1 Utility	5-9	Galveston, TX	1	2	12	11	1	27
Foilex 250 Skimmer (1)	3977	1000	1 Utility	5-9	Ingleside, TX	1	2	17	11	1	32
Foilex 250 Skimmer (1)	3977	1000	1 Utility	5-9	Lake Charles, LA	1	2	7	11	1	22
GT-185 Skimmer w Adaptor (2)	2742	2000	2 Utility	10-18	Galveston, TX	1	2	12	11	1	27
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Ingleside, TX	1	2	17	11	1	32
GT-185 Skimmer w Adaptor (2)	2742	2000	2 Utility	10-18	Lake Charles, LA	1	2	7	11	1	22
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Miami, FL	1	2	28	11	1	43
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Pascagoula, MS	1	2	6	11	1	21
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Port Arthur, TX	1	2	9	11	1	24
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Fort Jackson, LA	1	2	5	11	1	20
GT-185 Skimmer w Adaptor (1)	1371	1000	1 Utility	5-9	Tampa, FL	1	2	22	11	1	37

Staging Area: Fourchon

Offshore Equipment Preferred Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Site	Hrs to Deploy	Total Hrs
MSRC											
LFF 100 Brush Skimmer (1) *1,320' 67" Curtain Pressure Boom*	18086	1000	1 PSV	9	Houma, LA	1	2	2	11	1	17
LFF 100 Brush Skimmer (3) *1,320' 67" Curtain Pressure Boom*	54258	3000	3 PSV + 3-6 Support Vessels	27	Lake Charles, LA	1	2	7	11	1	22
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Fort Jackson, LA	1	2	5	11	1	20
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Galveston, TX	1	2	12	11	1	27
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Ingleside, TX	1	2	17	11	1	32
Stress I Skimmer (2)	31680	2000	2 Utility	10-18	Lake Charles, LA	1	2	7	11	1	22
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Miami, FL	1	2	28	11	1	43
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Pascagoula, MS	1	2	6	11	1	21
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Grand isle, LA	1	2	0	11	1	15
Stress I Skimmer (1)	15840	1000	1 Utility	5-9	Tampa, FL	1	2	22	11	1	37
Stress II Skimmer (1)	3017	1000	1 Utility	5-9	Pascagoula, MS	1	2	6	11	1	21
Transrec 350 Skimmer (2) *1,320' 67" Curtain Pressure Boom*	21134	2000	2 PSV + 2-4 Support Vessels	18	Lake Charles, LA	1	2	7	11	1	22
Walosep W4 Skimmer (1)	3017	1000	1 Utility	5-9	Fort Jackson, LA	1	2	5	11	1	20
Walosep W4 Skimmer (1)	3017	1000	1 Utility	5-9	Galveston, TX	1	2	12	11	1	27
Walosep W4 Skimmer (1)	3017	1000	1 Utility	5-9	Ingleside, TX	1	2	17	11	1	32
Walosep W4 Skimmer (1)	3017	1000	1 Utility	5-9	Miami, FL	1	2	28	11	1	43
NRCC											
4-Band Rope Mop Skimmer	1509	100	1 Offshore Vessel	4-8	Ft. Lauderdale, FL	4	4	27	11	1	47
4-Band Rope Mop Skimmer	1509	100	1 Offshore Vessel	4-8	Mobile, AL	4	4	7	11	1	27
4-Band Rope Mop Skimmer (2)	3018	200	1 Offshore Vessel	8-16	New Iberia, LA	4	4	4	11	1	24
4-Band Rope Mop Skimmer (2)	3018	200	1 Offshore Vessel	8-16	Corpus Christi, TX	4	4	17	11	1	37
Action 48 Skimmer	2414	100	1 Offshore Vessel	4-8	Key West, FL	4	4	32	11	1	52
Hoyle Disc Skimmer	1632	100	1 Offshore Vessel	4-8	Tampa, FL	4	4	22	11	1	42
Marco Class XI AB	24000	100	1 Offshore Vessel	4-8	New Iberia, LA	4	4	4	11	1	24
Marco Class XI AB	24000	100	1 Offshore Vessel	4-8	Harvey, LA	4	4	3	11	1	23
Vikoma Cascade Skimmer	5520	100	1 Offshore Vessel	4-8	Baytown, TX	4	4	10	11	1	30
Vikoma Cascade Skimmer	5520	100	1 Offshore Vessel	4-8	Sulphur, LA	4	4	7	11	1	27

Nearshore Response for Cameron Parish

Nearshore Equipment	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Staging	Hrs to Deploy	Total Hrs
CGA											
46' FRV	15257	65	NA	4	Aransas Pass, TX	2	0	2	13	1	18
46' FRV	15257	65	NA	4	Vermilion, LA	2	0	2	2.5	1	7.5
Trinity SWS	21500	249	NA	4	Galveston, TX	2	0	NA	48	1	51
Trinity SWS	21500	249	NA	4	Vermilion, LA	2	0	NA	48	1	51
Midship SWS	22885	249	NA	4	Galveston, TX	2	0	NA	48	1	51
MSRC											
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	6	Ingleside, TX	1	1	2	13	0	17
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	6	Galveston, TX	1	1	2	5	0	9
MSRC Quick Strike 2 LORI Brush Pack	5000	50	NA	6	Lake Charles, LA	2	0	1	2.5	1	6.5
Enterprise Marine (available through contract with CGA)											
CTCo 2603	NA	25000	1 Tug	6	Amelia, LA	27	0	6	14	1	48
CTCo 2607	NA	23000	1 Tug	6	Amelia, LA	27	0	6	14	1	48
CTCo 2608	NA	23000	1 Tug	6	Amelia, LA	27	0	6	14	1	48
CTCo 2609	NA	23000	1 Tug	6	Amelia, LA	27	0	6	14	1	48
Kirby Offshore (available through contract with CGA and/or MSRC)											
RO Barge	NA	80000+	1 Tug	6	Amelia, LA	41	0	4	14	1	60

Staging Area: Cameron

Nearshore and Inland Skimmers With Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Vermilion, LA	2	2	1	2	1	8
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Vermilion, LA	2	2	1	2	1	8
Foilex Skim Package (TDS 150)	1131	50	NA	3	Vermilion, LA	4	12	1	2	2	21
Foilex Skim Package (TDS 150)	1131	50	NA	3	Galveston, TX	4	12	5	2	2	25
SWS Egmopol	1810	100	NA	3	Galveston, TX	2	2	5	2	1	12
SWS Egmopol	1810	100	NA	3	Leeville, LA	2	2	7	2	1	14
SWS Marco	3588	20	NA	3	Vermilion, LA	2	2	1	2	1	8
MSRC											
AardVac Skimmer (1)	3840	400	1 Utility	4	Lake Charles, LA	1	1	1	2	0	5
Queensboro Skimmer (1)	905	400	1 Utility	4	Galveston, TX	1	1	5	2	0	9
Queensboro Skimmer (5)	4525	2000	5 Utility	20	Lake Charles, LA	1	1	1	2	0	5
NRCC											
Action 24 Skimmer	823	100	1 Utility	4-8	Baytown, TX	4	4	3.5	2	1	14.5
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	New Iberia, LA	4	4	3.5	2	1	14.5
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Corpus Christi, TX	4	4	9.5	2	1	20.5
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Channelview, TX	4	4	4	2	1	15
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Port Arthur, TX	4	4	1.5	2	1	12.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	New Iberia, LA	4	4	3.5	2	1	14.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Sulphur, LA	4	4	2	2	1	13
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	New Iberia, LA	4	4	3.5	2	1	14.5
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	Sulphur, LA	4	4	2	2	1	13
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Baytown, TX	4	4	3.5	2	1	14.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Corpus Christi, TX	4	4	9.5	2	1	20.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Port Arthur, TX	4	4	1.5	2	1	12.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Channelview, TX	4	4	4	2	1	15

Shoreline Protection Response for Cameron Parish

Staging Area: Cameron

Shoreline Protection Boom	Support Vessel(s)	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
AMPOL (Available through MSA)									
900' 18" Boom	1 Crew	2	Morgan City, LA	2	2	5	2	2	13
12,750' 18" Boom	7 Crew	14	Port Arthur, TX	2	2	1.5	2	6	13.5
MSRC									
9,700' 18" Boom	3 Crew	6	Lake Charles, LA	1	2	1	2	1	7
NRCC									
1,100' 18" Boom	2 Crew	4-8	Baytown, TX	4	2	3.5	2	4	15.5
2,100' 18" Boom	2 Crew	8-16	Corpus Christi, TX	4	2	9.5	2	4	21.5
5,200' 18" Boom	6 Crew	10-20	Channelview, TX	4	2	4	2	4	16
6,000' 18" Boom	4 Crew	8-16	New Iberia, LA	4	2	3	2	4	15

Wildlife Response	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
Bird Scare Guns (12)	NA	NA	NA	2	Galveston, TX	2	2	5	1	2	12
Bird Scare Guns (12)	NA	NA	NA	2	Aransas Pass, TX	2	2	9.5	1	2	16.5
Bird Scare Guns (24)	NA	NA	NA	2	Vermilion, LA	2	2	1	1	2	8

Nearshore Response for Plaquemines Parish

Nearshore Equipment	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Hrs to GOM	Travel to Staging	Hrs to Deploy	Total Hrs
CGA											
46' FRV	15257	65	NA	4	Leeville, LA	2	0	2	2.5	1	7.5
46' FRV	15257	65	NA	4	Venice, LA	2	0	2	2.5	1	7.5
Trinity SWS	21500	249	NA	4	Leeville, LA	2	0	NA	48	1	51
Trinity SWS	21500	249	NA	4	Venice, LA	2	0	NA	48	1	51
Midship SWS	22885	249	NA	4	Leeville, LA	2	0	NA	48	1	51
Midship SWS	22885	249	NA	4	Venice, LA	2	0	NA	48	1	51
MSRC											
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	6	Belle Chasse, LA	1	1	2	3	0	7
30 ft. Kvichak *Marco I Skimmer (1)*	3588	24	NA	6	Pascagoula, MS	1	1	2	4	0	8
MSRC Lightning 2 LORI Brush Pack	5000	50	NA	6	Tampa. FL	2	0	1	20	1	24
Enterprise Marine (available through contract with CGA)											
CTCo 2604	NA	20000	1 Tug	6	Amelia, LA	25	0	6	16	1	48
CTCo 2605	NA	20000	1 Tug	6	Amelia, LA	25	0	6	16	1	48
CTCo 2606	NA	20000	1 Tug	6	Amelia, LA	25	0	6	16	1	48
CTCo 5001	NA	47000	1 Tug	6	Amelia, LA	25	0	6	16	1	48
Kirby Offshore (available through contract with CGA and/or MSRC)											
RO Barge	NA	80000+	1 Tug	6	Venice, LA	48	0	4	7	1	60
RO Barge	NA	80000+	1 Tug	6	Venice, LA	48	0	4	7	1	60

Staging Area: Venice

Nearshore and Inland Skimmers With Staging	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Load Out	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
2 Drum Skimmer (TDS 118)	240	100	1 Crew	3	Harvey, LA	2	2	2	2	1	9
4 Drum Skimmer (Magnum 100)	680	100	1 Crew	3	Harvey, LA	2	2	2	2	1	9
Foilex Skim Package (TDS 150)	1131	50	NA	3	Harvey, LA	4	12	2	2	2	22
SWS Marco	3588	34	NA	3	Leeville, LA	2	2	5	2	1	12
SWS Marco	3588	34	NA	3	Venice, LA	2	2	2	2	1	9
MSRC											
AardVac Skimmer (1)	3840	400	1 Utility	4	Pascagoula, MS	1	1	5.5	2	0	9.5
AardVac Skimmer (2)	7680	800	2 Utility	8	Miami, FL	1	1	27	2	0	31
Queensboro Skimmer (1)	905	400	1 Utility	4	Belle Chasse, LA	1	1	2	2	0	6
Queensboro Skimmer (1)	905	400	1 Utility	4	Pascagoula, MS	1	1	5.5	2	0	9.5
WP 1 Skimmer (1)	3017	400	1 Utility	4	Pascagoula, MS	1	1	5.5	2	0	9.5
WP 1 Skimmer (1)	3017	400	1 Utility	4	Tampa, FL	1	1	21	2	0	25
WP 1 Skimmer (1)	3017	400	1 Utility	4	Miami, FL	1	1	27	2	0	31
NRCC											
Crucial Drum Skimmer	240	100	1 Utility	4-8	Cocoa, FL	4	4	22	2	1	33
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Cocoa, FL	4	4	22	2	1	33
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Ft. Lauderdale, FL	4	4	26	2	1	37
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Pensacola, FL	4	4	8	2	1	19
NRC Weir Disk Skimmer	1371	100	1 Utility	4-8	Tampa, FL	4	4	21	2	1	32
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Atlantic Beach, FL	4	4	18.5	2	1	29.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Pensacola, FL	4	4	11.5	2	1	22.5
Vikoma Fasflo Skimmer	2112	100	1 Utility	4-8	Belle Chasse, LA	4	4	2	2	1	13
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Atlantic Beach, FL	4	4	18.5	2	1	29.5
VTU w/weir head skimmer (2)	13714	48	1 Utility	8-12	Ft. Lauderdale, FL	4	4	26	2	1	37
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Pensacola, FL	4	4	11.5	2	1	22.5
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Tampa, FL	4	4	21	2	1	32
VTU w/weir head skimmer	6857	24	1 Utility	4-8	Harvey, LA	4	4	2	2	1	13

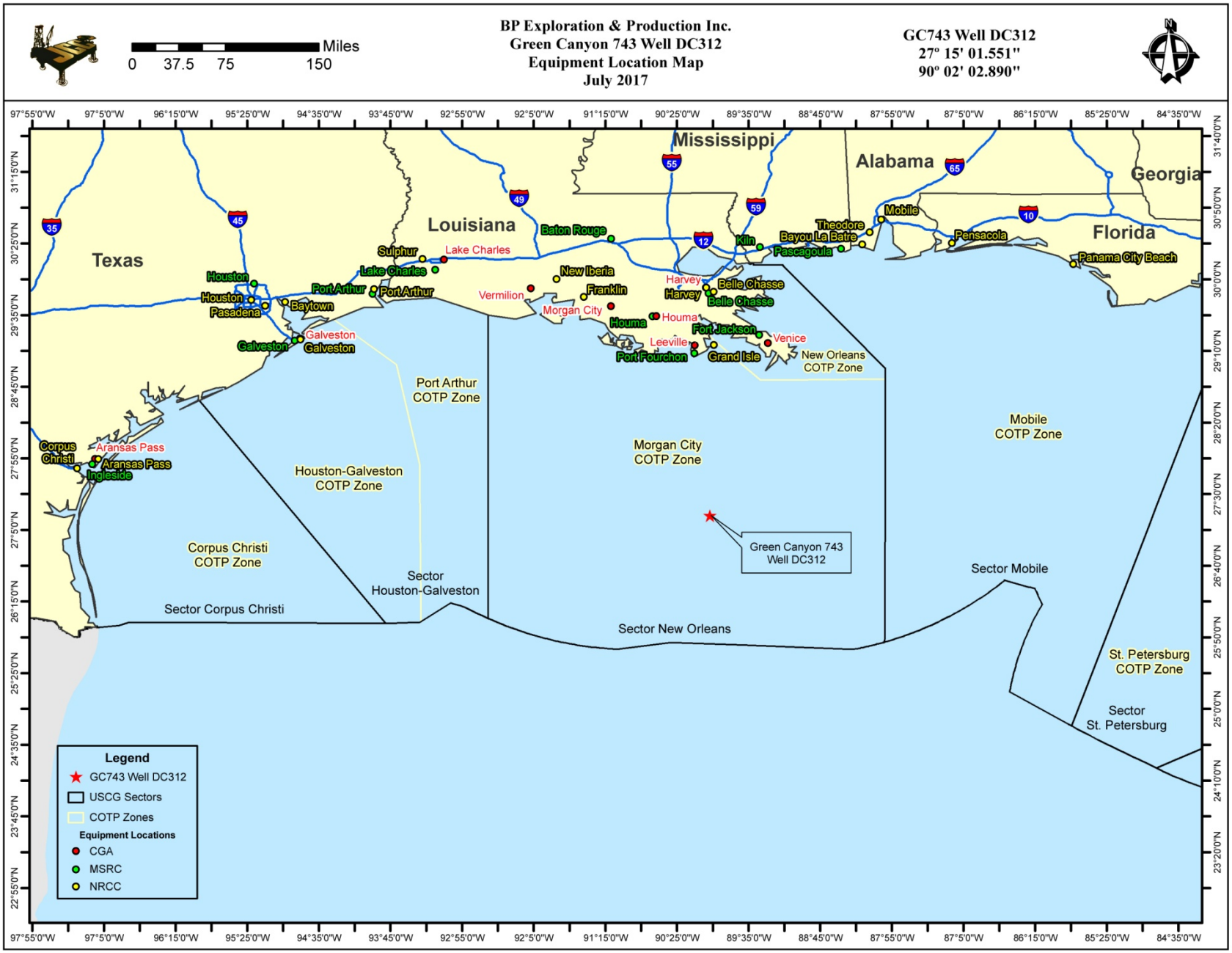
Shoreline Protection Response for Plaquemines Parish

Staging Area: Venice

Shoreline Protection Boom	Support Vessel(s)	Persons Req.	Storage/Warehouse Location	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
AMPOL (Available through MSA)									
34,050' 18" Boom	13 Crew	26	New Iberia, LA	2	2	6	2	12	24
12.850' 18" Boom	7 Crew	14	Chalmette, LA	2	2	2.5	2	6	14.5
3,200' 18" Boom	2 Crew	4	Venice, LA	2	2	0	2	2	8
MSRC									
6,950' 18" Boom	3 Crew	6	Pascagoula, MS	1	2	5.5	2	1	11.5
2,950' 18" Boom	3 Crew	6	Miami, FL	1	2	27	2	1	33
NRCC									
100' 18" Boom	2 Crew	4-8	Mobile, AL	4	2	7	2	4	19
2,000' 18" Boom	4 Crew	8-16	Cocoa, FL	4	2	22	2	4	34
100' 18" Boom	2 Crew	4-8	Ft. Lauderdale, FL	4	2	26	2	4	38
1,100' 18" Boom	2 Crew	4-8	Key West, FL	4	2	31	2	4	43
4,000' 18" Boom	4 Crew	8-16	Olive Branch, MS	4	2	13	2	4	25
4,100' 18" Boom	4 Crew	8-16	Savannah, GA	4	2	22	2	4	34
4,100' 18" Boom	4 Crew	8-16	Pensacola, FL	4	2	8	2	4	20
100' 18" Boom	2 Crew	4-8	Tampa, FL	4	2	21	2	4	33
4,100' 18" Boom	6 Crew	12-24	Lafitte, LA	4	2	3	2	4	15
100' 18" Boom	2 Crew	4-8	Sulphur, LA	4	2	8.5	2	4	20.5

Wildlife Response	EDRC	Storage Capacity	Support Vessel(s)	Persons Req.	From	Hrs to Procure	Hrs to Loadout	Travel to Staging	Travel to Deployment	Hrs to Deploy	Total Hrs
CGA											
Wildlife Support Trailer	NA	NA	NA	2	Harvey, LA	2	2	2	1	2	9
Bird Scare Guns (48)	NA	NA	NA	2	Harvey, LA	2	2	2	1	2	9
Bird Scare Guns (24)	NA	NA	NA	2	Leeville, LA	2	2	5	1	2	12

Response Asset Totals	Total (bbls)
Offshore EDRC	1,371,673
Offshore Recovered Oil Storage	1,657,896+
Nearshore / Shallow Water EDRC	409,892
Nearshore / Shallow Water Recovered Oil Storage	451,873+


BP Exploration & Production Inc.
Green Canyon 743 Well DC312
Equipment Location Map
July 2017
GC743 Well DC312
27° 15' 01.551"
90° 02' 02.890"
Miles
0 37.5 75 150
Texas
Louisiana
Mississippi
Alabama
Georgia
Florida
Houston
Pasadena
Baytown
Galveston
Port Arthur
Sulphur
Lake Charles
Vermilion
Baton Rouge
New Iberia
Franklin
Morgan City
Houma
Harvey
Belle Chasse
Leeville
Port Fourchon
Grand Isle
Fort Jackson
Venice
Kiln
Pascagoula
Bayou La Batre
Theodore
Mobile
Pensacola
Panama City Beach
Corpus Christi
Aransas Pass
Ingleside
Port Arthur COTP Zone
Houston-Galveston COTP Zone
Morgan City COTP Zone
New Orleans COTP Zone
Mobile COTP Zone
Corpus Christi COTP Zone
Sector Houston-Galveston
Sector Corpus Christi
Sector New Orleans
Sector Mobile
St. Petersburg COTP Zone
Sector St. Petersburg
Green Canyon 743 Well DC312
Legend
GC743 Well DC312
USCG Sectors
COTP Zones
Equipment Locations
CGA
MSRC
NRCC

References

Ji, Zhen-Gang, Walter R. Johnson, Charles F. Marshall, and Eileen M. Lear. 2004. Oil-Spill Risk Analysis: Contingency Planning Statistics for Gulf of Mexico OCS Activities. OCS Report 2004-026, Herndon, VA: U.S. Dept. of the Interior, Minerals Management Service, Environmental Division.

https://www.climatesignals.org/resources/chart-atlantic-hurricane-season-1851-2013

Appendix H: Service Processing Fee

Nesbit, Catherine

From: notification@pay.gov
Sent: Thursday, September 9, 2021 20:27
To: Nesbit, Catherine
Subject: Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

Follow Up Flag: Follow up
Flag Status: Flagged

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 Development/DOCD Plan - BD
Pay.gov Tracking ID: 26T9OF16
Agency Tracking ID: 76145265508
Transaction Type: Sale
Transaction Date: 09/09/2021 09:27:10 PM EDT
Account Holder Name: Catherine Nesbit
Transaction Amount: $8,476.00
Card Type: MasterCard
Card Number: **********4436

Region: Gulf of Mexico
Contact: Catherine Nesbit 281-896-5128
Company Name/No: BP Exploration & Production, 02481
Lease Number(s): 15604, 15606, 15607, 15608,
Area-Block: Green Canyon GC, 699: Green Canyon GC, 742: Green Canyon GC, 743: Green Canyon GC, 744: ,
Type-Wells: Supplemental Plan, 2

THIS IS AN AUTOMATED MESSAGE. PLEASE DO NOT REPLY.

Pay.gov is a program of the U.S. Department of the Treasury, Bureau of the Fiscal Service

Nesbit, Catherine

From: notification@pay.gov
Sent: Thursday, September 9, 2021 20:25
To: Nesbit, Catherine
Subject: Pay.gov Payment Confirmation: BOEM Development/DOCD Plan - BD

Follow Up Flag: Follow up
Flag Status: Flagged

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 Development/DOCD Plan - BD
Pay.gov Tracking ID: 26T9P1Q4
Agency Tracking ID: 76145264461
Transaction Type: Sale
Transaction Date: 09/09/2021 09:24:42 PM EDT
Account Holder Name: Catherine Nesbit
Transaction Amount: $8,476.00
Card Type: MasterCard
Card Number: **********4436

Region: Gulf of Mexico
Contact: Catherine Nesbit 281-896-5128
Company Name/No: BP Exploration & Production, 02481
Lease Number(s): 15604, 15606, 15607, 15608,
Area-Block: Green Canyon GC, 699: Green Canyon GC, 742: Green Canyon GC, 743: Green Canyon GC, 744: ,
Type-Wells: Supplemental Plan, 2

THIS IS AN AUTOMATED MESSAGE. PLEASE DO NOT REPLY.

Pay.gov is a program of the U.S. Department of the Treasury, Bureau of the Fiscal Service

Appendix I: New or Unusual Technology

MPD for GoM Exploration Wells

Context

Managed Pressure Drilling (MPD) is defined by the International Association of Drilling Contractors (IADC) as "An adaptive drilling process used to precisely control the annular pressure profile throughout the wellbore." The ability to control the annular pressure profile facilitates remaining within the downhole pressure limits imposed by the well's Pore Pressure Fracture Gradient (PPFG) and including additional factors like wellbore stability and trip margin. A study conducted by the Drilling Engineers Association on behalf of the U.S. Department of Interior Minerals Management Service concluded "MPD is as safe as or safer than conventional offshore drilling" (Malloy, 2008).

Background

BP has been using Surface Back Pressure (SBP) MPD to successfully deliver complex High Pressure High Temperature (HPHT) exploration wells in Egypt since 2007. This MPD method has many advantages for this environment, where geological uncertainty and associated challenges often lead to high Non-Productive Time (NPT) or inability to deliver exploration objectives. BP has also used this method to successfully deliver a shallow water deep gas exploration well in the GoM in 2009. The advantages of this method in exploration wells have long been established.

It is worth mentioning that the SBP method is not limited to exploration and appraisal wells, and it has been used successfully within BP to drill development wells where the high mud weight required for wellbore stability leads to a narrow drilling window and an increased risk of losses in depleted sands.

SBP MPD Theory

SBP MPD, often referred to within the industry as Constant Bottom Hole Pressure (CBHP), uses surface pressure to supplement a lighter than conventional mud weight to maintain an overbalanced condition. This technique enables maintaining a near constant pressure throughout the open hole well bore when both dynamic and static. This prevents the pressure cycling experienced by the open hole well bore which can cause well bore fatigue and lead to underbalanced conditions (i.e. kicks taken at pumps off events). The ability to apply SBP reduces the well control risk of allowing an influx during pumps off events and on trips. The system also provides an early kick and loss detection capability through the use of pressure monitoring and high accuracy flow rate monitors such as a Coriolis meter.

Benefits of SBP MPD for Exploration wells in GoM

GoM deepwater exploration wells, particularly sub-salt, face many challenges such as:

1. PPFG uncertainty, particularly with poor seismic imaging sub-salt.
2. Tight operating window between Pore Pressure and Fracture Gradient, which may potentially increase the risk of losses or well control issues.

3. Equivalent Circulating Density (ECD) management.
4. Risk and time associated with riser gas events.
5. Wellbore ballooning.
6. Challenges associated with salt exit uncertainty
7. Difficulty tripping out or pumping of hole due to narrow window and swabbing / losses.

SBP MPD allows managing and mitigating these challenges through the ability to control bottomhole pressure and maintain it near constant. Benefits of SBP MPD for exploration wells may include:

1. Early Kick/Loss detection.
2. Fast and Precise control of BHP.
3. Constant BHP reduces or eliminates ballooning. Unmanageable wellbore ballooning is a common cause for high NPT and failure to reach Total Depth (TD) objectives in exploration and HPHT environments.
4. Allows identification of operating window boundaries. A dynamic Formation Integrity Test (FIT) can be quickly carried out to test wellbore integrity prior to making any changes to mud weight.
5. Allows tripping out with surface pressure to mitigate swabbing effects, instead of pumping out or raising Mud Weight (MW).
6. The SBP system provides a safer and more efficient well and riser degassing method for floating operations.

BP use of SBP MPD for Exploration wells in GoM

The SBP MPD method is the MPD method which is most suitable to address the drilling challenges encountered in GoM exploration, as it is more suited to deal with well challenges such as geological uncertainty, tight PPFG window, well bore ballooning and well bore stability with rapid response capabilities to react to changing down hole conditions by adjusting the BHP precisely and quickly. In addition, the SBP MPD system provides additional techniques to examine the well bore boundaries of the PPFG by performing well bore bleed downs and dynamic FITs.

SBP MPD equipment for Exploration wells in GoM

The SBP MPD equipment package will be detailed in a technology permit submitted and approval sought from BSEE for each each rig equipped with MPD.