

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

HOBBS OGD

APR 16 2019

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

F/S
[H]

APPLICATION FOR PERMIT TO DRILL OR REENTER

RECEIVED

1a. Type of work: ☒ DRILL ☐ REENTER		5. Lease Serial No. NMNM108973
1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other		6. If Indian, Allottee or Tribe Name
1c. Type of Completion: ☐ Hydraulic Fracturing ☒ Single Zone ☐ Multiple Zone		7. If Unit or CA Agreement, Name and No.
2. Name of Operator COG OPERATING LLC (229137)		8. Lease Name and Well No. HARRIER FEDERAL COM 101H (325390)
3a. Address 600 West Illinois Ave Midland TX 79701	3b. Phone No. (include area code) (432)683-7443	9. API Well No. 70-025-45827
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface SESW / 375 FSL / 1490 FWL / LAT 32.066039 / LONG -103.649436 At proposed prod. zone NENW / 50 FNL / 1380 FWL / LAT 32.094113 / LONG -103.64978		10. Field and Pool, or Exploratory JENNINGS / UPPER BONE SPRING SH/ (97838)
11. Sec., T. R. M. or Blk. and Survey or Area SEC 2 / T26S / R32E / NMP		
14. Distance in miles and direction from nearest town or post office* 24 miles		12. County or Parish LEA
13. State NM		
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 50 feet	16. No of acres in lease 640	17. Spacing Unit dedicated to this well 320
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 711 feet	19. Proposed Depth 9033 feet / 19308 feet	20. BLM/BIA Bond No. in file FED: NMB000215
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3246 feet	22. Approximate date work will start* 05/01/2019	23. Estimated duration 30 days
24. Attachments		

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

- | | |
|--|---|
| 1. Well plat certified by a registered surveyor. | 4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above). |
| 2. A Drilling Plan. | 5. Operator certification. |
| 3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be requested by the BLM. |

25. Signature (Electronic Submission)	Name (Printed/Typed) Mayte Reyes / Ph: (575)748-6945	Date 01/17/2019
Title Regulatory Analyst		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) Cody Layton / Ph: (575)234-5959	Date 04/05/2019
Title Assistant Field Manager Lands & Minerals		
Office CARLSBAD		

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

GCP Rec 04/16/19

APPROVED WITH CONDITIONS

Approval Date: 04/05/2019

K 04/18/19

REQUIRES NFL
(Instructions on page 2)

INSTRUCTIONS

GENERAL: This form is designed for submitting proposals to perform certain well operations, as indicated on Federal and Indian lands and leases for action by appropriate Federal agencies, pursuant to applicable Federal laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from local Federal offices.

ITEM 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

ITEM 4: Locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local Federal offices for specific instructions.

ITEM 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on the reverse side, showing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal agency offices.

ITEMS 15 AND 18: If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective productive zone.

ITEM 22: Consult applicable Federal regulations, or appropriate officials, concerning approval of the proposal before operations are started.

ITEM 24: If the proposal will involve hydraulic fracturing operations, you must comply with 43 CFR 3162.3-3, including providing information about the protection of usable water. Operators should provide the best available information about all formations containing water and their depths. This information could include data and interpretation of resistivity logs run on nearby wells. Information may also be obtained from state or tribal regulatory agencies and from local BLM offices.

NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.

AUTHORITY: 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160

PRINCIPAL PURPOSES: The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service well or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts.

ROUTINE USE: Information from the record and/or the record will be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.

EFFECT OF NOT PROVIDING INFORMATION: Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM connects this information to an evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

BURDEN HOURS STATEMENT: Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0137), Bureau Information Connection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

Additional Operator Remarks

Location of Well

1. SHL: SESW / 375 FSL / 1490 FWL / TWSP: 26S / RANGE: 32E / SECTION: 2 / LAT: 32.066039 / LONG: -103.649436 (TVD: 0 feet, MD: 0 feet)
PPP: SESW / 0 FSL / 1380 FWL / TWSP: 25S / RANGE: 32E / SECTION: 35 / LAT: 32.07971 / LONG: -103.649783 (TVD: 8998 feet, MD: 14300 feet)
PPP: SESW / 100 FSL / 1380 FWL / TWSP: 26S / RANGE: 32E / SECTION: 2 / LAT: 32.065283 / LONG: -103.649787 (TVD: 9006 feet, MD: 9200 feet)
BHL: NENW / 50 FNL / 1380 FWL / TWSP: 25S / RANGE: 32E / SECTION: 35 / LAT: 32.094113 / LONG: -103.64978 (TVD: 9033 feet, MD: 19308 feet)

BLM Point of Contact

Name: Tanja Baca
Title: Admin Support Assistant
Phone: 5752345940
Email: tabaca@blm.gov

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Review and Appeal Rights

A person contesting a decision shall request a State Director review. This request must be filed within 20 working days of receipt of the Notice with the appropriate State Director (see 43 CFR 3165.3). The State Director review decision may be appealed to the Interior Board of Land Appeals, 801 North Quincy Street, Suite 300, Arlington, VA 22203 (see 43 CFR 3165.4). Contact the above listed Bureau of Land Management office for further information.

CONFIDENTIAL



U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

● APD Print Report

04/08/2019

APD ID: 10400037725

Submission Date: 01/17/2019

Operator Name: COG OPERATING LLC

Federal/Indian APD: FED

Well Name: HARRIER FEDERAL COM.

Well Number: 101H

[Show Final Text](#)

Well Type: OIL WELL

Well Work Type: Drill

Application

Section 1 - General

APD ID: 10400037725

Tie to previous NOS?

Submission Date: 01/17/2019

BLM Office: CARLSBAD

User: Mayte Reyes

Title: Regulatory Analyst

Federal/Indian APD: FED

Is the first lease penetrated for production Federal or Indian? FED

Lease number: NMNM108973

Lease Acres: 640

Surface access agreement in place?

Allotted?

Reservation:

Agreement in place? NO

Federal or Indian agreement:

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? NO

APD Operator: COG OPERATING LLC

Operator letter of designation:

Operator Info

Operator Organization Name: COG OPERATING LLC

Operator Address: 600 West Illinois Ave

Zip: 79701

Operator PO Box:

Operator City: Midland

State: TX

Operator Phone: (432)683-7443

Operator Internet Address: RODOM@CONCHO.COM

Section 2 - Well Information

Well in Master Development Plan? NO

Master Development Plan name:

Well in Master SUPO? NO

Master SUPO name:

Well in Master Drilling Plan? NO

Master Drilling Plan name:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Well API Number:

Field/Pool or Exploratory? Field and Pool

Field Name: JENNINGS

Pool Name: UPPER BONE
SPRING SHALE

Is the proposed well in an area containing other mineral resources? USEABLE WATER

Describe other minerals:

Is the proposed well in a Helium production area? N

Use Existing Well Pad? NO

New surface disturbance?

Type of Well Pad: MULTIPLE WELL

Multiple Well Pad Name:
HARRIER FEDERAL COM

Number: 201H, 303H AND
101H

Well Class: HORIZONTAL

Number of Legs:

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: EXPLORATORY (WILDCAT)

Describe sub-type:

Distance to town: 24 Miles

Distance to nearest well: 711 FT

Distance to lease line: 50 FT

Reservoir well spacing assigned acres Measurement: 320 Acres

Well plat: COH_Harrier_101H_C102_20190111091123.pdf

Well work start Date: 05/01/2019

Duration: 30 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83

Vertical Datum: NAVD88

Survey number:

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	375	FSL	149 0	FWL	26S	32E	2	Aliquot SESW	32.06603 9	- 103.6494 36	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	324 6	0	0
KOP Leg #1	375	FSL	149 0	FWL	26S	32E	2	Aliquot SESW	32.06603 9	- 103.6494 36	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	324 6	0	0

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
PPP Leg #1	100	FSL	138 0	FWL	26S	32E	2	Aliquot SESW	32.06528 3	- 103.6497 87	LEA	NEW MEXI CO	NEW MEXI CO	S	STATE	- 576 0	920 0	900 6
PPP Leg #1	0	FSL	138 0	FWL	25S	32E	35	Aliquot SESW	32.07971	- 103.6497 83	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 575 2	143 00	899 8
EXIT Leg #1	100	FNL	138 0	FWL	25S	32E	35	Aliquot NENW	32.09397 6	- 103.6497 8	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 571 7	192 58	896 3
BHL Leg #1	50	FNL	138 0	FWL	25S	32E	35	Aliquot NENW	32.09411 3	- 103.6497 8	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 108973	- 578 7	193 08	903 3

Drilling Plan

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	UNKNOWN	3246	0	0		NONE	No
2	RUSTLER	2529	717	717		NONE	No
3	TOP SALT	2157	1089	1089		NONE	No
4	BASE OF SALT	-1098	4344	4344		NONE	No
5	LAMAR	-1330	4576	4576		NONE	No
6	BELL CANYON	-1368	4614	4614		NONE	No
7	CHERRY CANYON	-2383	5629	5629		NATURAL GAS,OIL	No
8	BRUSHY CANYON	-3984	7231	7231		NATURAL GAS,OIL	No
9	UPPER AVALON SHALE	-5550	8796	8796		NATURAL GAS,OIL	No
10	—	-5860	9107	9107		NATURAL GAS,OIL	Yes

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
11	--	-6171	9418	9418		NATURAL GAS,OIL	No
12	BONE SPRING 1ST	-6491	9738	9738		NATURAL GAS,OIL	No

Section 2 - Blowout Prevention

Pressure Rating (PSI): 2M

Rating Depth: 4596

Equipment: Annular. The BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold.

Requesting Variance? NO

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.

Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG_Harrier_101H_2M_Choke_20190107110553.pdf

BOP Diagram Attachment:

COG_Harrier_101H_2M_BOP_20190107110600.pdf

COG_Harrier_101H_Flex_Hose_20190107110610.pdf

Pressure Rating (PSI): 3M

Rating Depth: 9033

Equipment: Annular. The BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold.

Requesting Variance? YES

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.

Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG_Harrier_101H_3M_Choke_20190107110643.pdf

BOP Diagram Attachment:

COG_Harrier_101H_3M_BOP_20190107110651.pdf

COG_Harrier_101H_Flex_Hose_20190107110659.pdf

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	745	0	745	-9530	-10415	745	J-55	54.5	STC	3.31	1.36	DRY	12.66	DRY	12.66
2	INTERMEDIATE	12.25	9.625	NEW	API	Y	0	4596	0	4596	-9530	-21730	4596	L-80	40	LTC	1.28	1.66	DRY	5.73	DRY	5.73
3	PRODUCTION	8.75	5.5	NEW	API	N	0	19308	0	19308	-9530	-32300	19308	P-110	17	LTC	1.71	3.07	DRY	2.9	DRY	2.9

Casing Attachments

Casing ID: 1 String Type: SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

COG_Harrier_101H_Casing_Prog_20190107110845.pdf

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Casing Attachments

Casing ID: 2 String Type: INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

COG_Harrier_101H_Casing_Prog_20190107110853.pdf

Casing Design Assumptions and Worksheet(s):

COG_Harrier_101H_Casing_Prog_20190107110900.pdf

Casing ID: 3 String Type: PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

COG_Harrier_101H_Casing_Prog_20190107110911.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	745	260	1.75	13.5	455	50	Class C	4% Gel + 1 % CaCl2
SURFACE	Tail		0	745	250	1.34	14.8	335	50	Class C	2% CaCl2
INTERMEDIATE	Lead		0	4596	880	2	12.7	1760	50	35:65:6 C Blend	No Additives
INTERMEDIATE	Tail		0	4596	250	1.34	14.8	335	50	Class C	2% CaCl

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
PRODUCTION	Lead		0	1930 8	620	2.5	11.9	1550	25	Lead: 50:50:10 H Blend	No additives
PRODUCTION	Tail		0	1930 8	2740	1.24	14.4	3397	25	Tail: 50:50:2 Class H Blend	No additives

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

Describe what will be on location to control well or mitigate other conditions: Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times

Describe the mud monitoring system utilized: PVT/Pason/Visual Monitoring

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
745	4596	OTHER : Saturated Brine	10	10.1							Saturated Brine
4596	1930 8	OTHER : CUT BRINE	8.6	9.3							Cut Brine
0	745	OTHER : Fresh water gel	8.6	8.8							Fresh water gel

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures:

None planned

List of open and cased hole logs run in the well:

CNL,GR

Coring operation description for the well:

None planned

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 4370

Anticipated Surface Pressure: 2382.73

Anticipated Bottom Hole Temperature(F): 150

Anticipated abnormal pressures, temperatures, or potential geologic hazards? NO

Describe:

Contingency Plans geohazards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

COG_Harrier_101H_H2S_Schem_20190107111518.pdf

COG_Harrier_101H_H2S_SUP_20190107111526.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

COG_Harrier_101H_Direct_Plan_20190107111542.pdf

COG_Harrier_101H_AC_Rpt_20190107111550.pdf

Other proposed operations facets description:

GCP Attached.

Other proposed operations facets attachment:

COG_Harrier_101H_Drill_Prog_20190107111602.pdf

COG_Harrier_101H_GCP_20190107111608.pdf

Other Variance attachment:

SUPO

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

COG_Harrier_101H_Existing_Rd_20190107104328.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT

Row(s) Exist? NO

ROW ID(s)

ID:

Do the existing roads need to be improved? NO

Existing Road Improvement Description:

Existing Road Improvement Attachment:

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

COG_Harrier_101H_Maps_Plats_20190107104346.pdf

New road type: RESOURCE

Length: 0 **Feet** **Width (ft.):** 30

Max slope (%): 33 **Max grade (%):** 1

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 14

New road access erosion control: Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage, and to be consistent with local drainage patterns.

New road access plan or profile prepared? NO

New road access plan attachment:

Access road engineering design? NO

Access road engineering design attachment:

Access surfacing type: OTHER

Access topsoil source: ONSITE

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Access surfacing type description: Caliche

Access onsite topsoil source depth: 6

Offsite topsoil source description:

Onsite topsoil removal process: Blading

Access other construction information: No turnouts are planned. Re-routing access road around proposed well location.

Access miscellaneous information:

Number of access turnouts:

Access turnout map:

Drainage Control

New road drainage crossing: OTHER

Drainage Control comments: None necessary

Road Drainage Control Structures (DCS) description: None needed.

Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Additional Attachment(s):

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

COG_Harrier_101H_1Mile_Data_20190107104359.pdf

Existing Wells description:

Section 4 - Location of Existing and/or Proposed Production Facilities

Submit or defer a Proposed Production Facilities plan? DEFER

Estimated Production Facilities description: A Central Tank Battery and facilities will be permitted and constructed at a later date, once the well is completed. The battery and facilities will be installed according to API specifications.

Section 5 - Location and Types of Water Supply

Water Source Table

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Water source use type: ICE PAD CONSTRUCTION & MAINTENANCE, STIMULATION, SURFACE CASING
Describe type: Fresh Water.

Water source type: OTHER

Source latitude:

Source longitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: PRIVATE

Water source transport method: PIPELINE

Source transportation land ownership: PRIVATE

Water source volume (barrels): 450000

Source volume (acre-feet): 58.001892

Source volume (gal): 18900000

Water source use type: INTERMEDIATE/PRODUCTION CASING

Water source type: OTHER

Describe type: Brine Water

Source latitude:

Source longitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: COMMERCIAL

Water source transport method: TRUCKING

Source transportation land ownership: COMMERCIAL

Water source volume (barrels): 30000

Source volume (acre-feet): 3.866793

Source volume (gal): 1260000

Water source and transportation map:

COG_Harrier_101H_Brine_H2O_20190115070050.pdf

COG_Harrier_101H_Fresh_H2O_20190115070057.pdf

Water source comments: Fresh water will be obtained from Airacuda Frac Pond located in Section 31. T25S, R33E. Brine water will be obtained from the Malaga Brine Station II, located in Section 12. T23S. R28E.

New water well? NO

New Water Well Info

Well latitude:

Well Longitude:

Well datum:

Well target aquifer:

Est. depth to top of aquifer(ft):

Est thickness of aquifer:

Aquifer comments:

Aquifer documentation:

Well depth (ft):

Well casing type:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Well casing outside diameter (in.):

Well casing inside diameter (in.):

New water well casing?

Used casing source:

Drilling method:

Drill material:

Grout material:

Grout depth:

Casing length (ft.):

Casing top depth (ft.):

Well Production type:

Completion Method:

Water well additional information:

State appropriation permit:

Additional information attachment:

Section 6 - Construction Materials

Construction Materials description: Caliche will be obtained from the actual well site if available. If not available onsite, caliche will be obtained from Oliver Kiehne Ranch and Cattle Co., caliche pit located in Section 4, T26S, R32E. P O Box 135, Orla, TX 79770. Phone (432) 448-6337.

Construction Materials source location attachment:

Section 7 - Methods for Handling Waste

Waste type: SEWAGE

Waste content description: Human waste and gray water

Amount of waste: 1000 gallons

Waste disposal frequency : One Time Only

Safe containment description: Waste will be properly contained and disposed of properly at a state approved disposal facility.

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** PRIVATE

Disposal type description:

Disposal location description: Trucked to an approved disposal facility

Waste type: DRILLING

Waste content description: Drilling fluids and produced oil land water while drilling and completion operations

Amount of waste: 6000 barrels

Waste disposal frequency : One Time Only

Safe containment description: All drilling waste will be stored safely and disposed of properly

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Disposal type description:

Disposal location description: Trucked to an approved disposal facility

Waste type: GARBAGE

Waste content description: Garbage and trash produced during drilling and completion operations.

Amount of waste: 500 pounds

Waste disposal frequency : One Time Only

Safe containment description: Garbage and trash produced during drilling and completion operations will be collected in a trash container and disposed of properly at a state approved disposal facility

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

Disposal type description:

Disposal location description: Trucked to an approved disposal facility.

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

Reserve pit length (ft.) **Reserve pit width (ft.)**

Reserve pit depth (ft.) **Reserve pit volume (cu. yd.)**

Is at least 50% of the reserve pit in cut?

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? YES

Description of cuttings location Roll off cutting containers on tracks

Cuttings area length (ft.) **Cuttings area width (ft.)**

Cuttings area depth (ft.) **Cuttings area volume (cu. yd.)**

Is at least 50% of the cuttings area in cut?

WCuttings area liner

Cuttings area liner specifications and installation description

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 8 - Ancillary Facilities

Are you requesting any Ancillary Facilities?: NO

Ancillary Facilities attachment:

Comments:

Section 9 - Well Site Layout

Well Site Layout Diagram:

COG_Harrier_101H_Layout_20190107104426.pdf

Comments: A Central Tank Battery and facilities will be permitted and constructed at a later date, once the well is completed. The battery and facilities will be installed according to API specifications.

Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance

Multiple Well Pad Name: HARRIER FEDERAL COM

Multiple Well Pad Number: 201H, 303H AND 101H

Recontouring attachment:

Drainage/Erosion control construction: Due to the relatively flat surface No waddles will be needed to reduce sediment impacts to fragile/sensitive soils.

Drainage/Erosion control reclamation: West 50'

Well pad proposed disturbance (acres): 3.67	Well pad interim reclamation (acres): 0.15	Well pad long term disturbance (acres): 2.35
Road proposed disturbance (acres): 0	Road interim reclamation (acres): 0	Road long term disturbance (acres): 0
Powerline proposed disturbance (acres): 0	Powerline interim reclamation (acres): 0	Powerline long term disturbance (acres): 0
Pipeline proposed disturbance (acres): 0	Pipeline interim reclamation (acres): 0	Pipeline long term disturbance (acres): 0
Other proposed disturbance (acres): 0	Other interim reclamation (acres): 0	Other long term disturbance (acres): 0
Total proposed disturbance: 3.67	Total interim reclamation: 0.15	Total long term disturbance: 2.35

Disturbance Comments:

Reconstruction method: If needed, portions of the pad not needed for production operations will be re-contoured to its original state as much as possible. The caliche that is removed will be reused. The stockpiled topsoil will be spread out over reclaimed area and reseeded with BLM approved seed mixture.

Topsoil redistribution: West 50'

Soil treatment: None

Existing Vegetation at the well pad: Shinnery Oak/Mesquite grassland

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Existing Vegetation at the well pad attachment:

Existing Vegetation Community at the road: Shinnery Oak/Mesquite grassland

Existing Vegetation Community at the road attachment:

Existing Vegetation Community at the pipeline: Shinnery Oak/Mesquite grassland

Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances: N/A

Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? NO

Seed harvest description:

Seed harvest description attachment:

Seed Management

Seed Table

Seed type:

Seed source:

Seed name:

Source name:

Source address:

Source phone:

Seed cultivar:

Seed use location:

PLS pounds per acre:

Proposed seeding season:

Seed Summary

Total pounds/Acre:

Seed Type	Pounds/Acre
-----------	-------------

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Seed reclamation attachment:

Operator Contact/Responsible Official Contact Info

First Name: Gerald

Last Name: Herrera

Phone: (432)260-7399

Email: gherrera@concho.com

Seedbed prep:

Seed BMP:

Seed method:

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: N/A

Weed treatment plan attachment:

Monitoring plan description: N/A

Monitoring plan attachment:

Success standards: N/A

Pit closure description: N/A

Pit closure attachment:

COG_Harrier_101H_Closed_Loop_20190107104442.pdf

Section 11 - Surface Ownership

Disturbance type: WELL PAD

Describe:

Surface Owner: STATE GOVERNMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office: STATE OF NEW MEXICO

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland:

USFS Ranger District:

Section 12 - Other Information

Right of Way needed? NO

Use APD as ROW?

ROW Type(s):

ROW Applications

SUPO Additional Information: Surface Use & Operating Plan.

Use a previously conducted onsite? YES

Previous Onsite information: Onsite completed on 4/26/2018 by Rand French (COG); Gerald Herrera (COG) and Jeff Robertson (BLM).

Other SUPO Attachment

COG_Harrier_101H_1Mile_Data_20190107104511.pdf
COG_Harrier_101H_Brine_H2O_20190107104524.pdf
COG_Harrier_101H_C102_20190107104532.pdf
COG_Harrier_101H_Certification_20190107104609.pdf
COG_Harrier_101H_Closed_Loop_20190107104617.pdf
COG_Harrier_101H_Existing_Rd._20190107104636.pdf
COG_Harrier_101H_Layout_20190107104649.pdf
COG_Harrier_101H_Maps_Plats_20190107104658.pdf
COG_Harrier_101H_Reclamation_20190115070132.pdf
COG_Harrier_101H_Fresh_H2O_20190115070139.pdf
COG_Harrier_101H_SUP_20190117093433.pdf

PWD

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 1 - General

Would you like to address long-term produced water disposal? NO

Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Describe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

Lined pit Monitor description:

Lined pit Monitor attachment:

Lined pit: do you have a reclamation bond for the pit?

Is the reclamation bond a rider under the BLM bond?

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Lined pit bond number:

Lined pit bond amount:

Additional bond information attachment:

Section 3 - Unlined Pits

Would you like to utilize Unlined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit specifications:

Precipitated solids disposal:

Describe precipitated solids disposal:

Precipitated solids disposal permit:

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule attachment:

Unlined pit reclamation description:

Unlined pit reclamation attachment:

Unlined pit Monitor description:

Unlined pit Monitor attachment:

Do you propose to put the produced water to beneficial use?

Beneficial use user confirmation:

Estimated depth of the shallowest aquifer (feet):

Does the produced water have an annual average Total Dissolved Solids (TDS) concentration equal to or less than that of the existing water to be protected?

TDS lab results:

Geologic and hydrologic evidence:

State authorization:

Unlined Produced Water Pit Estimated percolation:

Unlined pit: do you have a reclamation bond for the pit?

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information attachment:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Section 4 - Injection

Would you like to utilize Injection PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number:

Injection well name:

Assigned injection well API number?

Injection well API number:

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection attachment:

Underground Injection Control (UIC) Permit?

UIC Permit attachment:

Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 - Other

Would you like to utilize Other PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Other PWD discharge volume (bbl/day):

Other PWD type description:

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

Bond Info

Bond Information

Federal/Indian APD: FED

BLM Bond number: NMB000215

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment:

Operator Certification

Operator Certification

I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exist; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application. These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.

NAME: Mayte Reyes

Signed on: 12/27/2018

Title: Regulatory Analyst

Street Address: 2208 W Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6945

Email address: Mreyes1@concho.com

Operator Name: COG OPERATING LLC

Well Name: HARRIER FEDERAL COM

Well Number: 101H

Field Representative

Representative Name: Gerald Herrera

Street Address: 2208 West Main Street

City: Artesia

State: NM

Zip: 88210

Phone: (575)748-6940

Email address: gherrera@concho.com

Payment Info

Payment

APD Fee Payment Method: PAY.GOV

pay.gov Tracking ID: 26ENS5TL

COG Production, LLC - Harrier Federal Com #101H

1. Geologic Formations

TVD of target	9,033' EOL	Pilot hole depth	NA
MD at TD:	19,308'	Deepest expected fresh water:	405'

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	717	Water	
Top of Salt	1089	Salt	
Base of Salt	4344	Salt	
Lamar	4576	Salt Water	
Bell Canyon	4614	Salt Water	
Cherry Canyon	5629	Oil/Gas	
Brushy Canyon	7231	Oil/Gas	
U. Avalon Shale	8796	Oil/Gas	
M. Avalon Shale	9107	Target Zone	
L. Avalon Shale	9418	Not Penetrated	
1st Bone Spring Sand	9738	Not Penetrated	
2nd Bone Spring Sand	X	Not Penetrated	
3rd Bone Spring Sand	X	Not Penetrated	

2. Casing Program

Hole Size	Casing Interval		Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
	From	To							
17.5"	0	745	13.375"	54.5	J55	STC	3.31	1.36	12.66
12.25"	0	4000	9.625"	40	J55	LTC	1.22	1.14	3.25
12.25"	4000	4596	9.625"	40	L80	LTC	1.28	1.66	5.73
8.75"	0	19,308	5.5"	17	P110	LTC	1.71	3.07	2.90
BLM Minimum Safety Factor							1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing to mitigate collapse. Intermediate burst based on 0.7 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.

All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

COG Production, LLC - Harrier Federal Com #101H

	Y or N
Is casing new? If used, attach certification as required in Onshore Order #1	Y
Does casing meet API specifications? If no, attach casing specification sheet.	Y
Is premium or uncommon casing planned? If yes attach casing specification sheet.	N
Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria).	Y
Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing?	Y
Is well located within Capitan Reef?	N
If yes, does production casing cement tie back a minimum of 50' above the Reef?	
Is well within the designated 4 string boundary?	
Is well located in SOPA but not in R-111-P?	N
If yes, are the first 2 strings cemented to surface and 3 rd string cement tied back 500' into previous casing?	
Is well located in R-111-P and SOPA?	N
If yes, are the first three strings cemented to surface?	
Is 2 nd string set 100' to 600' below the base of salt?	
Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

3. Cementing Program

Casing	# Sks	Wt. lb/ gal	Yld ft ³ / sack	H ₂ O gal/sk	500# Comp. Strength (hours)	Slurry Description
Surf.	260	13.5	1.75	9	12	Lead: Class C + 4% Gel + 1% CaCl ₂
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl ₂
Inter.	880	12.7	2.0	9.6	16	Lead: 35:65:6 C Blend
	250	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl
5.5 Prod	620	11.9	2.5	19	72	Lead: 50:50:10 H Blend
	2740	14.4	1.24	5.7	19	Tail: 50:50:2 Class H Blend

Volumes Subject to Observed Hole Conditions and/or Fluid Caliper Results

Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC	% Excess
Surface	0'	50%
1 st Intermediate	0'	50%
Production	4,096'	25% OH in Lateral (KOP to EOL) – 40% OH in Vertical

COG Production, LLC - Harrier Federal Com #101H

4. Pressure Control Equipment

N	A variance is requested for the use of a diverter on the surface casing. See attached for schematic.
----------	---

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	x	Tested to:
12-1/4"	13-5/8"	2M	Annular	x	2000 psi
			Blind Ram		2M
			Pipe Ram		
			Double Ram		
			Other*		
8-3/4"	13-5/8"	3M	Annular	x	50% testing pressure
			Blind Ram	x	3M
			Pipe Ram	x	
			Double Ram		
			Other*		

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

X	Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i.
Y	A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart.
	N Are anchors required by manufacturer?
N	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested.

5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	Surf. Shoe	FW Gel	8.6 - 8.8	28-34	N/C
Surf csg	9-5/8" Int shoe	Saturated Brine	10 - 10.1	28-34	N/C
9-5/8" Int shoe	Lateral TD	Cut Brine	8.6 - 9.3	28-34	N/C

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?	PVT/Pason/Visual Monitoring
---	-----------------------------

6. Logging and Testing Procedures

Logging, Coring and Testing.

Y	Will run GR/CNL from TD to surface (horizontal well – vertical portion of hole). Stated logs run will be in the Completion Report and submitted to the BLM.
Y	No Logs are planned based on well control or offset log information.
N	Drill stem test? If yes, explain.
N	Coring? If yes, explain.

Additional logs planned		Interval
N	Resistivity	Pilot Hole TD to ICP
N	Density	Pilot Hole TD to ICP
Y	CBL	Production casing (If cement not circulated to surface)
Y	Mud log	Intermediate shoe to TD
N	PEX	

7. Drilling Conditions

Condition	Specify what type and where?
BH Pressure at deepest TVD	4370 psi at 9033' TVD
Abnormal Temperature	NO 150 Deg. F.

No abnormal pressure or temperature conditions are anticipated. Sufficient mud materials to maintain mud properties and weight increase requirements will be kept on location at all times.

Sufficient supplies of Paper/LCM for periodic sweeps to control seepage and losses will be maintained on location.

Hydrogen Sulfide (H2S) monitors will be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.

N H2S is present

Y H2S Plan attached

8. Other Facets of Operation

Y	Is it a walking operation?
N	Is casing pre-set?

x	H2S Plan.
x	BOP & Choke Schematics.
x	Directional Plan



CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 02, T 26-S, R 32-E

Harrier Federal Com 101H

Wellbore #1

Plan: Plan #1

Standard Survey Report

24 December, 2018





Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Project Lea County, NM (NAD27 NME)

Map System: US State Plane 1927 (Exact solution)
Geo Datum: NAD 1927 (NADCON CONUS)
Map Zone: New Mexico East 3001

System Datum: Mean Sea Level

Site Sec. 02, T 26-S, R 32-E

Site Position:
From: Map
Position Uncertainty: 0.00 usft
Northing: 388,376.40 usft
Easting: 712,001.00 usft
Slot Radius: 13-3/16 "
Latitude: 32.06592
Longitude: -103.64897
Grid Convergence: 0.36 °

Well Harrier Federal Com 101H

Well Position +N/-S 0.00 usft **Northing:** 388,376.40 usft **Latitude:** 32.06592
+E/-W 0.00 usft **Easting:** 712,001.00 usft **Longitude:** -103.64897
Position Uncertainty 0.00 usft **Wellhead Elevation:** 0.00 usft **Ground Level:** 3,246.00 usft

Wellbore Wellbore #1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	12/24/2018	6.72	59.70	47,772

Design Plan #1

Audit Notes:

Version: **Phase:** PLAN **Tie On Depth:** 0.00
Vertical Section: **Depth From (TVD) (usft)** **+N/-S (usft)** **+E/-W (usft)** **Direction (°)**
0.00 0.00 0.00 359.04

Survey Tool Program **Date** 12/24/2018

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	19,308.03	Plan #1 (Wellbore #1)	MWD	MWD - Standard

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
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MD Reference: KB=26' @ 3272.00usft (Scandrill Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,800.00	0.00	0.00	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,900.00	0.00	0.00	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	5,000.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
5,100.00	2.00	191.62	5,099.98	-1.71	-0.35	-1.70	2.00	2.00	0.00
5,200.00	4.00	191.62	5,199.84	-6.84	-1.41	-6.81	2.00	2.00	0.00

Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,259.58	5.19	191.62	5,259.22	-11.51	-2.37	-11.47	2.00	2.00	0.00
Start 3163.47 hold at 5259.58 MD									
5,300.00	5.19	191.62	5,299.48	-15.09	-3.10	-15.04	0.00	0.00	0.00
5,400.00	5.19	191.62	5,399.07	-23.96	-4.92	-23.87	0.00	0.00	0.00
5,500.00	5.19	191.62	5,498.66	-32.82	-6.75	-32.70	0.00	0.00	0.00
5,600.00	5.19	191.62	5,598.25	-41.68	-8.57	-41.53	0.00	0.00	0.00
5,700.00	5.19	191.62	5,697.84	-50.55	-10.39	-50.37	0.00	0.00	0.00
5,800.00	5.19	191.62	5,797.43	-59.41	-12.21	-59.20	0.00	0.00	0.00
5,900.00	5.19	191.62	5,897.02	-68.27	-14.03	-68.03	0.00	0.00	0.00
6,000.00	5.19	191.62	5,996.61	-77.14	-15.86	-76.86	0.00	0.00	0.00
6,100.00	5.19	191.62	6,096.20	-86.00	-17.68	-85.69	0.00	0.00	0.00
6,200.00	5.19	191.62	6,195.79	-94.86	-19.50	-94.52	0.00	0.00	0.00
6,300.00	5.19	191.62	6,295.38	-103.73	-21.32	-103.36	0.00	0.00	0.00
6,400.00	5.19	191.62	6,394.97	-112.59	-23.14	-112.19	0.00	0.00	0.00
6,500.00	5.19	191.62	6,494.56	-121.45	-24.96	-121.02	0.00	0.00	0.00
6,600.00	5.19	191.62	6,594.15	-130.32	-26.79	-129.85	0.00	0.00	0.00
6,700.00	5.19	191.62	6,693.74	-139.18	-28.61	-138.68	0.00	0.00	0.00
6,800.00	5.19	191.62	6,793.33	-148.04	-30.43	-147.51	0.00	0.00	0.00
6,900.00	5.19	191.62	6,892.92	-156.91	-32.25	-156.35	0.00	0.00	0.00
7,000.00	5.19	191.62	6,992.51	-165.77	-34.07	-165.18	0.00	0.00	0.00
7,100.00	5.19	191.62	7,092.10	-174.63	-35.90	-174.01	0.00	0.00	0.00
7,200.00	5.19	191.62	7,191.68	-183.50	-37.72	-182.84	0.00	0.00	0.00
7,300.00	5.19	191.62	7,291.27	-192.36	-39.54	-191.67	0.00	0.00	0.00
7,400.00	5.19	191.62	7,390.86	-201.22	-41.36	-200.50	0.00	0.00	0.00
7,500.00	5.19	191.62	7,490.45	-210.09	-43.18	-209.34	0.00	0.00	0.00
7,600.00	5.19	191.62	7,590.04	-218.95	-45.01	-218.17	0.00	0.00	0.00
7,700.00	5.19	191.62	7,689.63	-227.81	-46.83	-227.00	0.00	0.00	0.00
7,800.00	5.19	191.62	7,789.22	-236.68	-48.65	-235.83	0.00	0.00	0.00
7,900.00	5.19	191.62	7,888.81	-245.54	-50.47	-244.66	0.00	0.00	0.00
8,000.00	5.19	191.62	7,988.40	-254.40	-52.29	-253.49	0.00	0.00	0.00
8,100.00	5.19	191.62	8,087.99	-263.27	-54.11	-262.33	0.00	0.00	0.00
8,200.00	5.19	191.62	8,187.58	-272.13	-55.94	-271.16	0.00	0.00	0.00
8,300.00	5.19	191.62	8,287.17	-280.99	-57.76	-279.99	0.00	0.00	0.00
8,400.00	5.19	191.62	8,386.76	-289.86	-59.58	-288.82	0.00	0.00	0.00
8,423.05	5.19	191.62	8,409.72	-291.90	-60.00	-290.86	0.00	0.00	0.00
Start DLS 10.00 TFO 166.72									
8,500.00	2.90	334.14	8,486.58	-293.56	-61.55	-292.49	10.00	-2.98	185.23
8,600.00	12.70	353.10	8,585.54	-280.35	-63.98	-279.24	10.00	9.80	18.96
8,700.00	22.67	355.54	8,680.70	-250.15	-66.81	-248.99	10.00	9.97	2.44
8,800.00	32.66	356.53	8,769.15	-203.88	-69.95	-202.68	10.00	9.99	0.99
8,900.00	42.65	357.10	8,848.22	-142.96	-73.30	-141.71	10.00	9.99	0.57
9,000.00	52.65	357.48	8,915.50	-69.23	-76.77	-67.93	10.00	10.00	0.38
9,100.00	62.65	357.78	8,968.94	15.07	-80.25	16.41	10.00	10.00	0.29
9,200.00	72.65	358.02	9,006.92	107.38	-83.63	108.76	10.00	10.00	0.24



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,300.00	82.64	358.24	9,028.30	204.89	-86.81	206.31	10.00	10.00	0.22
9,377.69	90.41	358.40	9,033.00	282.34	-89.09	283.79	10.00	10.00	0.21
Start DLS 2.00 TFO 90.31									
9,400.00	90.41	358.85	9,032.84	304.65	-89.62	306.10	2.00	-0.01	2.00
9,434.28	90.40	359.53	9,032.60	338.92	-90.11	340.38	2.00	-0.01	2.00
Start 9873.76 hold at 9434.27 MD									
9,500.00	90.40	359.53	9,032.13	404.64	-90.64	406.10	0.00	0.00	0.00
9,600.00	90.40	359.53	9,031.43	504.63	-91.46	506.09	0.00	0.00	0.00
9,700.00	90.40	359.53	9,030.72	604.63	-92.28	606.08	0.00	0.00	0.00
9,800.00	90.40	359.53	9,030.02	704.62	-93.10	706.08	0.00	0.00	0.00
9,900.00	90.40	359.53	9,029.31	804.61	-93.91	806.07	0.00	0.00	0.00
10,000.00	90.40	359.53	9,028.61	904.61	-94.73	906.07	0.00	0.00	0.00
10,100.00	90.40	359.53	9,027.90	1,004.60	-95.55	1,006.06	0.00	0.00	0.00
10,200.00	90.40	359.53	9,027.20	1,104.60	-96.36	1,106.05	0.00	0.00	0.00
10,300.00	90.40	359.53	9,026.49	1,204.59	-97.18	1,206.05	0.00	0.00	0.00
10,400.00	90.40	359.53	9,025.79	1,304.58	-98.00	1,306.04	0.00	0.00	0.00
10,500.00	90.40	359.53	9,025.08	1,404.58	-98.82	1,406.03	0.00	0.00	0.00
10,600.00	90.40	359.53	9,024.38	1,504.57	-99.63	1,506.03	0.00	0.00	0.00
10,700.00	90.40	359.53	9,023.68	1,604.57	-100.45	1,606.02	0.00	0.00	0.00
10,800.00	90.40	359.53	9,022.97	1,704.56	-101.27	1,706.02	0.00	0.00	0.00
10,900.00	90.40	359.53	9,022.27	1,804.56	-102.09	1,806.01	0.00	0.00	0.00
11,000.00	90.40	359.53	9,021.56	1,904.55	-102.90	1,906.00	0.00	0.00	0.00
11,100.00	90.40	359.53	9,020.86	2,004.54	-103.72	2,006.00	0.00	0.00	0.00
11,200.00	90.40	359.53	9,020.15	2,104.54	-104.54	2,105.99	0.00	0.00	0.00
11,300.00	90.40	359.53	9,019.45	2,204.53	-105.35	2,205.99	0.00	0.00	0.00
11,400.00	90.40	359.53	9,018.74	2,304.53	-106.17	2,305.98	0.00	0.00	0.00
11,500.00	90.40	359.53	9,018.04	2,404.52	-106.99	2,405.97	0.00	0.00	0.00
11,600.00	90.40	359.53	9,017.33	2,504.51	-107.81	2,505.97	0.00	0.00	0.00
11,700.00	90.40	359.53	9,016.63	2,604.51	-108.62	2,605.96	0.00	0.00	0.00
11,800.00	90.40	359.53	9,015.92	2,704.50	-109.44	2,705.96	0.00	0.00	0.00
11,900.00	90.40	359.53	9,015.22	2,804.50	-110.26	2,805.95	0.00	0.00	0.00
12,000.00	90.40	359.53	9,014.51	2,904.49	-111.07	2,905.94	0.00	0.00	0.00
12,100.00	90.40	359.53	9,013.81	3,004.49	-111.89	3,005.94	0.00	0.00	0.00
12,200.00	90.40	359.53	9,013.10	3,104.48	-112.71	3,105.93	0.00	0.00	0.00
12,300.00	90.40	359.53	9,012.40	3,204.47	-113.53	3,205.92	0.00	0.00	0.00
12,400.00	90.40	359.53	9,011.69	3,304.47	-114.34	3,305.92	0.00	0.00	0.00
12,500.00	90.40	359.53	9,010.99	3,404.46	-115.16	3,405.91	0.00	0.00	0.00
12,600.00	90.40	359.53	9,010.28	3,504.46	-115.98	3,505.91	0.00	0.00	0.00
12,700.00	90.40	359.53	9,009.58	3,604.45	-116.80	3,605.90	0.00	0.00	0.00
12,800.00	90.40	359.53	9,008.87	3,704.44	-117.61	3,705.89	0.00	0.00	0.00
12,900.00	90.40	359.53	9,008.17	3,804.44	-118.43	3,805.89	0.00	0.00	0.00
13,000.00	90.40	359.53	9,007.46	3,904.43	-119.25	3,905.88	0.00	0.00	0.00
13,100.00	90.40	359.53	9,006.76	4,004.43	-120.06	4,005.88	0.00	0.00	0.00



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,200.00	90.40	359.53	9,006.05	4,104.42	-120.88	4,105.87	0.00	0.00	0.00
13,300.00	90.40	359.53	9,005.35	4,204.42	-121.70	4,205.86	0.00	0.00	0.00
13,400.00	90.40	359.53	9,004.64	4,304.41	-122.52	4,305.86	0.00	0.00	0.00
13,500.00	90.40	359.53	9,003.94	4,404.40	-123.33	4,405.85	0.00	0.00	0.00
13,600.00	90.40	359.53	9,003.23	4,504.40	-124.15	4,505.84	0.00	0.00	0.00
13,700.00	90.40	359.53	9,002.53	4,604.39	-124.97	4,605.84	0.00	0.00	0.00
13,800.00	90.40	359.53	9,001.82	4,704.39	-125.79	4,705.83	0.00	0.00	0.00
13,900.00	90.40	359.53	9,001.12	4,804.38	-126.60	4,805.83	0.00	0.00	0.00
14,000.00	90.40	359.53	9,000.41	4,904.38	-127.42	4,905.82	0.00	0.00	0.00
14,100.00	90.40	359.53	8,999.71	5,004.37	-128.24	5,005.81	0.00	0.00	0.00
14,200.00	90.40	359.53	8,999.00	5,104.36	-129.05	5,105.81	0.00	0.00	0.00
14,300.00	90.40	359.53	8,998.30	5,204.36	-129.87	5,205.80	0.00	0.00	0.00
14,400.00	90.40	359.53	8,997.60	5,304.35	-130.69	5,305.80	0.00	0.00	0.00
14,500.00	90.40	359.53	8,996.89	5,404.35	-131.51	5,405.79	0.00	0.00	0.00
14,600.00	90.40	359.53	8,996.19	5,504.34	-132.32	5,505.78	0.00	0.00	0.00
14,700.00	90.40	359.53	8,995.48	5,604.33	-133.14	5,605.78	0.00	0.00	0.00
14,800.00	90.40	359.53	8,994.78	5,704.33	-133.96	5,705.77	0.00	0.00	0.00
14,900.00	90.40	359.53	8,994.07	5,804.32	-134.78	5,805.76	0.00	0.00	0.00
15,000.00	90.40	359.53	8,993.37	5,904.32	-135.59	5,905.76	0.00	0.00	0.00
15,100.00	90.40	359.53	8,992.66	6,004.31	-136.41	6,005.75	0.00	0.00	0.00
15,200.00	90.40	359.53	8,991.96	6,104.31	-137.23	6,105.75	0.00	0.00	0.00
15,300.00	90.40	359.53	8,991.25	6,204.30	-138.04	6,205.74	0.00	0.00	0.00
15,400.00	90.40	359.53	8,990.55	6,304.29	-138.86	6,305.73	0.00	0.00	0.00
15,500.00	90.40	359.53	8,989.84	6,404.29	-139.68	6,405.73	0.00	0.00	0.00
15,600.00	90.40	359.53	8,989.14	6,504.28	-140.50	6,505.72	0.00	0.00	0.00
15,700.00	90.40	359.53	8,988.43	6,604.28	-141.31	6,605.72	0.00	0.00	0.00
15,800.00	90.40	359.53	8,987.73	6,704.27	-142.13	6,705.71	0.00	0.00	0.00
15,900.00	90.40	359.53	8,987.02	6,804.26	-142.95	6,805.70	0.00	0.00	0.00
16,000.00	90.40	359.53	8,986.32	6,904.26	-143.76	6,905.70	0.00	0.00	0.00
16,100.00	90.40	359.53	8,985.61	7,004.25	-144.58	7,005.69	0.00	0.00	0.00
16,200.00	90.40	359.53	8,984.91	7,104.25	-145.40	7,105.69	0.00	0.00	0.00
16,300.00	90.40	359.53	8,984.20	7,204.24	-146.22	7,205.68	0.00	0.00	0.00
16,400.00	90.40	359.53	8,983.50	7,304.24	-147.03	7,305.67	0.00	0.00	0.00
16,500.00	90.40	359.53	8,982.79	7,404.23	-147.85	7,405.67	0.00	0.00	0.00
16,600.00	90.40	359.53	8,982.09	7,504.22	-148.67	7,505.66	0.00	0.00	0.00
16,700.00	90.40	359.53	8,981.38	7,604.22	-149.49	7,605.65	0.00	0.00	0.00
16,800.00	90.40	359.53	8,980.68	7,704.21	-150.30	7,705.65	0.00	0.00	0.00
16,900.00	90.40	359.53	8,979.97	7,804.21	-151.12	7,805.64	0.00	0.00	0.00
17,000.00	90.40	359.53	8,979.27	7,904.20	-151.94	7,905.64	0.00	0.00	0.00
17,100.00	90.40	359.53	8,978.56	8,004.19	-152.75	8,005.63	0.00	0.00	0.00
17,200.00	90.40	359.53	8,977.86	8,104.19	-153.57	8,105.62	0.00	0.00	0.00
17,300.00	90.40	359.53	8,977.15	8,204.18	-154.39	8,205.62	0.00	0.00	0.00
17,400.00	90.40	359.53	8,976.45	8,304.18	-155.21	8,305.61	0.00	0.00	0.00
17,500.00	90.40	359.53	8,975.74	8,404.17	-156.02	8,405.61	0.00	0.00	0.00



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
17,600.00	90.40	359.53	8,975.04	8,504.17	-156.84	8,505.60	0.00	0.00	0.00
17,700.00	90.40	359.53	8,974.33	8,604.16	-157.66	8,605.59	0.00	0.00	0.00
17,800.00	90.40	359.53	8,973.63	8,704.15	-158.48	8,705.59	0.00	0.00	0.00
17,900.00	90.40	359.53	8,972.92	8,804.15	-159.29	8,805.58	0.00	0.00	0.00
18,000.00	90.40	359.53	8,972.22	8,904.14	-160.11	8,905.57	0.00	0.00	0.00
18,100.00	90.40	359.53	8,971.52	9,004.14	-160.93	9,005.57	0.00	0.00	0.00
18,200.00	90.40	359.53	8,970.81	9,104.13	-161.74	9,105.56	0.00	0.00	0.00
18,300.00	90.40	359.53	8,970.11	9,204.12	-162.56	9,205.56	0.00	0.00	0.00
18,400.00	90.40	359.53	8,969.40	9,304.12	-163.38	9,305.55	0.00	0.00	0.00
18,500.00	90.40	359.53	8,968.70	9,404.11	-164.20	9,405.54	0.00	0.00	0.00
18,600.00	90.40	359.53	8,967.99	9,504.11	-165.01	9,505.54	0.00	0.00	0.00
18,700.00	90.40	359.53	8,967.29	9,604.10	-165.83	9,605.53	0.00	0.00	0.00
18,800.00	90.40	359.53	8,966.58	9,704.10	-166.65	9,705.53	0.00	0.00	0.00
18,900.00	90.40	359.53	8,965.88	9,804.09	-167.47	9,805.52	0.00	0.00	0.00
19,000.00	90.40	359.53	8,965.17	9,904.08	-168.28	9,905.51	0.00	0.00	0.00
19,100.00	90.40	359.53	8,964.47	10,004.08	-169.10	10,005.51	0.00	0.00	0.00
19,200.00	90.40	359.53	8,963.76	10,104.07	-169.92	10,105.50	0.00	0.00	0.00
19,300.00	90.40	359.53	8,963.06	10,204.07	-170.73	10,205.49	0.00	0.00	0.00
19,308.03	90.40	359.53	8,963.00	10,212.10	-170.80	10,213.53	0.00	0.00	0.00

TD at 19308.03

Design Targets

Target Name

- hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- Shape									
Harrier Federal Com 1	0.00	0.00	0.00	-275.80	-107.20	388,100.60	711,893.80	32.06516	-103.64932
- plan misses target center by 295.90usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Harrier Federal Com 1	0.00	0.01	8,963.00	10,212.10	-170.80	398,588.50	711,830.20	32.09399	-103.64931
- plan hits target center									
- Point									
Harrier Federal Com 1	0.00	0.00	8,963.35	10,162.10	-170.50	398,538.50	711,830.50	32.09385	-103.64931
- plan misses target center by 0.11usft at 19258.03usft MD (8963.35 TVD, 10162.10 N, -170.39 E)									
- Point									



Survey Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Site: Sec. 02, T 26-S, R 32-E
Well: Harrier Federal Com 101H
Wellbore: Wellbore #1
Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandriil Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandriil Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1

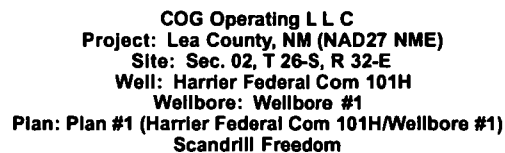
Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
716.00	716.00	Rustler		0.00	
1,088.00	1,088.00	TOS		0.00	
4,343.00	4,343.00	BOS (Fletcher)			
4,575.00	4,575.00	LMAR (Top Delaware)			
4,613.00	4,613.00	BLCN			
5,629.87	5,628.00	CYCN			
7,238.47	7,230.00	BYCN			
8,831.26	8,795.00	Bone Sprg (BSGL)			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
5000	5000	0	0	Start Build 2.00
5260	5259	-12	-2	Start 3163.47 hold at 5259.58 MD
8423	8410	-292	-60	Start DLS 10.00 TFO 166.72
9378	9033	282	-89	Start DLS 2.00 TFO 90.31
9434	9033	339	-90	Start 9873.76 hold at 9434.27 MD
19,308	8963	10,212	-171	TD at 19308.03

Checked By: _____ Approved By: _____ Date: _____



WELL DETAILS: Harrier Federal Com 101H

Ground Elevation:: 3246.00
RKB Elevation: KB=26' @ 3272.00usft (Scandriil Freedom)
Rig Name: Scandriil Freedom

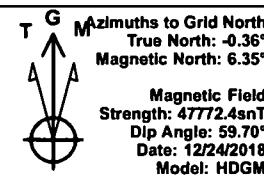
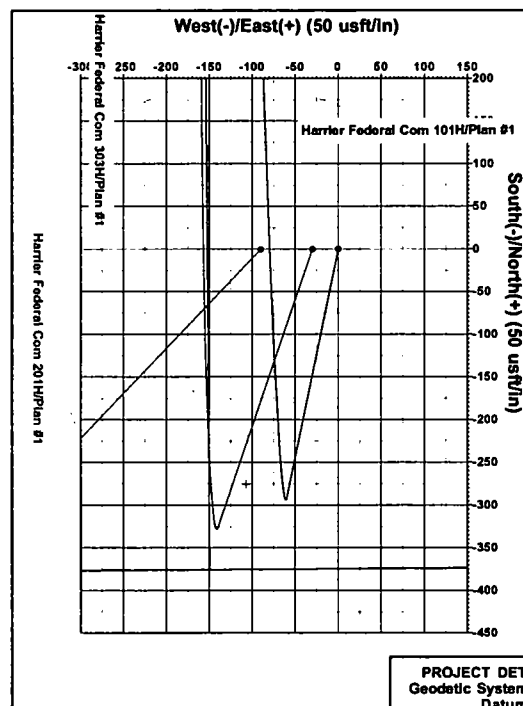
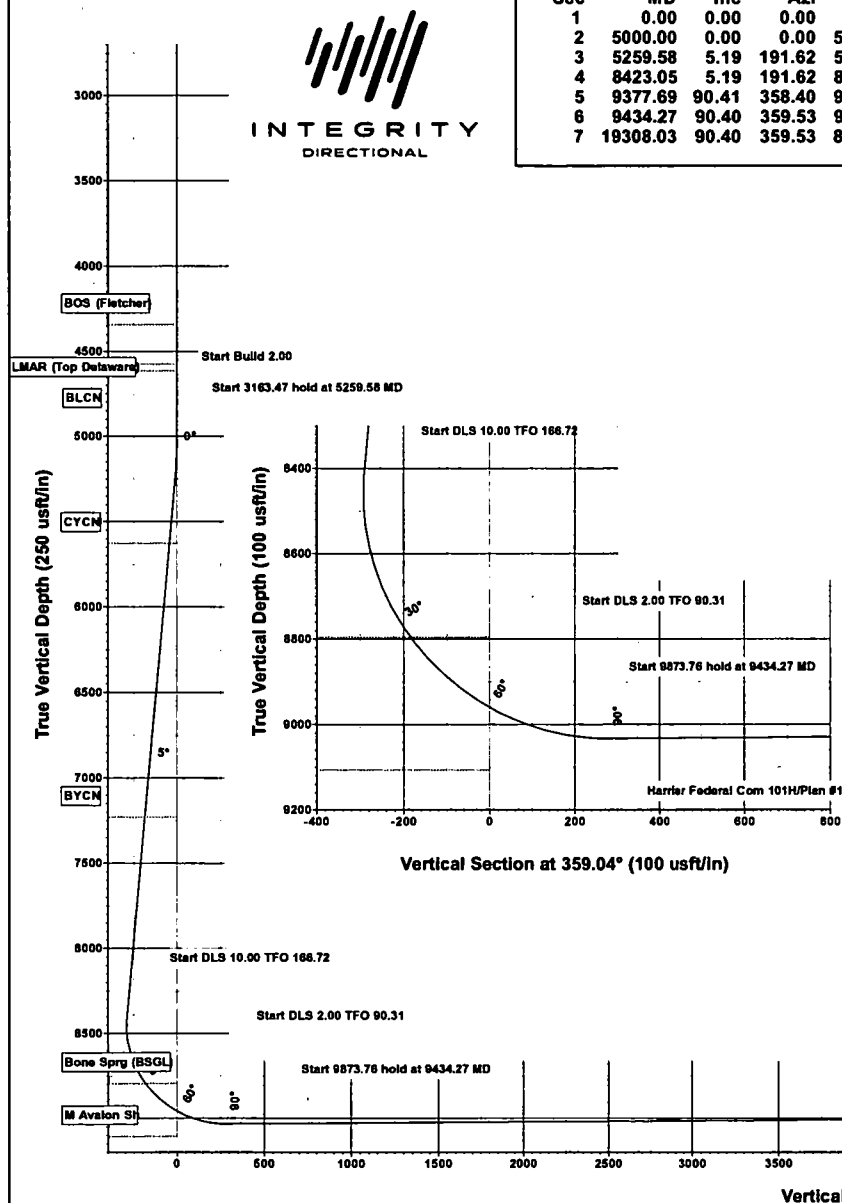
Northing	Easting	Latitude	Longitude
388376.40	712001.00	32.06591	-103.64896

Planned Section Details

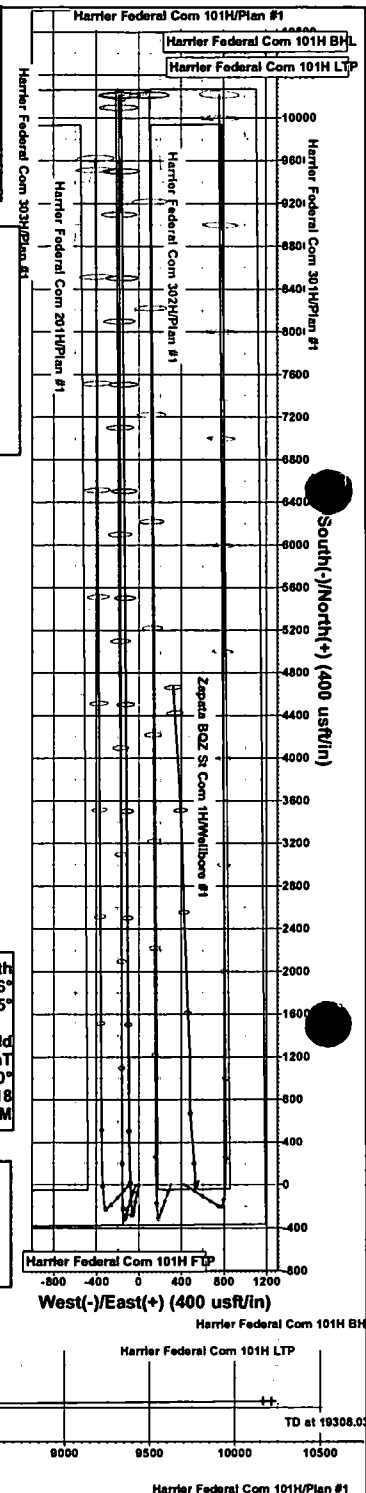
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	V Sect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	5000.00	0.00	0.00	5000.00	0.00	0.00	0.00	0.00	0.00	Start Build 2.00
3	5259.58	5.19	191.62	5259.22	-11.51	-2.37	2.00	191.62	-11.47	Start 3163.47 hold at 5259.58 MD
4	8423.05	5.19	191.62	8409.72	-291.90	-60.00	0.00	0.00	-290.86	Start DLS 10.00 TFO 168.72
5	9377.69	90.41	358.40	9033.00	282.34	-89.09	10.00	166.72	283.79	Start DLS 2.00 TFO 90.31
6	9434.27	90.40	359.53	9032.60	338.92	-90.11	2.00	90.31	340.38	Start 9873.78 hold at 9434.27 MD
7	18308.03	90.40	359.53	8963.00	10212.10	-170.80	0.00	0.0010213.53		TD at 18308.03

Annotation

Start Build 2.00
Start 3163.47 hold at 5259.58 MD
Start DLS 10.00 TFO 166.72
Start DLS 2.00 TFO 90.31
Start 9873.76 hold at 9434.27 MD
TD at 19308.03



PROJECT DETAILS: Lea County, NM (NAD27 NME)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid





CONCHO

COG Operating L L C

Lea County, NM (NAD27 NME)

Sec. 02, T 26-S, R 32-E

Harrier Federal Com 101H

Wellbore #1

Plan #1

Anticollision Report

24 December, 2018





Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandrill Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandrill Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference	Plan #1		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 19,999.96 u	Error Surface:	Circular Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program Date 12/24/2018

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	19,308.03	Plan #1 (Wellbore #1)	MWD	MWD - Standard

Summary

Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Sec. 02, T 26-S, R 32-E						
Harrier Federal Com 201H - Wellbore #1 - Plan #1	4,965.64	4,968.64	90.10	68.06	4.087	CC
Harrier Federal Com 201H - Wellbore #1 - Plan #1	18,706.41	18,896.71	343.16	-11.14	0.969	Level 1, ES, SF
Harrier Federal Com 301H - Wellbore #1 - Plan #1	4,464.16	4,471.16	419.91	400.11	21.207	CC
Harrier Federal Com 301H - Wellbore #1 - Plan #1	4,500.00	4,506.22	419.92	399.96	21.040	ES
Harrier Federal Com 301H - Wellbore #1 - Plan #1	19,308.03	19,919.80	1,149.16	772.88	3.054	SF
Harrier Federal Com 302H - Wellbore #1 - Plan #1	8,579.84	8,591.18	255.68	218.29	6.840	CC
Harrier Federal Com 302H - Wellbore #1 - Plan #1	19,308.03	19,793.03	511.98	135.06	1.358	Level 3, ES, SF
Harrier Federal Com 303H - Wellbore #1 - Plan #1	4,966.33	4,967.33	30.10	8.06	1.365	Level 3, CC
Harrier Federal Com 303H - Wellbore #1 - Plan #1	5,100.00	5,100.66	30.32	7.73	1.342	Level 3, ES, SF
Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1	13,755.82	13,660.00	465.04	293.33	2.708	CC, ES
Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1	13,800.00	13,660.00	467.13	294.63	2.708	SF

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Minimum		Separation		Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
0.00	0.00	3.00	3.00	0.00	0.00	-90.38	-0.60	-90.10	90.10				
100.00	100.00	103.00	103.00	0.08	0.09	-90.38	-0.60	-90.10	90.10	89.93	0.17	520.610	
200.00	200.00	203.00	203.00	0.31	0.31	-90.38	-0.60	-90.10	90.10	89.48	0.62	144.718	
300.00	300.00	303.00	303.00	0.53	0.54	-90.38	-0.60	-90.10	90.10	89.03	1.07	84.040	
400.00	400.00	403.00	403.00	0.76	0.76	-90.38	-0.60	-90.10	90.10	88.58	1.52	59.213	
500.00	500.00	503.00	503.00	0.98	0.99	-90.38	-0.60	-90.10	90.10	88.13	1.97	45.709	
600.00	600.00	603.00	603.00	1.21	1.21	-90.38	-0.60	-90.10	90.10	87.68	2.42	37.221	
700.00	700.00	703.00	703.00	1.43	1.44	-90.38	-0.60	-90.10	90.10	87.23	2.87	31.392	
800.00	800.00	803.00	803.00	1.66	1.66	-90.38	-0.60	-90.10	90.10	86.78	3.32	27.141	
900.00	900.00	903.00	903.00	1.88	1.89	-90.38	-0.60	-90.10	90.10	86.33	3.77	23.804	
1,000.00	1,000.00	1,003.00	1,003.00	2.11	2.11	-90.38	-0.60	-90.10	90.10	85.88	4.22	21.357	
1,100.00	1,100.00	1,103.00	1,103.00	2.33	2.34	-90.38	-0.60	-90.10	90.10	85.43	4.67	19.300	
1,200.00	1,200.00	1,203.00	1,203.00	2.56	2.56	-90.38	-0.60	-90.10	90.10	84.98	5.12	17.605	
1,300.00	1,300.00	1,303.00	1,303.00	2.78	2.79	-90.38	-0.60	-90.10	90.10	84.53	5.57	16.184	
1,400.00	1,400.00	1,403.00	1,403.00	3.01	3.01	-90.38	-0.60	-90.10	90.10	84.09	6.02	14.975	
1,500.00	1,500.00	1,503.00	1,503.00	3.23	3.24	-90.38	-0.60	-90.10	90.10	83.64	6.47	13.934	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandrift Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandrift Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
1,600.00	1,600.00	1,603.00	1,603.00	3.45	3.46	-90.38	-0.60	-90.10	90.10	83.19	6.92	13.028	
1,700.00	1,700.00	1,703.00	1,703.00	3.68	3.69	-90.38	-0.60	-90.10	90.10	82.74	7.37	12.233	
1,800.00	1,800.00	1,803.00	1,803.00	3.90	3.91	-90.38	-0.60	-90.10	90.10	82.29	7.82	11.529	
1,900.00	1,900.00	1,903.00	1,903.00	4.13	4.14	-90.38	-0.60	-90.10	90.10	81.84	8.26	10.902	
2,000.00	2,000.00	2,003.00	2,003.00	4.35	4.36	-90.38	-0.60	-90.10	90.10	81.39	8.71	10.340	
2,100.00	2,100.00	2,103.00	2,103.00	4.58	4.59	-90.38	-0.60	-90.10	90.10	80.94	9.16	9.832	
2,200.00	2,200.00	2,203.00	2,203.00	4.80	4.81	-90.38	-0.60	-90.10	90.10	80.49	9.61	9.373	
2,300.00	2,300.00	2,303.00	2,303.00	5.03	5.03	-90.38	-0.60	-90.10	90.10	80.04	10.06	8.954	
2,400.00	2,400.00	2,403.00	2,403.00	5.25	5.26	-90.38	-0.60	-90.10	90.10	79.59	10.51	8.571	
2,500.00	2,500.00	2,503.00	2,503.00	5.48	5.48	-90.38	-0.60	-90.10	90.10	79.14	10.96	8.220	
2,600.00	2,600.00	2,603.00	2,603.00	5.70	5.71	-90.38	-0.60	-90.10	90.10	78.69	11.41	7.896	
2,700.00	2,700.00	2,703.00	2,703.00	5.93	5.93	-90.38	-0.60	-90.10	90.10	78.24	11.86	7.597	
2,800.00	2,800.00	2,803.00	2,803.00	6.15	6.16	-90.38	-0.60	-90.10	90.10	77.79	12.31	7.319	
2,900.00	2,900.00	2,903.00	2,903.00	6.38	6.38	-90.38	-0.60	-90.10	90.10	77.34	12.76	7.061	
3,000.00	3,000.00	3,003.00	3,003.00	6.60	6.61	-90.38	-0.60	-90.10	90.10	76.89	13.21	6.821	
3,100.00	3,100.00	3,103.00	3,103.00	6.83	6.83	-90.38	-0.60	-90.10	90.10	76.44	13.66	6.597	
3,200.00	3,200.00	3,203.00	3,203.00	7.05	7.06	-90.38	-0.60	-90.10	90.10	75.99	14.11	6.386	
3,300.00	3,300.00	3,303.00	3,303.00	7.28	7.28	-90.38	-0.60	-90.10	90.10	75.54	14.56	6.189	
3,400.00	3,400.00	3,403.00	3,403.00	7.50	7.51	-90.38	-0.60	-90.10	90.10	75.09	15.01	6.004	
3,500.00	3,500.00	3,503.00	3,503.00	7.73	7.73	-90.38	-0.60	-90.10	90.10	74.64	15.46	5.829	
3,600.00	3,600.00	3,603.00	3,603.00	7.95	7.96	-90.38	-0.60	-90.10	90.10	74.20	15.91	5.664	
3,700.00	3,700.00	3,703.00	3,703.00	8.17	8.18	-90.38	-0.60	-90.10	90.10	73.75	16.36	5.509	
3,800.00	3,800.00	3,803.00	3,803.00	8.40	8.41	-90.38	-0.60	-90.10	90.10	73.30	16.81	5.361	
3,900.00	3,900.00	3,903.00	3,903.00	8.62	8.63	-90.38	-0.60	-90.10	90.10	72.85	17.26	5.222	
4,000.00	4,000.00	4,003.00	4,003.00	8.85	8.86	-90.38	-0.60	-90.10	90.10	72.40	17.70	5.089	
4,100.00	4,100.00	4,103.00	4,103.00	9.07	9.08	-90.38	-0.60	-90.10	90.10	71.95	18.15	4.963	
4,200.00	4,200.00	4,203.00	4,203.00	9.30	9.31	-90.38	-0.60	-90.10	90.10	71.50	18.60	4.843	
4,300.00	4,300.00	4,303.00	4,303.00	9.52	9.53	-90.38	-0.60	-90.10	90.10	71.05	19.05	4.729	
4,400.00	4,400.00	4,403.00	4,403.00	9.75	9.75	-90.38	-0.60	-90.10	90.10	70.60	19.50	4.620	
4,500.00	4,500.00	4,503.00	4,503.00	9.97	9.98	-90.38	-0.60	-90.10	90.10	70.15	19.95	4.516	
4,600.00	4,600.00	4,603.00	4,603.00	10.20	10.20	-90.38	-0.60	-90.10	90.10	69.70	20.40	4.416	
4,700.00	4,700.00	4,703.00	4,703.00	10.42	10.43	-90.38	-0.60	-90.10	90.10	69.25	20.85	4.321	
4,800.00	4,800.00	4,803.00	4,803.00	10.65	10.65	-90.38	-0.60	-90.10	90.10	68.80	21.30	4.230	
4,900.00	4,900.00	4,903.00	4,903.00	10.87	10.88	-90.38	-0.60	-90.10	90.10	68.35	21.75	4.143	
4,965.64	4,965.64	4,968.64	4,968.64	11.02	11.03	-90.38	-0.60	-90.10	90.10	68.06	22.05	4.087 CC	
5,000.00	5,000.00	5,002.94	5,002.94	11.10	11.10	-90.38	-0.60	-90.10	90.10	67.90	22.20	4.059	
5,100.00	5,099.98	5,100.00	5,099.98	11.29	11.30	78.23	-1.87	-91.30	91.00	68.41	22.59	4.028	
5,200.00	5,199.84	5,198.59	5,198.43	11.48	11.47	78.99	-5.59	-94.84	93.54	70.61	22.93	4.079	
5,259.58	5,259.22	5,256.82	5,256.47	11.58	11.58	79.66	-8.94	-98.02	95.86	72.72	23.14	4.143	
5,300.00	5,299.48	5,297.15	5,296.64	11.63	11.65	80.18	-11.58	-100.52	97.66	74.38	23.28	4.195	
5,400.00	5,399.07	5,397.02	5,396.11	11.80	11.83	81.40	-18.12	-106.72	102.14	78.51	23.63	4.322	
5,500.00	5,498.66	5,496.90	5,495.58	11.98	12.02	82.52	-24.65	-112.92	106.66	82.67	24.00	4.445	
5,600.00	5,598.25	5,596.78	5,595.05	12.16	12.21	83.55	-31.19	-119.12	111.23	86.86	24.36	4.565	
5,700.00	5,697.84	5,696.65	5,694.52	12.34	12.40	84.49	-37.72	-125.33	115.82	91.08	24.74	4.681	
5,800.00	5,797.43	5,796.53	5,793.99	12.53	12.60	85.37	-44.25	-131.53	120.45	95.32	25.13	4.794	
5,900.00	5,897.02	5,896.41	5,893.46	12.72	12.80	86.17	-50.79	-137.73	125.10	99.58	25.52	4.903	
6,000.00	5,996.61	5,996.28	5,992.93	12.91	13.00	86.92	-57.32	-143.93	129.77	103.86	25.91	5.008	
6,100.00	6,096.20	6,096.16	6,092.40	13.11	13.20	87.62	-63.86	-150.13	134.46	108.15	26.32	5.110	
6,200.00	6,195.79	6,196.04	6,191.86	13.31	13.41	88.27	-70.39	-156.33	139.17	112.45	26.72	5.208	
6,300.00	6,295.38	6,295.91	6,291.33	13.52	13.62	88.88	-76.93	-162.53	143.90	116.76	27.14	5.302	
6,400.00	6,394.97	6,395.79	6,390.80	13.72	13.84	89.45	-83.46	-168.73	148.65	121.09	27.56	5.394	
6,500.00	6,494.56	6,495.67	6,490.27	13.93	14.05	89.98	-90.00	-174.93	153.40	125.42	27.98	5.482	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (")	Distance		Minimum Separation (usft)	Separation Factor	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)				Between Centres (usft)	Between Ellipses (usft)
6,600.00	6,594.15	6,595.54	6,589.74	14.14	14.27	90.49	-96.53	-181.13	158.17	129.76	28.41	5.567	
6,700.00	6,693.74	6,695.42	6,689.21	14.36	14.49	90.96	-103.06	-187.33	162.96	134.11	28.85	5.649	
6,800.00	6,793.33	6,795.30	6,788.68	14.57	14.71	91.40	-109.60	-193.53	167.75	138.48	29.28	5.728	
6,900.00	6,892.92	6,895.17	6,888.15	14.79	14.93	91.83	-116.13	-199.74	172.55	142.82	29.73	5.805	
7,000.00	6,992.51	6,995.05	6,987.62	15.01	15.16	92.22	-122.67	-205.94	177.36	147.19	30.17	5.878	
7,100.00	7,092.10	7,094.93	7,087.09	15.23	15.39	92.60	-129.20	-212.14	182.18	151.56	30.62	5.949	
7,200.00	7,191.68	7,194.81	7,186.56	15.46	15.62	92.98	-135.74	-218.34	187.00	155.93	31.08	6.018	
7,300.00	7,291.27	7,294.68	7,286.03	15.68	15.85	93.30	-142.27	-224.54	191.84	160.31	31.53	6.084	
7,400.00	7,390.86	7,394.56	7,385.50	15.91	16.08	93.62	-148.81	-230.74	196.68	164.68	31.99	6.148	
7,500.00	7,490.45	7,494.44	7,484.97	16.14	16.32	93.93	-155.34	-236.94	201.52	169.07	32.46	6.209	
7,600.00	7,590.04	7,594.31	7,584.44	16.37	16.55	94.22	-161.87	-243.14	206.37	173.45	32.92	6.268	
7,700.00	7,689.63	7,694.19	7,683.91	16.60	16.79	94.50	-168.41	-249.34	211.23	177.84	33.39	6.326	
7,800.00	7,789.22	7,794.07	7,783.38	16.84	17.03	94.77	-174.94	-255.54	216.09	182.22	33.86	6.381	
7,900.00	7,888.81	7,893.94	7,882.85	17.07	17.27	95.02	-181.48	-261.74	220.95	186.61	34.34	6.434	
8,000.00	7,988.40	7,993.82	7,982.32	17.31	17.51	95.27	-188.01	-267.95	225.82	191.01	34.82	6.486	
8,100.00	8,087.99	8,093.70	8,081.79	17.55	17.75	95.50	-194.55	-274.15	230.70	195.40	35.30	6.536	
8,200.00	8,187.58	8,193.57	8,181.26	17.79	17.99	95.72	-201.08	-280.35	235.57	199.79	35.78	6.584	
8,300.00	8,287.17	8,293.45	8,280.73	18.03	18.24	95.94	-207.62	-286.55	240.45	204.19	36.26	6.631	
8,400.00	8,386.76	8,393.33	8,380.20	18.27	18.48	96.15	-214.15	-292.75	245.34	208.59	36.75	6.676	
8,423.05	8,409.72	8,416.35	8,403.13	18.33	18.54	96.19	-215.66	-294.18	246.48	209.60	36.86	6.688	
8,450.00	8,436.60	8,443.27	8,429.94	18.39	18.60	96.69	-217.42	-295.85	247.57	210.58	36.99	6.692	
8,500.00	8,486.58	8,493.10	8,479.57	18.49	18.73	-47.02	-220.68	-298.94	248.53	211.31	37.22	6.678	
8,550.00	8,536.35	8,542.45	8,528.71	18.58	18.85	-64.25	-223.91	-302.01	248.25	210.82	37.43	6.633	
8,600.00	8,585.54	8,590.95	8,577.01	18.64	18.97	-70.52	-227.08	-305.02	247.12	209.51	37.61	6.570	
8,650.00	8,633.78	8,638.22	8,624.10	18.70	19.09	-75.71	-230.17	-307.95	245.76	207.98	37.78	6.505	
8,700.00	8,680.70	8,683.91	8,669.60	18.73	19.20	-80.94	-233.16	-310.79	244.98	207.05	37.93	6.458	
8,704.96	8,685.27	8,688.30	8,673.97	18.74	19.21	-81.46	-233.45	-311.06	244.97	207.02	37.95	6.456	
8,750.00	8,725.94	8,728.00	8,713.57	18.76	19.30	-86.06	-234.53	-313.54	245.74	207.68	38.06	6.456	
8,800.00	8,769.15	8,773.61	8,759.02	18.78	19.40	-91.00	-232.39	-316.41	248.45	210.28	38.18	6.508	
8,850.00	8,810.02	8,821.04	8,805.96	18.80	19.49	-95.79	-226.32	-319.40	253.12	214.84	38.28	6.612	
8,900.00	8,848.22	8,870.58	8,854.27	18.82	19.56	-100.40	-215.86	-322.50	259.66	221.28	38.38	6.765	
8,950.00	8,883.47	8,922.54	8,903.76	18.84	19.63	-104.81	-200.44	-325.71	267.89	229.41	38.48	6.962	
9,000.00	8,915.50	8,977.27	8,954.16	18.88	19.70	-108.99	-179.41	-329.01	277.56	238.98	38.58	7.195	
9,050.00	8,944.06	9,035.16	9,005.03	18.94	19.75	-112.95	-152.03	-332.39	288.33	249.64	38.69	7.453	
9,100.00	8,968.94	9,096.64	9,055.74	19.03	19.79	-116.65	-117.49	-335.80	299.84	261.01	38.82	7.723	
9,150.00	8,989.95	9,162.14	9,105.36	19.15	19.83	-120.09	-74.93	-339.20	311.64	272.66	38.98	7.995	
9,200.00	9,006.92	9,232.06	9,152.61	19.30	19.86	-123.24	-23.55	-342.51	323.30	284.13	39.17	8.254	
9,250.00	9,019.74	9,308.72	9,195.76	19.49	19.90	-126.09	37.22	-345.62	334.30	294.91	39.39	8.487	
9,300.00	9,028.30	9,386.25	9,232.65	19.72	19.98	-128.60	107.56	-348.41	344.16	304.46	39.70	8.669	
9,350.00	9,032.53	9,470.51	9,260.72	19.97	20.28	-130.72	186.89	-350.70	352.36	312.11	40.26	8.753	
9,377.69	9,033.00	9,519.03	9,271.52	20.13	20.52	-131.72	234.16	-351.69	356.02	315.38	40.64	8.759	
9,400.00	9,032.84	9,559.07	9,277.39	20.25	20.73	-132.51	273.76	-352.32	358.21	317.23	40.97	8.742	
9,434.28	9,032.60	9,621.78	9,281.01	20.42	21.10	-133.03	336.33	-352.97	359.63	318.11	41.52	8.662	
9,500.00	9,032.13	9,690.31	9,280.53	20.83	21.56	-133.05	404.86	-353.39	359.52	317.13	42.39	8.481	
9,600.00	9,031.43	9,790.31	9,279.78	21.63	22.33	-133.06	504.86	-354.01	359.34	315.38	43.96	8.174	
9,700.00	9,030.72	9,890.31	9,279.02	22.55	23.22	-133.08	604.85	-354.63	359.16	313.40	45.77	7.848	
9,800.00	9,030.02	9,990.31	9,278.27	23.57	24.20	-133.09	704.85	-355.25	358.98	311.21	47.78	7.514	
9,900.00	9,029.31	10,090.31	9,277.51	24.69	25.28	-133.11	804.84	-355.87	358.81	308.84	49.97	7.180	
10,000.00	9,028.61	10,190.31	9,276.76	25.88	26.44	-133.13	904.84	-356.48	358.63	306.30	52.33	6.854	
10,100.00	9,027.90	10,290.31	9,276.00	27.15	27.67	-133.14	1,004.83	-357.10	358.45	303.63	54.82	6.538	
10,200.00	9,027.20	10,390.31	9,275.25	28.48	28.96	-133.16	1,104.83	-357.72	358.27	300.83	57.44	6.237	
10,300.00	9,026.49	10,490.31	9,274.49	29.86	30.31	-133.17	1,204.82	-358.34	358.09	297.93	60.16	5.952	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
10,400.00	9,025.79	10,590.31	9,273.74	31.28	31.70	-133.19	1,304.82	-358.96	357.91	294.93	62.98	5.683	
10,500.00	9,025.08	10,690.31	9,272.99	32.75	33.14	-133.21	1,404.81	-359.58	357.73	291.85	65.88	5.430	
10,600.00	9,024.38	10,790.31	9,272.23	34.25	34.61	-133.22	1,504.81	-360.20	357.55	288.70	68.85	5.193	
10,700.00	9,023.68	10,890.31	9,271.48	35.77	36.11	-133.24	1,604.80	-360.81	357.38	285.49	71.89	4.971	
10,800.00	9,022.97	10,990.31	9,270.72	37.33	37.64	-133.25	1,704.80	-361.43	357.20	282.22	74.97	4.764	
10,900.00	9,022.27	11,090.31	9,269.97	38.91	39.20	-133.27	1,804.79	-362.05	357.02	278.91	78.11	4.571	
11,000.00	9,021.56	11,190.31	9,269.21	40.51	40.78	-133.29	1,904.79	-362.67	356.84	275.55	81.29	4.390	
11,100.00	9,020.86	11,290.31	9,268.46	42.13	42.38	-133.30	2,004.78	-363.29	356.66	272.16	84.50	4.221	
11,200.00	9,020.15	11,390.31	9,267.70	43.76	43.99	-133.32	2,104.78	-363.91	356.48	268.73	87.76	4.062	
11,300.00	9,019.45	11,490.31	9,266.95	45.41	45.62	-133.33	2,204.77	-364.53	356.30	265.27	91.04	3.914	
11,400.00	9,018.74	11,590.31	9,266.20	47.07	47.27	-133.35	2,304.77	-365.14	356.13	261.78	94.34	3.775	
11,500.00	9,018.04	11,690.31	9,265.44	48.75	48.93	-133.37	2,404.76	-365.76	355.95	258.27	97.67	3.644	
11,600.00	9,017.33	11,790.31	9,264.69	50.43	50.60	-133.38	2,504.76	-366.38	355.77	254.74	101.03	3.521	
11,700.00	9,016.63	11,890.31	9,263.93	52.13	52.28	-133.40	2,604.75	-367.00	355.59	251.19	104.40	3.406	
11,800.00	9,015.92	11,990.31	9,263.18	53.83	53.97	-133.42	2,704.75	-367.62	355.41	247.62	107.79	3.297	
11,900.00	9,015.22	12,090.31	9,262.42	55.54	55.66	-133.43	2,804.74	-368.24	355.23	244.03	111.20	3.195	
12,000.00	9,014.51	12,190.31	9,261.67	57.25	57.37	-133.45	2,904.74	-368.86	355.05	240.43	114.62	3.098	
12,100.00	9,013.81	12,290.31	9,260.91	58.98	59.08	-133.46	3,004.73	-369.47	354.88	236.82	118.06	3.006	
12,200.00	9,013.10	12,390.31	9,260.16	60.71	60.80	-133.48	3,104.73	-370.09	354.70	233.19	121.51	2.919	
12,300.00	9,012.40	12,490.31	9,259.41	62.44	62.53	-133.50	3,204.72	-370.71	354.52	229.55	124.97	2.837	
12,400.00	9,011.69	12,590.31	9,258.65	64.18	64.26	-133.51	3,304.72	-371.33	354.34	225.90	128.44	2.759	
12,500.00	9,010.99	12,690.31	9,257.90	65.93	65.99	-133.53	3,404.71	-371.95	354.16	222.24	131.92	2.685	
12,600.00	9,010.28	12,790.31	9,257.14	67.68	67.73	-133.55	3,504.71	-372.57	353.99	218.58	135.41	2.614	
12,700.00	9,009.58	12,890.31	9,256.39	69.43	69.48	-133.56	3,604.70	-373.19	353.81	214.90	138.91	2.547	
12,800.00	9,008.87	12,990.31	9,255.63	71.19	71.22	-133.58	3,704.70	-373.80	353.63	211.22	142.41	2.483	
12,900.00	9,008.17	13,090.31	9,254.88	72.94	72.98	-133.59	3,804.69	-374.42	353.45	207.53	145.92	2.422	
13,000.00	9,007.46	13,190.31	9,254.12	74.71	74.73	-133.61	3,904.69	-375.04	353.27	203.83	149.44	2.364	
13,100.00	9,006.76	13,290.31	9,253.37	76.47	76.49	-133.63	4,004.68	-375.66	353.09	200.13	152.97	2.308	
13,200.00	9,006.05	13,390.31	9,252.62	78.24	78.25	-133.64	4,104.68	-376.28	352.92	196.42	156.50	2.255	
13,300.00	9,005.35	13,490.31	9,251.86	80.01	80.02	-133.66	4,204.67	-376.90	352.74	192.71	160.03	2.204	
13,400.00	9,004.64	13,590.31	9,251.11	81.79	81.79	-133.68	4,304.67	-377.52	352.56	188.99	163.57	2.155	
13,500.00	9,003.94	13,690.31	9,250.35	83.56	83.56	-133.69	4,404.66	-378.13	352.38	185.27	167.12	2.109	
13,600.00	9,003.23	13,790.31	9,249.60	85.34	85.33	-133.71	4,504.66	-378.75	352.20	181.54	170.67	2.064	
13,700.00	9,002.53	13,890.31	9,248.84	87.12	87.10	-133.73	4,604.65	-379.37	352.03	177.81	174.22	2.021	
13,800.00	9,001.82	13,990.31	9,248.09	88.90	88.88	-133.74	4,704.65	-379.99	351.85	174.07	177.78	1.979	
13,900.00	9,001.12	14,090.30	9,247.33	90.68	90.66	-133.76	4,804.64	-380.61	351.67	170.33	181.34	1.939	
14,000.00	9,000.41	14,190.30	9,246.58	92.47	92.44	-133.78	4,904.64	-381.23	351.49	166.59	184.90	1.901	
14,100.00	8,999.71	14,290.30	9,245.83	94.26	94.22	-133.79	5,004.63	-381.85	351.32	162.84	188.47	1.864	
14,200.00	8,999.00	14,390.30	9,245.07	96.04	96.00	-133.81	5,104.63	-382.46	351.14	159.09	192.04	1.828	
14,300.00	8,998.30	14,490.30	9,244.32	97.83	97.79	-133.83	5,204.62	-383.08	350.96	155.34	195.62	1.794	
14,400.00	8,997.60	14,590.30	9,243.56	99.62	99.57	-133.84	5,304.62	-383.70	350.78	151.59	199.19	1.761	
14,500.00	8,996.89	14,690.30	9,242.81	101.41	101.36	-133.86	5,404.61	-384.32	350.61	147.83	202.77	1.729	
14,600.00	8,996.19	14,790.30	9,242.05	103.21	103.15	-133.88	5,504.61	-384.94	350.43	144.07	206.35	1.698	
14,700.00	8,995.48	14,890.30	9,241.30	105.00	104.94	-133.89	5,604.60	-385.56	350.25	140.31	209.94	1.668	
14,800.00	8,994.78	14,990.30	9,240.54	106.80	106.73	-133.91	5,704.60	-386.18	350.07	136.55	213.52	1.639	
14,900.00	8,994.07	15,090.30	9,239.79	108.59	108.52	-133.93	5,804.59	-386.79	349.89	132.78	217.11	1.612	
15,000.00	8,993.37	15,190.30	9,239.04	110.39	110.31	-133.94	5,904.59	-387.41	349.72	129.01	220.70	1.585	
15,100.00	8,992.66	15,290.30	9,238.28	112.19	112.11	-133.96	6,004.58	-388.03	349.54	125.24	224.30	1.558	
15,200.00	8,991.96	15,390.30	9,237.53	113.99	113.90	-133.98	6,104.58	-388.65	349.36	121.47	227.89	1.533	
15,300.00	8,991.25	15,490.30	9,236.77	115.79	115.70	-133.99	6,204.58	-389.27	349.19	117.70	231.49	1.508	
15,400.00	8,990.55	15,590.30	9,236.02	117.59	117.50	-134.01	6,304.57	-389.89	349.01	113.92	235.08	1.485 Level 3	
15,500.00	8,989.84	15,690.30	9,235.26	119.39	119.30	-134.03	6,404.57	-390.51	348.83	110.15	238.68	1.461 Level 3	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 201H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
15,800.00	8,989.14	15,790.30	9,234.51	121.19	121.09	-134.04	6,504.56	-391.12	348.65	106.37	242.28	1.439 Level 3	
15,700.00	8,988.43	15,890.30	9,233.75	122.99	122.89	-134.06	6,604.56	-391.74	348.48	102.59	245.88	1.417 Level 3	
15,800.00	8,987.73	15,990.30	9,233.00	124.79	124.69	-134.08	6,704.55	-392.36	348.30	98.81	249.49	1.398 Level 3	
15,900.00	8,987.02	16,090.30	9,232.25	126.60	126.49	-134.09	6,804.55	-392.98	348.12	95.03	253.09	1.375 Level 3	
16,000.00	8,986.32	16,190.30	9,231.49	128.40	128.30	-134.11	6,904.54	-393.60	347.94	91.25	256.70	1.355 Level 3	
16,100.00	8,985.61	16,290.30	9,230.74	130.21	130.10	-134.13	7,004.54	-394.22	347.77	87.46	260.31	1.336 Level 3	
16,200.00	8,984.91	16,390.30	9,229.98	132.01	131.90	-134.14	7,104.53	-394.84	347.59	83.68	263.91	1.317 Level 3	
16,300.00	8,984.20	16,490.30	9,229.23	133.82	133.70	-134.16	7,204.53	-395.45	347.41	79.89	267.52	1.299 Level 3	
16,400.00	8,983.50	16,590.30	9,228.47	135.63	135.51	-134.18	7,304.52	-396.07	347.24	76.10	271.13	1.281 Level 3	
16,500.00	8,982.79	16,690.30	9,227.72	137.43	137.31	-134.20	7,404.52	-396.69	347.06	72.31	274.75	1.263 Level 3	
16,600.00	8,982.09	16,790.30	9,226.96	139.24	139.12	-134.21	7,504.51	-397.31	346.88	68.52	278.36	1.246 Level 2	
16,700.00	8,981.38	16,890.30	9,226.21	141.05	140.92	-134.23	7,604.51	-397.93	346.71	64.73	281.97	1.230 Level 2	
16,800.00	8,980.68	16,990.30	9,225.46	142.86	142.73	-134.25	7,704.50	-398.55	346.53	60.94	285.59	1.213 Level 2	
16,900.00	8,979.97	17,090.30	9,224.70	144.66	144.54	-134.26	7,804.50	-399.17	346.35	57.15	289.20	1.198 Level 2	
17,000.00	8,979.27	17,190.30	9,223.95	146.47	146.34	-134.28	7,904.49	-399.79	346.17	53.36	292.82	1.182 Level 2	
17,100.00	8,978.56	17,290.30	9,223.19	148.28	148.15	-134.30	8,004.49	-400.40	346.00	49.56	296.43	1.167 Level 2	
17,200.00	8,977.86	17,390.30	9,222.44	150.09	149.96	-134.31	8,104.48	-401.02	345.82	45.77	300.05	1.153 Level 2	
17,300.00	8,977.15	17,490.30	9,221.68	151.90	151.77	-134.33	8,204.48	-401.64	345.64	41.97	303.67	1.138 Level 2	
17,400.00	8,976.45	17,590.30	9,220.93	153.71	153.57	-134.35	8,304.47	-402.26	345.47	38.18	307.29	1.124 Level 2	
17,500.00	8,975.74	17,690.30	9,220.17	155.53	155.38	-134.37	8,404.47	-402.88	345.29	34.38	310.91	1.111 Level 2	
17,600.00	8,975.04	17,790.30	9,219.42	157.34	157.19	-134.38	8,504.46	-403.50	345.11	30.58	314.53	1.097 Level 2	
17,700.00	8,974.33	17,890.30	9,218.67	159.15	159.00	-134.40	8,604.46	-404.12	344.94	26.79	318.15	1.084 Level 2	
17,800.00	8,973.63	17,990.30	9,217.91	160.96	160.81	-134.42	8,704.45	-404.73	344.76	22.99	321.77	1.071 Level 2	
17,900.00	8,972.92	18,090.30	9,217.16	162.77	162.62	-134.43	8,804.45	-405.35	344.58	19.19	325.39	1.059 Level 2	
18,000.00	8,972.22	18,190.30	9,216.40	164.58	164.43	-134.45	8,904.44	-405.97	344.41	15.39	329.02	1.047 Level 2	
18,100.00	8,971.52	18,290.30	9,215.65	166.40	166.24	-134.47	9,004.44	-406.59	344.23	11.59	332.64	1.035 Level 2	
18,200.00	8,970.81	18,390.30	9,214.89	168.21	168.05	-134.49	9,104.43	-407.21	344.05	7.79	336.27	1.023 Level 2	
18,300.00	8,970.11	18,490.30	9,214.14	170.02	169.87	-134.50	9,204.43	-407.83	343.88	3.99	339.89	1.012 Level 2	
18,400.00	8,969.40	18,590.30	9,213.38	171.84	171.68	-134.52	9,304.42	-408.45	343.70	0.19	343.51	1.001 Level 2	
18,500.00	8,968.70	18,690.30	9,212.63	173.65	173.49	-134.54	9,404.42	-409.06	343.53	-3.62	347.14	0.990 Level 1	
18,600.00	8,967.99	18,790.30	9,211.88	175.47	175.30	-134.56	9,504.41	-409.68	343.35	-7.42	350.77	0.979 Level 1	
18,700.00	8,967.29	18,890.29	9,211.12	177.28	176.81	-134.57	9,604.41	-410.30	343.17	-10.92	354.09	0.969 Level 1	
18,706.41	8,967.24	18,896.71	9,211.07	177.40	176.91	-134.57	9,610.82	-410.34	343.16	-11.14	354.30	0.969 Level 1, ES, SF	
18,800.00	8,966.58	18,906.29	9,211.00	179.09	177.05	-134.58	9,620.40	-410.40	353.13	-3.01	356.14	0.992 Level 1	
18,900.00	8,965.88	18,906.29	9,211.00	180.91	177.05	-134.58	9,620.40	-410.40	389.08	31.12	357.96	1.087 Level 2	
19,000.00	8,965.17	18,906.29	9,211.00	182.72	177.05	-134.58	9,620.40	-410.40	445.04	85.27	359.77	1.237 Level 2	
19,100.00	8,964.47	18,906.29	9,211.00	184.54	177.05	-134.58	9,620.40	-410.40	514.53	152.94	361.59	1.423 Level 3	
19,200.00	8,963.76	18,906.29	9,211.00	186.35	177.05	-134.58	9,620.40	-410.40	592.81	229.41	363.40	1.631	
19,308.03	8,963.00	18,906.29	9,211.00	188.32	177.05	-134.58	9,620.40	-410.40	683.77	318.41	365.37	1.871	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 301H - Wellbore #1 - Plan #1												Offset Site Error: 0.00 usft	
Survey Program: 0-MWD												Offset Well Error: 0.00 usft	
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
0.00	0.00	7.00	7.00	0.00	0.01	89.59	3.00	419.90	419.91				
100.00	100.00	107.00	107.00	0.08	0.10	89.59	3.00	419.90	419.91	419.73	0.18	2,306.432	
200.00	200.00	207.00	207.00	0.31	0.32	89.59	3.00	419.90	419.91	419.28	0.63	664.844	
300.00	300.00	307.00	307.00	0.53	0.55	89.59	3.00	419.90	419.91	418.83	1.08	388.402	
400.00	400.00	407.00	407.00	0.76	0.77	89.59	3.00	419.90	419.91	418.38	1.53	274.334	
500.00	500.00	507.00	507.00	0.98	1.00	89.59	3.00	419.90	419.91	417.93	1.98	212.056	
600.00	600.00	607.00	607.00	1.21	1.22	89.59	3.00	419.90	419.91	417.48	2.43	172.823	
700.00	700.00	707.00	707.00	1.43	1.45	89.59	3.00	419.90	419.91	417.03	2.88	145.840	
800.00	800.00	807.00	807.00	1.66	1.67	89.59	3.00	419.90	419.91	416.58	3.33	126.145	
900.00	900.00	907.00	907.00	1.88	1.90	89.59	3.00	419.90	419.91	416.13	3.78	111.137	
1,000.00	1,000.00	1,007.00	1,007.00	2.11	2.12	89.59	3.00	419.90	419.91	415.68	4.23	99.320	
1,100.00	1,100.00	1,107.00	1,107.00	2.33	2.35	89.59	3.00	419.90	419.91	415.23	4.68	89.775	
1,200.00	1,200.00	1,207.00	1,207.00	2.56	2.57	89.59	3.00	419.90	419.91	414.78	5.13	81.903	
1,300.00	1,300.00	1,307.00	1,307.00	2.78	2.80	89.59	3.00	419.90	419.91	414.33	5.58	75.301	
1,400.00	1,400.00	1,407.00	1,407.00	3.01	3.02	89.59	3.00	419.90	419.91	413.88	6.03	69.683	
1,500.00	1,500.00	1,507.00	1,507.00	3.23	3.25	89.59	3.00	419.90	419.91	413.44	6.48	64.846	
1,600.00	1,600.00	1,607.00	1,607.00	3.45	3.47	89.59	3.00	419.90	419.91	412.99	6.93	60.637	
1,700.00	1,700.00	1,707.00	1,707.00	3.68	3.70	89.59	3.00	419.90	419.91	412.54	7.37	56.940	
1,800.00	1,800.00	1,807.00	1,807.00	3.90	3.92	89.59	3.00	419.90	419.91	412.09	7.82	53.669	
1,900.00	1,900.00	1,907.00	1,907.00	4.13	4.14	89.59	3.00	419.90	419.91	411.64	8.27	50.753	
2,000.00	2,000.00	2,007.00	2,007.00	4.35	4.37	89.59	3.00	419.90	419.91	411.19	8.72	48.137	
2,100.00	2,100.00	2,107.00	2,107.00	4.58	4.59	89.59	3.00	419.90	419.91	410.74	9.17	45.778	
2,200.00	2,200.00	2,207.00	2,207.00	4.80	4.82	89.59	3.00	419.90	419.91	410.29	9.62	43.640	
2,300.00	2,300.00	2,307.00	2,307.00	5.03	5.04	89.59	3.00	419.90	419.91	409.84	10.07	41.692	
2,400.00	2,400.00	2,407.00	2,407.00	5.25	5.27	89.59	3.00	419.90	419.91	409.39	10.52	39.911	
2,500.00	2,500.00	2,507.00	2,507.00	5.48	5.49	89.59	3.00	419.90	419.91	408.94	10.97	38.275	
2,600.00	2,600.00	2,607.00	2,607.00	5.70	5.72	89.59	3.00	419.90	419.91	408.49	11.42	36.769	
2,700.00	2,700.00	2,707.00	2,707.00	5.93	5.94	89.59	3.00	419.90	419.91	408.04	11.87	35.376	
2,800.00	2,800.00	2,807.00	2,807.00	6.15	6.17	89.59	3.00	419.90	419.91	407.59	12.32	34.085	
2,900.00	2,900.00	2,907.00	2,907.00	6.38	6.39	89.59	3.00	419.90	419.91	407.14	12.77	32.885	
3,000.00	3,000.00	3,007.00	3,007.00	6.60	6.62	89.59	3.00	419.90	419.91	406.69	13.22	31.767	
3,100.00	3,100.00	3,107.00	3,107.00	6.83	6.84	89.59	3.00	419.90	419.91	406.24	13.67	30.722	
3,200.00	3,200.00	3,207.00	3,207.00	7.05	7.07	89.59	3.00	419.90	419.91	405.79	14.12	29.744	
3,300.00	3,300.00	3,307.00	3,307.00	7.28	7.29	89.59	3.00	419.90	419.91	405.34	14.57	28.826	
3,400.00	3,400.00	3,407.00	3,407.00	7.50	7.52	89.59	3.00	419.90	419.91	404.89	15.02	27.963	
3,500.00	3,500.00	3,507.00	3,507.00	7.73	7.74	89.59	3.00	419.90	419.91	404.44	15.47	27.150	
3,600.00	3,600.00	3,607.00	3,607.00	7.95	7.97	89.59	3.00	419.90	419.91	404.00	15.92	26.383	
3,700.00	3,700.00	3,707.00	3,707.00	8.17	8.19	89.59	3.00	419.90	419.91	403.55	16.37	25.659	
3,800.00	3,800.00	3,807.00	3,807.00	8.40	8.42	89.59	3.00	419.90	419.91	403.10	16.81	24.973	
3,900.00	3,900.00	3,907.00	3,907.00	8.62	8.64	89.59	3.00	419.90	419.91	402.65	17.26	24.323	
4,000.00	4,000.00	4,007.00	4,007.00	8.85	8.86	89.59	3.00	419.90	419.91	402.20	17.71	23.705	
4,100.00	4,100.00	4,107.00	4,107.00	9.07	9.09	89.59	3.00	419.90	419.91	401.75	18.16	23.119	
4,200.00	4,200.00	4,207.00	4,207.00	9.30	9.31	89.59	3.00	419.90	419.91	401.30	18.61	22.560	
4,300.00	4,300.00	4,307.00	4,307.00	9.52	9.54	89.59	3.00	419.90	419.91	400.85	19.06	22.028	
4,400.00	4,400.00	4,407.00	4,407.00	9.75	9.76	89.59	3.00	419.90	419.91	400.40	19.51	21.521	
4,464.16	4,464.16	4,471.16	4,471.16	9.89	9.91	89.59	3.00	419.90	419.91	400.11	19.80	21.207 CC	
4,500.00	4,500.00	4,506.22	4,506.22	9.97	9.99	89.59	3.00	419.91	419.92	399.96	19.96	21.040 ES	
4,600.00	4,600.00	4,600.00	4,599.98	10.20	10.18	89.72	2.09	421.39	421.45	401.08	20.37	20.686	
4,700.00	4,700.00	4,683.80	4,683.67	10.42	10.33	90.01	-0.06	424.94	425.58	404.82	20.75	20.507	
4,800.00	4,800.00	4,773.41	4,772.99	10.65	10.50	90.50	-3.76	431.02	432.38	411.23	21.15	20.448	
4,900.00	4,900.00	4,872.99	4,872.16	10.87	10.69	91.11	-8.49	438.80	440.27	418.71	21.56	20.420	
5,000.00	5,000.00	4,972.57	4,971.32	11.10	10.88	91.70	-13.23	446.59	448.20	426.22	21.98	20.392	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 301H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
5,100.00	5,099.98	5,072.18	5,070.52	11.29	11.08	-99.40	-17.96	454.37	456.47	434.10	22.37	20.403	
5,200.00	5,199.84	5,171.78	5,169.70	11.46	11.28	-99.32	-22.69	462.16	465.32	442.57	22.74	20.460	
5,259.58	5,259.22	5,231.07	5,228.74	11.56	11.40	-99.46	-25.51	466.79	470.86	447.89	22.97	20.502	
5,300.00	5,299.48	5,271.27	5,268.77	11.63	11.49	-99.67	-27.42	469.93	474.69	451.58	23.12	20.533	
5,400.00	5,399.07	5,370.72	5,367.80	11.80	11.69	-100.20	-32.15	477.70	484.21	460.71	23.50	20.607	
5,500.00	5,498.66	5,470.17	5,466.84	11.98	11.90	-100.70	-36.87	485.47	493.77	469.88	23.88	20.675	
5,600.00	5,598.25	5,569.62	5,565.87	12.16	12.12	-101.18	-41.60	493.25	503.36	479.08	24.27	20.736	
5,700.00	5,697.84	5,669.07	5,664.90	12.34	12.33	-101.64	-46.32	501.02	512.98	488.31	24.67	20.791	
5,800.00	5,797.43	5,768.52	5,763.94	12.53	12.55	-102.09	-51.05	508.79	522.64	497.56	25.08	20.839	
5,900.00	5,897.02	5,867.97	5,862.97	12.72	12.77	-102.52	-55.78	516.56	532.33	506.84	25.49	20.883	
6,000.00	5,996.61	5,967.42	5,962.01	12.91	12.99	-102.94	-60.50	524.34	542.05	516.14	25.91	20.921	
6,100.00	6,096.20	6,066.88	6,061.04	13.11	13.22	-103.34	-65.23	532.11	551.79	525.46	26.33	20.955	
6,200.00	6,195.79	6,166.33	6,160.07	13.31	13.45	-103.73	-69.95	539.88	561.56	534.80	26.76	20.986	
6,300.00	6,295.38	6,265.78	6,259.11	13.52	13.68	-104.10	-74.68	547.65	571.36	544.16	27.19	21.012	
6,400.00	6,394.97	6,365.23	6,358.14	13.72	13.91	-104.46	-79.41	555.43	581.17	553.55	27.63	21.035	
6,500.00	6,494.56	6,464.68	6,457.18	13.93	14.14	-104.81	-84.13	563.20	591.01	562.94	28.07	21.055	
6,600.00	6,594.15	6,564.13	6,556.21	14.14	14.37	-105.15	-88.86	570.97	600.88	572.36	28.52	21.071	
6,700.00	6,693.74	6,663.58	6,655.25	14.36	14.61	-105.47	-93.58	578.74	610.76	581.79	28.97	21.086	
6,800.00	6,793.33	6,763.03	6,754.28	14.57	14.85	-105.79	-98.31	586.52	620.66	591.24	29.42	21.097	
6,900.00	6,892.92	6,862.48	6,853.31	14.79	15.09	-106.10	-103.03	594.29	630.58	600.70	29.88	21.106	
7,000.00	6,992.51	6,961.94	6,952.35	15.01	15.33	-106.39	-107.76	602.06	640.51	610.18	30.34	21.113	
7,100.00	7,092.10	7,061.39	7,051.38	15.23	15.57	-106.68	-112.49	609.83	650.46	619.66	30.80	21.119	
7,200.00	7,191.68	7,160.84	7,150.42	15.46	15.81	-106.96	-117.21	617.60	660.43	629.16	31.27	21.122	
7,300.00	7,291.27	7,260.29	7,249.45	15.68	16.05	-107.23	-121.94	625.38	670.42	638.68	31.74	21.124	
7,400.00	7,390.86	7,359.74	7,348.49	15.91	16.30	-107.49	-126.66	633.15	680.41	648.20	32.21	21.124	
7,500.00	7,490.45	7,459.19	7,447.52	16.14	16.54	-107.75	-131.39	640.92	690.42	657.74	32.69	21.123	
7,600.00	7,590.04	7,558.64	7,546.55	16.37	16.79	-108.00	-136.12	648.69	700.45	667.29	33.16	21.121	
7,700.00	7,689.63	7,658.09	7,645.59	16.60	17.04	-108.24	-140.84	656.47	710.49	676.84	33.64	21.117	
7,800.00	7,789.22	7,757.54	7,744.62	16.84	17.29	-108.47	-145.57	664.24	720.54	686.41	34.13	21.113	
7,900.00	7,888.81	7,857.00	7,843.66	17.07	17.54	-108.70	-150.29	672.01	730.60	695.98	34.61	21.107	
8,000.00	7,988.40	7,956.45	7,942.69	17.31	17.79	-108.92	-155.02	679.78	740.67	705.57	35.10	21.101	
8,100.00	8,087.99	8,055.90	8,041.73	17.55	18.04	-109.14	-159.75	687.56	750.75	715.16	35.59	21.094	
8,200.00	8,187.58	8,155.35	8,140.76	17.79	18.29	-109.35	-164.47	695.33	760.85	724.76	36.08	21.086	
8,300.00	8,287.17	8,254.80	8,239.79	18.03	18.55	-109.55	-169.20	703.10	770.95	734.37	36.58	21.077	
8,400.00	8,386.76	8,354.25	8,338.83	18.27	18.80	-109.75	-173.92	710.87	781.06	743.99	37.07	21.068	
8,423.05	8,409.72	8,377.18	8,361.68	18.33	18.86	-109.80	-175.01	712.66	783.39	746.21	37.19	21.066	
8,450.00	8,436.60	8,403.99	8,388.36	18.39	18.93	-123.59	-176.29	714.76	786.05	748.73	37.32	21.063	
8,500.00	8,486.58	8,453.67	8,437.83	18.49	19.06	107.28	-178.65	718.64	790.58	753.03	37.55	21.054	
8,550.00	8,536.35	8,502.93	8,486.88	18.58	19.18	92.00	-180.99	722.49	794.62	756.86	37.76	21.044	
8,600.00	8,585.54	8,551.40	8,535.15	18.64	19.31	89.00	-183.29	726.28	798.26	760.31	37.95	21.033	
8,650.00	8,633.78	8,598.71	8,582.26	18.70	19.43	88.23	-185.54	729.98	801.66	763.53	38.13	21.027	
8,700.00	8,680.70	8,644.50	8,627.86	18.73	19.55	88.35	-187.72	733.56	805.02	766.74	38.28	21.029	
8,750.00	8,725.94	8,688.42	8,671.60	18.76	19.66	88.95	-189.80	736.99	808.61	770.19	38.42	21.046	
8,800.00	8,769.15	8,730.14	8,713.14	18.78	19.77	89.79	-191.79	740.25	812.73	774.18	38.55	21.082	
8,850.00	8,810.02	8,769.34	8,752.18	18.80	19.87	90.74	-193.65	743.31	817.70	779.03	38.67	21.146	
8,900.00	8,848.22	8,805.72	8,788.41	18.82	19.96	91.67	-195.38	746.16	823.85	785.06	38.78	21.242	
8,950.00	8,883.47	8,839.01	8,821.55	18.84	20.05	92.47	-196.96	748.76	831.48	792.59	38.89	21.378	
9,000.00	8,915.50	8,868.94	8,851.36	18.88	20.13	93.05	-198.38	751.10	840.89	801.88	39.01	21.556	
9,050.00	8,944.06	8,895.30	8,877.61	18.94	20.20	93.33	-199.83	753.16	852.32	813.18	39.14	21.778	
9,100.00	8,968.94	8,917.88	8,900.10	19.03	20.25	93.23	-200.71	754.92	865.92	826.64	39.28	22.043	
9,150.00	8,989.95	8,936.52	8,918.65	19.15	20.30	92.68	-201.59	756.38	881.80	842.35	39.45	22.351	
9,200.00	9,006.92	8,951.06	8,933.13	19.30	20.34	91.65	-202.28	757.51	899.97	860.32	39.65	22.701	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 301H - Wellbore #1 - Plan #1												Offset Site Error: 0.00 usft
Survey Program: 0-MWD												Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis			Distance					Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	
9,250.00	9,019.74	8,961.40	8,943.43	19.49	20.37	90.08	-202.77	758.32	920.35	880.49	39.86	23.089
9,300.00	9,028.30	8,967.46	8,949.48	19.72	20.38	87.97	-203.06	758.80	942.79	902.68	40.10	23.510
9,350.00	9,032.53	8,969.19	8,951.19	19.97	20.39	85.31	-203.14	758.93	967.06	926.69	40.36	23.960
9,377.69	9,033.00	8,968.28	8,950.29	20.13	20.39	83.61	-203.10	758.86	981.18	940.67	40.51	24.218
9,400.00	9,032.84	8,967.02	8,949.03	20.25	20.38	83.56	-203.04	758.76	992.85	952.22	40.63	24.437
9,434.28	9,032.60	8,965.11	8,947.13	20.42	20.38	83.49	-202.95	758.61	1,011.18	970.39	40.79	24.787
9,500.00	9,032.13	8,961.49	8,943.52	20.83	20.37	83.25	-202.78	758.33	1,048.26	1,007.06	41.20	25.444
9,600.00	9,031.43	8,955.97	8,938.02	21.63	20.35	82.88	-202.52	757.90	1,109.75	1,067.77	41.98	26.433
9,700.00	9,030.72	10,315.73	9,713.23	22.55	24.42	126.69	614.63	814.31	1,130.83	1,083.66	46.96	24.074
9,800.00	9,030.02	10,415.73	9,712.52	23.57	25.35	126.68	714.62	813.74	1,130.82	1,081.90	48.92	23.116
9,900.00	9,029.31	10,515.73	9,711.81	24.69	26.37	126.67	814.62	813.16	1,131.01	1,079.95	51.06	22.152
10,000.00	9,028.61	10,615.73	9,711.10	25.88	27.47	126.67	914.61	812.59	1,131.20	1,077.85	53.36	21.201
10,100.00	9,027.90	10,715.73	9,710.39	27.15	28.65	126.66	1,014.61	812.02	1,131.39	1,075.60	55.80	20.276
10,200.00	9,027.20	10,815.73	9,709.68	28.48	29.89	126.65	1,114.60	811.44	1,131.59	1,073.22	58.37	19.388
10,300.00	9,026.49	10,915.73	9,708.97	29.86	31.19	126.64	1,214.60	810.87	1,131.78	1,070.74	61.04	18.541
10,400.00	9,025.79	11,015.73	9,708.26	31.28	32.53	126.64	1,314.60	810.29	1,131.97	1,068.16	63.81	17.739
10,500.00	9,025.08	11,115.73	9,707.55	32.75	33.92	126.63	1,414.59	809.72	1,132.16	1,065.49	66.67	16.982
10,600.00	9,024.38	11,215.73	9,706.84	34.25	35.35	126.62	1,514.59	809.15	1,132.35	1,062.76	69.60	16.270
10,700.00	9,023.68	11,315.73	9,706.13	35.77	36.82	126.61	1,614.58	808.57	1,132.55	1,059.96	72.59	15.602
10,800.00	9,022.97	11,415.73	9,705.42	37.33	38.31	126.61	1,714.58	808.00	1,132.74	1,057.10	75.64	14.975
10,900.00	9,022.27	11,515.73	9,704.71	38.91	39.83	126.60	1,814.57	807.43	1,132.93	1,054.19	78.74	14.388
11,000.00	9,021.56	11,615.72	9,704.00	40.51	41.38	126.59	1,914.57	806.85	1,133.12	1,051.23	81.89	13.837
11,100.00	9,020.86	11,715.72	9,703.29	42.13	42.95	126.58	2,014.56	806.28	1,133.32	1,048.24	85.08	13.321
11,200.00	9,020.15	11,815.72	9,702.58	43.76	44.53	126.58	2,114.56	805.70	1,133.51	1,045.21	88.30	12.837
11,300.00	9,019.45	11,915.72	9,701.87	45.41	46.14	126.57	2,214.56	805.13	1,133.70	1,042.15	91.55	12.383
11,400.00	9,018.74	12,015.72	9,701.16	47.07	47.76	126.56	2,314.55	804.56	1,133.89	1,039.06	94.83	11.957
11,500.00	9,018.04	12,115.72	9,700.45	48.75	49.39	126.55	2,414.55	803.98	1,134.08	1,035.94	98.14	11.556
11,600.00	9,017.33	12,215.72	9,699.73	50.43	51.04	126.54	2,514.54	803.41	1,134.28	1,032.80	101.47	11.178
11,700.00	9,016.63	12,315.72	9,699.02	52.13	52.70	126.54	2,614.54	802.83	1,134.47	1,029.64	104.82	10.823
11,800.00	9,015.92	12,415.72	9,698.31	53.83	54.37	126.53	2,714.53	802.26	1,134.66	1,026.46	108.20	10.487
11,900.00	9,015.22	12,515.72	9,697.60	55.54	56.05	126.52	2,814.53	801.69	1,134.85	1,023.27	111.59	10.170
12,000.00	9,014.51	12,615.72	9,696.89	57.25	57.74	126.51	2,914.52	801.11	1,135.05	1,020.06	114.99	9.871
12,100.00	9,013.81	12,715.72	9,696.18	58.98	59.43	126.51	3,014.52	800.54	1,135.24	1,016.83	118.41	9.587
12,200.00	9,013.10	12,815.72	9,695.47	60.71	61.13	126.50	3,114.52	799.97	1,135.43	1,013.59	121.84	9.319
12,300.00	9,012.40	12,915.72	9,694.76	62.44	62.84	126.49	3,214.51	799.39	1,135.62	1,010.34	125.29	9.064
12,400.00	9,011.69	13,015.72	9,694.05	64.18	64.56	126.48	3,314.51	798.82	1,135.81	1,007.07	128.74	8.822
12,500.00	9,010.99	13,115.72	9,693.34	65.93	66.28	126.48	3,414.50	798.24	1,136.01	1,003.80	132.21	8.592
12,600.00	9,010.28	13,215.72	9,692.63	67.68	68.01	126.47	3,514.50	797.67	1,136.20	1,000.51	135.69	8.374
12,700.00	9,009.58	13,315.72	9,691.92	69.43	69.74	126.46	3,614.49	797.10	1,136.39	997.22	139.17	8.166
12,800.00	9,008.87	13,415.72	9,691.21	71.19	71.48	126.45	3,714.49	796.52	1,136.58	993.92	142.66	7.967
12,900.00	9,008.17	13,515.72	9,690.50	72.94	73.22	126.45	3,814.48	795.95	1,136.78	990.61	146.16	7.777
13,000.00	9,007.46	13,615.72	9,689.79	74.71	74.96	126.44	3,914.48	795.37	1,136.97	987.30	149.67	7.596
13,100.00	9,006.76	13,715.72	9,689.08	76.47	76.71	126.43	4,014.48	794.80	1,137.16	983.98	153.19	7.423
13,200.00	9,006.05	13,815.72	9,688.37	78.24	78.46	126.42	4,114.47	794.23	1,137.35	980.65	156.71	7.258
13,300.00	9,005.35	13,915.72	9,687.66	80.01	80.22	126.42	4,214.47	793.65	1,137.55	977.31	160.23	7.099
13,400.00	9,004.64	14,015.72	9,686.95	81.79	81.98	126.41	4,314.46	793.08	1,137.74	973.98	163.76	6.947
13,500.00	9,003.94	14,115.72	9,686.24	83.56	83.74	126.40	4,414.46	792.51	1,137.93	970.63	167.30	6.802
13,600.00	9,003.23	14,215.72	9,685.53	85.34	85.50	126.39	4,514.45	791.93	1,138.12	967.28	170.84	6.662
13,700.00	9,002.53	14,315.72	9,684.82	87.12	87.27	126.39	4,614.45	791.36	1,138.32	963.93	174.39	6.528
13,800.00	9,001.82	14,415.72	9,684.10	88.90	89.04	126.38	4,714.44	790.78	1,138.51	960.57	177.94	6.398
13,900.00	9,001.12	14,515.72	9,683.39	90.68	90.81	126.37	4,814.44	790.21	1,138.70	957.21	181.49	6.274
14,000.00	9,000.41	14,615.72	9,682.68	92.47	92.58	126.36	4,914.44	789.64	1,138.90	953.85	185.05	6.155

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Sec. 02, T 26-S, R 32-E - Harrier Federal Com 301H - Wellbore #1 - Plan #1		Offset Site Error: 0.00 usft	
Survey Program: 0-MWD													Offset Well Error: 0.00 usft			
Reference		Offset		Semi Major Axis			Distance									
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning			
14,100.00	8,999.71	14,715.72	9,681.97	94.26	94.35	126.36	5,014.43	789.06	1,139.09	950.48	188.61	6.039				
14,200.00	8,999.00	14,815.72	9,681.26	96.04	96.13	126.35	5,114.43	788.49	1,139.28	947.11	192.17	5.928				
14,300.00	8,998.30	14,915.72	9,680.55	97.83	97.91	126.34	5,214.42	787.92	1,139.47	943.73	195.74	5.821				
14,400.00	8,997.60	15,015.71	9,679.84	99.62	99.69	126.33	5,314.42	787.34	1,139.67	940.35	199.31	5.718				
14,500.00	8,996.89	15,115.71	9,679.13	101.41	101.47	126.33	5,414.41	786.77	1,139.86	936.97	202.88	5.618				
14,600.00	8,996.19	15,215.71	9,678.42	103.21	103.25	126.32	5,514.41	786.19	1,140.05	933.59	206.46	5.522				
14,700.00	8,995.48	15,315.71	9,677.71	105.00	105.04	126.31	5,614.40	785.62	1,140.24	930.21	210.04	5.429				
14,800.00	8,994.78	15,415.71	9,677.00	106.80	106.82	126.30	5,714.40	785.05	1,140.44	926.82	213.62	5.339				
14,900.00	8,994.07	15,515.71	9,676.29	108.59	108.61	126.30	5,814.40	784.47	1,140.63	923.43	217.20	5.251				
15,000.00	8,993.37	15,615.71	9,675.58	110.39	110.40	126.29	5,914.39	783.90	1,140.82	920.04	220.79	5.167				
15,100.00	8,992.66	15,715.71	9,674.87	112.19	112.19	126.28	6,014.39	783.32	1,141.02	916.64	224.38	5.085				
15,200.00	8,991.96	15,815.71	9,674.16	113.99	113.98	126.27	6,114.38	782.75	1,141.21	913.24	227.96	5.006				
15,300.00	8,991.25	15,915.71	9,673.45	115.79	115.77	126.27	6,214.38	782.18	1,141.40	909.85	231.56	4.929				
15,400.00	8,990.55	16,015.71	9,672.74	117.59	117.56	126.26	6,314.37	781.60	1,141.59	906.45	235.15	4.855				
15,500.00	8,989.84	16,115.71	9,672.03	119.39	119.36	126.25	6,414.37	781.03	1,141.79	903.04	238.74	4.782				
15,600.00	8,989.14	16,215.71	9,671.32	121.19	121.15	126.24	6,514.36	780.46	1,141.98	899.64	242.34	4.712				
15,700.00	8,988.43	16,315.71	9,670.61	122.99	122.95	126.24	6,614.36	779.88	1,142.17	896.24	245.94	4.644				
15,800.00	8,987.73	16,415.71	9,669.90	124.79	124.74	126.23	6,714.35	779.31	1,142.37	892.83	249.54	4.578				
15,900.00	8,987.02	16,515.71	9,669.19	126.60	126.54	126.22	6,814.35	778.73	1,142.56	889.42	253.14	4.514				
16,000.00	8,986.32	16,615.71	9,668.47	128.40	128.34	126.22	6,914.35	778.16	1,142.75	886.01	256.74	4.451				
16,100.00	8,985.61	16,715.71	9,667.76	130.21	130.14	126.21	7,014.34	777.59	1,142.95	882.60	260.34	4.390				
16,200.00	8,984.91	16,815.71	9,667.05	132.01	131.93	126.20	7,114.34	777.01	1,143.14	879.19	263.95	4.331				
16,300.00	8,984.20	16,915.71	9,666.34	133.82	133.73	126.19	7,214.33	776.44	1,143.33	875.78	267.55	4.273				
16,400.00	8,983.50	17,015.71	9,665.63	135.63	135.54	126.19	7,314.33	775.86	1,143.53	872.37	271.16	4.217				
16,500.00	8,982.79	17,115.71	9,664.92	137.43	137.34	126.18	7,414.32	775.29	1,143.72	868.95	274.77	4.162				
16,600.00	8,982.09	17,215.71	9,664.21	139.24	139.14	126.17	7,514.32	774.72	1,143.91	865.53	278.38	4.109				
16,700.00	8,981.38	17,315.71	9,663.50	141.05	140.94	126.16	7,614.31	774.14	1,144.11	862.12	281.99	4.057				
16,800.00	8,980.68	17,415.71	9,662.79	142.86	142.74	126.16	7,714.31	773.57	1,144.30	858.70	285.60	4.007				
16,900.00	8,979.97	17,515.71	9,662.08	144.66	144.55	126.15	7,814.31	773.00	1,144.49	855.28	289.21	3.957				
17,000.00	8,979.27	17,615.71	9,661.37	146.47	146.35	126.14	7,914.30	772.42	1,144.68	851.86	292.82	3.909				
17,100.00	8,978.56	17,715.71	9,660.66	148.28	148.15	126.13	8,014.30	771.85	1,144.88	848.44	296.44	3.862				
17,200.00	8,977.86	17,815.71	9,659.95	150.09	149.96	126.13	8,114.29	771.27	1,145.07	845.02	300.05	3.816				
17,300.00	8,977.15	17,915.71	9,659.24	151.90	151.76	126.12	8,214.29	770.70	1,145.26	841.60	303.67	3.771				
17,400.00	8,976.45	18,015.71	9,658.53	153.71	153.57	126.11	8,314.28	770.13	1,145.46	838.17	307.29	3.728				
17,500.00	8,975.74	18,115.71	9,657.82	155.53	155.38	126.10	8,414.28	769.55	1,145.65	834.75	310.90	3.685				
17,600.00	8,975.04	18,215.71	9,657.11	157.34	157.18	126.10	8,514.27	768.98	1,145.84	831.32	314.52	3.643				
17,700.00	8,974.33	18,315.71	9,656.40	159.15	158.99	126.09	8,614.27	768.40	1,146.04	827.90	318.14	3.602				
17,800.00	8,973.63	18,415.70	9,655.69	160.96	160.80	126.08	8,714.27	767.83	1,146.23	824.47	321.76	3.562				
17,900.00	8,972.92	18,515.70	9,654.98	162.77	162.61	126.07	8,814.26	767.26	1,146.43	821.05	325.38	3.523				
18,000.00	8,972.22	18,615.70	9,654.27	164.58	164.41	126.07	8,914.26	766.68	1,146.62	817.62	329.00	3.485				
18,100.00	8,971.52	18,715.70	9,653.55	166.40	166.22	126.06	9,014.25	766.11	1,146.81	814.19	332.62	3.448				
18,200.00	8,970.81	18,815.70	9,652.84	168.21	168.03	126.05	9,114.25	765.54	1,147.01	810.76	336.24	3.411				
18,300.00	8,970.11	18,915.70	9,652.13	170.02	169.84	126.04	9,214.24	764.96	1,147.20	807.33	339.86	3.375				
18,400.00	8,969.40	19,015.70	9,651.42	171.84	171.65	126.04	9,314.24	764.39	1,147.39	803.91	343.49	3.340				
18,500.00	8,968.70	19,115.70	9,650.71	173.65	173.46	126.03	9,414.23	763.81	1,147.59	800.48	347.11	3.306				
18,600.00	8,967.99	19,215.70	9,650.00	175.47	175.27	126.02	9,514.23	763.24	1,147.78	797.04	350.74	3.272				
18,700.00	8,967.29	19,315.70	9,649.29	177.28	177.08	126.02	9,614.23	762.67	1,147.97	793.61	354.36	3.240				
18,800.00	8,966.58	19,415.70	9,648.58	179.09	178.89	126.01	9,714.22	762.09	1,148.17	790.18	357.98	3.207				
18,900.00	8,965.88	19,515.70	9,647.87	180.91	180.70	126.00	9,814.22	761.52	1,148.36	786.75	361.61	3.176				
19,000.00	8,965.17	19,615.70	9,647.16	182.72	182.51	125.99	9,914.21	760.95	1,148.55	783.32	365.24	3.145				
19,100.00	8,964.47	19,715.70	9,646.45	184.54	184.32	125.99	10,014.21	760.37	1,148.75	779.88	368.86	3.114				
19,200.00	8,963.76	19,815.70	9,645.74	186.35	186.14	125.98	10,114.20	759.80	1,148.94	776.45	372.49	3.084				

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 301H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Distance							Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
19,308.03	8,963.00	19,919.80	9,645.00	188.32	187.96	125.97	10,218.30	759.20	1,149.16	772.88	376.27	3.054 SF	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design												Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1		Offset Site Error:	0.00 usft
Survey Program: 0-MWD														Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance				Warning				
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor		
0.00	0.00	4.00	4.00	0.00	0.00	89.58	2.20	299.90	299.91						
100.00	100.00	104.00	104.00	0.08	0.09	89.58	2.20	299.90	299.91	299.73	0.18	1,710.655			
200.00	200.00	204.00	204.00	0.31	0.32	89.58	2.20	299.90	299.91	299.28	0.62	479.968			
300.00	300.00	304.00	304.00	0.53	0.54	89.58	2.20	299.90	299.91	298.83	1.07	279.145			
400.00	400.00	404.00	404.00	0.76	0.77	89.58	2.20	299.90	299.91	298.38	1.52	196.801			
500.00	500.00	504.00	504.00	0.98	0.99	89.58	2.20	299.90	299.91	297.93	1.97	151.972			
600.00	600.00	604.00	604.00	1.21	1.22	89.58	2.20	299.90	289.91	297.49	2.42	123.777			
700.00	700.00	704.00	704.00	1.43	1.44	89.58	2.20	299.90	299.91	297.04	2.87	104.406			
800.00	800.00	804.00	804.00	1.66	1.67	89.58	2.20	299.90	299.91	296.59	3.32	90.278			
900.00	900.00	904.00	904.00	1.88	1.89	89.58	2.20	299.90	299.91	296.14	3.77	79.518			
1,000.00	1,000.00	1,004.00	1,004.00	2.11	2.12	89.58	2.20	299.90	299.91	295.69	4.22	71.050			
1,100.00	1,100.00	1,104.00	1,104.00	2.33	2.34	89.58	2.20	299.90	299.91	295.24	4.67	64.211			
1,200.00	1,200.00	1,204.00	1,204.00	2.56	2.56	89.58	2.20	299.90	299.91	294.79	5.12	58.574			
1,300.00	1,300.00	1,304.00	1,304.00	2.78	2.79	89.58	2.20	299.90	299.91	294.34	5.57	53.846			
1,400.00	1,400.00	1,404.00	1,404.00	3.01	3.01	89.58	2.20	299.90	299.91	293.89	6.02	49.825			
1,500.00	1,500.00	1,504.00	1,504.00	3.23	3.24	89.58	2.20	299.90	299.91	293.44	6.47	46.362			
1,600.00	1,600.00	1,604.00	1,604.00	3.45	3.46	89.58	2.20	299.90	299.91	292.99	6.92	43.350			
1,700.00	1,700.00	1,704.00	1,704.00	3.68	3.69	89.58	2.20	299.90	299.91	292.54	7.37	40.705			
1,800.00	1,800.00	1,804.00	1,804.00	3.90	3.91	89.58	2.20	299.90	299.91	292.09	7.82	38.364			
1,900.00	1,900.00	1,904.00	1,904.00	4.13	4.14	89.58	2.20	299.90	299.91	291.64	8.27	36.278			
2,000.00	2,000.00	2,004.00	2,004.00	4.35	4.36	89.58	2.20	299.90	299.91	291.19	8.72	34.407			
2,100.00	2,100.00	2,104.00	2,104.00	4.58	4.59	89.58	2.20	299.90	299.91	290.74	9.17	32.720			
2,200.00	2,200.00	2,204.00	2,204.00	4.80	4.81	89.58	2.20	299.90	299.91	290.29	9.62	31.190			
2,300.00	2,300.00	2,304.00	2,304.00	5.03	5.04	89.58	2.20	299.90	299.91	289.84	10.07	29.797			
2,400.00	2,400.00	2,404.00	2,404.00	5.25	5.26	89.58	2.20	299.90	299.91	289.39	10.51	28.523			
2,500.00	2,500.00	2,504.00	2,504.00	5.48	5.49	89.58	2.20	299.90	299.91	288.94	10.96	27.354			
2,600.00	2,600.00	2,604.00	2,604.00	5.70	5.71	89.58	2.20	299.90	299.91	288.49	11.41	26.276			
2,700.00	2,700.00	2,704.00	2,704.00	5.93	5.94	89.58	2.20	299.90	299.91	288.04	11.86	25.281			
2,800.00	2,800.00	2,804.00	2,804.00	6.15	6.16	89.58	2.20	299.90	299.91	287.60	12.31	24.358			
2,900.00	2,900.00	2,904.00	2,904.00	6.38	6.39	89.58	2.20	299.90	299.91	287.15	12.76	23.500			
3,000.00	3,000.00	3,004.00	3,004.00	6.60	6.61	89.58	2.20	299.90	299.91	286.70	13.21	22.700			
3,100.00	3,100.00	3,104.00	3,104.00	6.83	6.84	89.58	2.20	299.90	299.91	286.25	13.66	21.953			
3,200.00	3,200.00	3,204.00	3,204.00	7.05	7.06	89.58	2.20	299.90	299.91	285.80	14.11	21.254			
3,300.00	3,300.00	3,304.00	3,304.00	7.28	7.28	89.58	2.20	299.90	299.91	285.35	14.56	20.598			
3,400.00	3,400.00	3,404.00	3,404.00	7.50	7.51	89.58	2.20	299.90	299.91	284.90	15.01	19.981			
3,500.00	3,500.00	3,504.00	3,504.00	7.73	7.73	89.58	2.20	299.90	299.91	284.45	15.46	19.400			
3,600.00	3,600.00	3,604.00	3,604.00	7.95	7.96	89.58	2.20	299.90	299.91	284.00	15.91	18.852			
3,700.00	3,700.00	3,704.00	3,704.00	8.17	8.18	89.58	2.20	299.90	299.91	283.55	16.36	18.334			
3,800.00	3,800.00	3,804.00	3,804.00	8.40	8.41	89.58	2.20	299.90	299.91	283.10	16.81	17.843			
3,900.00	3,900.00	3,904.00	3,904.00	8.62	8.63	89.58	2.20	299.90	299.91	282.65	17.26	17.378			
4,000.00	4,000.00	4,004.00	4,004.00	8.85	8.86	89.58	2.20	299.90	299.91	282.20	17.71	16.937			
4,100.00	4,100.00	4,104.00	4,104.00	9.07	9.08	89.58	2.20	299.90	299.91	281.75	18.16	16.518			
4,200.00	4,200.00	4,204.00	4,204.00	9.30	9.31	89.58	2.20	299.90	299.91	281.30	18.61	16.119			
4,300.00	4,300.00	4,304.00	4,304.00	9.52	9.53	89.58	2.20	299.90	299.91	280.85	19.06	15.739			
4,400.00	4,400.00	4,404.00	4,404.00	9.75	9.76	89.58	2.20	299.90	299.91	280.40	19.51	15.376			
4,500.00	4,500.00	4,504.00	4,504.00	9.97	9.98	89.58	2.20	299.90	299.91	279.95	19.95	15.029			
4,600.00	4,600.00	4,604.00	4,604.00	10.20	10.21	89.58	2.20	299.90	299.91	279.50	20.40	14.698			
4,700.00	4,700.00	4,704.00	4,704.00	10.42	10.43	89.58	2.20	299.90	299.91	279.05	20.85	14.381			
4,800.00	4,800.00	4,804.00	4,804.00	10.65	10.66	89.58	2.20	299.90	299.91	278.60	21.30	14.078			
4,900.00	4,900.00	4,904.00	4,904.00	10.87	10.88	89.58	2.20	299.90	299.91	278.16	21.75	13.787			
5,000.00	5,000.00	5,004.15	5,004.15	11.10	11.10	89.58	2.20	299.90	299.91	277.71	22.20	13.508			
5,100.00	5,099.98	5,108.00	5,107.97	11.29	11.31	-102.02	0.29	299.19	299.58	276.98	22.60	13.256			

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1		Offset Site Error:	0.00 usft
Survey Program: 0-MWD															Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor				
5,200.00	5,199.84	5,211.82	5,211.63	11.46	11.48	-102.01	-5.14	297.18	298.70	275.75	22.94	13.018				
5,259.58	5,259.22	5,273.08	5,272.67	11.56	11.59	-102.03	-9.96	295.40	297.92	274.77	23.15	12.868				
5,300.00	5,299.48	5,313.49	5,312.92	11.63	11.66	-102.06	-13.36	294.14	297.40	274.11	23.29	12.769				
5,400.00	5,399.07	5,413.48	5,412.51	11.80	11.83	-102.15	-21.78	291.03	296.11	272.48	23.64	12.528				
5,500.00	5,498.66	5,513.48	5,512.09	11.98	12.01	-102.24	-30.20	287.92	294.82	270.84	23.99	12.290				
5,600.00	5,598.25	5,613.47	5,611.68	12.16	12.19	-102.33	-38.62	284.80	293.54	269.19	24.35	12.055				
5,700.00	5,697.84	5,713.46	5,711.27	12.34	12.38	-102.42	-47.03	281.69	292.25	267.53	24.72	11.823				
5,800.00	5,797.43	5,813.45	5,810.86	12.53	12.57	-102.51	-55.45	278.57	290.96	265.87	25.10	11.594				
5,900.00	5,897.02	5,913.44	5,910.44	12.72	12.76	-102.60	-63.87	275.46	289.68	264.20	25.48	11.369				
6,000.00	5,996.61	6,013.43	6,010.03	12.91	12.96	-102.69	-72.29	272.34	288.39	262.52	25.87	11.148				
6,100.00	6,096.20	6,113.42	6,109.62	13.11	13.16	-102.79	-80.71	269.23	287.11	260.84	26.27	10.930				
6,200.00	6,195.79	6,213.41	6,209.20	13.31	13.36	-102.88	-89.13	266.12	285.83	259.18	26.67	10.717				
6,300.00	6,295.38	6,313.40	6,308.79	13.52	13.56	-102.98	-97.55	263.00	284.55	257.47	27.08	10.508				
6,400.00	6,394.97	6,413.39	6,408.38	13.72	13.77	-103.07	-105.96	259.89	283.26	255.77	27.49	10.303				
6,500.00	6,494.56	6,513.38	6,507.96	13.93	13.98	-103.17	-114.38	256.77	281.98	254.07	27.91	10.103				
6,600.00	6,594.15	6,613.37	6,607.55	14.14	14.19	-103.27	-122.80	253.66	280.70	252.37	28.34	9.907				
6,700.00	6,693.74	6,713.36	6,707.14	14.36	14.41	-103.37	-131.22	250.54	279.43	250.66	28.76	9.715				
6,800.00	6,793.33	6,813.35	6,806.73	14.57	14.62	-103.47	-139.64	247.43	278.15	248.95	29.20	9.527				
6,900.00	6,892.92	6,913.34	6,906.31	14.79	14.84	-103.57	-148.06	244.32	276.87	247.24	29.63	9.343				
7,000.00	6,992.51	7,013.33	7,005.90	15.01	15.06	-103.67	-156.47	241.20	275.59	245.52	30.08	9.163				
7,100.00	7,092.10	7,113.33	7,105.49	15.23	15.29	-103.77	-164.89	238.09	274.32	243.80	30.52	8.988				
7,200.00	7,191.68	7,213.32	7,205.07	15.46	15.51	-103.87	-173.31	234.97	273.04	242.07	30.97	8.816				
7,300.00	7,291.27	7,313.31	7,304.66	15.68	15.74	-103.98	-181.73	231.86	271.77	240.35	31.42	8.649				
7,400.00	7,390.86	7,413.30	7,404.25	15.91	15.97	-104.08	-190.15	228.75	270.50	238.62	31.88	8.485				
7,500.00	7,490.45	7,513.29	7,503.83	16.14	16.20	-104.19	-198.57	225.63	269.22	236.89	32.34	8.325				
7,600.00	7,590.04	7,613.28	7,603.42	16.37	16.43	-104.30	-206.98	222.52	267.95	235.15	32.80	8.169				
7,700.00	7,689.63	7,713.27	7,703.01	16.60	16.66	-104.40	-215.40	219.40	266.68	233.42	33.27	8.017				
7,800.00	7,789.22	7,813.26	7,802.60	16.84	16.90	-104.51	-223.82	216.29	265.41	231.68	33.74	7.868				
7,900.00	7,888.81	7,913.25	7,902.18	17.07	17.13	-104.62	-232.24	213.17	264.15	229.94	34.21	7.722				
8,000.00	7,988.40	8,013.24	8,001.77	17.31	17.37	-104.74	-240.66	210.06	262.88	228.20	34.68	7.580				
8,100.00	8,087.99	8,113.23	8,101.36	17.55	17.61	-104.85	-249.08	206.95	261.61	226.46	35.16	7.441				
8,200.00	8,187.58	8,213.22	8,200.94	17.79	17.85	-104.96	-257.50	203.83	260.35	224.71	35.64	7.306				
8,300.00	8,287.17	8,313.21	8,300.53	18.03	18.09	-105.08	-265.91	200.72	259.08	222.97	36.12	7.173				
8,400.00	8,386.76	8,413.20	8,400.12	18.27	18.33	-105.19	-274.33	197.60	257.82	221.22	36.60	7.044				
8,423.05	8,409.72	8,436.25	8,423.07	18.33	18.39	-105.22	-276.27	196.89	257.53	220.82	36.71	7.015				
8,450.00	8,436.60	8,463.19	8,449.90	18.39	18.45	-118.59	-278.54	196.05	257.17	220.33	36.84	6.980				
8,500.00	8,486.58	8,512.99	8,499.50	18.49	18.57	113.50	-282.73	194.50	256.43	219.37	37.07	6.918				
8,550.00	8,536.35	8,562.22	8,548.53	18.58	18.69	100.07	-286.88	192.96	255.81	218.54	37.27	6.864				
8,579.84	8,565.80	8,591.18	8,577.38	18.62	18.76	99.19	-289.32	192.06	255.68	218.29	37.38	6.840 CC				
8,600.00	8,585.54	8,610.52	8,596.63	18.64	18.81	99.40	-290.94	191.46	255.76	218.30	37.46	6.828				
8,650.00	8,633.78	8,657.51	8,643.43	18.70	18.93	101.36	-294.90	189.99	256.89	219.27	37.62	6.828				
8,700.00	8,680.70	8,702.83	8,688.58	18.73	19.04	104.42	-298.72	188.58	260.00	222.23	37.77	6.883				
8,750.00	8,725.94	8,746.15	8,731.72	18.76	19.14	107.96	-302.36	187.23	265.92	228.01	37.90	7.015				
8,800.00	8,769.15	8,787.13	8,772.54	18.78	19.24	111.53	-305.81	185.96	275.46	237.43	38.03	7.244				
8,850.00	8,810.02	8,825.47	8,810.72	18.80	19.34	114.82	-309.04	184.76	289.24	251.11	38.14	7.584				
8,900.00	8,848.22	8,860.86	8,845.96	18.82	19.43	117.57	-312.02	183.66	307.65	269.41	38.25	8.044				
8,950.00	8,883.47	8,896.95	8,881.92	18.84	19.51	120.12	-314.96	182.54	330.73	292.37	38.36	8.622				
9,000.00	8,915.50	8,949.08	8,934.00	18.88	19.63	124.26	-316.01	180.89	357.07	318.56	38.51	9.272				
9,050.00	8,944.06	9,008.61	8,993.29	18.94	19.73	128.49	-311.42	178.97	385.40	346.73	38.67	9.966				
9,100.00	8,968.94	9,078.82	9,062.15	19.03	19.82	132.94	-298.13	176.70	414.82	375.97	38.85	10.678				
9,150.00	8,989.95	9,164.93	9,143.57	19.15	19.89	137.70	-270.50	173.93	444.25	405.21	39.04	11.380				
9,200.00	9,006.92	9,275.03	9,240.08	19.30	19.93	142.67	-217.97	170.53	472.19	432.96	39.23	12.035				

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1		Offset Site Error: 0.00 usft	
Survey Program: 0-MWD													Offset Well Error: 0.00 usft			
Reference		Offset		Semi Major Axis			Distance						Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor				
9,250.00	9,019.74	9,420.29	9,348.83	19.49	19.96	147.37	-122.34	166.46	496.32	456.87	39.45	12.581				
9,300.00	9,028.30	9,609.67	9,448.53	19.72	20.12	150.74	37.60	162.28	513.11	473.27	39.84	12.879				
9,350.00	9,032.53	9,832.64	9,492.03	19.97	20.96	151.46	254.84	159.52	518.55	477.61	40.94	12.667				
9,371.77	9,033.01	9,859.85	9,491.82	20.10	21.11	151.37	282.04	159.35	518.19	476.98	41.21	12.574				
9,377.69	9,033.00	9,865.76	9,491.77	20.13	21.15	151.35	287.96	159.31	518.22	476.94	41.28	12.555				
9,400.00	9,032.84	9,888.07	9,491.57	20.25	21.28	151.31	310.26	159.18	518.37	476.85	41.52	12.484				
9,434.28	9,032.60	9,922.34	9,491.26	20.42	21.50	151.28	344.54	158.97	518.45	476.53	41.91	12.370				
9,500.00	9,032.13	9,988.07	9,490.66	20.83	21.94	151.26	410.26	158.57	518.40	475.63	42.77	12.120				
9,600.00	9,031.43	10,088.07	9,489.76	21.63	22.73	151.23	510.25	157.97	518.33	473.97	44.36	11.685				
9,700.00	9,030.72	10,188.07	9,488.85	22.55	23.63	151.20	610.24	157.36	518.25	472.07	46.18	11.223				
9,800.00	9,030.02	10,288.07	9,487.95	23.57	24.63	151.17	710.24	156.76	518.18	469.98	48.20	10.750				
9,900.00	9,029.31	10,388.07	9,487.05	24.69	25.72	151.14	810.23	156.15	518.11	467.70	50.41	10.278				
10,000.00	9,028.61	10,488.07	9,486.14	25.88	26.89	151.11	910.23	155.54	518.03	465.26	52.78	9.815				
10,100.00	9,027.90	10,588.07	9,485.24	27.15	28.13	151.07	1,010.22	154.94	517.96	462.68	55.28	9.369				
10,200.00	9,027.20	10,688.07	9,484.33	28.48	29.43	151.04	1,110.21	154.33	517.89	459.98	57.91	8.943				
10,300.00	9,026.49	10,788.06	9,483.43	29.86	30.79	151.01	1,210.21	153.73	517.82	457.17	60.64	8.539				
10,400.00	9,025.79	10,888.06	9,482.52	31.28	32.19	150.98	1,310.20	153.12	517.75	454.28	63.47	8.157				
10,500.00	9,025.08	10,988.06	9,481.62	32.75	33.63	150.95	1,410.19	152.52	517.67	451.30	66.37	7.799				
10,600.00	9,024.38	11,088.06	9,480.72	34.25	35.10	150.92	1,510.19	151.91	517.60	448.25	69.35	7.464				
10,700.00	9,023.68	11,188.06	9,479.81	35.77	36.61	150.89	1,610.18	151.31	517.53	445.15	72.39	7.150				
10,800.00	9,022.97	11,288.06	9,478.91	37.33	38.15	150.86	1,710.17	150.70	517.46	441.98	75.48	6.856				
10,900.00	9,022.27	11,388.06	9,478.00	38.91	39.71	150.82	1,810.17	150.09	517.39	438.77	78.62	6.581				
11,000.00	9,021.56	11,488.06	9,477.10	40.51	41.29	150.79	1,910.16	149.49	517.32	435.52	81.80	6.324				
11,100.00	9,020.86	11,588.06	9,476.19	42.13	42.89	150.76	2,010.16	148.88	517.25	432.23	85.02	6.084				
11,200.00	9,020.15	11,688.06	9,475.29	43.76	44.51	150.73	2,110.15	148.28	517.18	428.91	88.27	5.859				
11,300.00	9,019.45	11,788.06	9,474.38	45.41	46.14	150.70	2,210.14	147.67	517.11	425.56	91.55	5.648				
11,400.00	9,018.74	11,888.06	9,473.48	47.07	47.79	150.67	2,310.14	147.07	517.04	422.18	94.86	5.450				
11,500.00	9,018.04	11,988.06	9,472.58	48.75	49.45	150.64	2,410.13	146.46	516.97	418.77	98.19	5.265				
11,600.00	9,017.33	12,088.06	9,471.67	50.43	51.12	150.61	2,510.12	145.86	516.90	415.35	101.55	5.090				
11,700.00	9,016.63	12,188.06	9,470.77	52.13	52.80	150.57	2,610.12	145.25	516.83	411.90	104.92	4.926				
11,800.00	9,015.92	12,288.06	9,469.86	53.83	54.49	150.54	2,710.11	144.64	516.76	408.44	108.32	4.771				
11,900.00	9,015.22	12,388.06	9,468.96	55.54	56.19	150.51	2,810.10	144.04	516.69	404.96	111.72	4.625				
12,000.00	9,014.51	12,488.06	9,468.05	57.25	57.89	150.48	2,910.10	143.43	516.62	401.47	115.15	4.487				
12,100.00	9,013.81	12,588.06	9,467.15	58.98	59.60	150.45	3,010.09	142.83	516.55	397.97	118.58	4.356				
12,200.00	9,013.10	12,688.06	9,466.25	60.71	61.32	150.42	3,110.09	142.22	516.48	394.45	122.03	4.232				
12,300.00	9,012.40	12,788.06	9,465.34	62.44	63.05	150.39	3,210.08	141.62	516.41	390.92	125.49	4.115				
12,400.00	9,011.69	12,888.06	9,464.44	64.18	64.78	150.36	3,310.07	141.01	516.34	387.38	128.96	4.004				
12,500.00	9,010.99	12,988.06	9,463.53	65.93	66.52	150.32	3,410.07	140.41	516.27	383.83	132.44	3.898				
12,600.00	9,010.28	13,088.06	9,462.63	67.68	68.26	150.29	3,510.06	139.80	516.21	380.27	135.93	3.797				
12,700.00	9,009.58	13,188.05	9,461.72	69.43	70.00	150.26	3,610.05	139.19	516.14	376.71	139.43	3.702				
12,800.00	9,008.87	13,288.05	9,460.82	71.19	71.75	150.23	3,710.05	138.59	516.07	373.13	142.94	3.611				
12,900.00	9,008.17	13,388.05	9,459.92	72.94	73.50	150.20	3,810.04	137.98	516.00	369.55	146.45	3.523				
13,000.00	9,007.46	13,488.05	9,459.01	74.71	75.26	150.17	3,910.03	137.38	515.93	365.97	149.97	3.440				
13,100.00	9,006.76	13,588.05	9,458.11	76.47	77.02	150.14	4,010.03	136.77	515.87	362.37	153.49	3.361				
13,200.00	9,006.05	13,688.05	9,457.20	78.24	78.78	150.10	4,110.02	136.17	515.80	358.78	157.02	3.285				
13,300.00	9,005.35	13,788.05	9,456.30	80.01	80.54	150.07	4,210.02	135.56	515.73	355.17	160.56	3.212				
13,400.00	9,004.64	13,888.05	9,455.39	81.79	82.31	150.04	4,310.01	134.96	515.66	351.57	164.10	3.142				
13,500.00	9,003.94	13,988.05	9,454.49	83.56	84.08	150.01	4,410.00	134.35	515.60	347.95	167.64	3.076				
13,600.00	9,003.23	14,088.05	9,453.59	85.34	85.85	149.98	4,510.00	133.74	515.53	344.34	171.19	3.011				
13,700.00	9,002.53	14,188.05	9,452.68	87.12	87.63	149.95	4,609.99	133.14	515.46	340.72	174.75	2.950				
13,800.00	9,001.82	14,288.05	9,451.78	88.90	89.40	149.92	4,709.98	132.53	515.40	337.09	178.30	2.891				
13,900.00	9,001.12	14,388.05	9,450.87	90.68	91.18	149.88	4,809.98	131.93	515.33	333.47	181.86	2.834				

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Offset Site Error:	0.00 usft
Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1														
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance				Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (")	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor	
14,000.00	9,000.41	14,488.05	9,449.97	92.47	92.96	149.85	4,909.97	131.32	515.26	329.83	185.43	2.779		
14,100.00	8,999.71	14,588.05	9,449.06	94.26	94.74	149.82	5,009.97	130.72	515.20	326.20	189.00	2.726		
14,200.00	8,999.00	14,688.05	9,448.16	96.04	96.53	149.79	5,109.96	130.11	515.13	322.56	192.57	2.675		
14,300.00	8,998.30	14,788.05	9,447.26	97.83	98.31	149.76	5,209.95	129.50	515.07	318.92	196.14	2.626		
14,400.00	8,997.60	14,888.05	9,446.35	99.62	100.10	149.73	5,309.95	128.90	515.00	315.28	199.72	2.579		
14,500.00	8,996.89	14,988.05	9,445.45	101.41	101.88	149.70	5,409.94	128.29	514.93	311.64	203.30	2.533		
14,600.00	8,996.19	15,088.05	9,444.54	103.21	103.67	149.66	5,509.93	127.69	514.87	307.99	206.88	2.489		
14,700.00	8,995.48	15,188.05	9,443.64	105.00	105.46	149.63	5,609.93	127.08	514.80	304.34	210.46	2.446		
14,800.00	8,994.78	15,288.05	9,442.73	106.80	107.25	149.60	5,709.92	126.48	514.74	300.69	214.05	2.405		
14,900.00	8,994.07	15,388.05	9,441.83	108.59	109.05	149.57	5,809.91	125.87	514.67	297.04	217.64	2.365		
15,000.00	8,993.37	15,488.04	9,440.92	110.39	110.84	149.54	5,909.91	125.27	514.61	293.38	221.23	2.326		
15,100.00	8,992.66	15,588.04	9,440.02	112.19	112.63	149.51	6,009.90	124.66	514.54	289.73	224.82	2.289		
15,200.00	8,991.96	15,688.04	9,439.12	113.99	114.43	149.47	6,109.90	124.05	514.48	286.07	228.41	2.252		
15,300.00	8,991.25	15,788.04	9,438.21	115.79	116.22	149.44	6,209.89	123.45	514.42	282.41	232.01	2.217		
15,400.00	8,990.55	15,888.04	9,437.31	117.59	118.02	149.41	6,309.88	122.84	514.35	278.75	235.61	2.183		
15,500.00	8,989.84	15,988.04	9,436.40	119.39	119.82	149.38	6,409.88	122.24	514.29	275.08	239.21	2.150		
15,600.00	8,989.14	16,088.04	9,435.50	121.19	121.62	149.35	6,509.87	121.63	514.22	271.42	242.81	2.118		
15,700.00	8,988.43	16,188.04	9,434.59	122.99	123.42	149.32	6,609.86	121.03	514.16	267.75	246.41	2.087		
15,800.00	8,987.73	16,288.04	9,433.69	124.79	125.22	149.28	6,709.86	120.42	514.10	264.09	250.01	2.056		
15,900.00	8,987.02	16,388.04	9,432.79	126.60	127.02	149.25	6,809.85	119.82	514.03	260.42	253.62	2.027		
16,000.00	8,986.32	16,488.04	9,431.88	128.40	128.82	149.22	6,909.84	119.21	513.97	256.75	257.22	1.998		
16,100.00	8,985.61	16,588.04	9,430.98	130.21	130.62	149.19	7,009.84	118.60	513.91	253.08	260.83	1.970		
16,200.00	8,984.91	16,688.04	9,430.07	132.01	132.42	149.16	7,109.83	118.00	513.84	249.41	264.44	1.943		
16,300.00	8,984.20	16,788.04	9,429.17	133.82	134.23	149.13	7,209.83	117.39	513.78	245.74	268.05	1.917		
16,400.00	8,983.50	16,888.04	9,428.26	135.63	136.03	149.09	7,309.82	116.79	513.72	242.06	271.66	1.891		
16,500.00	8,982.79	16,988.04	9,427.36	137.43	137.83	149.06	7,409.81	116.18	513.66	238.39	275.27	1.866		
16,600.00	8,982.09	17,088.04	9,426.46	139.24	139.64	149.03	7,509.81	115.58	513.60	234.72	278.88	1.842		
16,700.00	8,981.38	17,188.04	9,425.55	141.05	141.44	149.00	7,609.80	114.97	513.53	231.04	282.49	1.818		
16,800.00	8,980.68	17,288.04	9,424.65	142.86	143.25	148.97	7,709.79	114.37	513.47	227.36	286.11	1.795		
16,900.00	8,979.97	17,388.04	9,423.74	144.66	145.06	148.94	7,809.79	113.76	513.41	223.69	289.72	1.772		
17,000.00	8,979.27	17,488.04	9,422.84	146.47	146.86	148.90	7,909.78	113.15	513.35	220.01	293.34	1.750		
17,100.00	8,978.56	17,588.04	9,421.93	148.28	148.67	148.87	8,009.77	112.55	513.29	216.33	296.95	1.729		
17,200.00	8,977.86	17,688.04	9,421.03	150.09	150.48	148.84	8,109.77	111.94	513.23	212.65	300.57	1.707		
17,300.00	8,977.15	17,788.04	9,420.13	151.90	152.29	148.81	8,209.76	111.34	513.16	208.97	304.19	1.687		
17,400.00	8,976.45	17,888.03	9,419.22	153.71	154.09	148.78	8,309.76	110.73	513.10	205.29	307.81	1.667		
17,500.00	8,975.74	17,988.03	9,418.32	155.53	155.90	148.75	8,409.75	110.13	513.04	201.61	311.43	1.647		
17,600.00	8,975.04	18,088.03	9,417.41	157.34	157.71	148.71	8,509.74	109.52	512.98	197.93	315.05	1.628		
17,700.00	8,974.33	18,188.03	9,416.51	159.15	159.52	148.68	8,609.74	108.92	512.92	194.25	318.67	1.610		
17,800.00	8,973.63	18,288.03	9,415.60	160.96	161.33	148.65	8,709.73	108.31	512.86	190.57	322.29	1.591		
17,900.00	8,972.92	18,388.03	9,414.70	162.77	163.14	148.62	8,809.72	107.70	512.80	186.89	325.91	1.573		
18,000.00	8,972.22	18,488.03	9,413.80	164.58	164.95	148.59	8,909.72	107.10	512.74	183.20	329.54	1.556		
18,100.00	8,971.52	18,588.03	9,412.89	166.40	166.76	148.55	9,009.71	106.49	512.68	179.52	333.16	1.539		
18,200.00	8,970.81	18,688.03	9,411.99	168.21	168.57	148.52	9,109.71	105.89	512.62	175.84	336.79	1.522		
18,300.00	8,970.11	18,788.03	9,411.08	170.02	170.39	148.49	9,209.70	105.28	512.56	172.15	340.41	1.506		
18,400.00	8,969.40	18,888.03	9,410.18	171.84	172.20	148.46	9,309.69	104.68	512.50	168.47	344.03	1.490 Level 3		
18,500.00	8,968.70	18,988.03	9,409.27	173.65	174.01	148.43	9,409.69	104.07	512.44	164.78	347.66	1.474 Level 3		
18,600.00	8,967.99	19,088.03	9,408.37	175.47	175.82	148.40	9,509.68	103.46	512.38	161.10	351.29	1.459 Level 3		
18,700.00	8,967.29	19,188.03	9,407.46	177.28	177.63	148.36	9,609.67	102.86	512.33	157.41	354.91	1.444 Level 3		
18,800.00	8,966.58	19,288.03	9,406.56	179.09	179.45	148.33	9,709.67	102.25	512.27	153.73	358.54	1.429 Level 3		
18,900.00	8,965.88	19,388.03	9,405.66	180.91	181.26	148.30	9,809.66	101.65	512.21	150.04	362.17	1.414 Level 3		
19,000.00	8,965.17	19,488.03	9,404.75	182.72	183.07	148.27	9,909.65	101.04	512.15	146.35	365.80	1.400 Level 3		
19,100.00	8,964.47	19,588.03	9,403.85	184.54	184.89	148.24	10,009.65	100.44	512.09	142.67	369.42	1.386 Level 3		

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 302H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)					
19,200.00	8,963.76	19,688.03	9,402.94	186.35	186.70	148.20	10,109.64	99.83	512.03	138.98	373.05	1.373 Level 3	
19,276.12	8,963.23	19,764.14	9,402.25	187.74	188.08	148.18	10,185.75	99.37	511.99	136.17	375.81	1.362 Level 3	
19,308.03	8,963.00	19,793.03	9,401.99	188.32	188.60	148.17	10,214.63	99.20	511.98	135.06	376.92	1.358 Level 3, ES, SF	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
0.00	0.00	1.00	1.00	0.00	0.00	-90.38	-0.20	-30.10	30.10				
100.00	100.00	101.00	101.00	0.08	0.09	-90.38	-0.20	-30.10	30.10	29.93	0.17	178.560	
200.00	200.00	201.00	201.00	0.31	0.31	-90.38	-0.20	-30.10	30.10	29.48	0.62	48.698	
300.00	300.00	301.00	301.00	0.53	0.53	-90.38	-0.20	-30.10	30.10	29.03	1.07	28.194	
400.00	400.00	401.00	401.00	0.76	0.76	-90.38	-0.20	-30.10	30.10	28.58	1.52	19.840	
500.00	500.00	501.00	501.00	0.98	0.98	-90.38	-0.20	-30.10	30.10	28.13	1.97	15.305	
600.00	600.00	601.00	601.00	1.21	1.21	-90.38	-0.20	-30.10	30.10	27.68	2.42	12.458	
700.00	700.00	701.00	701.00	1.43	1.43	-90.38	-0.20	-30.10	30.10	27.23	2.87	10.504	
800.00	800.00	801.00	801.00	1.66	1.66	-90.38	-0.20	-30.10	30.10	26.79	3.32	9.079	
900.00	900.00	901.00	901.00	1.88	1.88	-90.38	-0.20	-30.10	30.10	26.34	3.76	7.995	
1,000.00	1,000.00	1,001.00	1,001.00	2.11	2.11	-90.38	-0.20	-30.10	30.10	25.89	4.21	7.142	
1,100.00	1,100.00	1,101.00	1,101.00	2.33	2.33	-90.38	-0.20	-30.10	30.10	25.44	4.66	6.454	
1,200.00	1,200.00	1,201.00	1,201.00	2.56	2.56	-90.38	-0.20	-30.10	30.10	24.99	5.11	5.887	
1,300.00	1,300.00	1,301.00	1,301.00	2.78	2.78	-90.38	-0.20	-30.10	30.10	24.54	5.56	5.411	
1,400.00	1,400.00	1,401.00	1,401.00	3.01	3.01	-90.38	-0.20	-30.10	30.10	24.09	6.01	5.006	
1,500.00	1,500.00	1,501.00	1,501.00	3.23	3.23	-90.38	-0.20	-30.10	30.10	23.64	6.46	4.658	
1,600.00	1,600.00	1,601.00	1,601.00	3.45	3.46	-90.38	-0.20	-30.10	30.10	23.19	6.91	4.355	
1,700.00	1,700.00	1,701.00	1,701.00	3.68	3.68	-90.38	-0.20	-30.10	30.10	22.74	7.36	4.089	
1,800.00	1,800.00	1,801.00	1,801.00	3.90	3.91	-90.38	-0.20	-30.10	30.10	22.29	7.81	3.854	
1,900.00	1,900.00	1,901.00	1,901.00	4.13	4.13	-90.38	-0.20	-30.10	30.10	21.84	8.26	3.644	
2,000.00	2,000.00	2,001.00	2,001.00	4.35	4.36	-90.38	-0.20	-30.10	30.10	21.39	8.71	3.456	
2,100.00	2,100.00	2,101.00	2,101.00	4.58	4.58	-90.38	-0.20	-30.10	30.10	20.94	9.16	3.286	
2,200.00	2,200.00	2,201.00	2,201.00	4.80	4.81	-90.38	-0.20	-30.10	30.10	20.49	9.61	3.133	
2,300.00	2,300.00	2,301.00	2,301.00	5.03	5.03	-90.38	-0.20	-30.10	30.10	20.04	10.06	2.993	
2,400.00	2,400.00	2,401.00	2,401.00	5.25	5.26	-90.38	-0.20	-30.10	30.10	19.59	10.51	2.865	
2,500.00	2,500.00	2,501.00	2,501.00	5.48	5.48	-90.38	-0.20	-30.10	30.10	19.14	10.96	2.747	
2,600.00	2,600.00	2,601.00	2,601.00	5.70	5.70	-90.38	-0.20	-30.10	30.10	18.69	11.41	2.639	
2,700.00	2,700.00	2,701.00	2,701.00	5.93	5.93	-90.38	-0.20	-30.10	30.10	18.24	11.86	2.539	
2,800.00	2,800.00	2,801.00	2,801.00	6.15	6.15	-90.38	-0.20	-30.10	30.10	17.79	12.31	2.446	
2,900.00	2,900.00	2,901.00	2,901.00	6.38	6.38	-90.38	-0.20	-30.10	30.10	17.35	12.76	2.360	
3,000.00	3,000.00	3,001.00	3,001.00	6.60	6.60	-90.38	-0.20	-30.10	30.10	16.90	13.21	2.279	
3,100.00	3,100.00	3,101.00	3,101.00	6.83	6.83	-90.38	-0.20	-30.10	30.10	16.45	13.65	2.204	
3,200.00	3,200.00	3,201.00	3,201.00	7.05	7.05	-90.38	-0.20	-30.10	30.10	16.00	14.10	2.134	
3,300.00	3,300.00	3,301.00	3,301.00	7.28	7.28	-90.38	-0.20	-30.10	30.10	15.55	14.55	2.068	
3,400.00	3,400.00	3,401.00	3,401.00	7.50	7.50	-90.38	-0.20	-30.10	30.10	15.10	15.00	2.006	
3,500.00	3,500.00	3,501.00	3,501.00	7.73	7.73	-90.38	-0.20	-30.10	30.10	14.65	15.45	1.948	
3,600.00	3,600.00	3,601.00	3,601.00	7.95	7.95	-90.38	-0.20	-30.10	30.10	14.20	15.90	1.893	
3,700.00	3,700.00	3,701.00	3,701.00	8.17	8.18	-90.38	-0.20	-30.10	30.10	13.75	16.35	1.841	
3,800.00	3,800.00	3,801.00	3,801.00	8.40	8.40	-90.38	-0.20	-30.10	30.10	13.30	16.80	1.792	
3,900.00	3,900.00	3,901.00	3,901.00	8.62	8.63	-90.38	-0.20	-30.10	30.10	12.85	17.25	1.745	
4,000.00	4,000.00	4,001.00	4,001.00	8.85	8.85	-90.38	-0.20	-30.10	30.10	12.40	17.70	1.701	
4,100.00	4,100.00	4,101.00	4,101.00	9.07	9.08	-90.38	-0.20	-30.10	30.10	11.95	18.15	1.658	
4,200.00	4,200.00	4,201.00	4,201.00	9.30	9.30	-90.38	-0.20	-30.10	30.10	11.50	18.60	1.618	
4,300.00	4,300.00	4,301.00	4,301.00	9.52	9.53	-90.38	-0.20	-30.10	30.10	11.05	19.05	1.580	
4,400.00	4,400.00	4,401.00	4,401.00	9.75	9.75	-90.38	-0.20	-30.10	30.10	10.60	19.50	1.544	
4,500.00	4,500.00	4,501.00	4,501.00	9.97	9.98	-90.38	-0.20	-30.10	30.10	10.15	19.95	1.509	
4,600.00	4,600.00	4,601.00	4,601.00	10.20	10.20	-90.38	-0.20	-30.10	30.10	9.70	20.40	1.476 Level 3	
4,700.00	4,700.00	4,701.00	4,701.00	10.42	10.42	-90.38	-0.20	-30.10	30.10	9.25	20.85	1.444 Level 3	
4,800.00	4,800.00	4,801.00	4,801.00	10.65	10.65	-90.38	-0.20	-30.10	30.10	8.80	21.30	1.413 Level 3	
4,900.00	4,900.00	4,901.00	4,901.00	10.87	10.87	-90.38	-0.20	-30.10	30.10	8.35	21.75	1.384 Level 3	
4,966.33	4,966.33	4,967.33	4,967.33	11.02	11.02	-90.38	-0.20	-30.10	30.10	8.06	22.04	1.365 Level 3, CC	
5,000.00	5,000.00	5,001.00	5,001.00	11.10	11.10	-90.38	-0.20	-30.10	30.10	7.91	22.20	1.356 Level 3	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)					
5,100.00	5,099.98	5,100.66	5,100.63	11.29	11.29	78.06	-1.88	-30.66	30.32	7.73	22.59	1.342	Level 3, ES, SF
5,200.00	5,199.84	5,200.31	5,200.15	11.46	11.46	78.33	-6.83	-32.33	30.94	8.01	22.92	1.349	Level 3
5,259.58	5,259.22	5,259.72	5,259.36	11.56	11.57	78.62	-11.33	-33.85	31.49	8.37	23.13	1.362	Level 3
5,300.00	5,299.48	5,300.14	5,299.63	11.63	11.63	79.09	-14.65	-34.97	31.88	8.61	23.27	1.370	Level 3
5,400.00	5,399.07	5,400.13	5,399.25	11.80	11.81	80.19	-22.87	-37.73	32.84	9.23	23.61	1.391	Level 3
5,500.00	5,498.66	5,500.12	5,498.86	11.98	11.98	81.23	-31.09	-40.50	33.81	9.85	23.96	1.411	Level 3
5,600.00	5,598.25	5,600.12	5,598.48	12.16	12.16	82.22	-39.31	-43.27	34.79	10.47	24.32	1.430	Level 3
5,700.00	5,697.84	5,700.11	5,698.10	12.34	12.35	83.14	-47.53	-46.03	35.78	11.09	24.69	1.449	Level 3
5,800.00	5,797.43	5,800.10	5,797.71	12.53	12.54	84.02	-55.75	-48.80	36.78	11.71	25.07	1.467	Level 3
5,900.00	5,897.02	5,900.10	5,897.33	12.72	12.73	84.86	-63.97	-51.57	37.79	12.34	25.45	1.485	Level 3
6,000.00	5,996.61	6,000.09	5,996.95	12.91	12.92	85.64	-72.19	-54.34	38.80	12.97	25.84	1.502	
6,100.00	6,096.20	6,100.08	6,096.56	13.11	13.12	86.39	-80.41	-57.10	39.83	13.59	26.23	1.518	
6,200.00	6,195.79	6,200.08	6,196.18	13.31	13.32	87.10	-88.63	-59.87	40.86	14.22	26.63	1.534	
6,300.00	6,295.38	6,300.07	6,295.80	13.52	13.52	87.78	-96.85	-62.64	41.89	14.85	27.04	1.549	
6,400.00	6,394.97	6,400.06	6,395.41	13.72	13.73	88.42	-105.06	-65.41	42.93	15.48	27.45	1.564	
6,500.00	6,494.56	6,500.06	6,495.03	13.93	13.94	89.03	-113.28	-68.17	43.98	16.11	27.87	1.578	
6,600.00	6,594.15	6,600.05	6,594.65	14.14	14.15	89.62	-121.50	-70.94	45.03	16.74	28.29	1.592	
6,700.00	6,693.74	6,700.05	6,694.26	14.36	14.36	90.17	-129.72	-73.71	46.08	17.37	28.72	1.605	
6,800.00	6,793.33	6,800.04	6,793.88	14.57	14.57	90.71	-137.94	-76.47	47.14	17.99	29.15	1.617	
6,900.00	6,892.92	6,900.03	6,893.50	14.79	14.79	91.22	-146.16	-79.24	48.20	18.62	29.58	1.629	
7,000.00	6,992.51	7,000.03	6,993.11	15.01	15.01	91.70	-154.38	-82.01	49.27	19.25	30.02	1.641	
7,100.00	7,092.10	7,100.02	7,092.73	15.23	15.23	92.17	-162.60	-84.78	50.34	19.88	30.47	1.652	
7,200.00	7,191.68	7,200.01	7,192.35	15.46	15.45	92.62	-170.82	-87.54	51.41	20.50	30.91	1.663	
7,300.00	7,291.27	7,300.01	7,291.96	15.68	15.68	93.04	-179.04	-90.31	52.49	21.13	31.36	1.674	
7,400.00	7,390.86	7,400.00	7,391.58	15.91	15.90	93.46	-187.26	-93.08	53.57	21.75	31.82	1.684	
7,500.00	7,490.45	7,499.99	7,491.20	16.14	16.13	93.85	-195.48	-95.85	54.65	22.38	32.27	1.693	
7,600.00	7,590.04	7,599.99	7,590.81	16.37	16.36	94.23	-203.70	-98.61	55.74	23.00	32.73	1.703	
7,700.00	7,689.63	7,699.98	7,690.43	16.60	16.59	94.59	-211.92	-101.38	56.82	23.63	33.20	1.712	
7,800.00	7,789.22	7,799.97	7,790.05	16.84	16.82	94.95	-220.13	-104.15	57.91	24.25	33.66	1.720	
7,900.00	7,888.81	7,899.97	7,889.66	17.07	17.06	95.28	-228.35	-106.91	59.00	24.87	34.13	1.729	
8,000.00	7,988.40	7,999.96	7,989.28	17.31	17.29	95.61	-236.57	-109.68	60.10	25.49	34.60	1.737	
8,100.00	8,087.99	8,099.95	8,088.90	17.55	17.53	95.92	-244.79	-112.45	61.19	26.11	35.08	1.744	
8,200.00	8,187.58	8,199.95	8,188.51	17.79	17.76	96.23	-253.01	-115.22	62.29	26.73	35.55	1.752	
8,300.00	8,287.17	8,299.94	8,288.13	18.03	18.00	96.52	-261.23	-117.98	63.39	27.35	36.03	1.759	
8,400.00	8,386.76	8,399.93	8,387.75	18.27	18.24	96.80	-269.45	-120.75	64.49	27.97	36.51	1.766	
8,423.05	8,409.72	8,422.98	8,410.71	18.33	18.30	96.87	-271.35	-121.39	64.74	28.11	36.62	1.768	
8,450.00	8,436.60	8,449.92	8,437.55	18.39	18.36	82.91	-273.56	-122.13	64.82	28.07	36.75	1.764	
8,500.00	8,486.58	8,499.73	8,487.17	18.49	18.48	-49.76	-277.65	-123.51	63.97	27.00	36.97	1.730	
8,550.00	8,536.35	8,548.98	8,536.23	18.58	18.60	-72.80	-281.70	-124.88	62.62	25.44	37.18	1.684	
8,579.49	8,565.45	8,577.61	8,564.76	18.62	18.67	-81.53	-284.06	-125.67	62.25	24.96	37.29	1.669	
8,600.00	8,585.54	8,597.30	8,584.37	18.64	18.72	-87.60	-285.67	-126.21	62.50	25.14	37.36	1.673	
8,650.00	8,633.78	8,644.33	8,631.22	18.70	18.83	-102.75	-289.54	-127.51	66.11	28.59	37.53	1.762	
8,700.00	8,680.70	8,689.70	8,676.42	18.73	18.94	-117.00	-293.27	-128.77	75.68	38.00	37.67	2.009	
8,750.00	8,725.94	8,733.07	8,719.62	18.76	19.05	-128.68	-296.83	-129.97	91.98	54.17	37.81	2.433	
8,800.00	8,769.15	8,774.10	8,760.51	18.78	19.15	-137.36	-300.21	-131.11	114.51	76.58	37.93	3.019	
8,850.00	8,810.02	8,812.50	8,798.76	18.80	19.24	-143.49	-303.36	-132.17	142.33	104.29	38.04	3.742	
8,900.00	8,848.22	8,847.96	8,834.08	18.82	19.33	-147.66	-306.28	-133.15	174.60	136.45	38.15	4.577	
8,950.00	8,883.47	8,880.21	8,866.22	18.84	19.41	-150.34	-308.93	-134.04	210.63	172.38	38.25	5.507	
9,000.00	8,915.50	8,909.02	8,894.91	18.88	19.48	-151.80	-311.30	-134.84	249.87	211.51	38.36	6.514	
9,050.00	8,944.06	8,934.15	8,919.95	18.94	19.54	-152.13	-313.36	-135.54	291.85	253.37	38.48	7.585	
9,100.00	8,968.94	8,955.42	8,941.14	19.03	19.59	-151.23	-315.11	-136.12	336.11	297.50	38.62	8.704	
9,150.00	8,989.95	8,972.68	8,958.33	19.15	19.63	-148.66	-316.53	-136.60	382.26	343.48	38.78	9.857	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design													Offset Site Error:	0.00 usft
Survey Program: 0-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance				Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)		Minimum Separation (usft)	Separation Factor	
9,200.00	9,006.92	8,985.77	8,971.38	19.30	19.66	-143.31	-317.61	-136.96	429.88	390.91	38.97	11.032		
9,250.00	9,019.74	8,994.61	8,980.19	19.49	19.69	-132.34	-318.33	-137.21	478.56	439.38	39.18	12.215		
9,300.00	9,028.30	8,999.14	8,984.69	19.72	19.70	-108.73	-318.70	-137.33	527.91	488.50	39.41	13.394		
9,350.00	9,032.53	8,999.30	8,984.86	19.97	19.70	-69.06	-318.72	-137.34	577.54	537.87	39.67	14.558		
9,377.69	9,033.00	8,997.52	8,983.08	20.13	19.69	-49.64	-318.57	-137.29	604.99	565.17	39.82	15.193		
9,400.00	9,032.84	8,995.54	8,981.11	20.25	19.69	-46.46	-318.41	-137.23	627.09	587.16	39.93	15.703		
9,434.28	9,032.60	8,992.50	8,978.08	20.42	19.68	-41.07	-318.16	-137.15	661.09	620.99	40.10	16.487		
9,500.00	9,032.13	10,213.29	9,702.38	20.83	22.39	-174.09	411.14	-159.97	672.86	629.64	43.22	15.568		
9,600.00	9,031.43	10,313.29	9,701.37	21.63	23.17	-174.13	511.13	-160.29	672.51	627.71	44.80	15.011		
9,700.00	9,030.72	10,413.29	9,700.37	22.55	24.06	-174.17	611.12	-160.60	672.16	625.55	46.61	14.421		
9,800.00	9,030.02	10,513.29	9,699.37	23.57	25.05	-174.21	711.11	-160.92	671.81	623.19	48.63	13.816		
9,900.00	9,029.31	10,613.28	9,698.36	24.69	26.14	-174.25	811.11	-161.23	671.46	620.64	50.82	13.212		
10,000.00	9,028.61	10,713.28	9,697.36	25.88	27.29	-174.29	911.10	-161.55	671.12	617.94	53.18	12.620		
10,100.00	9,027.90	10,813.28	9,696.36	27.15	28.52	-174.33	1,011.09	-161.86	670.77	615.09	55.67	12.048		
10,200.00	9,027.20	10,913.28	9,695.35	28.48	29.81	-174.37	1,111.09	-162.18	670.42	612.13	58.29	11.501		
10,300.00	9,026.49	11,013.28	9,694.35	29.86	31.16	-174.41	1,211.08	-162.49	670.07	609.06	61.01	10.983		
10,400.00	9,025.79	11,113.28	9,693.34	31.28	32.55	-174.45	1,311.07	-162.80	669.73	605.90	63.83	10.493		
10,500.00	9,025.08	11,213.27	9,692.34	32.75	33.98	-174.49	1,411.06	-163.12	669.38	602.66	66.72	10.032		
10,600.00	9,024.38	11,313.27	9,691.34	34.25	35.44	-174.53	1,511.06	-163.43	669.04	599.35	69.69	9.600		
10,700.00	9,023.68	11,413.27	9,690.33	35.77	36.94	-174.57	1,611.05	-163.75	668.69	595.98	72.72	9.196		
10,800.00	9,022.97	11,513.27	9,689.33	37.33	38.47	-174.61	1,711.04	-164.06	668.35	592.55	75.80	8.817		
10,900.00	9,022.27	11,613.27	9,688.33	38.91	40.02	-174.65	1,811.04	-164.38	668.00	589.07	78.93	8.463		
11,000.00	9,021.56	11,713.27	9,687.32	40.51	41.59	-174.69	1,911.03	-164.69	667.66	585.56	82.10	8.132		
11,100.00	9,020.86	11,813.26	9,686.32	42.13	43.19	-174.74	2,011.02	-165.01	667.31	582.00	85.31	7.822		
11,200.00	9,020.15	11,913.26	9,685.31	43.76	44.80	-174.78	2,111.01	-165.32	666.97	578.41	88.56	7.531		
11,300.00	9,019.45	12,013.26	9,684.31	45.41	46.42	-174.82	2,211.01	-165.64	666.63	574.79	91.83	7.259		
11,400.00	9,018.74	12,113.26	9,683.31	47.07	48.06	-174.86	2,311.00	-165.95	666.28	571.15	95.14	7.003		
11,500.00	9,018.04	12,213.26	9,682.30	48.75	49.72	-174.90	2,410.99	-166.26	665.94	567.48	98.46	6.763		
11,600.00	9,017.33	12,313.26	9,681.30	50.43	51.38	-174.94	2,510.98	-166.58	665.60	563.79	101.81	6.538		
11,700.00	9,016.63	12,413.25	9,680.30	52.13	53.06	-174.98	2,610.98	-166.89	665.26	560.08	105.18	6.325		
11,800.00	9,015.92	12,513.25	9,679.29	53.83	54.74	-175.02	2,710.97	-167.21	664.92	556.35	108.57	6.124		
11,900.00	9,015.22	12,613.25	9,678.29	55.54	56.43	-175.06	2,810.96	-167.52	664.58	552.60	111.97	5.935		
12,000.00	9,014.51	12,713.25	9,677.28	57.25	58.13	-175.10	2,910.96	-167.84	664.23	548.85	115.39	5.756		
12,100.00	9,013.81	12,813.25	9,676.28	58.98	59.84	-175.14	3,010.95	-168.15	663.89	545.07	118.82	5.587		
12,200.00	9,013.10	12,913.25	9,675.28	60.71	61.56	-175.18	3,110.94	-168.47	663.55	541.29	122.27	5.427		
12,300.00	9,012.40	13,013.24	9,674.27	62.44	63.28	-175.23	3,210.93	-168.78	663.21	537.49	125.72	5.275		
12,400.00	9,011.69	13,113.24	9,673.27	64.18	65.00	-175.27	3,310.93	-169.09	662.87	533.69	129.19	5.131		
12,500.00	9,010.99	13,213.24	9,672.27	65.93	66.74	-175.31	3,410.92	-169.41	662.53	529.87	132.66	4.994		
12,600.00	9,010.28	13,313.24	9,671.26	67.68	68.47	-175.35	3,510.91	-169.72	662.20	526.05	136.15	4.864		
12,700.00	9,009.58	13,413.24	9,670.26	69.43	70.21	-175.39	3,610.90	-170.04	661.86	522.22	139.64	4.740		
12,800.00	9,008.87	13,513.24	9,669.26	71.19	71.96	-175.43	3,710.90	-170.35	661.52	518.38	143.14	4.621		
12,900.00	9,008.17	13,613.23	9,668.25	72.94	73.71	-175.47	3,810.89	-170.67	661.18	514.53	146.65	4.509		
13,000.00	9,007.46	13,713.23	9,667.25	74.71	75.46	-175.51	3,910.88	-170.98	660.84	510.68	150.17	4.401		
13,100.00	9,006.76	13,813.23	9,666.24	76.47	77.22	-175.56	4,010.88	-171.30	660.51	506.82	153.69	4.298		
13,200.00	9,006.05	13,913.23	9,665.24	78.24	78.97	-175.60	4,110.87	-171.61	660.17	502.95	157.22	4.199		
13,300.00	9,005.35	14,013.23	9,664.24	80.01	80.74	-175.64	4,210.86	-171.93	659.83	499.09	160.75	4.105		
13,400.00	9,004.64	14,113.23	9,663.23	81.79	82.50	-175.68	4,310.85	-172.24	659.50	495.21	164.29	4.014		
13,500.00	9,003.94	14,213.22	9,662.23	83.56	84.27	-175.72	4,410.85	-172.55	659.16	491.33	167.83	3.928		
13,600.00	9,003.23	14,313.22	9,661.23	85.34	86.04	-175.76	4,510.84	-172.87	658.83	487.45	171.37	3.844		
13,700.00	9,002.53	14,413.22	9,660.22	87.12	87.81	-175.81	4,610.83	-173.18	658.49	483.57	174.93	3.764		
13,800.00	9,001.82	14,513.22	9,659.22	88.90	89.58	-175.85	4,710.83	-173.50	658.16	479.68	178.48	3.688		
13,900.00	9,001.12	14,613.22	9,658.21	90.68	91.36	-175.89	4,810.82	-173.81	657.82	475.78	182.04	3.614		

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
14,000.00	9,000.41	14,713.21	9,657.21	92.47	93.13	-175.93	4,910.81	-174.13	657.49	471.89	185.60	3.542	
14,100.00	8,999.71	14,813.21	9,656.21	94.26	94.91	-175.97	5,010.80	-174.44	657.16	467.99	189.17	3.474	
14,200.00	8,999.00	14,913.21	9,655.20	96.04	96.69	-176.01	5,110.80	-174.76	656.82	464.09	192.73	3.408	
14,300.00	8,998.30	15,013.21	9,654.20	97.83	98.47	-176.06	5,210.79	-175.07	656.49	460.18	196.31	3.344	
14,400.00	8,997.60	15,113.21	9,653.20	99.62	100.26	-176.10	5,310.78	-175.38	656.16	456.28	199.88	3.283	
14,500.00	8,996.89	15,213.21	9,652.19	101.41	102.04	-176.14	5,410.77	-175.70	655.82	452.37	203.46	3.223	
14,600.00	8,996.19	15,313.20	9,651.19	103.21	103.83	-176.18	5,510.77	-176.01	655.49	448.46	207.04	3.166	
14,700.00	8,995.48	15,413.20	9,650.19	105.00	105.62	-176.23	5,610.76	-176.33	655.16	444.54	210.62	3.111	
14,800.00	8,994.78	15,513.20	9,649.18	106.80	107.41	-176.27	5,710.75	-176.64	654.83	440.63	214.20	3.057	
14,900.00	8,994.07	15,613.20	9,648.18	108.59	109.20	-176.31	5,810.75	-176.96	654.50	436.71	217.79	3.005	
15,000.00	8,993.37	15,713.20	9,647.17	110.39	110.99	-176.35	5,910.74	-177.27	654.17	432.79	221.38	2.955	
15,100.00	8,992.66	15,813.20	9,646.17	112.19	112.78	-176.39	6,010.73	-177.59	653.84	428.87	224.97	2.906	
15,200.00	8,991.96	15,913.19	9,645.17	113.99	114.57	-176.44	6,110.72	-177.90	653.51	424.95	228.56	2.859	
15,300.00	8,991.25	16,013.19	9,644.16	115.79	116.37	-176.48	6,210.72	-178.22	653.18	421.03	232.15	2.814	
15,400.00	8,990.55	16,113.19	9,643.16	117.59	118.16	-176.52	6,310.71	-178.53	652.85	417.10	235.75	2.769	
15,500.00	8,989.84	16,213.19	9,642.16	119.39	119.96	-176.56	6,410.70	-178.84	652.52	413.18	239.34	2.726	
15,600.00	8,989.14	16,313.19	9,641.15	121.19	121.75	-176.61	6,510.69	-179.16	652.19	409.25	242.94	2.685	
15,700.00	8,988.43	16,413.19	9,640.15	122.99	123.55	-176.65	6,610.69	-179.47	651.87	405.32	246.54	2.644	
15,800.00	8,987.73	16,513.18	9,639.14	124.79	125.35	-176.69	6,710.68	-179.79	651.54	401.39	250.14	2.605	
15,900.00	8,987.02	16,613.18	9,638.14	126.60	127.15	-176.73	6,810.67	-180.10	651.21	397.46	253.75	2.566	
16,000.00	8,986.32	16,713.18	9,637.14	128.40	128.95	-176.78	6,910.67	-180.42	650.88	393.53	257.35	2.529	
16,100.00	8,985.61	16,813.18	9,636.13	130.21	130.75	-176.82	7,010.66	-180.73	650.56	389.60	260.96	2.493	
16,200.00	8,984.91	16,913.18	9,635.13	132.01	132.55	-176.86	7,110.65	-181.05	650.23	385.67	264.56	2.458	
16,300.00	8,984.20	17,013.18	9,634.13	133.82	134.35	-176.90	7,210.64	-181.36	649.91	381.74	268.17	2.423	
16,400.00	8,983.50	17,113.17	9,633.12	135.63	136.15	-176.95	7,310.64	-181.67	649.58	377.80	271.78	2.390	
16,500.00	8,982.79	17,213.17	9,632.12	137.43	137.96	-176.99	7,410.63	-181.99	649.26	373.87	275.39	2.358	
16,600.00	8,982.09	17,313.17	9,631.11	139.24	139.76	-177.03	7,510.62	-182.30	648.93	369.93	279.00	2.326	
16,700.00	8,981.38	17,413.17	9,630.11	141.05	141.56	-177.08	7,610.62	-182.62	648.61	366.00	282.61	2.295	
16,800.00	8,980.68	17,513.17	9,629.11	142.86	143.37	-177.12	7,710.61	-182.93	648.28	362.06	286.22	2.265	
16,900.00	8,979.97	17,613.17	9,628.10	144.66	145.17	-177.16	7,810.60	-183.25	647.96	358.12	289.84	2.236	
17,000.00	8,979.27	17,713.16	9,627.10	146.47	146.98	-177.21	7,910.59	-183.56	647.64	354.19	293.45	2.207	
17,100.00	8,978.56	17,813.16	9,626.10	148.28	148.78	-177.25	8,010.59	-183.88	647.31	350.25	297.07	2.179	
17,200.00	8,977.86	17,913.16	9,625.09	150.09	150.59	-177.29	8,110.58	-184.19	646.99	346.31	300.68	2.152	
17,300.00	8,977.15	18,013.16	9,624.09	151.90	152.39	-177.34	8,210.57	-184.51	646.67	342.37	304.30	2.125	
17,400.00	8,976.45	18,113.16	9,623.09	153.71	154.20	-177.38	8,310.56	-184.82	646.35	338.43	307.92	2.099	
17,500.00	8,975.74	18,213.16	9,622.08	155.53	156.01	-177.42	8,410.56	-185.13	646.02	334.49	311.53	2.074	
17,600.00	8,975.04	18,313.15	9,621.08	157.34	157.82	-177.47	8,510.55	-185.45	645.70	330.55	315.15	2.049	
17,700.00	8,974.33	18,413.15	9,620.07	159.15	159.62	-177.51	8,610.54	-185.76	645.38	326.61	318.77	2.025	
17,800.00	8,973.63	18,513.15	9,619.07	160.96	161.43	-177.55	8,710.54	-186.08	645.06	322.67	322.39	2.001	
17,900.00	8,972.92	18,613.15	9,618.07	162.77	163.24	-177.60	8,810.53	-186.39	644.74	318.73	326.01	1.978	
18,000.00	8,972.22	18,713.15	9,617.06	164.58	165.05	-177.64	8,910.52	-186.71	644.42	314.79	329.63	1.955	
18,100.00	8,971.52	18,813.14	9,616.06	166.40	166.86	-177.68	9,010.51	-187.02	644.10	310.85	333.26	1.933	
18,200.00	8,970.81	18,913.14	9,615.06	168.21	168.67	-177.73	9,110.51	-187.34	643.79	306.91	336.88	1.911	
18,300.00	8,970.11	19,013.14	9,614.05	170.02	170.48	-177.77	9,210.50	-187.65	643.47	302.96	340.50	1.890	
18,400.00	8,969.40	19,113.14	9,613.05	171.84	172.29	-177.81	9,310.49	-187.96	643.15	299.02	344.13	1.869	
18,500.00	8,968.70	19,213.14	9,612.04	173.65	174.10	-177.86	9,410.49	-188.28	642.83	295.08	347.75	1.849	
18,600.00	8,967.99	19,313.14	9,611.04	175.47	175.91	-177.90	9,510.48	-188.59	642.51	291.14	351.38	1.829	
18,700.00	8,967.29	19,413.13	9,610.04	177.28	177.72	-177.95	9,610.47	-188.91	642.20	287.20	355.00	1.809	
18,800.00	8,966.58	19,513.13	9,609.03	179.09	179.53	-177.99	9,710.46	-189.22	641.88	283.25	358.63	1.790	
18,900.00	8,965.88	19,613.13	9,608.03	180.91	181.34	-178.03	9,810.46	-189.54	641.56	279.31	362.25	1.771	
19,000.00	8,965.17	19,713.13	9,607.03	182.72	183.16	-178.08	9,910.45	-189.85	641.25	275.37	365.88	1.753	
19,100.00	8,964.47	19,813.13	9,606.02	184.54	184.97	-178.12	10,010.44	-190.17	640.93	271.43	369.51	1.735	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Harrier Federal Com 303H - Wellbore #1 - Plan #1													Offset Site Error: 0.00 usft
Survey Program: 0-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)					
19,200.00	8,963.76	19,913.13	9,605.02	186.35	186.78	-178.17	10,110.43	-190.48	640.62	267.49	373.13	1.717	
19,284.70	8,963.16	19,997.83	9,604.17	187.89	188.31	-178.20	10,195.13	-190.75	640.35	264.15	376.21	1.702	
19,308.03	8,963.00	20,014.60	9,604.00	188.32	188.57	-178.21	10,211.90	-190.80	640.31	263.43	376.88	1.699	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1												Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD												Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning						
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor
0.00	0.00	5.48	5.48	0.00	0.01	86.95	29.89	560.15	560.94			
100.00	100.00	105.14	105.14	0.08	0.12	86.93	30.01	560.17	560.98	560.77	0.21	2,700.363
200.00	200.00	204.92	204.92	0.31	0.24	86.90	30.34	560.25	561.07	560.52	0.55	1,014.830
300.00	300.00	307.23	307.23	0.53	0.41	86.88	30.48	560.14	560.97	560.03	0.94	594.750
400.00	400.00	409.26	409.26	0.76	0.58	86.92	30.11	559.63	560.46	559.12	1.34	419.540
500.00	500.00	508.54	508.53	0.98	0.77	86.96	29.66	559.06	559.85	558.10	1.75	319.643
600.00	600.00	607.95	607.94	1.21	0.96	86.98	29.44	558.59	559.37	557.20	2.17	257.611
700.00	700.00	708.94	708.93	1.43	1.21	87.00	29.22	558.07	558.85	556.21	2.64	211.561
800.00	800.00	809.67	809.66	1.66	1.45	87.04	28.83	557.39	558.15	555.04	3.11	179.465
900.00	900.00	908.02	908.01	1.88	1.68	87.08	28.41	556.82	557.55	553.99	3.56	156.474
1,000.00	1,000.00	1,006.54	1,006.52	2.11	1.91	87.12	28.00	556.54	557.25	553.23	4.02	138.725
1,100.00	1,100.00	1,107.37	1,107.35	2.33	2.15	87.17	27.49	556.31	556.99	552.51	4.48	124.371
1,200.00	1,200.00	1,207.91	1,207.89	2.56	2.38	87.24	26.80	555.93	556.58	551.65	4.94	112.730
1,290.77	1,290.77	1,296.29	1,296.27	2.76	2.57	87.32	26.03	555.78	556.39	551.06	5.33	104.464
1,300.00	1,300.00	1,305.28	1,305.26	2.78	2.59	87.33	25.94	555.79	556.39	551.03	5.37	103.694
1,400.00	1,400.00	1,402.84	1,402.81	3.01	2.79	87.44	24.88	556.11	556.67	550.88	5.79	96.063
1,500.00	1,500.00	1,507.46	1,507.42	3.23	3.02	87.57	23.58	556.24	556.74	550.49	6.25	89.063
1,600.00	1,600.00	1,611.39	1,611.34	3.45	3.26	87.72	22.16	555.52	555.99	549.28	6.71	82.858
1,700.00	1,700.00	1,710.12	1,710.06	3.68	3.51	87.85	20.83	554.64	555.05	547.86	7.19	77.198
1,800.00	1,800.00	1,809.28	1,809.20	3.90	3.77	87.97	19.61	553.98	554.34	546.67	7.67	72.262
1,900.00	1,900.00	1,912.71	1,912.62	4.13	4.04	88.12	18.15	553.02	553.37	545.20	8.17	67.773
2,000.00	2,000.00	2,015.83	2,015.71	4.35	4.30	88.31	16.28	551.44	551.78	543.12	8.66	63.728
2,100.00	2,100.00	2,117.40	2,117.23	4.58	4.57	88.53	14.08	549.48	549.78	540.63	9.15	60.087
2,200.00	2,200.00	2,218.67	2,218.45	4.80	4.84	88.79	11.54	547.24	547.51	537.87	9.64	56.795
2,300.00	2,300.00	2,318.80	2,318.53	5.03	5.10	89.04	9.17	544.90	545.14	535.01	10.13	53.829
2,400.00	2,400.00	2,418.61	2,418.29	5.25	5.36	89.24	7.15	542.54	542.74	532.12	10.61	51.139
2,500.00	2,500.00	2,516.98	2,516.62	5.48	5.62	89.42	5.50	540.39	540.53	529.44	11.09	48.724
2,600.00	2,600.00	2,615.57	2,615.18	5.70	5.87	89.56	4.16	538.52	538.62	527.04	11.58	46.533
2,700.00	2,700.00	2,715.25	2,714.84	5.93	6.13	89.69	2.88	536.76	536.85	524.79	12.06	44.515
2,800.00	2,800.00	2,815.00	2,814.56	6.15	6.39	89.84	1.53	535.06	535.14	522.60	12.55	42.656
2,900.00	2,900.00	2,915.16	2,914.70	6.38	6.66	89.98	0.17	533.35	533.43	520.40	13.03	40.930
3,000.00	3,000.00	3,014.48	3,014.00	6.60	6.90	90.12	-1.13	531.63	531.70	518.20	13.50	39.387
3,100.00	3,100.00	3,109.10	3,108.61	6.83	7.02	90.21	-1.92	530.60	530.61	516.76	13.85	38.312
3,158.09	3,158.09	3,164.08	3,163.59	6.96	7.10	90.22	-2.06	530.44	530.44	516.39	14.05	37.745
3,200.00	3,200.00	3,203.87	3,203.38	7.05	7.14	90.22	-2.03	530.52	530.53	516.33	14.20	37.373
3,300.00	3,300.00	3,301.65	3,301.16	7.28	7.16	90.15	-1.42	531.12	531.14	516.70	14.43	36.797
3,400.00	3,400.00	3,400.00	3,399.49	7.50	7.17	90.00	-0.04	532.13	532.17	517.49	14.67	36.269
3,500.00	3,500.00	3,499.37	3,498.83	7.73	7.20	89.81	1.74	533.37	533.41	518.48	14.93	35.734
3,600.00	3,600.00	3,599.34	3,598.78	7.95	7.23	89.62	3.54	534.61	534.66	519.48	15.18	35.217
3,700.00	3,700.00	3,699.73	3,699.15	8.17	7.28	89.44	5.23	535.82	535.89	520.43	15.46	34.673
3,800.00	3,800.00	3,800.00	3,799.40	8.40	7.33	89.29	6.70	536.96	537.03	521.31	15.73	34.143
3,900.00	3,900.00	3,897.58	3,896.97	8.62	7.42	89.20	7.55	538.26	538.38	522.34	16.04	33.560
4,000.00	4,000.00	3,995.03	3,994.40	8.85	7.51	89.21	7.45	540.04	540.20	523.85	16.36	33.027
4,100.00	4,100.00	4,094.50	4,093.85	9.07	7.64	89.30	6.66	542.15	542.31	525.60	16.72	32.438
4,200.00	4,200.00	4,194.06	4,193.38	9.30	7.78	89.42	5.52	544.34	544.50	527.42	17.08	31.874
4,300.00	4,300.00	4,295.50	4,294.79	9.52	7.95	89.57	4.14	546.48	546.60	529.13	17.48	31.275
4,400.00	4,400.00	4,397.08	4,396.33	9.75	8.12	89.71	2.73	548.34	548.42	530.55	17.87	30.684
4,500.00	4,500.00	4,500.69	4,499.93	9.97	8.31	89.84	1.57	549.74	549.77	531.48	18.28	30.070
4,600.00	4,600.00	4,604.36	4,603.60	10.20	8.50	89.89	1.04	550.44	550.44	531.75	18.69	29.443
4,700.00	4,700.00	4,707.39	4,706.62	10.42	8.71	89.94	0.55	550.51	550.51	531.38	19.13	28.771
4,800.00	4,800.00	4,810.15	4,809.38	10.65	8.93	90.04	-0.40	550.02	550.04	530.46	19.57	28.101
4,900.00	4,900.00	4,810.63	4,809.85	10.87	9.14	90.12	-1.19	549.27	549.29	529.28	20.01	27.446

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	
5,000.00	5,000.00	5,010.86	5,010.08	11.10	9.36	90.15	-1.46	548.43	548.46	528.00	20.45	26.816	
5,081.90	5,081.89	5,091.32	5,090.54	11.26	9.53	-101.58	-1.57	547.87	548.11	527.32	20.79	26.367	
5,100.00	5,099.98	5,109.09	5,108.31	11.29	9.57	-101.63	-1.61	547.77	548.13	527.27	20.86	26.274	
5,200.00	5,199.84	5,207.42	5,206.63	11.46	9.79	-102.11	-1.92	547.42	548.85	527.60	21.25	25.833	
5,259.58	5,259.22	5,267.38	5,266.60	11.56	9.93	-102.56	-2.17	547.25	549.70	528.21	21.49	25.576	
5,300.00	5,299.48	5,308.04	5,307.25	11.63	10.03	-102.91	-2.38	547.10	550.36	528.70	21.66	25.409	
5,400.00	5,399.07	5,408.61	5,407.82	11.80	10.27	-103.77	-3.00	546.61	551.95	529.87	22.07	25.005	
5,500.00	5,498.66	5,508.94	5,508.15	11.98	10.50	-104.62	-3.56	545.98	553.52	531.04	22.48	24.623	
5,600.00	5,598.25	5,609.08	5,608.29	12.16	10.73	-105.49	-3.95	545.22	555.09	532.20	22.89	24.252	
5,700.00	5,697.84	5,707.58	5,706.79	12.34	10.94	-106.36	-4.15	544.52	556.86	533.58	23.28	23.924	
5,800.00	5,797.43	5,806.11	5,805.31	12.53	11.14	-107.24	-4.18	544.01	558.97	535.30	23.67	23.616	
5,900.00	5,897.02	5,905.57	5,904.77	12.72	11.36	-108.12	-4.22	543.60	561.31	537.23	24.08	23.314	
6,000.00	5,996.61	6,005.06	6,004.26	12.91	11.57	-108.97	-4.41	543.24	563.81	539.32	24.49	23.024	
6,100.00	6,096.20	6,104.70	6,103.90	13.11	11.78	-109.83	-4.56	542.87	566.44	541.54	24.90	22.752	
6,200.00	6,195.79	6,204.31	6,203.50	13.31	11.99	-110.69	-4.52	542.47	569.19	543.88	25.31	22.491	
6,300.00	6,295.38	6,304.08	6,303.27	13.52	12.21	-111.53	-4.64	542.08	572.06	546.33	25.72	22.238	
6,400.00	6,394.97	6,403.91	6,403.11	13.72	12.42	-112.32	-5.24	541.75	575.01	548.86	26.15	21.993	
6,500.00	6,494.56	6,503.39	6,502.58	13.93	12.67	-113.07	-6.05	541.45	578.06	551.46	26.60	21.734	
6,600.00	6,594.15	6,602.90	6,602.09	14.14	12.91	-113.81	-6.88	541.20	581.25	554.20	27.05	21.487	
6,700.00	6,693.74	6,703.65	6,702.83	14.36	13.15	-114.56	-7.64	540.83	584.45	556.94	27.51	21.244	
6,800.00	6,793.33	6,804.26	6,803.44	14.57	13.40	-115.33	-8.25	540.24	587.56	559.59	27.97	21.004	
6,900.00	6,892.92	6,902.29	6,901.46	14.79	13.64	-116.07	-8.74	539.71	590.85	562.41	28.43	20.780	
7,000.00	6,992.51	7,000.30	6,999.48	15.01	13.88	-116.80	-9.18	539.44	594.51	565.61	28.90	20.574	
7,100.00	7,092.10	7,100.87	7,100.05	15.23	14.13	-117.54	-9.69	539.24	598.32	568.96	29.37	20.373	
7,200.00	7,191.68	7,201.51	7,200.68	15.46	14.38	-118.25	-10.40	538.93	602.08	572.24	29.84	20.175	
7,300.00	7,291.27	7,304.24	7,303.40	15.68	14.64	-118.96	-11.32	538.32	605.59	575.26	30.33	19.969	
7,400.00	7,390.86	7,406.61	7,405.76	15.91	14.90	-119.65	-12.46	537.23	608.68	577.87	30.81	19.756	
7,500.00	7,490.45	7,503.51	7,502.65	16.14	15.14	-120.29	-13.65	536.28	611.89	580.61	31.28	19.562	
7,600.00	7,590.04	7,600.42	7,599.55	16.37	15.38	-120.90	-14.88	535.81	615.64	583.88	31.75	19.389	
7,700.00	7,689.63	7,700.24	7,699.37	16.60	15.62	-121.51	-16.16	535.56	619.67	587.44	32.23	19.227	
7,800.00	7,789.22	7,800.00	7,799.11	16.84	15.87	-122.12	-17.44	535.29	623.75	591.05	32.71	19.070	
7,900.00	7,888.81	7,898.98	7,898.09	17.07	16.11	-122.72	-18.60	535.04	627.96	594.77	33.19	18.921	
8,000.00	7,988.40	7,997.85	7,996.96	17.31	16.36	-123.33	-19.55	534.83	632.36	598.69	33.67	18.781	
8,100.00	8,087.99	8,095.92	8,095.02	17.55	16.58	-123.91	-20.56	534.86	637.02	602.89	34.13	18.663	
8,200.00	8,187.58	8,194.01	8,193.10	17.79	16.81	-124.44	-21.93	535.31	642.00	607.41	34.60	18.557	
8,300.00	8,287.17	8,295.65	8,294.72	18.03	17.04	-124.97	-23.49	535.81	647.02	611.96	35.07	18.450	
8,400.00	8,386.76	8,397.50	8,396.57	18.27	17.27	-125.52	-24.90	535.89	651.77	616.23	35.54	18.337	
8,423.05	8,409.72	8,420.51	8,419.57	18.33	17.30	-125.65	-25.20	535.85	652.83	617.20	35.63	18.322	
8,450.00	8,436.60	8,447.38	8,446.44	18.39	17.34	-139.35	-25.55	535.82	653.84	618.11	35.73	18.301	
8,500.00	8,486.58	8,497.28	8,496.33	18.49	17.40	91.76	-26.20	535.75	654.42	618.53	35.89	18.233	
8,550.00	8,536.35	8,546.92	8,545.97	18.58	17.46	76.91	-26.84	535.69	653.36	617.32	36.04	18.130	
8,600.00	8,585.54	8,595.05	8,594.09	18.64	17.50	74.46	-27.41	535.62	650.77	614.63	36.14	18.006	
8,650.00	8,633.78	8,641.22	8,640.26	18.70	17.50	74.33	-27.32	535.43	646.95	610.75	36.19	17.874	
8,700.00	8,680.70	8,686.16	8,685.19	18.73	17.50	75.21	-26.46	535.09	642.12	605.89	36.23	17.721	
8,750.00	8,725.94	8,728.34	8,727.29	18.76	17.50	76.57	-23.95	534.37	636.64	600.37	36.26	17.555	
8,800.00	8,769.15	8,764.26	8,762.97	18.78	17.51	78.02	-19.93	533.51	630.98	594.69	36.29	17.388	
8,850.00	8,810.02	8,801.00	8,799.12	18.80	17.51	79.67	-13.45	532.62	625.70	589.39	36.31	17.231	
8,900.00	8,848.22	8,832.00	8,829.19	18.82	17.52	81.19	-5.98	531.86	620.95	584.61	36.34	17.088	
8,950.00	8,883.47	8,866.90	8,862.41	18.84	17.53	82.91	4.65	531.05	616.95	580.58	36.37	16.962	
9,000.00	8,915.50	8,903.78	8,896.72	18.88	17.54	84.75	18.14	530.29	613.80	577.37	36.42	16.852	
9,050.00	8,944.06	8,946.04	8,934.72	18.94	17.56	86.83	36.57	529.35	611.49	574.99	36.50	16.753	
9,100.00	8,968.94	8,993.19	8,975.07	19.03	17.60	89.09	60.87	527.59	609.56	572.93	36.62	16.643	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference	Offset	Semi Major Axis		Distance		Warning							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
9,150.00	8,989.95	9,032.04	9,006.38	19.15	17.64	90.91	83.80	525.95	608.46	571.67	36.79	16.537	
9,162.64	8,994.62	9,040.48	9,012.89	19.19	17.66	91.29	89.15	525.65	608.41	571.56	36.84	16.513	
9,200.00	9,006.92	9,083.58	9,044.22	19.30	17.73	93.13	118.67	524.09	608.66	571.63	37.04	16.435	
9,250.00	9,019.74	9,151.02	9,085.44	19.49	17.91	95.63	171.72	519.55	608.00	570.60	37.40	16.256	
9,297.02	9,027.91	9,195.41	9,106.26	19.70	18.07	96.95	210.76	516.41	607.58	569.80	37.77	16.084	
9,300.00	9,028.30	9,197.94	9,107.28	19.72	18.08	97.02	213.07	516.25	607.58	569.78	37.80	16.074	
9,350.00	9,032.53	9,249.96	9,124.27	19.97	18.32	98.19	262.10	513.58	608.07	569.78	38.29	15.880	
9,377.69	9,033.00	9,285.09	9,132.16	20.13	18.51	98.86	296.29	511.80	608.30	569.67	38.64	15.744	
9,400.00	9,032.84	9,328.27	9,139.21	20.25	18.77	99.57	338.78	508.99	608.01	568.99	39.02	15.582	
9,434.28	9,032.60	9,376.29	9,143.55	20.42	19.10	100.07	386.41	504.78	606.03	566.51	39.52	15.334	
9,500.00	9,032.13	9,449.83	9,142.85	20.83	19.69	100.15	459.65	498.39	600.88	560.36	40.52	14.830	
9,600.00	9,031.43	9,544.35	9,138.23	21.63	20.53	99.89	553.74	490.67	592.92	550.76	42.16	14.064	
9,700.00	9,030.72	9,632.85	9,133.44	22.55	21.35	99.58	641.91	484.85	586.45	542.55	43.89	13.360	
9,800.00	9,030.02	9,723.75	9,130.62	23.57	22.21	99.43	732.65	480.27	581.88	536.10	45.78	12.710	
9,900.00	9,029.31	9,806.48	9,129.18	24.69	23.06	99.38	815.31	477.41	579.16	531.41	47.75	12.129	
9,923.51	9,029.15	9,824.62	9,128.94	24.97	23.26	99.37	833.45	477.19	579.05	530.82	48.23	12.007	
10,000.00	9,028.61	9,891.18	9,128.31	25.88	24.01	99.34	900.01	477.48	579.93	530.03	49.89	11.623	
10,100.00	9,027.90	9,989.98	9,127.86	27.15	25.17	99.34	998.79	478.64	581.94	529.62	52.32	11.123	
10,200.00	9,027.20	10,093.59	9,127.94	28.48	26.42	99.39	1,102.40	479.33	583.52	528.63	54.89	10.630	
10,300.00	9,026.49	10,210.17	9,128.97	29.86	27.90	99.57	1,218.97	478.39	583.86	526.11	57.76	10.109	
10,400.00	9,025.79	10,324.00	9,130.82	31.28	29.44	99.89	1,332.67	473.54	580.82	520.10	60.72	9.565	
10,500.00	9,025.08	10,419.66	9,133.74	32.75	30.79	100.31	1,428.15	468.54	577.14	513.60	63.54	9.084	
10,600.00	9,024.38	10,522.99	9,134.79	34.25	32.31	100.56	1,531.36	463.70	573.64	507.09	66.55	8.619	
10,700.00	9,023.68	10,619.96	9,135.53	35.77	33.73	100.77	1,628.22	459.17	570.13	500.62	69.51	8.202	
10,800.00	9,022.97	10,714.07	9,135.76	37.33	35.14	100.91	1,722.26	455.63	567.42	494.95	72.47	7.830	
10,900.00	9,022.27	10,809.75	9,135.74	38.91	36.60	101.01	1,817.91	453.14	565.79	490.28	75.51	7.493	
11,000.00	9,021.56	10,917.31	9,134.42	40.51	38.24	101.00	1,925.41	449.90	563.52	484.77	78.75	7.156	
11,100.00	9,020.86	11,018.09	9,133.17	42.13	39.79	101.00	2,026.12	446.29	560.70	478.78	81.92	6.844	
11,200.00	9,020.15	11,121.95	9,132.67	43.76	41.40	101.09	2,129.88	441.76	557.25	472.09	85.16	6.544	
11,300.00	9,019.45	11,221.77	9,133.40	45.41	42.96	101.32	2,229.58	437.02	553.68	465.31	88.37	6.265	
11,400.00	9,018.74	11,322.82	9,134.56	47.07	44.57	101.59	2,330.50	432.05	550.02	458.38	91.64	6.002	
11,500.00	9,018.04	11,419.68	9,134.19	48.75	46.13	101.70	2,427.25	427.57	546.38	451.49	94.88	5.759	
11,600.00	9,017.33	11,513.97	9,132.53	50.43	47.65	101.65	2,521.47	424.42	543.67	445.59	98.09	5.543	
11,700.00	9,016.63	11,609.94	9,132.01	52.13	49.21	101.71	2,617.41	421.88	541.92	440.59	101.33	5.348	
11,800.00	9,015.92	11,709.77	9,130.69	53.83	50.83	101.67	2,717.21	419.90	540.65	435.99	104.66	5.166	
11,900.00	9,015.22	11,812.59	9,131.57	55.54	52.50	101.88	2,819.98	416.94	538.95	430.91	108.04	4.988	
12,000.00	9,014.51	11,918.79	9,132.48	57.25	54.24	102.12	2,926.11	413.15	536.59	425.10	111.49	4.813	
12,100.00	9,013.81	12,016.00	9,132.47	58.98	55.84	102.26	3,023.24	409.12	533.49	418.67	114.82	4.646	
12,200.00	9,013.10	12,116.98	9,131.29	60.71	57.52	102.27	3,124.16	405.85	531.03	412.80	118.23	4.491	
12,300.00	9,012.40	12,217.59	9,130.08	62.44	59.19	102.28	3,224.69	402.17	528.15	406.52	121.63	4.342	
12,400.00	9,011.69	12,314.38	9,130.37	64.18	60.79	102.45	3,321.41	398.58	525.53	400.56	124.97	4.205	
12,500.00	9,010.99	12,418.35	9,130.17	65.93	62.52	102.57	3,425.31	394.95	523.04	394.59	128.45	4.072	
12,600.00	9,010.28	12,521.49	9,129.50	67.68	64.25	102.66	3,528.36	390.50	519.64	387.71	131.92	3.939	
12,700.00	9,009.58	12,622.89	9,129.76	69.43	65.94	102.87	3,629.63	385.58	515.91	380.54	135.37	3.811	
12,800.00	9,008.87	12,725.11	9,130.39	71.19	67.66	103.14	3,731.70	379.95	511.63	372.79	138.84	3.685	
12,900.00	9,008.17	12,824.43	9,130.44	72.94	69.34	103.34	3,830.88	374.64	507.39	365.10	142.29	3.566	
13,000.00	9,007.46	12,925.30	9,129.84	74.71	71.06	103.47	3,931.61	369.25	503.02	357.25	145.77	3.451	
13,100.00	9,006.76	13,026.93	9,129.34	76.47	72.78	103.62	4,033.07	363.62	498.47	349.21	149.26	3.340	
13,200.00	9,006.05	13,128.89	9,129.92	78.24	74.52	103.92	4,134.83	357.18	493.43	340.67	152.76	3.230	
13,300.00	9,005.35	13,229.69	9,130.39	80.01	76.24	104.22	4,235.41	350.55	488.13	331.87	156.25	3.124	
13,400.00	9,004.64	13,330.77	9,131.31	81.79	77.97	104.59	4,336.24	343.58	482.64	322.88	159.75	3.021	
13,500.00	9,003.94	13,429.32	9,131.58	83.56	79.66	104.88	4,434.57	336.88	477.10	313.88	163.22	2.923	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error: 0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Distance							
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning
13,600.00	9,003.23	13,528.93	9,131.18	85.34	81.37	105.09	4,533.97	330.40	471.68	304.97	166.71	2.829	
13,700.00	9,002.53	13,623.77	9,130.80	87.12	82.98	105.27	4,628.64	324.94	466.99	296.89	170.10	2.745	
13,755.82	9,002.14	13,660.00	9,130.72	88.11	83.60	105.35	4,664.82	323.01	465.04	293.33	171.71	2.708 CC, ES	
13,800.00	9,001.82	13,660.00	9,130.72	88.90	83.60	105.35	4,664.82	323.01	467.13	294.63	172.50	2.708 SF	
13,900.00	9,001.12	13,660.00	9,130.72	90.68	83.60	105.35	4,664.82	323.01	486.86	312.58	174.28	2.794	
14,000.00	9,000.41	13,660.00	9,130.72	92.47	83.60	105.35	4,664.82	323.01	525.22	349.15	176.07	2.983	
14,100.00	8,999.71	13,660.00	9,130.72	94.26	83.60	105.35	4,664.82	323.01	578.51	400.65	177.85	3.253	
14,200.00	8,999.00	13,660.00	9,130.72	96.04	83.60	105.35	4,664.82	323.01	643.03	483.39	179.64	3.580	
14,300.00	8,998.30	13,660.00	9,130.72	97.83	83.60	105.35	4,664.82	323.01	715.76	534.33	181.43	3.945	
14,400.00	8,997.60	13,660.00	9,130.72	99.62	83.60	105.35	4,664.82	323.01	794.44	611.22	183.22	4.336	
14,500.00	8,996.89	13,660.00	9,130.72	101.41	83.60	105.35	4,664.82	323.01	877.47	692.46	185.01	4.743	
14,600.00	8,996.19	13,660.00	9,130.72	103.21	83.60	105.35	4,664.82	323.01	963.73	776.92	186.81	5.159	
14,700.00	8,995.48	13,660.00	9,130.72	105.00	83.60	105.35	4,664.82	323.01	1,052.42	863.82	188.60	5.580	
14,800.00	8,994.78	13,660.00	9,130.72	106.80	83.60	105.35	4,664.82	323.01	1,142.98	952.59	190.39	6.003	
14,900.00	8,994.07	13,660.00	9,130.72	108.59	83.60	105.35	4,664.82	323.01	1,235.00	1,042.81	192.19	6.426	
15,000.00	8,993.37	13,660.00	9,130.72	110.39	83.60	105.35	4,664.82	323.01	1,328.17	1,134.19	193.99	6.847	
15,100.00	8,992.66	13,660.00	9,130.72	112.19	83.60	105.35	4,664.82	323.01	1,422.28	1,226.49	195.78	7.264	
15,200.00	8,991.96	13,660.00	9,130.72	113.99	83.60	105.35	4,664.82	323.01	1,517.13	1,319.55	197.58	7.678	
15,300.00	8,991.25	13,660.00	9,130.72	115.79	83.60	105.35	4,664.82	323.01	1,612.61	1,413.23	199.38	8.088	
15,400.00	8,990.55	13,660.00	9,130.72	117.59	83.60	105.35	4,664.82	323.01	1,708.60	1,507.42	201.18	8.493	
15,500.00	8,989.84	13,660.00	9,130.72	119.39	83.60	105.35	4,664.82	323.01	1,805.03	1,602.05	202.98	8.892	
15,600.00	8,989.14	13,660.00	9,130.72	121.19	83.60	105.35	4,664.82	323.01	1,901.83	1,697.05	204.79	9.287	
15,700.00	8,988.43	13,660.00	9,130.72	122.99	83.60	105.35	4,664.82	323.01	1,998.95	1,792.36	206.59	9.676	
15,800.00	8,987.73	13,660.00	9,130.72	124.79	83.60	105.35	4,664.82	323.01	2,096.33	1,887.94	208.39	10.060	
15,900.00	8,987.02	13,660.00	9,130.72	126.60	83.60	105.35	4,664.82	323.01	2,193.95	1,983.76	210.20	10.438	
16,000.00	8,986.32	13,660.00	9,130.72	128.40	83.60	105.35	4,664.82	323.01	2,291.78	2,079.78	212.00	10.810	
16,100.00	8,985.61	13,660.00	9,130.72	130.21	83.60	105.35	4,664.82	323.01	2,389.78	2,175.98	213.81	11.177	
16,200.00	8,984.91	13,660.00	9,130.72	132.01	83.60	105.35	4,664.82	323.01	2,487.95	2,272.34	215.61	11.539	
16,300.00	8,984.20	13,660.00	9,130.72	133.82	83.60	105.35	4,664.82	323.01	2,586.25	2,368.84	217.42	11.895	
16,400.00	8,983.50	13,660.00	9,130.72	135.63	83.60	105.35	4,664.82	323.01	2,684.68	2,465.46	219.22	12.246	
16,500.00	8,982.79	13,660.00	9,130.72	137.43	83.60	105.35	4,664.82	323.01	2,783.23	2,562.20	221.03	12.592	
16,600.00	8,982.09	13,660.00	9,130.72	139.24	83.60	105.35	4,664.82	323.01	2,881.87	2,659.03	222.84	12.933	
16,700.00	8,981.38	13,660.00	9,130.72	141.05	83.60	105.35	4,664.82	323.01	2,980.60	2,755.96	224.65	13.268	
16,800.00	8,980.68	13,660.00	9,130.72	142.86	83.60	105.35	4,664.82	323.01	3,079.42	2,852.98	226.45	13.598	
16,900.00	8,979.97	13,660.00	9,130.72	144.66	83.60	105.35	4,664.82	323.01	3,178.31	2,950.04	228.26	13.924	
17,000.00	8,979.27	13,660.00	9,130.72	146.47	83.60	105.35	4,664.82	323.01	3,277.26	3,047.19	230.07	14.245	
17,100.00	8,978.56	13,660.00	9,130.72	148.28	83.60	105.35	4,664.82	323.01	3,376.28	3,144.40	231.88	14.560	
17,200.00	8,977.86	13,660.00	9,130.72	150.09	83.60	105.35	4,664.82	323.01	3,475.35	3,241.66	233.69	14.872	
17,300.00	8,977.15	13,660.00	9,130.72	151.90	83.60	105.35	4,664.82	323.01	3,574.48	3,338.98	235.50	15.178	
17,400.00	8,976.45	13,660.00	9,130.72	153.71	83.60	105.35	4,664.82	323.01	3,673.65	3,436.34	237.31	15.480	
17,500.00	8,975.74	13,660.00	9,130.72	155.53	83.60	105.35	4,664.82	323.01	3,772.87	3,533.75	239.12	15.778	
17,600.00	8,975.04	13,660.00	9,130.72	157.34	83.60	105.35	4,664.82	323.01	3,872.13	3,631.19	240.93	16.071	
17,700.00	8,974.33	13,660.00	9,130.72	159.15	83.60	105.35	4,664.82	323.01	3,971.42	3,728.67	242.75	16.360	
17,800.00	8,973.63	13,660.00	9,130.72	160.96	83.60	105.35	4,664.82	323.01	4,070.75	3,826.19	244.56	16.645	
17,900.00	8,972.92	13,660.00	9,130.72	162.77	83.60	105.35	4,664.82	323.01	4,170.11	3,923.74	246.37	16.926	
18,000.00	8,972.22	13,660.00	9,130.72	164.58	83.60	105.35	4,664.82	323.01	4,269.50	4,021.32	248.18	17.203	
18,100.00	8,971.52	13,660.00	9,130.72	166.40	83.60	105.35	4,664.82	323.01	4,368.92	4,118.82	250.00	17.476	
18,200.00	8,970.81	13,660.00	9,130.72	168.21	83.60	105.35	4,664.82	323.01	4,468.38	4,216.56	251.81	17.745	
18,300.00	8,970.11	13,660.00	9,130.72	170.02	83.60	105.35	4,664.82	323.01	4,567.83	4,314.21	253.62	18.010	
18,400.00	8,969.40	13,660.00	9,130.72	171.84	83.60	105.35	4,664.82	323.01	4,667.32	4,411.89	255.44	18.272	
18,500.00	8,968.70	13,660.00	9,130.72	173.65	83.60	105.35	4,664.82	323.01	4,766.84	4,509.59	257.25	18.530	
18,600.00	8,967.99	13,660.00	9,130.72	175.47	83.60	105.35	4,664.82	323.01	4,866.37	4,607.31	259.06	18.784	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation



Anticollision Report



Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

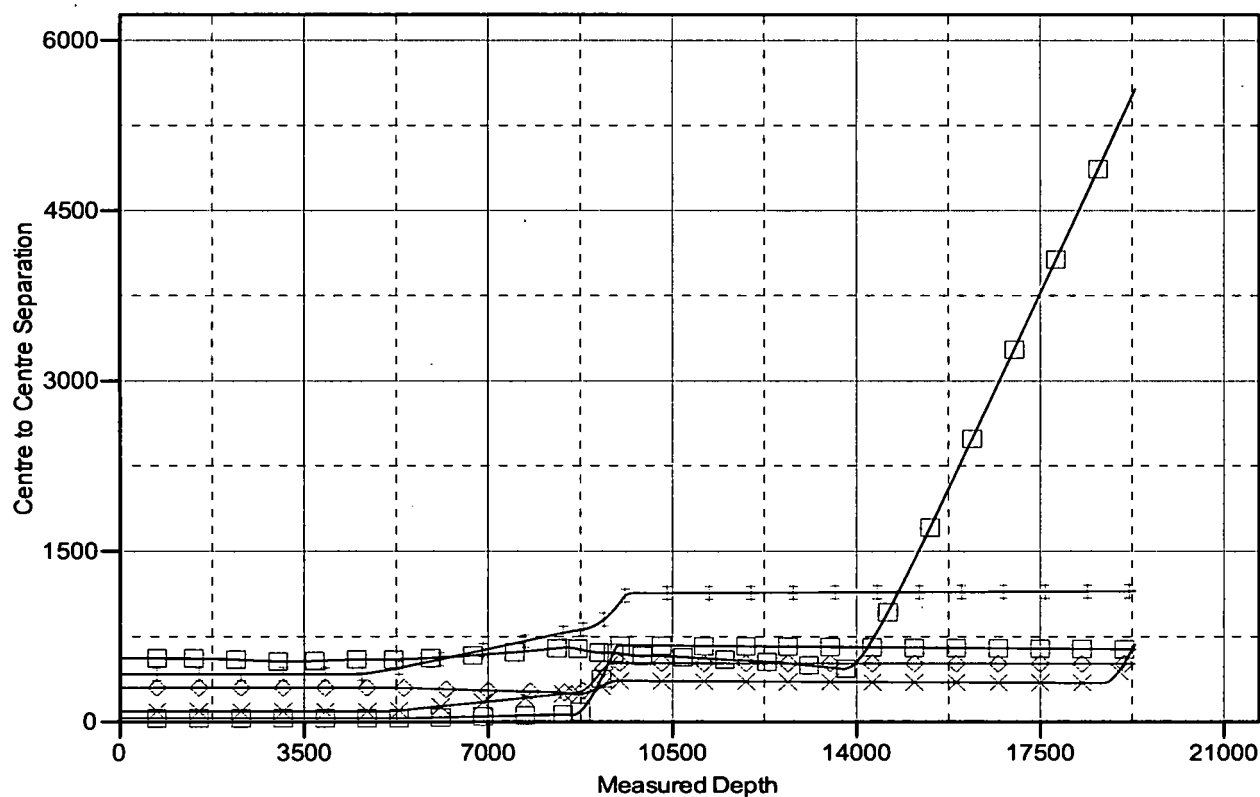
Offset Design Sec. 02, T 26-S, R 32-E - Zapata BQZ St Com 1H - Wellbore #1 - Wellbore #1													Offset Site Error:	0.00 usft
Survey Program: 200-NS-GYRO-MS, 8576-MWD													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
18,700.00	8,967.29	13,660.00	9,130.72	177.28	83.60	105.35	4,664.82	323.01	4,965.92	4,705.04	260.88	19.035		
18,800.00	8,966.58	13,660.00	9,130.72	179.09	83.60	105.35	4,664.82	323.01	5,065.49	4,802.80	262.69	19.283		
18,900.00	8,965.88	13,660.00	9,130.72	180.91	83.60	105.35	4,664.82	323.01	5,165.08	4,900.57	264.51	19.527		
19,000.00	8,965.17	13,660.00	9,130.72	182.72	83.60	105.35	4,664.82	323.01	5,264.68	4,998.36	266.32	19.768		
19,100.00	8,964.47	13,660.00	9,130.72	184.54	83.60	105.35	4,664.82	323.01	5,364.29	5,096.16	268.14	20.006		
19,200.00	8,963.76	13,660.00	9,130.72	186.35	83.60	105.35	4,664.82	323.01	5,463.93	5,193.97	269.95	20.240		
19,308.03	8,963.00	13,660.00	9,130.72	188.32	83.60	105.35	4,664.82	323.01	5,571.57	5,299.66	271.91	20.490		

Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandrill Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandrill Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference Depths are relative to KB=26' @ 3272.00usft (Scandrill FreeCoordinates are relative to: Harrier Federal Com 101H
 Offset Depths are relative to Offset Datum
 Central Meridian is -104.33334
 Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
 Grid Convergence at Surface is: 0.36°

Ladder Plot



LEGEND

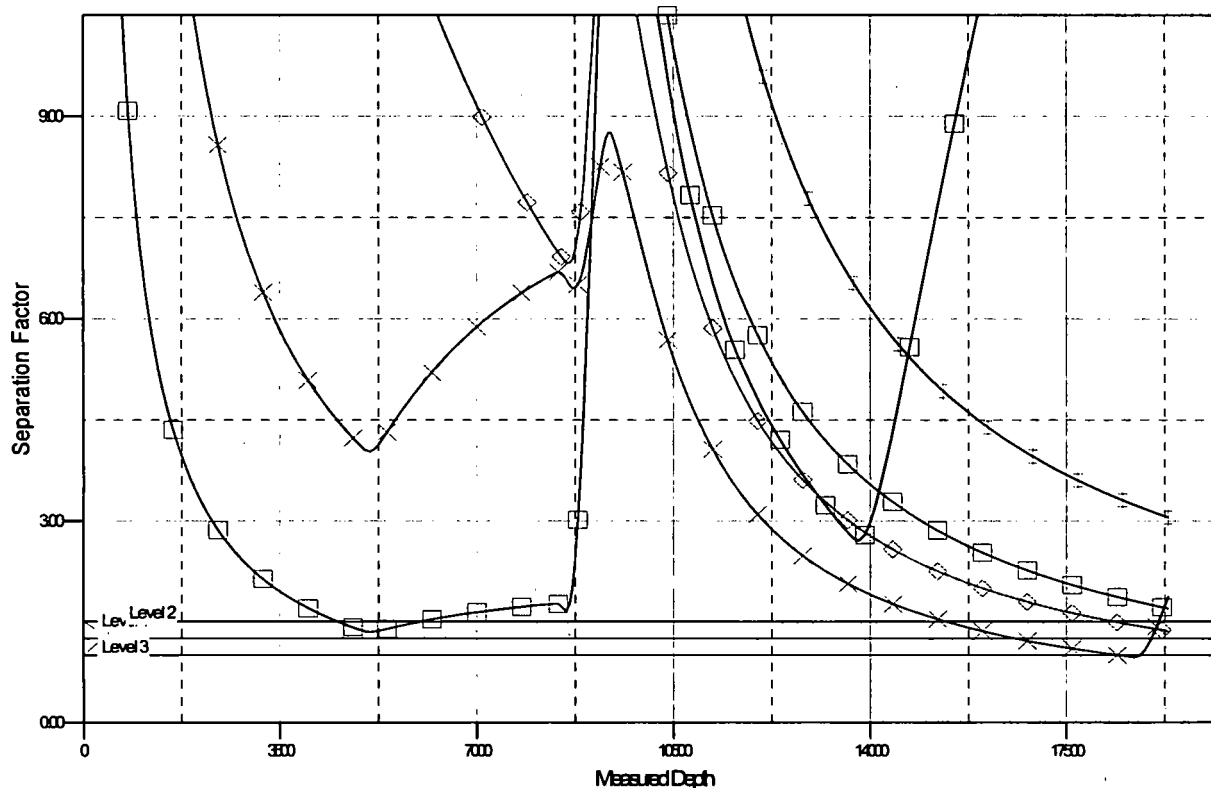
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 Federal Com 301H, Wellbore #1, Plan #1 V0 Harrier Federal Com 302H, Wellbore #1, Plan #1 V0

Company: COG Operating L L C
Project: Lea County, NM (NAD27 NME)
Reference Site: Sec. 02, T 26-S, R 32-E
Site Error: 0.00 usft
Reference Well: Harrier Federal Com 101H
Well Error: 0.00 usft
Reference Wellbore: Wellbore #1
Reference Design: Plan #1

Local Co-ordinate Reference: Well Harrier Federal Com 101H
TVD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
MD Reference: KB=26' @ 3272.00usft (Scandril Freedom)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: EDM 5000.1
Offset TVD Reference: Offset Datum

Reference Depths are relative to KB=26' @ 3272.00usft (Scandril FreeCoordinates are relative to: Harrier Federal Com 101H
 Offset Depths are relative to Offset Datum
 Central Meridian is -104.33334
 Coordinate System is US State Plane 1927 (Exact solution), New Mexico East 30
 Grid Convergence at Surface is: 0.36°

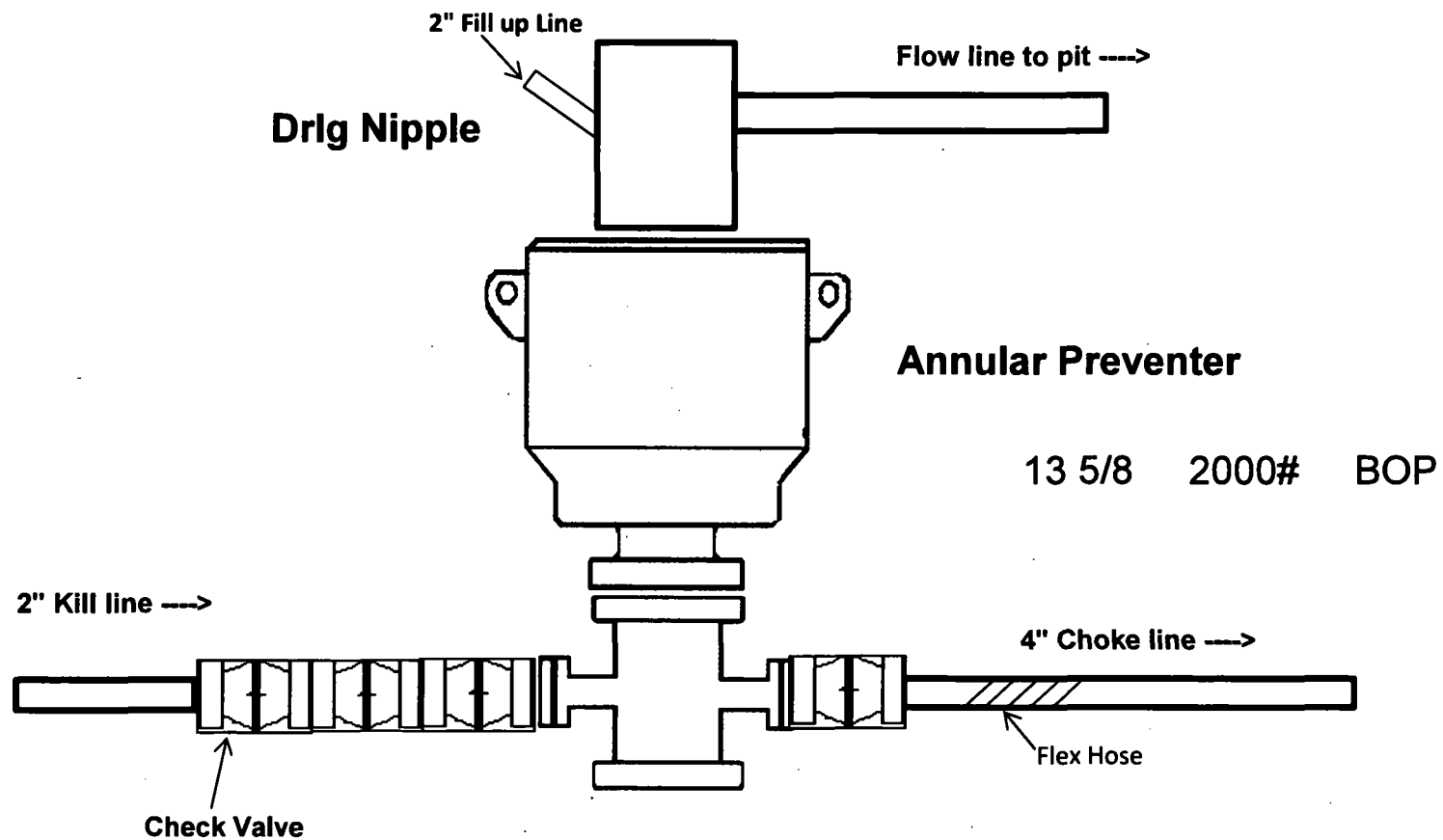
Separation Factor Plot



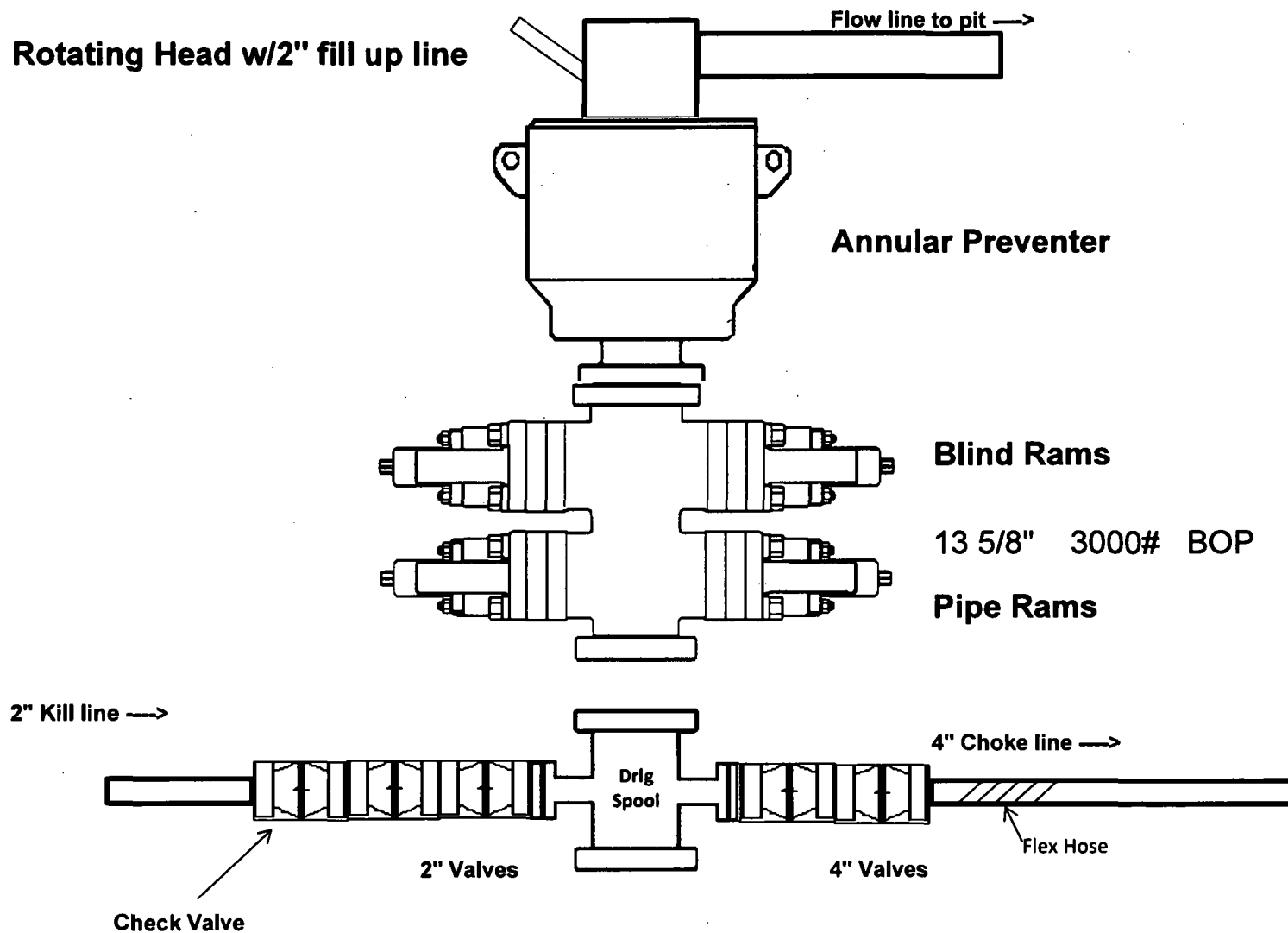
LEGEND

Federal Com 303H, Wellbore #1, Plan #1 V0 Zapata BQZ St Com 1H, Wellbore #1, Wellbore #1 V0 Harrier Federal Com 201H, Wellbore #1 P
 Federal Com 301H, Wellbore #1, Plan #1 V0 Harrier Federal Com 302H, Wellbore #1, Plan #1 V0

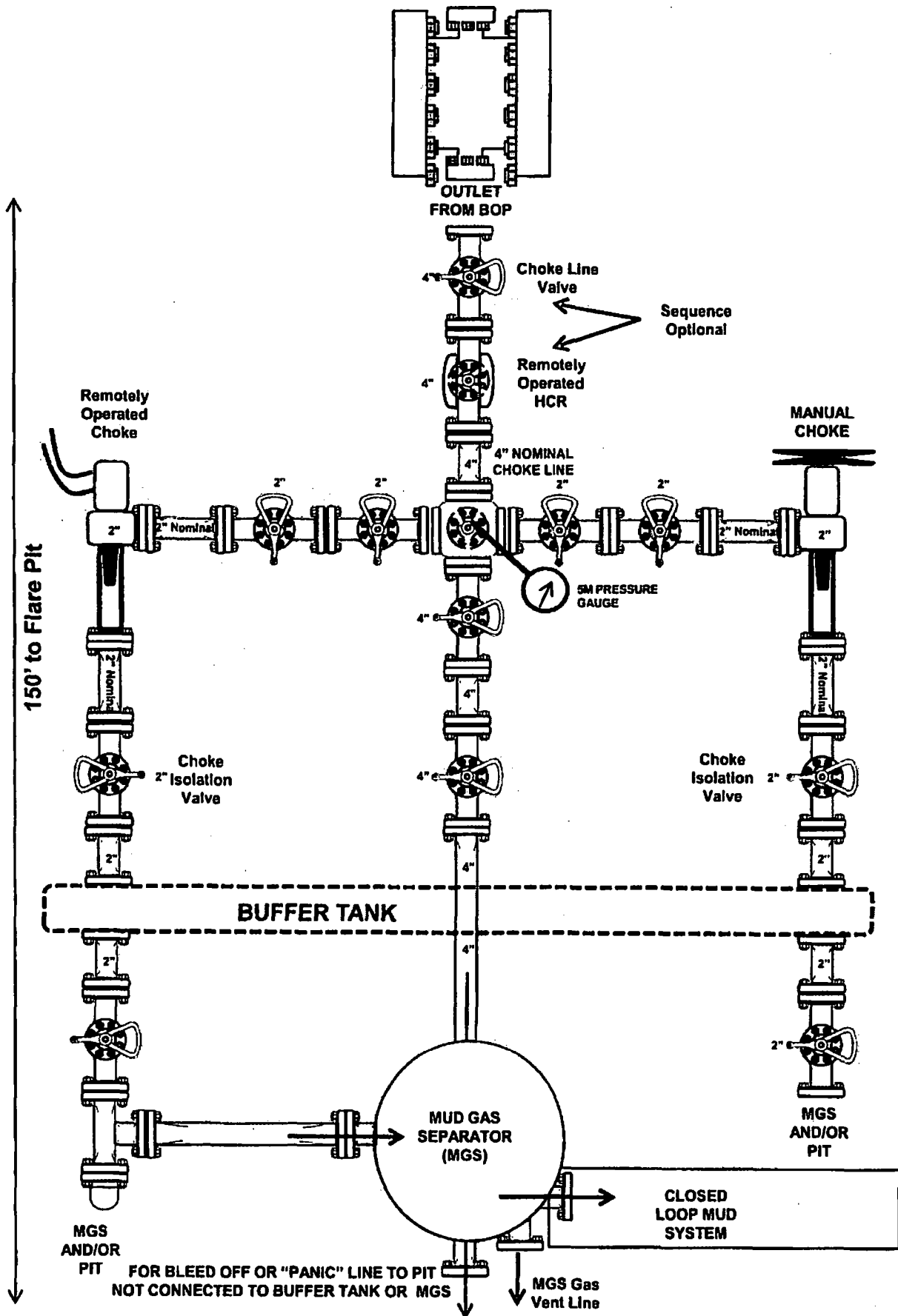
2,000 psi BOP Schematic



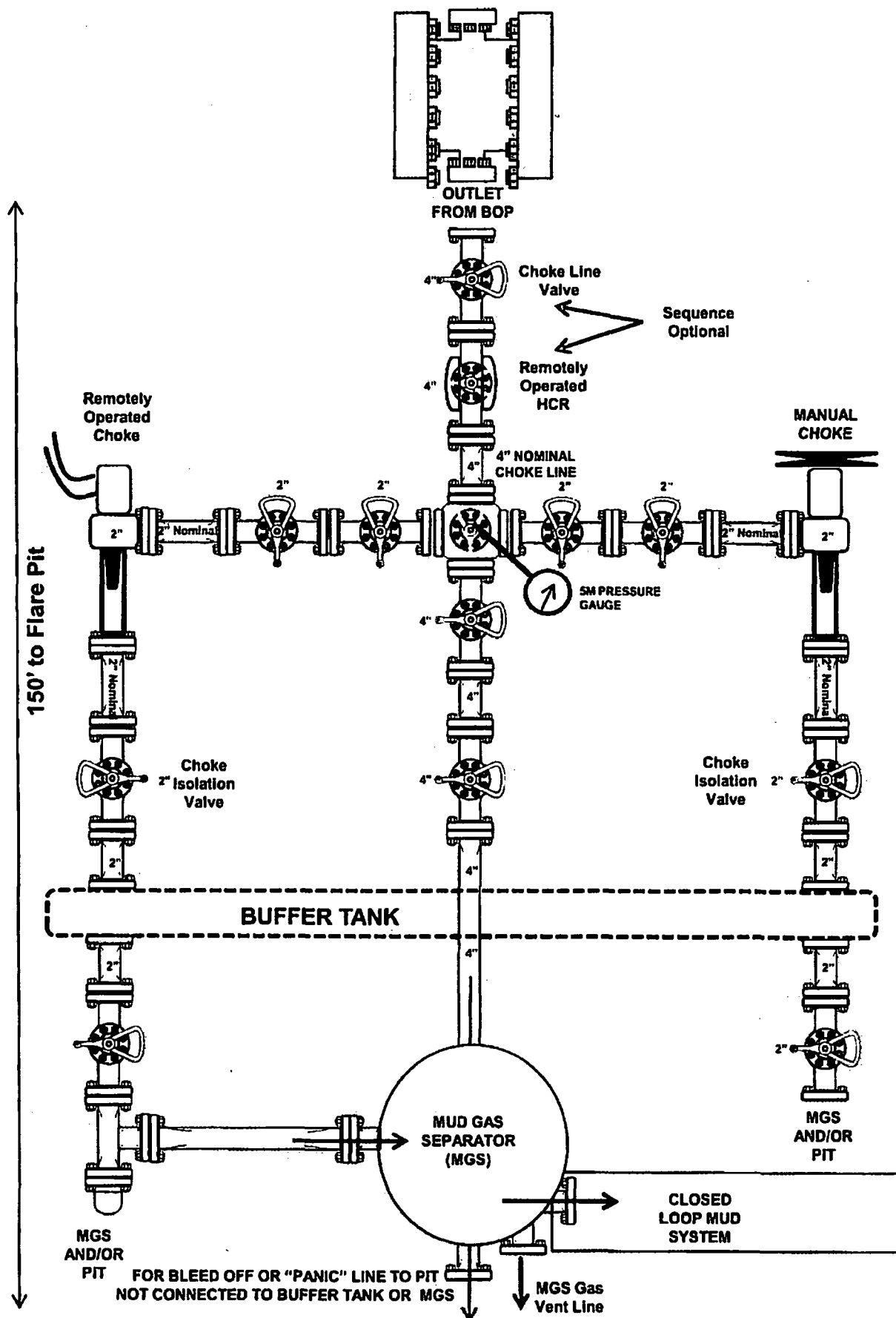
3,000 psi BOP Schematic

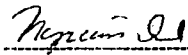
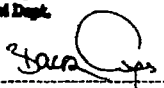


2M Choke Manifold Equipment (WITH MGS + CLOSED LOOP)



3M Choke Manifold Equipment (WITH MGS + CLOSED LOOP)



QUALITY CONTROL INSPECTION AND TEST CERTIFICATE		CERT. N°: 814	
PURCHASER: Contitech Oil & Marine Corp.		P.O. N°: 4501005826	
CONTITECH RUBBER order N°: 1001224	HOSE TYPE: 3" ID Choke and Kill Hose		
HOSE SERIAL N°: 74077	NOMINAL / ACTUAL LENGTH: 12,19 m / 12,22 m		
W.P. 69,0 MPa 10000 psi	T.P. 103,5 MPa 15000 psi	Duration: 60 min.	
Pressure test with water at ambient temperature See attachment (1 page)			
COUPLINGS Type	Serial N°	Quality	Heat N°
3" coupling with 3 1/16" 10K API Swivel Flange end Hub	8183	AISI 4130 AISI 4130 AISI 4130	A0231W 85913 A0355Y
3" coupling with 3 1/16" 10K API b.w. Flange end	8182	AISI 4130 AISI 4130	A0231W 85913
Not Designed For Well Testing API Spec 16 C 2 nd Edition- FSL2 Temperature rate: "B"			
All metal parts are flawless			
WE CERTIFY THAT THE ABOVE HOSE HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE TERMS OF THE ORDER INSPECTED AND PRESSURE TESTED AS ABOVE WITH SATISFACTORY RESULT.			
STATEMENT OF CONFORMITY: We hereby certify that the above items/equipment supplied by us are in conformity with the terms, conditions and specifications of the above Purchaser Order and that these items/equipment were fabricated inspected and tested in accordance with the referenced standards, codes and specifications and meet the relevant acceptance criteria and design requirements.			
COUNTRY OF ORIGIN HUNGARY/EU			
Date: 17. November 2017.	Inspector	Quality Control	Contitech Rubber Industrial Kft. Quality Control Dept. (1)
		 	

ATTACHMENT OF QUALITY CONTROL
INSPECTION AND TEST CERTIFICATE
No: 814, 817

CH042

CONTITECH RUBBER Industrial Kft.	No: QC-DB- 335 / 2017 Page: 6 / 83
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1/1

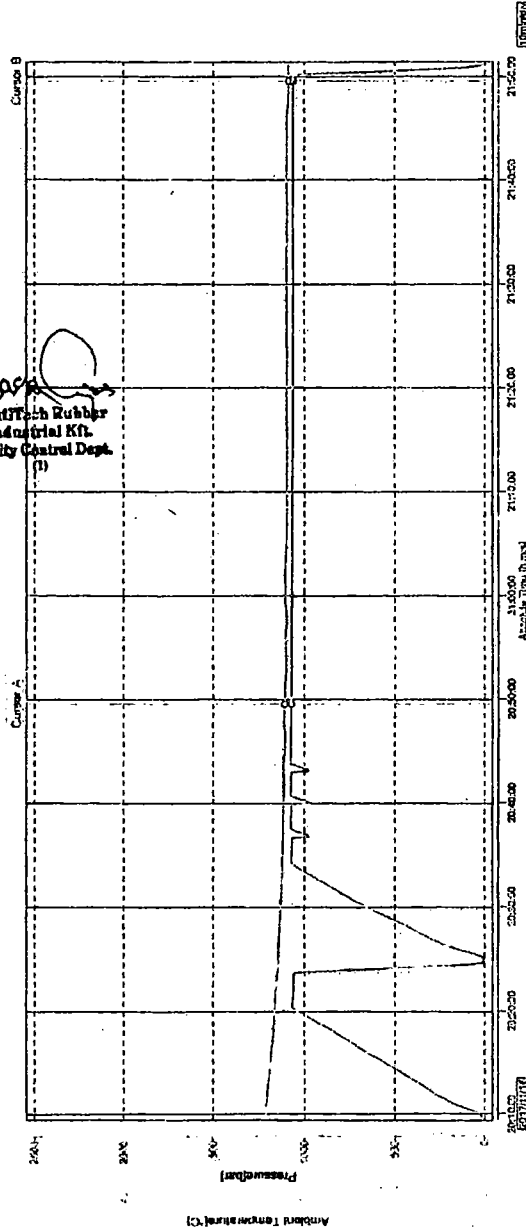
5.000 sec
2017/11/16 20:09:25.000
2017/11/16 21:51:25.000

Sampling Int.
Start Time
Stop Time

File Name : 021325_74077,74089.GEV.....021335_74077,74089.GEV
File Message : 74077,74089
Device Type : GX10
Serial No. : 200906399
Data Count : 1225
Print Group : Press-Temp
Print Range : 2017/11/16 20:09:25.000 - 2017/11/16 21:51:25.000
Comment : 140358835

Data No.	Cursor A	Cursor B	Difference
720	482	1202	720
Alarm Time	2017/11/16 20:09:33.000	2017/11/16 21:49:33.000	0140000.000
Tag Comment	Value A	Value B	Value B-A
Pressure (bar)	1073.19	1083.67	-10.48
Ambient Temperature (°C)	23.19	21.74	-1.45

Contitech Rubber
Industrial Kft.
Quality Control Dept.





ContiTech

Hose Data Sheet

CRI Order No.	1001224
Customer	ContiTech Oil & Marine Corp
Customer Order No	4501005826 CO1000284
Item No.	10
Hose Type	Flexible Hose
Standard	API SPEC 16C 2ND EDITION FSL2
Inside dia in inches	3
Length	40 ft
Type of coupling one end	FLANGE 3.1/16" 10K FLANGE API SPEC 6A TYPE 6BX MONOGRAMMED B.W.BX154ST/ST LINED RING GROOVE SOUR
Type of coupling other end	FLANGE 3.1/16" 10K FLANGE API SPEC 17D SV SWIVEL FLANGE BX154 ST/ST LINED RING GROOVE SOUR
H2S service NACE MR0175	Yes
Working Pressure	10 000 psi
Design Pressure	10 000 psi
Test Pressure	15 000 psi
Safety Factor	2,25
Marking	CONTINENTAL CONTITECH
Cover	NOT FIRE RESISTANT
Outside protection	St. steel outer wrap
Internal stripwound tube	No
Lining	OIL + GAS RESISTANT SOUR
Safety clamp	Yes
Lifting collar	Yes
Element C	Yes
Safety chain	Yes
Safety wire rope	No
Max. design temperature [°C]	100
Min. design temperature [°C]	-20
Min. Bend Radius operating [m]	0,90
Min. Bend Radius storage [m]	0,90
Calculated Gross / Net weight of hose assembly [kg]	
Electrical continuity	The Hose is electrically continuous
Type of packing	WOODEN CRATE ISPM-15



ContiTech Fluid Technology

ContiTech Oil & Marine Corp. # 11535 Brittonmoore Park Dr., Houston, TX 77041-6916 USA		Delivery Note	
ScanDrill Inc. 9395 HWY 2767 TYLER TX 75708		Document No.	85367700
		Document Date	12/20/2017
		Customer Number	15483
		Customer VAT No.	
		Supplier Number	
		N° EORI:	FR41027953300021
		Purchase Order No.	149618
		Purchase Order Date	09/26/2017
		Sales Order Number	1000284
		Sales Order Date	09/26/2017
		Unloading Point	
Transport-Details - Shipping		Page 1 of 2	
Conditions		Weights (Gross / Net)	
Shipping Conditions	0 days	Total Weight	2,219.000 LB
Inco Terms	EXW Houston, TX	Net Weight	2,219.000 LB
	Ex Works		
Buyer: Joe Ward E-mail: jward@scandrift.com Tel: 903.597.6368			
Item	Material/Description	Quantity	Weight
10	HCK3FA40IPSIVS 3" 40R API 16C C&K Hose WP 10K Temp B End A: 3.1/16" 10K Flange, API Spec. 8A Type 6BX, Butt Welded, BX154 Stainless Steel 316 Lined Ring Groove - Sour End B: 3.1/16" 10K API Spec 17D SV Swivel Flange, BX154 Stainless Steel 316 Lined Ring Groove - Sour Hose metallic parts NACE MR 0175 latest edition Hose is suitable for H2S Service Standard: API Spec 16C - 2nd Edition - FSL Level 2 - Monogrammed Working Pressure: 10000 psi Test Pressure: 15000 psi Fire Rated: No Armoured: Yes - Stainless Steel 316L Interlock Design Temperature: -20 to 100°C High Temperature Exposure / Survival @ 177 Deg C (internal in a kick situation) Brand Name: Continental ContiTech Supplied with: 2 x Safety Clamps 2 x Lifting Collars Double Eyed 2 x Safety Chains c/w Shackles Each End x 8ft Packing to ISPM-15 Heat Treated	1 PC	2,219.000 LB

ContiTech Oil & Marine Corp.
11535 Brittonmoore Park Drive
Houston, TX 77041
USAPhone: (832)-327-0141
Fax: (832)-327-0148
www.contitech-oil-gas.comManaging Director
(President)
Zuzana CizekBank: Wells Fargo Bank, N.A.
420 Montgomery Street, San Francisco, CA 94103
Account #: 4942682294
ABA/Routing #: 121000248, SWIFT #: WFBUI833

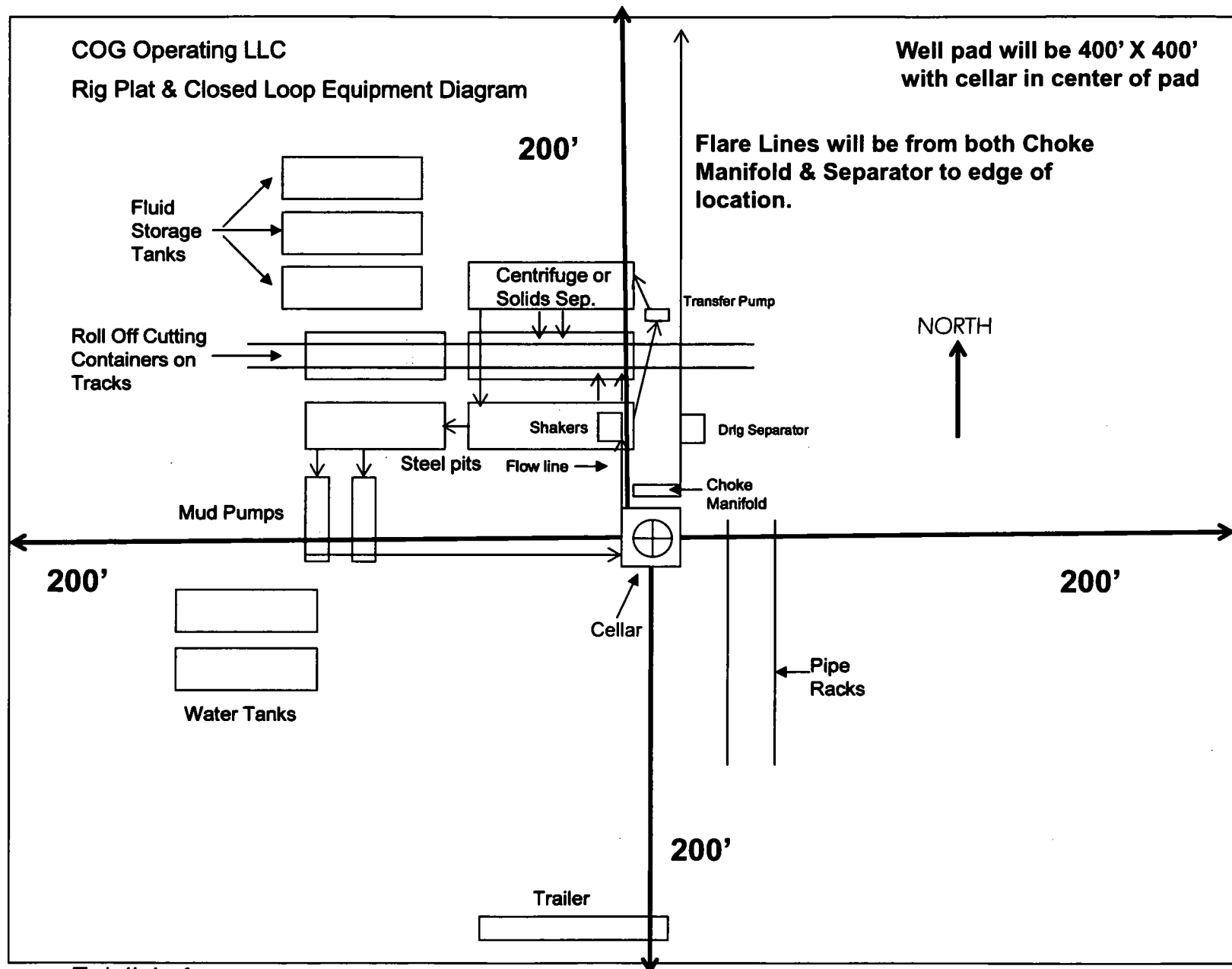
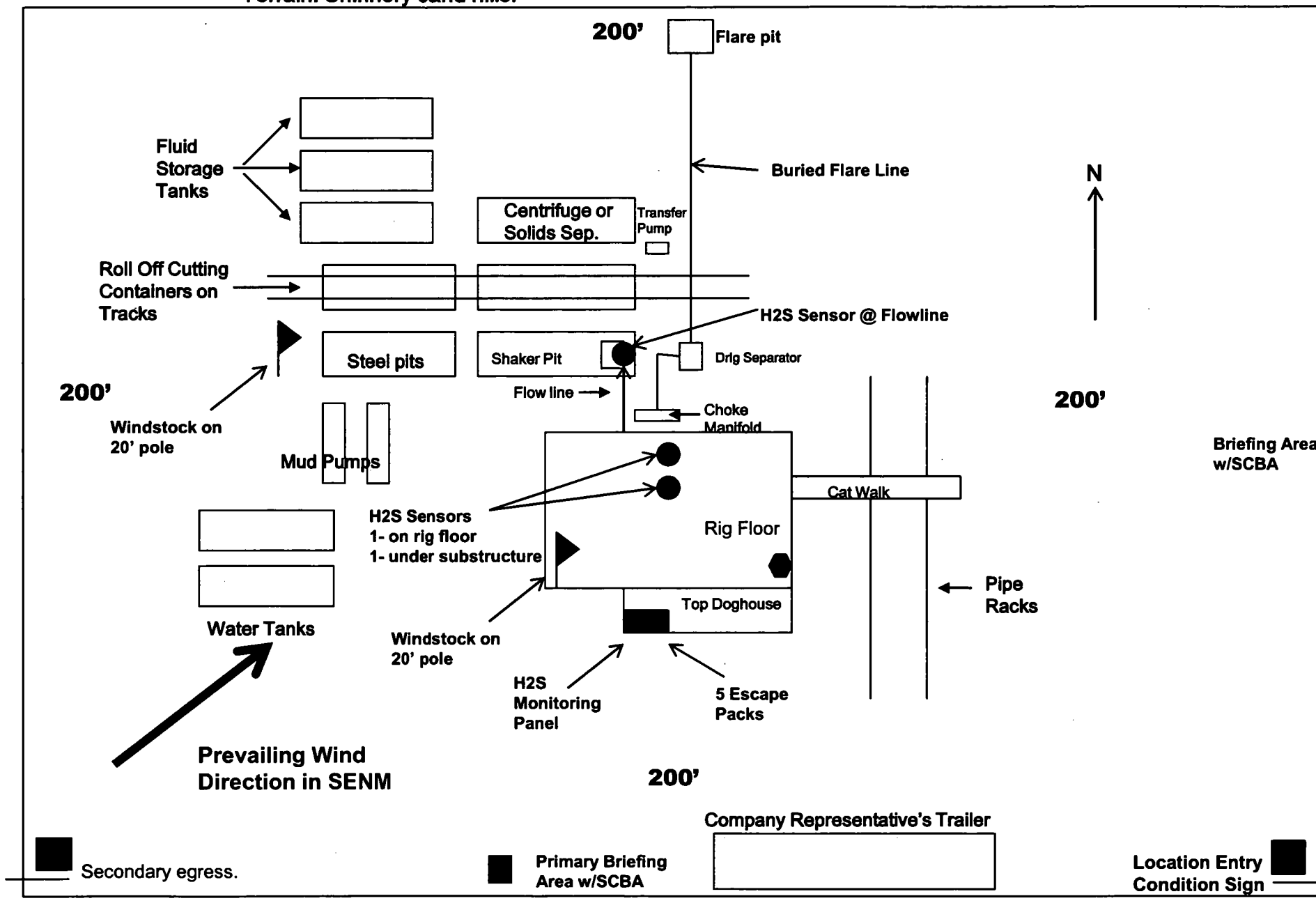


Exhibit 1

"I further certify that COG will comply with Rule 19.15.17 NMAC by using a Closed Loop System."

COG Operating LLC
H₂S Equipment Schematic
Terrain: Shinnery sand hills.

Well pad will be 400' x 400'
with cellar in center of pad



COG OPERATING LLC
HYDROGEN SULFIDE DRILLING OPERATIONS PLAN

1. HYDROGEN SULFIDE TRAINING

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on this well:

- a. The hazards and characteristics of hydrogen sulfide (H₂S).
- b. The proper use and maintenance of personal protective equipment and life support systems.
- c. The proper use of H₂S detectors, alarms, warning systems, briefing areas, evacuation procedures, and prevailing winds.
- d. The proper techniques for first aid and rescue procedures.

In addition, supervisory personnel will be trained in the following areas:

- a. The effects of H₂S on metal components. If high tensile tubulars are to be used, personnel will be trained in their special maintenance requirements.
- b. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
- c. The contents and requirements of the H₂S Drilling Operations Plan and the Public Protection Plan.

There will be an initial training session just prior to encountering a known or probable H₂S zone (within 3 days or 500 feet) and weekly H₂S and well control drills for all personnel in each crew. The initial training session shall include a review of the site specific H₂S Drilling Operations Plan and the Public Protection Plan. This plan shall be available at the well site. All personnel will be required to carry documentation that they have received the proper training.

2. H₂S SAFETY EQUIPMENT AND SYSTEMS

Note: All H₂S safety equipment and systems will be installed, tested, and operational when drilling reaches a depth of 500 feet above, or three days prior to penetrating the first zone containing or reasonably expected to contain H₂S. If H₂S greater than 100 ppm is encountered in the gas stream we will shut in and install H₂S equipment.

- a. Well Control Equipment:
 - Flare line.
 - Choke manifold with remotely operated choke.
 - Blind rams and pipe rams to accommodate all pipe sizes with properly sized closing unit.
 - Auxiliary equipment to include: annular preventer, mud-gas separator, rotating head.

- b. Protective equipment for essential personnel:
Mark II Surviveair 30-minute units located in the dog house and at briefing areas.
- c. H2S detection and monitoring equipment:
2 - portable H2S monitor positioned on location for best coverage and response. These units have warning lights and audible sirens when H2S levels of 20 ppm are reached.
- d. Visual warning systems:
Caution/Danger signs shall be posted on roads providing direct access to location. Signs will be painted a high visibility yellow with black lettering of sufficient size to be readable at a reasonable distance from the immediate location. Bilingual signs will be used, when appropriate. See example attached.
- e. Mud Program:
The mud program has been designed to minimize the volume of H2S circulated to the surface.
- f. Metallurgy:
All drill strings, casings, tubing, wellhead, blowout preventers, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H2S service.
- g. Communication:
Company vehicles equipped with cellular telephone.

COG OPERATING LLC has conducted a review to determine if an H2S contingency plan is required for the above referenced well. We were able to conclude that any potential hazardous volume would be minimal. H2S concentrations of wells in this area from surface to TD are low enough; therefore, we do not believe that an H2S contingency plan is necessary.

W A R N I N G

**YOU ARE ENTERING AN H₂S AREA
AUTHORIZED PERSONNEL ONLY**

- 1. BEARDS OR CONTACT LENSES NOT ALLOWED**
- 2. HARD HATS REQUIRED**
- 3. SMOKING IN DESIGNATED AREAS ONLY**
- 4. BE WIND CONSCIOUS AT ALL TIMES**
- 5. CK WITH COG OPERATING LLC FOREMAN AT MAIN OFFICE**

COG OPERATING LLC

1-575-748-6940

EMERGENCY CALL LIST

	<u>OFFICE</u>	<u>MOBILE</u>
COG OPERATING LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

EMERGENCY RESPONSE NUMBERS

	<u>OFFICE</u>
STATE POLICE	575-748-9718
EDDY COUNTY SHERIFF	575-746-2701
EMERGENCY MEDICAL SERVICES (AMBULANCE)	911 or 575-746-2701
EDDY COUNTY EMERGENCY MANAGEMENT (HARRY BURGESS)	575-887-9511
STATE EMERGENCY RESPONSE CENTER (SERC)	575-476-9620
CARLSBAD POLICE DEPARTMENT	575-885-2111
CARLSBAD FIRE DEPARTMENT	575-885-3125
NEW MEXICO OIL CONSERVATION DIVISION	575-748-1283
INDIAN FIRE & SAFETY	800-530-8693
HALLIBURTON SERVICES	800-844-8451

**PECOS DISTRICT
DRILLING CONDITIONS OF APPROVAL**

OPERATOR'S NAME:	COG Operating LLC
WELL NAME & NO.:	Harrier Federal Com 101H
SURFACE HOLE FOOTAGE:	375'/S & 1490'/W
BOTTOM HOLE FOOTAGE:	50'/N & 1380'/W
LOCATION:	Section 2, T.26 S., R.32 E., NMPM
COUNTY:	Lea County, New Mexico

Potash	☒ None	☐ Secretary	☐ R-111-P
Cave/Karst Potential	☐ Low	☒ Medium	☐ High
Variance	☐ None	☒ Flex Hose	☐ Other
Wellhead	☒ Conventional	☐ Multibowl	
Other	☐ 4 String Area	☐ Capitan Reef	☐ WIPP

A. HYDROGEN SULFIDE

1. Hydrogen Sulfide (H₂S) monitors shall be installed prior to drilling out the surface shoe. If H₂S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.

B. CASING

1. The 13 3/8 inch surface casing shall be set at approximately **825** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface.
 - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.
 - b. Wait on cement (WOC) time for a primary cement job will be a minimum of **8 hours** or 500 pounds compressive strength, whichever is greater. (This is to include the lead cement)
 - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.

- d. If cement falls back, remedial cementing will be done prior to drilling out that string.
- ❖ In **Medium/Karst Areas** if cement does not circulate to surface on the first two casing strings, the cement on the 3rd casing string must come to surface.
2. The minimum required fill of cement behind the 9 5/8 inch intermediate casing is:
 - Cement to surface. If cement does not circulate see B.1.a, c-d above. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst.**
3. The minimum required fill of cement behind the 5 1/2 inch production casing is:
 - Cement should tie-back at least **200** feet into previous casing string. Operator shall provide method of verification.

C. PRESSURE CONTROL

1. Variance approved to use flex line from BOP to choke manifold. Manufacturer's specification to be readily available. No external damage to flex line. Flex line to be installed as straight as possible (no hard bends).
2. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **2000 (2M) psi Annular. In the case where the only BOP installed is an annular preventer, it shall be tested to a minimum of 2000 psi (which may require upgrading to 3M or 5M annular)**
3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the 9 5/8 inch intermediate casing shoe shall be **3000 (3M) psi.**

D. SPECIAL REQUIREMENT (S)

Communitization Agreement

- The operator will submit a Communitization Agreement to the Carlsbad Field Office, 620 E Greene St. Carlsbad, New Mexico 88220, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees of record), or certification that the operator has obtained the written signatures of all

such owners and will make those signatures available to the BLM immediately upon request.

- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

MHH 03212019

GENERAL REQUIREMENTS

The BLM is to be notified in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ Chaves and Roosevelt Counties
Call the Roswell Field Office, 2909 West Second St., Roswell NM 88201.
During office hours call (575) 627-0272.
After office hours call (575)

☒ Eddy County
Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,
(575) 361-2822

☒ Lea County
Call the Hobbs Field Station, 414 West Taylor, Hobbs NM 88240, (575)
393-3612

1. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval.
 - a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
 - b. When the operator proposes to set surface casing with Spudder Rig
 - Notify the BLM when moving in and removing the Spudder Rig.
 - Notify the BLM when moving in the 2nd Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
 - BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
2. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works are located, this does not include the dog house or stairway area.

3. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log.
3. Wait on cement (WOC) for Water Basin: After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. On that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.
7. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

B. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.
3. 5M or higher system requires an HCR valve, remote kill line and annular to match. The remote kill line is to be installed prior to testing the system and tested to stack pressure.
4. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:
 - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
 - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
 - c. Manufacturer representative shall install the test plug for the initial BOP test.
 - d. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.
 - e. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
 - a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the

plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

- b. In potash areas, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time.
- c. The tests shall be done by an independent service company utilizing a test plug not a cup or J-packer. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (8 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).
- d. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.
- e. The results of the test shall be reported to the appropriate BLM office.
- f. All tests are required to be recorded on a calibrated test chart. A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.
- g. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.
- h. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

C. DRILLING MUD

Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

D. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.