

HOBBS OCD

SEP 21 2012

FORM APPROVED
OMB No. 1004-013
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

RECEIVED

1a. Type of Work: ☒ DRILL ☐ REENTER		7. If Unit or CA Agreement, Name and No.
1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other ☒ Single Zone ☐ Multiple Zone		8. Lease Name and Well No. (39465) Patterson B-52 Federal Com #2H
2. Name of Operator COG Operating LLC. (229137)		9. API Well No. 30-025-40773
3a. Address 2208 West Main Street Artesia, NM 88210	3b. Phone No. (include area code) 575-748-6940	10. Field and Pool, or Exploratory 41450 Lusk ; Bone Spring , North K2
4. Location of Well (Report location clearly and in accordance with any State requirements *) At surface 330' FNL & 330' FEL, Unit A (NENE) Sec5-T19S-R32E At proposed prod. Zone 380' FNL & 330' FWL, Unit D (NWNW) Sec5-T19S-R32E		11. Sec., T.R.M. or Bk and Survey or Area Sec. 5 - T19S - R32E
14. Distance in miles and direction from nearest town or post office* About 14 miles from Maljamar		12. County or Parish Lea County
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drg. Unit line, if any) 330'		13. State NM
16. No. of acres in lease 640	17. Spacing Unit dedicated to this well 160	
18. Distance from location* to nearest well, drilling, completed, applied for, on this lease, ft. 330'	19. Proposed Depth TVD: 9320' MD: 13880'	20. BLM/BIA Bond No. on file NMB000740, NMB00215
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3674'	22. Approximate date work will start* ASAP	23. Estimated duration 30 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, shall be attached to this form:

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

25. Signature <i>Mayte Reyes</i>	Name (Printed/Typed) Mayte Reyes	Date 7/24/2012
Title Regulatory Analyst		
Approved by (Signature) <i>/s/ Don Peterson</i>	Name (Printed/Typed) <i>/s/ Don Peterson</i>	Date SEP 19 2012
Title FIELD MANAGER		
Office CARLSBAD FIELD OFFICE		

Application approval does not warrant or certify that the applicant holds legan 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.

APPROVAL FOR TWO YEARS

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.

(Continued on page 2)

*(Instructions on page 2)

Capitan Controlled Water Basin

Approval Subject to General Requirements
& Special Stipulations Attached

SEE ATTACHED FOR
CONDITIONS OF APPROVAL

SEP 25 2012

STATEMENT ACCEPTING RESPONSIBILITY FOR OPERATIONS

The undersigned accepts all applicable terms, conditions, stipulations, and restrictions concerning operations conducted on the leased land or portion thereof, as described below:

Date: 7/24/2012

Lease #: NMNM118720
Patterson B52 Federal #2H

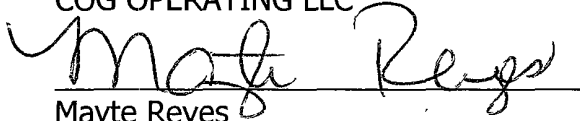
Legal Description: Sec. 5- T19S - R32E
Lea County, New Mexico

Formation(s): 2nd Bone Spring Sand

Bond Coverage: Statewide

BLM Bond File #: NMB000740

COG OPERATING LLC

A handwritten signature in black ink, appearing to read "Mayte Reyes", is written over a horizontal line.

Mayte Reyes
Regulatory Analyst

COG Operating LLC
DRILLING AND OPERATIONS PROGRAM
Patterson B-52 Fed Com #2H
SHL: 330' FNL & 330' FEL
BHL: 380' FNL & 330' FWL
Section 5 T19S R32E
Lea County, New Mexico

In conjunction with Form 3160-3, Application for Permit to Drill subject well, COG Operating LLC submits the following eleven items of pertinent information in accordance with BLM requirements.

1. Geological surface formation: Permian
2. The estimated tops of geologic markers & estimated depths at which anticipated water, oil or gas formations are expected to be encountered are as follows:

Fresh Water	223'	
Rustler	1,189'	
Top of Salt	1,268'	
Base of Salt	2,811'	
Yates	2,928'	
Seven Rivers	3,387'	
Queen	3,820'	
Grayburg	4,325'	
Delaware	5,521'	Oil
Bone Spring	7,115'	Oil
2 nd Bone Spring	9,238'	Oil
TD TVD	9,320'	
TD MD	13,880'	

No other formations are expected to give up oil, gas or fresh water in measurable quantities. The surface fresh water sands will be protected by setting 13-3/8" casing at 1,215' and circulating cement back to surface. All intervals will be isolated by setting 5 1/2" casing to total depth and tying back cement to a minimum of 500' into 9-5/8" csg.

3. Proposed Casing Program: All casing is new and API approved

Hole Size	Depths	Section	OD Casing	New/Used	Wt	Collar	Grade	Collapse Design Factor	Burst Design Factor	Tension Design Factor
17 1/2"	0' - 1,215' ^{1,260' sec} _{coll}	Surface	13 3/8"	New	54.5#	STC	J-55	1.125	1.125	1.6
12 1/4"	0' - 3,100'	Intrmd	9 5/8"	New	36#	LTC	J-55	1.125	1.125	1.6
7 7/8"	0' - 13,880'	Production Curve & Lateral	5 1/2"	New	17#	LTC	P-110	1.125	1.125	1.6

- While running all casing strings, the pipe will be kept a minimum of 1/3 full at all times to avoid approaching the collapse pressure of casing.

4. Proposed Cement Program

- a. 13-3/8" Surface
- Lead: 525 sx Class C + 4% Gel + 2% CaCl₂
(13.5 ppg / 1.75 cuft/sx)
- Tail: 250 sx Class C + 2% CaCl₂
(14.8 ppg / 1.34 cuft/sx)
- **Calculated w/50% excess on OH volumes
- b. 9 5/8" Intermediate:
- Lead: 550 sx Class C + 4% Gel + 2% CaCl₂
(13.5 ppg / 1.75 cuft/sx)
- Tail: 250 sx Class C + 2% CaCl₂
(14.8 ppg / 1.34 cuft/sx)
- **Calculated w/35% excess on OH volumes
- d. 5 1/2" Production
- Lead: 600 sx 50:50:10 H + Salt+Gilsonite+CFR-3+ HR601
(11.8 ppg / 2.5 cuft/sx)
- Tail: 925 sx 50:50:2 H +Salt+GasStop +HR601 +CFR-3
(14.4 ppg / 1.25 cuft/sx)
- **Calculated w/35% excess on OH volumes
- The above cement volumes could be revised pending the caliper measurement from the open hole logs.
 - The 9-5/8" intermediate string is designed to circulate to surface.
 - The production string will at least tie back 500' into 9-5/8" shoe

5. Control:

Nipple up on 13 3/8 with annular preventer tested to 50% of rating working pressure by independent tester and the rest of the 2M system tested to 2000 psi.

Nipple up on 9 5/8 with 3M system tested 3000 psi to by independent tester.

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. A 2" kill line and a minimum 3" choke line will be included in the drilling spool located below the ram-type BOP. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold with 3000 psi WP rating.

6. Estimated BHP:

Lateral TD = 4,042 psi

7. Mud Program: The applicable depths and properties of this system are as follows:

Depth	Type System	Mud Weight	Viscosity (sec)	Waterloss (cc)
0' - 1,215' <i>1260</i>	Fresh Water	8.4	29	N.C.
<i>1,215</i> - 3,100'	Brine	10	29	N.C.
3,100' - 13,880' (Lateral)	Cut Brine	8.8 - 9.2	29	N.C.

The necessary mud products for weight addition and fluid loss control will be on location at all times.

8. Auxiliary Well Control and Monitoring Equipment:

- a. A Kelly cock will be in the drill string at all times.
- b. A full opening drill pipe stabbing valve having the appropriate connections will be on the rig floor at all times.
- c. Hydrogen Sulfide detection equipment will be in operation after drilling out the 13 3/8" casing shoe until the 5 1/2" casing is cemented. Breathing equipment will be on location upon drilling the 13 3/8" shoe until total depth is reached.

9. Testing, Logging and Coring Program:

- a. Drill stem tests will be based on geological sample shows.
- b. If open hole electrical logging is preformed, the program will be:
 - i. Total Depth to Intermediate Casing: Dual Laterolog-Micro Laterolog and Gamma Ray. Compensated Neutron – Z Density log with Gamma Ray and Caliper.
 - ii. Total Depth to Surface: Compensated Neutron with Gamma Ray
 - iii. No coring program is planned
 - iv. Additional testing will be initiated subsequent to setting the 5 1/2" production casing. Specific intervals will be targeted based on log evaluation, geological sample shows and drill stem tests.

10. Potential Hazards:

- a. No abnormal pressures or temperatures are expected. There is no known presence of H2S in this area. If H2S is encountered the operator will comply with the provisions of Onshore Oil and Gas Order No. 6. All personnel will be familiar with all aspects of safe operation of equipment being used to drill this well. No H2S is anticipated to be encountered.

11. Anticipated starting date and Duration of Operations:

- a. Road and location construction will begin after the BLM has approved the APD. Anticipated spud date will be as possible after BLM approval and as soon as a rig will be available. Move in operations and drilling is expected to take 30 days.



COG Operating LLC

Lea County(NAD27)
Patterson B-52 Federal
#2H

OH

Plan: Plan #1

Standard Survey Report

19 July, 2012

PATHFINDER[®]
A Schlumberger Company



Schlumberger
Survey Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: Plan #1

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000 1 Single User local Db

Project	Lea County(NAD27)		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Patterson B-52 Federal		
Site Position:		Northing:	617,258 000 usft
From:	Map	Easting:	670,083 900 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	32.696
		Longitude:	-103.780
		Grid Convergence:	0.30 °

Well	#2H		
Well Position	+N/-S	0.0 usft	Northing:
	+E/-W	0.0 usft	Easting:
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32.696
		Longitude:	-103.780
		Ground Level:	3,674.0 usft

Wellbore	OH		
Magnetics	Model Name	Sample Date	Declination
			(°)
	IGRF200510	7/19/2012	7.57
			Dip Angle
			(°)
			60.59
			Field Strength
			(nT)
			48,806

Design:	Plan #1		
Audit Notes:			
Version:	Phase:	PLAN	Tie On Depth:
			0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction
			(°)
			269.22

Survey Tool Program	Date: 7/19/2012		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
0.0	13,880.1	Plan #1 (OH)	NS-GYRO-MS
			Description
			North sensing gyrocompassing m/s

Planned Survey									
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn
Depth	(°)	(°)	Depth	(usft)	(usft)	Section	Rate	Rate	Rate
(usft)			(usft)			(usft)	(°/100usft)	(°/100usft)	(°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00



Schlumberger

Survey Report



A Schlumberger Company

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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)
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	0.00
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	0.00
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	0.00
2,300.0	0.00	0.00	2,300.0	0.0	0.0	0.0	0.00	0.00	0.00
2,400.0	0.00	0.00	2,400.0	0.0	0.0	0.0	0.00	0.00	0.00
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.0	0.00	0.00	0.00
2,600.0	0.00	0.00	2,600.0	0.0	0.0	0.0	0.00	0.00	0.00
2,700.0	0.00	0.00	2,700.0	0.0	0.0	0.0	0.00	0.00	0.00
2,800.0	0.00	0.00	2,800.0	0.0	0.0	0.0	0.00	0.00	0.00
2,900.0	0.00	0.00	2,900.0	0.0	0.0	0.0	0.00	0.00	0.00
3,000.0	0.00	0.00	3,000.0	0.0	0.0	0.0	0.00	0.00	0.00
3,100.0	0.00	0.00	3,100.0	0.0	0.0	0.0	0.00	0.00	0.00
3,200.0	0.00	0.00	3,200.0	0.0	0.0	0.0	0.00	0.00	0.00
3,300.0	0.00	0.00	3,300.0	0.0	0.0	0.0	0.00	0.00	0.00
3,400.0	0.00	0.00	3,400.0	0.0	0.0	0.0	0.00	0.00	0.00
3,500.0	0.00	0.00	3,500.0	0.0	0.0	0.0	0.00	0.00	0.00
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.0	0.00	0.00	0.00
3,700.0	0.00	0.00	3,700.0	0.0	0.0	0.0	0.00	0.00	0.00
3,800.0	0.00	0.00	3,800.0	0.0	0.0	0.0	0.00	0.00	0.00
3,900.0	0.00	0.00	3,900.0	0.0	0.0	0.0	0.00	0.00	0.00
4,000.0	0.00	0.00	4,000.0	0.0	0.0	0.0	0.00	0.00	0.00
4,100.0	0.00	0.00	4,100.0	0.0	0.0	0.0	0.00	0.00	0.00
4,200.0	0.00	0.00	4,200.0	0.0	0.0	0.0	0.00	0.00	0.00
4,300.0	0.00	0.00	4,300.0	0.0	0.0	0.0	0.00	0.00	0.00
4,400.0	0.00	0.00	4,400.0	0.0	0.0	0.0	0.00	0.00	0.00
4,500.0	0.00	0.00	4,500.0	0.0	0.0	0.0	0.00	0.00	0.00
4,600.0	0.00	0.00	4,600.0	0.0	0.0	0.0	0.00	0.00	0.00
4,700.0	0.00	0.00	4,700.0	0.0	0.0	0.0	0.00	0.00	0.00
4,800.0	0.00	0.00	4,800.0	0.0	0.0	0.0	0.00	0.00	0.00
4,900.0	0.00	0.00	4,900.0	0.0	0.0	0.0	0.00	0.00	0.00
5,000.0	0.00	0.00	5,000.0	0.0	0.0	0.0	0.00	0.00	0.00
5,100.0	0.00	0.00	5,100.0	0.0	0.0	0.0	0.00	0.00	0.00
5,200.0	0.00	0.00	5,200.0	0.0	0.0	0.0	0.00	0.00	0.00
5,300.0	0.00	0.00	5,300.0	0.0	0.0	0.0	0.00	0.00	0.00



Schlumberger
Survey Report

PATHFINDER
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Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: Plan #1

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North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User local Db

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)	
5,400.0	0.00	0 00	5,400.0	0.0	0 0	0 0	0 00	0.00	0.00	
5,500.0	0.00	0.00	5,500.0	0.0	0.0	0.0	0.00	0.00	0.00	
5,600.0	0.00	0.00	5,600.0	0.0	0.0	0 0	0 00	0.00	0.00	
5,700.0	0.00	0.00	5,700.0	0.0	0.0	0 0	0.00	0.00	0 00	
5,800.0	0.00	0.00	5,800.0	0.0	0 0	0.0	0.00	0.00	0 00	
5,900.0	0.00	0.00	5,900.0	0 0	0.0	0 0	0.00	0.00	0.00	
6,000.0	0 00	0.00	6,000.0	0.0	0 0	0 0	0.00	0 00	0.00	
6,100.0	0.00	0 00	6,100.0	0 0	0 0	0 0	0 00	0.00	0 00	
6,200.0	0.00	0 00	6,200.0	0.0	0.0	0.0	0.00	0.00	0.00	
6,300.0	0.00	0.00	6,300.0	0.0	0.0	0.0	0.00	0.00	0.00	
6,400.0	0.00	0.00	6,400.0	0 0	0.0	0.0	0.00	0 00	0.00	
6,500.0	0.00	0.00	6,500.0	0.0	0.0	0 0	0 00	0 00	0.00	
6,600.0	0.00	0.00	6,600.0	0 0	0 0	0.0	0 00	0.00	0.00	
6,700.0	0.00	0.00	6,700.0	0.0	0.0	0 0	0 00	0.00	0.00	
6,800.0	0.00	0.00	6,800.0	0.0	0.0	0.0	0.00	0.00	0.00	
6,900.0	0.00	0 00	6,900.0	0 0	0.0	0.0	0.00	0 00	0.00	
7,000.0	0.00	0.00	7,000.0	0 0	0 0	0.0	0.00	0.00	0 00	
7,100.0	0.00	0.00	7,100.0	0 0	0 0	0.0	0.00	0.00	0.00	
7,200.0	0.00	0.00	7,200.0	0.0	0.0	0 0	0.00	0.00	0 00	
7,300.0	0.00	0.00	7,300.0	0 0	0 0	0.0	0.00	0.00	0 00	
7,400.0	0.00	0 00	7,400.0	0.0	0 0	0 0	0.00	0 00	0.00	
7,500.0	0.00	0.00	7,500.0	0 0	0.0	0.0	0.00	0.00	0.00	
7,600.0	0.00	0.00	7,600.0	0.0	0.0	0.0	0 00	0 00	0.00	
7,700.0	0.00	0.00	7,700.0	0.0	0.0	0 0	0.00	0 00	0 00	
7,800.0	0.00	0.00	7,800.0	0.0	0 0	0.0	0 00	0.00	0.00	
7,900.0	0.00	0.00	7,900.0	0.0	0.0	0.0	0.00	0.00	0.00	
8,000.0	0.00	0.00	8,000.0	0.0	0 0	0.0	0.00	0.00	0.00	
8,100.0	0.00	0 00	8,100.0	0.0	0.0	0.0	0 00	0.00	0.00	
8,200.0	0.00	0 00	8,200.0	0 0	0 0	0.0	0.00	0.00	0.00	
8,300.0	0.00	0.00	8,300.0	0.0	0.0	0.0	0.00	0 00	0 00	
8,400.0	0.00	0.00	8,400.0	0.0	0.0	0 0	0.00	0 00	0.00	
8,500.0	0.00	0 00	8,500.0	0 0	0.0	0.0	0.00	0 00	0.00	
8,600.0	0.00	0.00	8,600.0	0.0	0.0	0.0	0 00	0.00	0.00	
8,700.0	0.00	0.00	8,700.0	0.0	0.0	0 0	0.00	0.00	0.00	
8,800.0	0.00	0.00	8,800.0	0.0	0 0	0.0	0.00	0.00	0 00	
8,900.0	0.00	0.00	8,900.0	0.0	0.0	0.0	0 00	0.00	0.00	
8,982.8	0.00	0.00	8,982.8	0.0	0.0	0 0	0 00	0 00	0.00	
9,000.0	2.06	269.22	9,000.0	0.0	-0.3	0.3	12.00	12.00	0 00	
9,025.0	5.06	269.22	9,024.9	0.0	-1.9	1.9	12.00	12.00	0.00	
9,050.0	8.06	269.22	9,049.8	-0.1	-4.7	4.7	12.00	12.00	0.00	
9,075.0	11.06	269.22	9,074.4	-0.1	-8.9	8.9	12.00	12.00	0.00	
9,100.0	14.06	269.22	9,098.8	-0.2	-14.3	14.3	12.00	12.00	0.00	
9,125.0	17.06	269.22	9,122.9	-0.3	-21.0	21.0	12.00	12.00	0.00	



Schlumberger
Survey Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: Plan #1

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grd
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User local Db

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)
9,150.0	20.06	269.22	9,146.6	-0.4	-29.0	29.0	12.00	12.00	0.00
9,175.0	23.06	269.22	9,169.9	-0.5	-38.2	38.2	12.00	12.00	0.00
9,200.0	26.06	269.22	9,192.6	-0.7	-48.6	48.6	12.00	12.00	0.00
9,225.0	29.06	269.22	9,214.7	-0.8	-60.1	60.1	12.00	12.00	0.00
9,250.0	32.06	269.22	9,236.3	-1.0	-72.8	72.8	12.00	12.00	0.00
9,275.0	35.06	269.22	9,257.1	-1.2	-86.6	86.7	12.00	12.00	0.00
9,300.0	38.06	269.22	9,277.2	-1.4	-101.5	101.5	12.00	12.00	0.00
9,325.0	41.06	269.22	9,296.4	-1.6	-117.5	117.5	12.00	12.00	0.00
9,350.0	44.06	269.22	9,314.9	-1.8	-134.4	134.4	12.00	12.00	0.00
9,375.0	47.06	269.22	9,332.4	-2.1	-152.2	152.2	12.00	12.00	0.00
9,400.0	50.06	269.22	9,348.9	-2.3	-170.9	171.0	12.00	12.00	0.00
9,425.0	53.06	269.22	9,364.4	-2.6	-190.5	190.5	12.00	12.00	0.00
9,450.0	56.06	269.22	9,378.9	-2.9	-210.9	210.9	12.00	12.00	0.00
9,475.0	59.06	269.22	9,392.3	-3.2	-232.0	232.0	12.00	12.00	0.00
9,500.0	62.06	269.22	9,404.6	-3.5	-253.8	253.8	12.00	12.00	0.00
9,525.0	65.06	269.22	9,415.8	-3.8	-276.1	276.2	12.00	12.00	0.00
9,550.0	68.06	269.22	9,425.7	-4.1	-299.1	299.1	12.00	12.00	0.00
9,575.0	71.06	269.22	9,434.4	-4.4	-322.5	322.5	12.00	12.00	0.00
9,600.0	74.06	269.22	9,441.9	-4.7	-346.3	346.4	12.00	12.00	0.00
9,625.0	77.06	269.22	9,448.1	-5.1	-370.5	370.6	12.00	12.00	0.00
9,650.0	80.06	269.22	9,453.1	-5.4	-395.0	395.1	12.00	12.00	0.00
9,675.0	83.06	269.22	9,456.8	-5.7	-419.8	419.8	12.00	12.00	0.00
9,700.0	86.06	269.22	9,459.1	-6.1	-444.6	444.7	12.00	12.00	0.00
9,725.0	89.06	269.22	9,460.2	-6.4	-469.6	469.7	12.00	12.00	0.00
9,749.0	91.94	269.22	9,460.0	-6.7	-493.6	493.6	12.00	12.00	0.00
9,800.0	91.94	269.22	9,458.3	-7.4	-544.6	544.6	0.00	0.00	0.00
9,900.0	91.94	269.22	9,454.9	-8.8	-644.5	644.6	0.00	0.00	0.00
10,000.0	91.94	269.22	9,451.5	-10.2	-744.4	744.5	0.00	0.00	0.00
10,100.0	91.94	269.22	9,448.1	-11.5	-844.4	844.5	0.00	0.00	0.00
10,200.0	91.94	269.22	9,444.7	-12.9	-944.3	944.4	0.00	0.00	0.00
10,300.0	91.94	269.22	9,441.3	-14.3	-1,044.2	1,044.3	0.00	0.00	0.00
10,400.0	91.94	269.22	9,437.9	-15.6	-1,144.2	1,144.3	0.00	0.00	0.00
10,500.0	91.94	269.22	9,434.5	-17.0	-1,244.1	1,244.2	0.00	0.00	0.00
10,600.0	91.94	269.22	9,431.2	-18.3	-1,344.0	1,344.2	0.00	0.00	0.00
10,700.0	91.94	269.22	9,427.8	-19.7	-1,444.0	1,444.1	0.00	0.00	0.00
10,800.0	91.94	269.22	9,424.4	-21.1	-1,543.9	1,544.1	0.00	0.00	0.00
10,900.0	91.94	269.22	9,421.0	-22.4	-1,643.8	1,644.0	0.00	0.00	0.00
11,000.0	91.94	269.22	9,417.6	-23.8	-1,743.8	1,743.9	0.00	0.00	0.00
11,100.0	91.94	269.22	9,414.2	-25.2	-1,843.7	1,843.9	0.00	0.00	0.00
11,200.0	91.94	269.22	9,410.8	-26.5	-1,943.6	1,943.8	0.00	0.00	0.00
11,300.0	91.94	269.22	9,407.4	-27.9	-2,043.6	2,043.8	0.00	0.00	0.00
11,400.0	91.94	269.22	9,404.0	-29.3	-2,143.5	2,143.7	0.00	0.00	0.00
11,500.0	91.94	269.22	9,400.7	-30.6	-2,243.4	2,243.7	0.00	0.00	0.00



Schlumberger
Survey Report

PATHFINDER
A Schlumberger Company

Company: COG Operating LLC
Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Design: Plan #1

Local Co-ordinate Reference: Well #2H
TVD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
MD Reference: KB = 18' @ 3692.0usft (Original Well Elev)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: EDM 5000.1 Single User local Db

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)
11,600.0	91.94	269.22	9,397.3	-32.0	-2,343.4	2,343.6	0.00	0.00	0.00
11,700.0	91.94	269.22	9,393.9	-33.4	-2,443.3	2,443.5	0.00	0.00	0.00
11,800.0	91.94	269.22	9,390.5	-34.7	-2,543.2	2,543.5	0.00	0.00	0.00
11,900.0	91.94	269.22	9,387.1	-36.1	-2,643.2	2,643.4	0.00	0.00	0.00
12,000.0	91.94	269.22	9,383.7	-37.4	-2,743.1	2,743.4	0.00	0.00	0.00
12,100.0	91.94	269.22	9,380.3	-38.8	-2,843.0	2,843.3	0.00	0.00	0.00
12,200.0	91.94	269.22	9,376.9	-40.2	-2,943.0	2,943.3	0.00	0.00	0.00
12,300.0	91.94	269.22	9,373.6	-41.5	-3,042.9	3,043.2	0.00	0.00	0.00
12,400.0	91.94	269.22	9,370.2	-42.9	-3,142.8	3,143.1	0.00	0.00	0.00
12,500.0	91.94	269.22	9,366.8	-44.3	-3,242.8	3,243.1	0.00	0.00	0.00
12,600.0	91.94	269.22	9,363.4	-45.6	-3,342.7	3,343.0	0.00	0.00	0.00
12,700.0	91.94	269.22	9,360.0	-47.0	-3,442.6	3,443.0	0.00	0.00	0.00
12,800.0	91.94	269.22	9,356.6	-48.4	-3,542.6	3,542.9	0.00	0.00	0.00
12,900.0	91.94	269.22	9,353.2	-49.7	-3,642.5	3,642.9	0.00	0.00	0.00
13,000.0	91.94	269.22	9,349.8	-51.1	-3,742.4	3,742.8	0.00	0.00	0.00
13,100.0	91.94	269.22	9,346.4	-52.5	-3,842.4	3,842.7	0.00	0.00	0.00
13,200.0	91.94	269.22	9,343.1	-53.8	-3,942.3	3,942.7	0.00	0.00	0.00
13,300.0	91.94	269.22	9,339.7	-55.2	-4,042.2	4,042.6	0.00	0.00	0.00
13,400.0	91.94	269.22	9,336.3	-56.5	-4,142.2	4,142.6	0.00	0.00	0.00
13,500.0	91.94	269.22	9,332.9	-57.9	-4,242.1	4,242.5	0.00	0.00	0.00
13,600.0	91.94	269.22	9,329.5	-59.3	-4,342.0	4,342.5	0.00	0.00	0.00
13,700.0	91.94	269.22	9,326.1	-60.6	-4,442.0	4,442.4	0.00	0.00	0.00
13,800.0	91.94	269.22	9,322.7	-62.0	-4,541.9	4,542.3	0.00	0.00	0.00
13,880.4	91.94	269.22	9,320.0	-63.1	-4,622.3	4,622.7	0.00	0.00	0.00

Design Targets

Target Name hit/miss target Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL (Patterson B-52 # - plan hits target center - Point	0.00	0.00	9,320.0	-63.1	-4,622.3	617,194.900	665,461.600	32.696	-103.795

Checked By: _____ Approved By: _____ Date: _____



Project: Lea County(NAD27)
Site: Patterson B-52 Federal
Well: #2H
Wellbore: OH
Plan: Plan #1 (#2H/OH)



Azimuths to Grid North
True North: -0.30°
Magnetic North: 7.27°

Magnetic Field
Strength: 48806.0snT
Dip Angle: 60.59°
Date: 7/19/2012
Model: IGRF200510



A Schlumberger Company

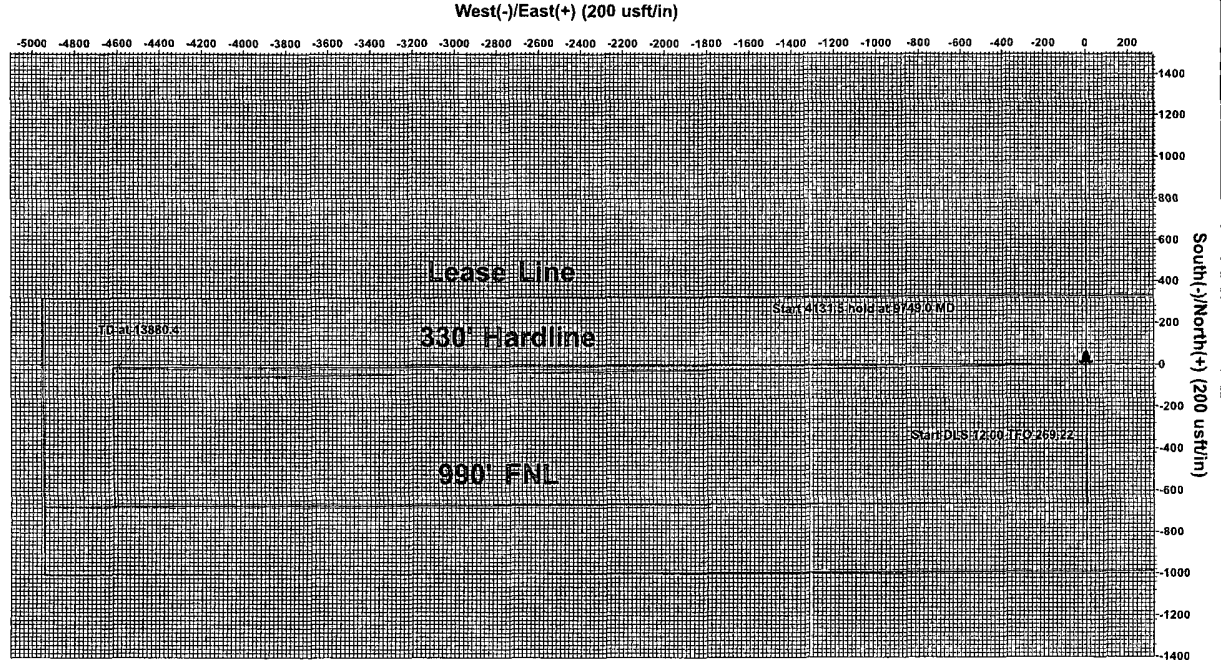
WELL DETAILS: #2H

Ground Elevation: 3574.0
RKB Elevation KB = 16' @ 3692.0usft (Original Well Elev)
Rug Name Original Well Elev

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Spot
0.0	0.0	617258.000	670083.900	32.696	-103.780	

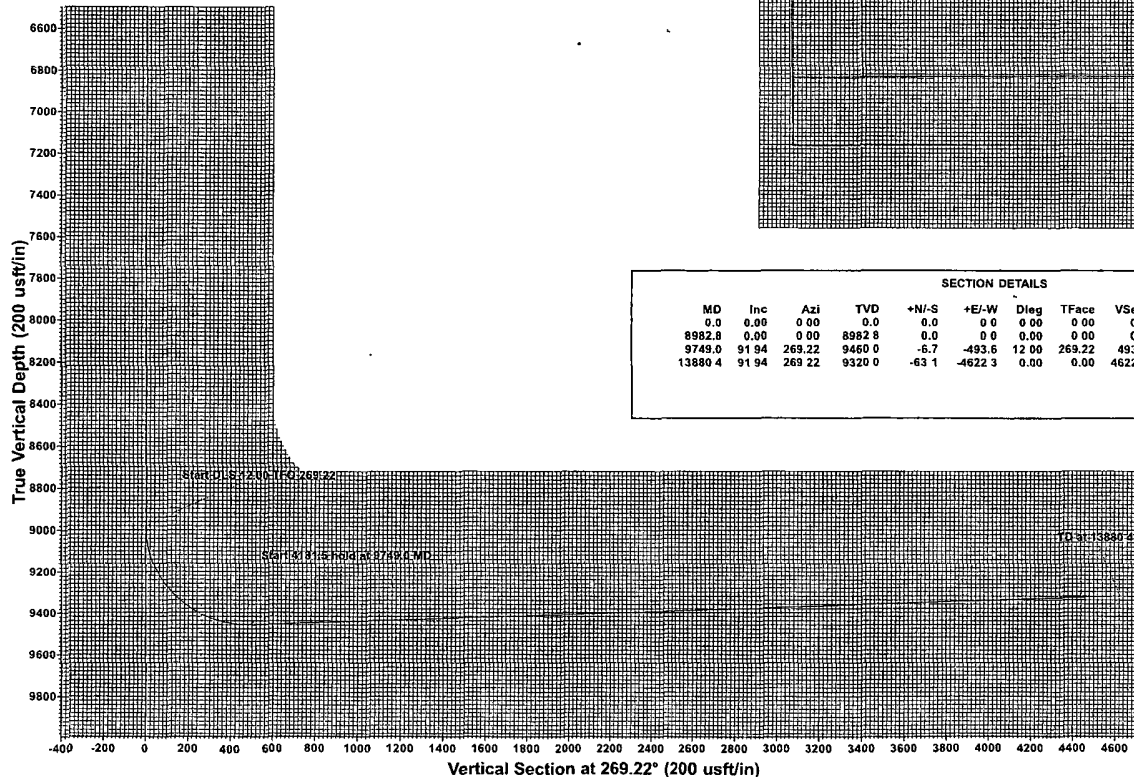
WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	+N/-S	+E/-W	Northing	Easting	Shape
PBHL (Patterson B-52 #2H)	9320.0	-63.1	-4622.3	617194.900	665461.600	Point



SECTION DETAILS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSecl	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
8982.8	0.00	0.00	8982.8	0.0	0.0	0.00	0.00	0.0	
9749.0	91.94	269.22	9460.0	-6.7	-493.6	12.00	269.22	493.6	
13880.4	91.94	269.22	9320.0	-63.1	-4622.3	0.00	0.00	4622.7	PBHL (Patterson B-52 #2H)



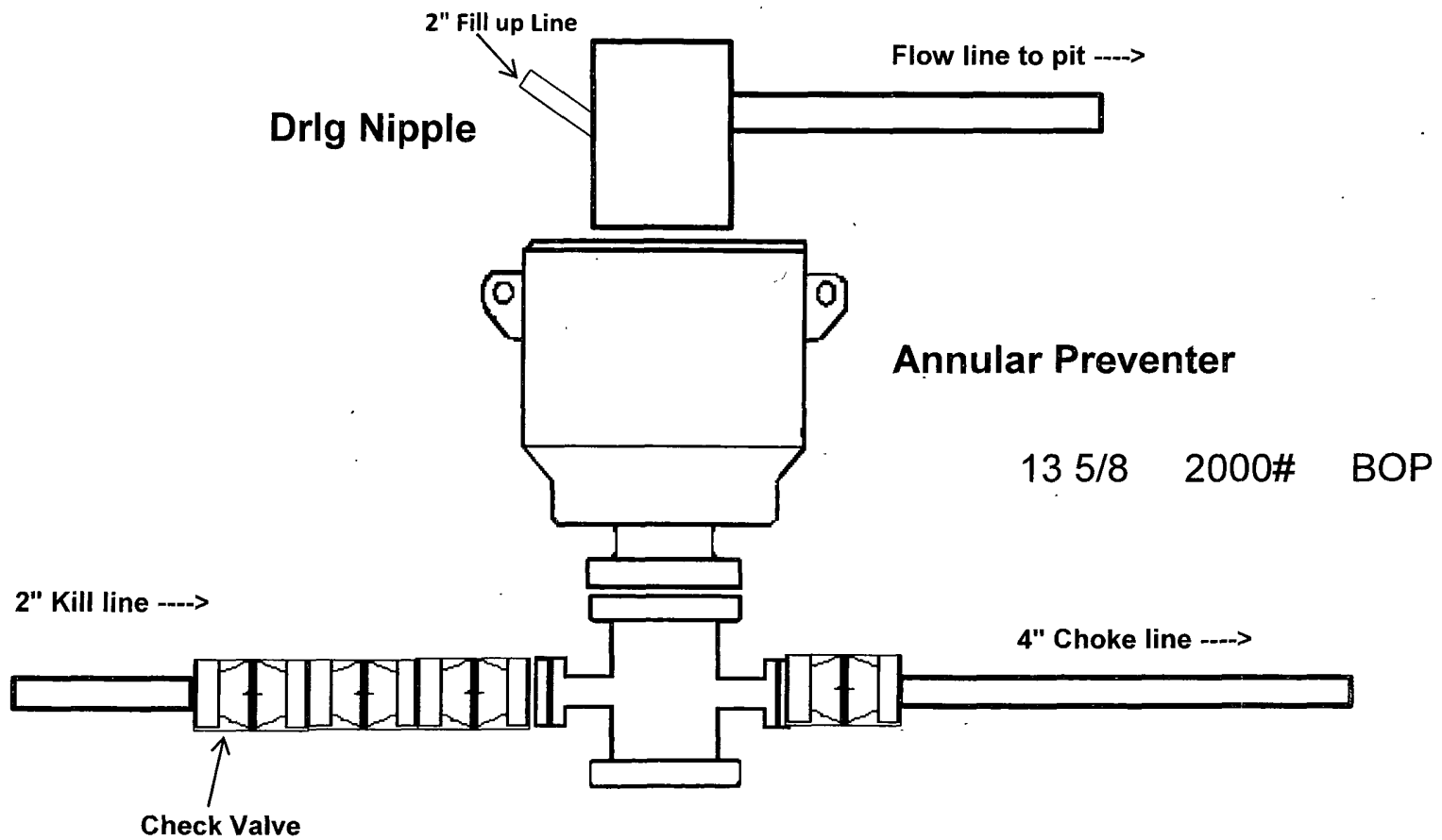
PROJECT DETAILS: Lea County(NAD27)
Geodetic System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone: New Mexico East 3001
System Datum: Mean Sea Level
Local North: Grid

Plan: Plan #1 (#2H/OH)

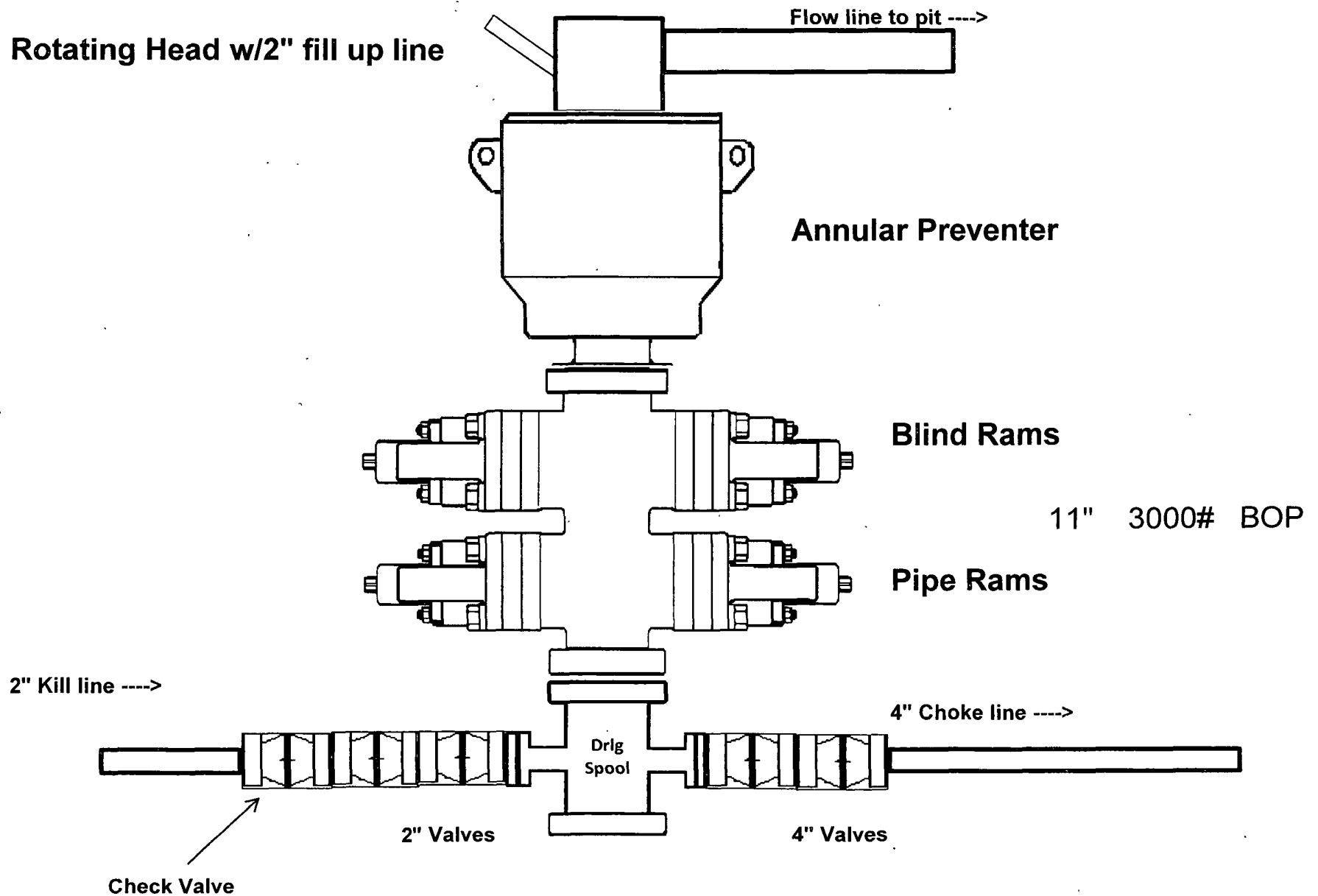
Created By: Michael Trout Date: 16.43, July 19 2012
Checked: _____ Date: _____

COG Operating LLC
Lea County(NAD27)
Patterson B-52 Federal
Well: #2H
Original Well Elev
Spot
Plan #1

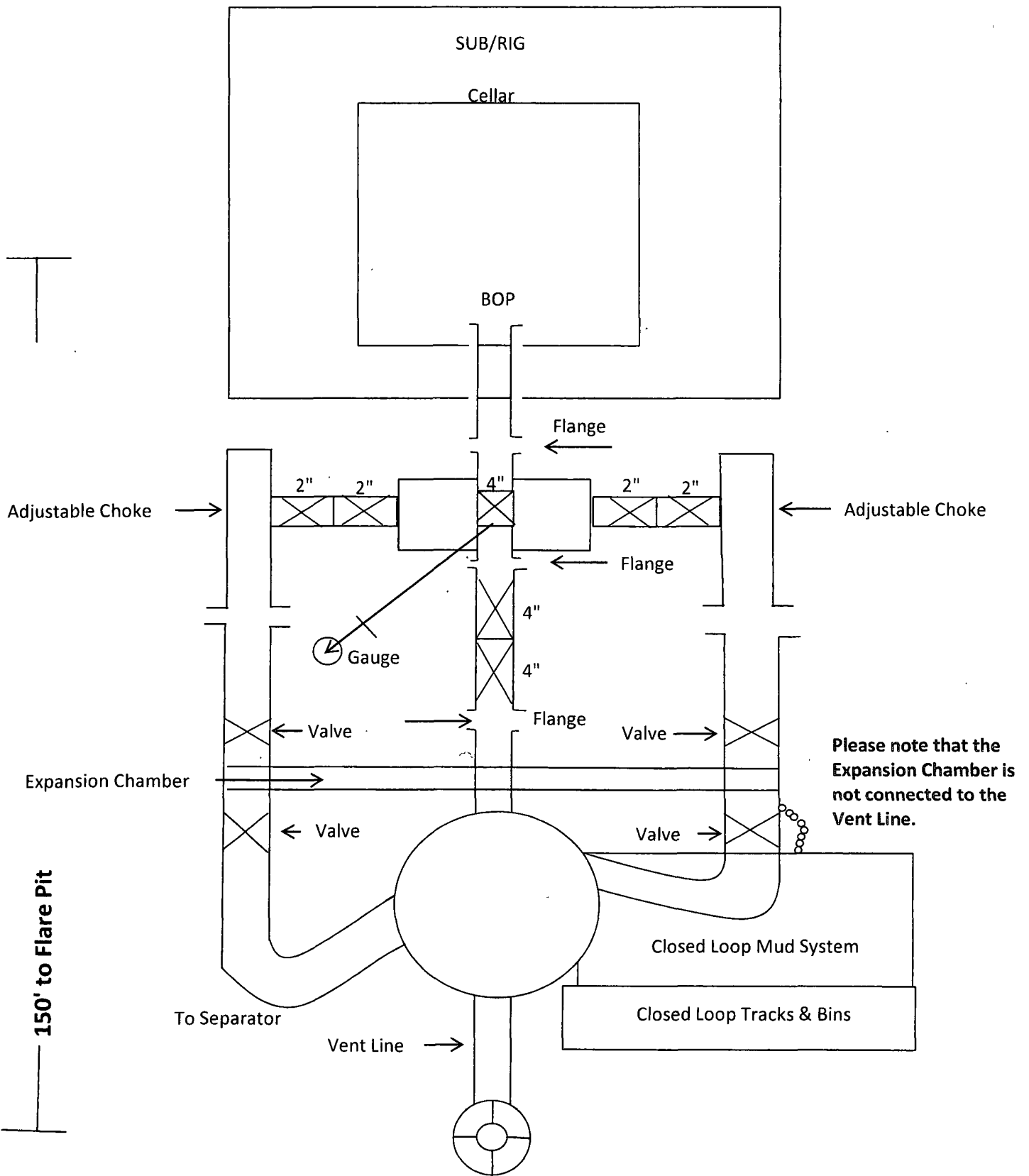
2,000 psi BOP Schematic



3,000 psi BOP Schematic



2M Choke Manifold Equipment



3M Choke Manifold Equipment

