

SECRETARY'S POTASH

OCD Hobbs

FORM APPROVED
OMB No. 1004-0137
Expires October 31, 2014

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

HOBBS OCD

APPLICATION FOR PERMIT TO DRILL OR REENTER

SEP 22 2014

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. (40118) Nightcap 6 Federal #2H	
2. Name of Operator COG Operating LLC. (229137)		9. API Well No. 70-025-42134	
3a. Address 2208 West Main Street Artesia, NM 88210	3b. Phone No. (include area code) 575-748-6940	10. Field and Pool, or Exploratory (41460) Lusk; Bone Spring, South	
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface 1680' FSL & 660' FEL Unit Letter I (NESE) SHL Sec. 31-T19S - R32E At proposed prod. Zone 330' FSL & 2310' FEL Unit Letter O (SWSE) BHL Sec. 6 - T20S - R32E		11. Sec., T.R.M. or Blk and Survey or Area Sec. 31- T19S - R32E	
14. Distance in miles and direction from nearest town or post office* About 14 miles from Loco Hills		12. County or Parish Lea County	13. State NM
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. Unit line, if any) 330'	16. No. of acres in lease SHL: 281.03 BHL: 636.47	17. Spacing Unit dedicated to this well 159.94	
18. Distance from location* to nearest well, drilling, completed, applied for, on this lease, ft. SHL: 300' BHL: 3763'	19. Proposed Depth TVD: 9450' MD: 15,845'	20. BLM/BIA Bond No. on file NMB000740 & NMB000215	
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3523.7 GL	22. Approximate date work will start* 7/1/2014	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:

- | | |
|---|--|
| 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 shall be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be required by the authorized officer. |

25. Signature Mayte Reyes	Name (Printed/Typed) Mayte Reyes	Date 4/24/2014
Title Regulatory Analyst		
Approved by (Signature) Steve Caffey	Name (Printed/Typed)	Date SEP 16 2014
Title FIELD MANAGER	Office CARLSBAD FIELD OFFICE	

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.

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)

Capitan Controlled Water Basin

Approval Subject to General Requirements
& Special Stipulations Attached

SEE ATTACHED FOR
CONDITIONS OF APPROVAL

*(Instructions on page 2)

Surface Use Plan
COG Operating LLC
Nightcap 6 Federal #2H
SHL: 1680' FSL & 660' FEL UL I
Section 31, T19S, R32E
BHL: 330' FSL & 2310' FEL UL O
Section 6, T20S, R32E
Lea County, New Mexico

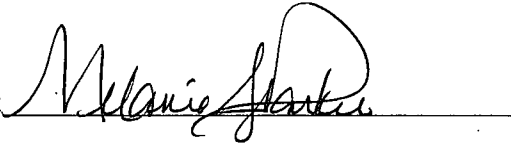
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SEP 22 2014

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OPERATOR CERTIFICATION

I hereby certify that I, or persons under my direct supervision, have inspected the drill site and access road proposed herein; that I am familiar with the conditions that presently 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 COG Operating LLC, 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. Executed this 24th day of April, 2014.

Signed: 

Printed Name: Melanie J. Parker

Position: Regulatory Coordinator

Address: 2208 W. Main Street, Artesia, NM 88210

Telephone: (575) 748-6940

Field Representative (if not above signatory): Rand French

E-mail: mparker@concho.com

ATTACHMENT TO FORM 3160-3
COG Operating, LLC
NIGHTCAP 6 FEDERAL #2H
SHL: 1680' FSL & 660' FEL, UNIT I
Sec 31 T19S R32E
BHL: 330' FSL & 2310' FEL, Unit O
Sec 6, T20S, R32E
Lea County, NM

HOBBS OCD

SEP 22 2014

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1. Proration Unit Spacing: 159.94 Acres

2. Ground Elevation: 3523.7'

3. Proposed Depths: Horizontal:

KOP (Kick off Point) TVD=8556' MD=8556'

EOC (end of curve) TVD=9071' MD=9300'

Toe (end of lateral) TVD=9450' MD= 15845'

4. Estimated tops of geological markers:

Fresh Water	223'
Rustler	845'
Top of Salt	936'
BOS/Top of Tansil	2477'
Yates	2587'
Seven Rivers	2754'
Capitan Reef	2867'
BOR/ CYCN	4347'
Brushy Canyon	5623'
Bone Spring	7303'
1 st Bone Spring Sd.	8482'
2 nd Bone Spring Sd.	9183'
3 rd Bone Spring Sd.	10031'
Wolfcamp	10440'

5. Possible mineral bearing formations:

Yates	2587'	Oil/Gas
Seven Rivers	2754'	Oil/Gas
Capitan Reef	2867'	Brackish Water
BOR/ CYCN	4347'	Oil/Gas
Brushy Canyon	5623'	Oil/Gas
Bone Spring	7303'	Oil/Gas
1 st Bone Spring Sd.	8482'	Oil/Gas
2 nd Bone Spring Sd.	9183'	Oil/Gas
3 rd Bone Spring Sd.	10031'	Oil/Gas
Wolfcamp	10440'	Oil/Gas

No other formations are expected to give up oil, gas or fresh water in measurable quantities. Setting 20" casing at ~~870'~~ ^{2750'} (25' into Rustler) and circulating cement back to the surface will protect the surface fresh water sand. The Salt Section will be isolated and protected by setting 13 3/8" casing at ~~2497'~~ ^{925'} (20' into Tansil) and circulating cement back to surface in a single stage job. The Capitan Reef will be isolated and protected by setting 9 5/8" casing at 4350' (13' into Cherry Canyon) and circulating cement back to surface in a single stage job.. Any shallower zones above TD, which contain commercial quantities of oil and/or gas, will have cement circulated across them as described in the following paragraph.

ATTACHMENT TO FORM 3160-3
COG Operating, LLC
NIGHTCAP 6 FEDERAL #2H
Page 2 of 6

A 8 3/4" open hole will be drilled from 9 5/8" casing shoe to TD. 5 1/2" production casing will be installed. This casing string will be cemented from the TD to surface in single stage job. If wellbore conditions arise that require immediate action and/or a change to this program, COG Operating LLC personnel will always react to protect the wellbore and/or environment.

6. Proposed Mud System

The well will be drilled to TD with a combination of fresh water, brine, cut brine mud systems. The applicable depths and properties of these systems are as follows:

See COA

DEPTH (MD)	TYPE	WEIGHT	VISCOSITY	WATERLOSS
0-870' 925' ^{2750'}	Fresh Water	8.3-8.8	28-40	N.C.
870'-2497'	Brine	9.8-10.1	28-32	N.C.
2497'-4350'	Fresh Water	8.3-8.7	28-32	N.C.
4350'-8555'	FW/CutBrine mud	8.3-9.2	28-32	N.C.
8555'-15845'	Cut Brine mud	8.5-9.2	30-35	N.C.

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

Visual or electronic mud monitoring equipment shall be in place to detect volume changes indicating loss or gain of circulating fluid volume.

The mud program has been designed to minimize the volume of H₂S circulated to surface. Proper mud weights, safe drilling practices and the use of H₂S scavengers will minimize hazards when penetrating H₂S bearing zones.

6. Proposed Casing Program

See COA

Hole Size	Interval MD	OD Casing	Weight	Grade	Condition	Jt.	brst/clps/ten
26"	0-870' 925' ^{2750'}	20" 0-870'	94#	J55	New	ST&C	2.43/1.35/11.00
17 1/2"	870'-2497' 2750'	13 3/8" 0-2497'	61#	J55	New	ST&C	1.24/1.19/4.61
12 1/4"	2497'-4350'	9 5/8" 0-4350'	40#	J55	New	LT&C	2.14/1.29/3.45
8 3/4"	4350'-15845'	5 1/2" 0-15845'	17#	P110	New	LT&C	1.33/1.65/3.22



NIGHTCAP 6 FEDERAL #1H, 2H & 4H

Melanie Parker <MParker@concho.com>
To: "Mason, Jennifer" <jamason@blm.gov>
Cc: Mayte Reyes <mreyes1@concho.com>

Tue, Sep 16, 2014 at 7:50 AM

Jennifer,

The revised 20" Surface Casing Cement Program for the Nightcap 6 Federal #1H, 2H and 4H is:

Lead: 1100 sx Class "C" w/2% CC + 4% Gel, 1.75 cf/sx, 13.5 ppg, 9.2 gal/sx

Tail: 500 sx Class "C" w/2% CaCl₂, 1.32 cf/sx, 14.8 ppg, 6.3 gal/sx

If you need anything more, please let me know.

Thank you!!

Melanie

575-748-6952 (direct)

From: Mason, Jennifer [mailto:jamason@blm.gov]
Sent: Tuesday, September 16, 2014 7:10 AM
To: Melanie Parker
Subject:

Did you ever find out the cement on the 20" casing for the nightcaps 1H, 2H, and 4H?

—

Thank you,

Jennifer Mason

Bureau of Land Management

FID	OPERATOR	WELL_NAME	LATITUDE	LONGITUDE	TOWNSHIP	RANGE	SECTION	FTG_NS	NS_CD	FTG_EW	EW_CD	TVD_DEPTH	COMPL_STAT
0	CIMAREX ENERGY CO. OF COLORADO	SOUTHERN CALIFORNIA 29 FEDERAL 015	32.62522	-103.795838	19.0S	32E	29	375 S		330 W		9321	New (Not drilled or compl)
1	COG OPERATING LLC	WILD CAP STATE COM 001	32.615161	-103.816218	19.0S	31E	36	1980 S		660 E		12941	Active
2	TEXACO EXPLORATION & PRODUCTION INC	BOWMAN FEDERAL 001	32.625078	-103.789376	19.0S	32E	29	330 S		2310 W		2770	Plugged
3	ARGO ROYALTY CO	BURNER 001	32.607557	-103.800198	20.0S	32E	6	750 N		990 E		2925	Plugged
4	ENDURANCE RESOURCES LLC	POLEWSKI FEDERAL 001	32.62242	-103.811938	19.0S	32E	31	660 N		660 W		12976	Active
5	COG OPERATING LLC	FEDERAL USA J 001	32.626921	-103.799071	19.0S	32E	30	990 S		660 E		11296	Active
6	ATLANTIC REFINING	LUSK FEDERAL 001	32.607802	-103.786213	20.0S	32E	5	660 N		1980 E		2689	Plugged
7	MARBOB ENERGY CORP	NEW MEXICO CR STATE 001	32.622372	-103.794767	19.0S	32E	32	660 N		660 W		11495	Plugged
8	COG OPERATING LLC	FEDERAL USA I 001	32.622385	-103.799074	19.0S	32E	31	660 N		660 E		11385	Active
9	COG OPERATING LLC	STRING BEAN FEDERAL COM 002	32.615055	-103.799099	19.0S	32E	31	1980 S		660 E		12911	Active
10	MARBOB ENERGY CORP	NEW MEXICO CR STATE 002	32.612053	-103.78261	19.0S	32E	32	885 S		885 E		11500	Plugged
11	COG OPERATING LLC	NEW MEXICO CR STATE 003	32.615046	-103.794791	19.0S	32E	32	1980 S		660 W		11500	Active
12	CIMAREX ENERGY CO. OF COLORADO	TEXACO CITIES SERVICE STATE COM 001	32.618719	-103.786166	19.0S	32E	32	1980 N		1980 E		13300	Active
13	SIETE OIL & GAS CORP	KACHINA FEDERAL 001	32.604258	-103.811898	20.0S	32E	6	1980 N		660 W		7460	Plugged
14	CIMAREX ENERGY CO. OF COLORADO	LUSK WEST DELAWARE UNIT 913	32.626908	-103.794763	19.0S	32E	29	990 S		660 W		7200	Active
15	MATADOR OPERATING CO	FORAN NF STATE 001	32.623255	-103.786152	19.0S	32E	32	330 N		1980 E		6588	Plugged
16	TEXACO EXPLORATION & PRODUCTION INC	NEW MEXICO CR STATE 004	32.62327	-103.791494	19.0S	32E	32	330 N		1662 W		6863	Plugged
17	CIMAREX ENERGY CO. OF COLORADO	LUSK WEST DELAWARE UNIT 914	32.626898	-103.791502	19.0S	32E	29	990 S		1659 W		6850	Plugged
18	TEXACO EXPLORATION & PRODUCTION INC	NEW MEXICO CR STATE 005	32.615054	-103.789406	19.0S	32E	32	1980 S		2310 W		3023	Plugged
19	ASPEN OIL INC	PRINCESS D 002	32.619691	-103.808697	19.0S	32E	31	1650 N		1650 W		7150	Plugged
20	COG OPERATING LLC	FEDERAL USA J 002	32.626011	-103.798173	19.0S	32E	30	660 S		385 E		7229	Active
21	TEXACO EXPLORATION & PRODUCTION INC	FEDERAL USA J 005	32.625117	-103.80231	19.0S	32E	30	330 S		1653 E		7300	Plugged
22	TRITEX RESOURCES, L.L.C.	POLEWSKI FEDERAL 002	32.621505	-103.808678	19.0S	32E	31	990 N		1658 W		7303	Plugged
23	APACHE CORP	TRES ELO FEDERAL COM 001	32.621482	-103.800154	19.0S	32E	31	990 N		990 E		12550	Active
24	COG OPERATING LLC	MAGNUM PRONTO STATE COM 001	32.621462	-103.793693	19.0S	32E	32	990 N		990 W		12700	Active
25	COG OPERATING LLC	CAP FEDERAL 001	32.607847	-103.807194	20.0S	32E	6	660 N		2100 W		12960	Active
26	COG OPERATING LLC	STRING BEAN FEDERAL COM 001	32.611515	-103.811896	19.0S	32E	31	660 S		660 W		12949	Active
27	COG OPERATING LLC	GEORGE FEDERAL COM 001	32.606897	-103.784495	20.0S	32E	5	990 N		1450 E		13010	Active
28	COG OPERATING LLC	GEORGE FEDERAL COM 002	32.608042	-103.79142	20.0S	32E	5	570 N		1700 W		13120	Active
29	COG OPERATING LLC	MAGNUM PRONTO STATE 003	32.623267	-103.790456	19.0S	32E	32	330 N		1980 W		11044	New (Not drilled or compl)
30	COG OPERATING LLC	MAGNUM PRONTO STATE 002	32.615052	-103.790483	19.0S	32E	32	1980 S		1980 W		12945	Active
31	COG OPERATING LLC	LIZARD POT FEDERAL 004H	32.614254	-103.816508	19.0S	31E	36	1650 S		750 E		9428	New (Not drilled or compl)
32	COG OPERATING LLC	DIRTY DOZEN FEDERAL COM 004H	32.614254	-103.816214	19.0S	31E	36	1650 S		660 E		9388	New (Not drilled or compl)
33	COG OPERATING LLC	MAGNUM PRONTO STATE COM 005H	32.610521	-103.787101	19.0S	32E	32	330 S		2260 E		13755	New (Not drilled or compl)
34	COG OPERATING LLC	DIRTY DOZEN FEDERAL COM 003H	32.614694	-103.816412	19.0S	31E	36	1810 S		720 E		9409	New (Not drilled or compl)
35	CIMAREX ENERGY CO. OF COLORADO	SOUTH LUSK 32 STATE COM 002	32.623258	-103.787228	19.0S	32E	32	330 N		2310 E		0	New (Not drilled or compl)
36	COG OPERATING LLC	SL EAST 30 FEDERAL COM 001H	32.625117	-103.802366	19.0S	32E	30	330 S		1670 E		13540	New (Not drilled or compl)

Nightcap 6 Federal #2H

ATTACHMENT TO FORM 3160-3
COG Operating, LLC
NIGHTCAP 6 FEDERAL #2H
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7. Proposed Cement Program

20" SURFACE: (Circulate to Surface)

	<u>Description</u>	<u>Yield</u>	<u>Density</u>	<u>Water Requirements</u>
Lead: 1100 sks		1.75		
Tail: 0'-870' 375 sks	Class "C" w/2% CaCl ₂	1.32 cf/sk	14.8 ppg	6.3 gal/sk.
Excess 104% tail 500'				

13 3/8" INTERMEDIATE: (Circulate to Surface)

Lead:				
0'-2000' 1250 sks	Class "C" + 4% Gel +	1.75 cf/sk	13.5 ppg	9.2 gal/sk.
Excess 31%	2% CaCl ₂ + 0.25 ppsCF			
Tail: 350 sks	Class C w/2% CaCl ₂	1.32 cf/sk	14.8 ppg	6.3 gal/sk.
2000'-2497'				
Excess 24%				

Combined Excess 30%

2800' See COA

9 5/8" INTERMEDIATE: (DV Tool @ 2767' — 100' above T/Capitan Reef)

Multi-Stage: (Cement circulated to surface)

	<u>Description</u>	<u>Yield</u>	<u>Density</u>	<u>Water Requirement</u>
1st Stage:				
Lead: 350 sks	Class "C" w/ 4% Gel	1.75 cf/sk	13.5 ppg	9.2 gal/sk.
2767-3750'	+ 2% CaCl ₂			
Excess 100%				
Tail: 250 sks	Class "C" w/1% CaCl ₂	1.35 cf/sk	14.8 ppg	6.3 gal/sk.
3750'-4350'				
Excess 65%				
DV Tool @ 2767'				
2nd Stage:				
Lead: 600 sks	Class "C" w/ 4% Gel	1.75 cf/sk	13.5 ppg	9.2 gal/sk.
0'-2497'	+ 2% CaCl ₂			
Excess 12%				

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Tail: 150 sks Class C w/2% CaCl₂ 1.35 cf/sk 14.8 ppg 6.3 gal/sk.
2497'-2767'
Excess 139%

Combined Excess 1st & 2nd stage 56%

5 1/2" PRODUCTION CASING:

*Secretary's Potash 500' tie back
* Capitan Reef - 50' above Capitan Reef - 2850' **

Single Stage: (Cement cal to surface) (Minimum tie-back ~~200'~~ above ~~9 5/8"~~ casing shoe)

1st Lead: 1200 sks EconoCem-H+ 2.51 cf/sk 11.9 ppg 14.2 gal/sk.
0'-8555' 0.5% Halad-322+
Excess 37% 5 pps Kol-Seal+
0.25 pps D-Air 5000+
0.2% HR-601

Tail: 1750 sks VersaCem+0.4% GasStop 1.24 cf/sk 14.4 ppg 5.7 gal/sk.
8555'-15845' +0.3% CFR-3+1% Salt+
Excess 18% 0.1% HR-601

Combined Lead & Tail Excess: 28%

8. Pressure Control Equipment:

A 20" X 2000 psi annular BOP will be installed on the 20" casing with mud cross, choke manifold, chokes, kill line, Kelly cock, safety valve and subs to fit all drill strings in use. (see attached BOPE drawings). This equipment will be nipped up on the 20" casing head and used to TD of 17 1/2" hole. This unit will be hydraulically operated and will be hydrostatically tested by independent tester using test plug to 250/300 psig low and 1000 psig. high. Choke line valve, chokes, upper Kelly cock valve, safety valve shall be tested to 2000 psig. by independent tester..

After setting the 13 3/8" casing, the 20" X 2000 psi Hydril type annular preventer with mud cross, choke manifold, chokes will be rigged up again. Kill line, Kelly cock, safety valve and subs to fit all drill strings in use will be on location. (see attached BOPE drawings). Hydril and associated equipment will be tested using test plug to 250/300 psig low and 1000 psig high independent tester using test plug. Choke line valve, chokes, upper Kelly cock valve, safety valve shall be tested to 2000 psig. by independent tester..

After setting 9 5/8" casing a 13 3/8" X 5000 psi annular and 13 5/8" X 5000 psi double ram BOPs will be rigged up and used to TD. This double ram BOP will be hydraulically operated and will be tested by independent tester using test plug to 250 psig/300 psig low and 3000 psig high. Annular preventer will be hydraulically operated and will be tested to 250 psig/300 psig low and 1500 psig. high. Choke line valve, chokes, upper Kelly cock valve, safety valve shall also be tested to 250 psig/300 psig low and 3000 psig high by independent tester.

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Note: as per Onshore Order #2 D.1 if an operator chooses to use higher rated equipment than that authorized in the Application for Permit to Drill (APD), testing procedures shall apply to the approved working pressures, not the upgraded higher working pressures" therefore test pressures of 3000 psig for dual rams & 1500 psig for annular will be followed.

All casing strings below the conductor shall be pressure tested to 0.22 psi per foot of casing string length or 1500 psig, whichever is greater, but not to exceed 70 percent of casing's minimum internal yield. If pressure declines more than 10 percent in 30 minutes, corrective action will be taken.

9. Production Hole Drilling Summary:

Drill 8¾" hole to 8555'. Kick off at +/- 8555', building curve at 11°/100' to 82.00° inclination, 210.25° az at 9300' MD/9071' TVD. Continue this inclination and azimuth to 11230' MD/9339' TVD. Resume building angle at 4°/100' to 89.17° inclination at 11918' MD/9393' TVD. Continue this inclination and azimuth to 15845' MD/9450' TVD. Run 5-1/2" production casing. 5 ½" to be run from surface thru kickoff point, curve and lateral to TD. 5 ½" casing will be isolated by a single stage cement job. Cement volume will be calculated to surface. Minimum tie-back is 200' above 9 5/8" casing shoe.

10. Auxiliary Well Control and Monitoring Equipment

- A. Kelly cock will be kept in the drill string at all times.
- B. A full opening drill pipe-stabbing valve with proper drill pipe connections will be on the rig floor at all times.

11. Logging, Testing and Coring Program:

- A. Cased hole GR/CNL logs will be run in the vertical portion of the hole.
- B. The mud logging program will consist of lagged 10' samples from 9 5/8" casing shoe to TD in Horizontal hole.
- C. Drill Stem testing is not anticipated.
- D. No conventional coring is anticipated.
- E. Further testing procedures will be determined after the 5 ½" production casing has been cemented at TD based on drill shows and log evaluation.

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COG Operating, LLC
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12. Abnormal Conditions, Pressures, Temperatures and Potential Hazards:

Spec COA

No abnormal pressures or temperatures are anticipated. The estimated bottom hole temperature at TD is 112° Fahrenheit and estimated maximum bottom hole pressure is 4063 psi. Wells in this area will penetrate formations that are known or could reasonably be expected to contain Hydrogen Sulfide. Therefore, a H₂S drilling operations plan is included with this APD. Hydrogen sulfide detection equipment will be operational and breathing equipment will be on location after drilling out the 20" casing shoe and until the 5 ½" casing is cemented. If while drilling the 17 ½" or 12 ¼" intermediate hole sections H₂S concentrations exceed 100 ppm the well will be shut-in and a remote operated choke installed. A remote operated choke will be installed as part of the 5000 psi BOP equipment rigged up after setting 9 5/8" casing and before drilling the 9 5/8" casing shoe. COG will comply with Onshore Order #6. All BOPE testing companies used by COG have H₂S certified employees and will work on H₂S locations. No major loss circulation zones have been reported in offsetting wells.

13. Anticipated Starting Date

Drilling operations will commence approximately on July 31, 2014 with drilling and completion operations lasting approximately 90 days.

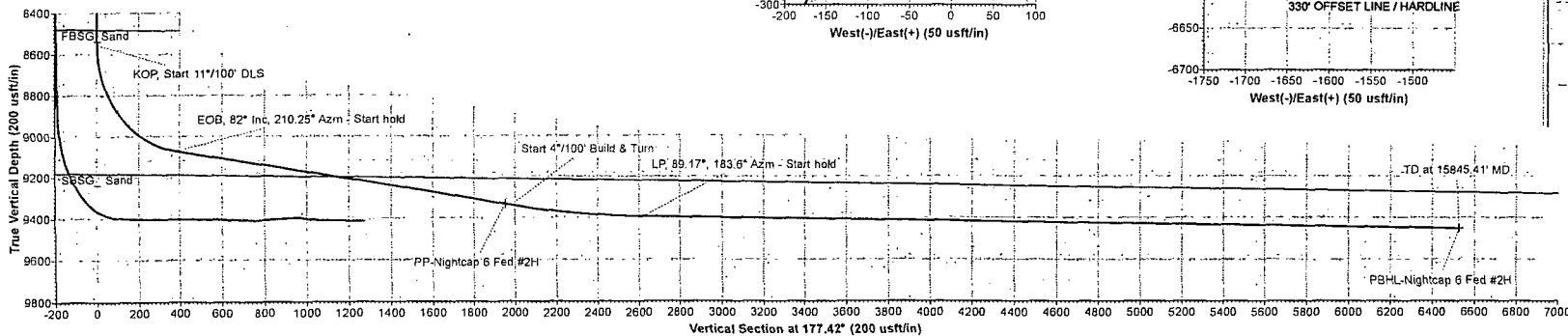
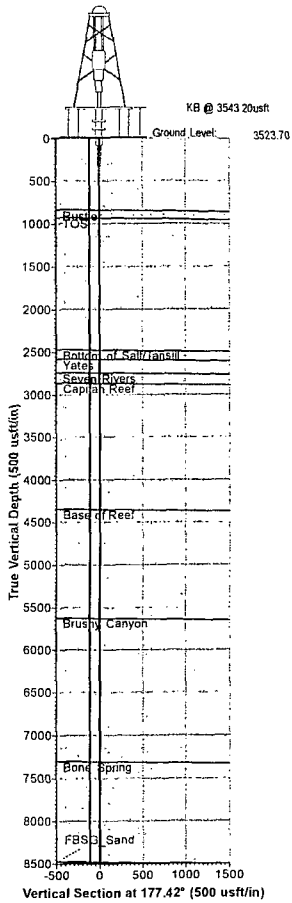
GEG 5.29.14



Project: Lea County, NM (NAD27 NME)
Site: Nightcap 6 Federal
Well: #2H
Wellbore: WB1
Design: Plan #3 02-23-14



Azimuths to Grid North
True North: -0.29°
Magnetic North: 7.08°
Magnetic Field
Strength: 48543.7nT
Dip Angle: 60.44°
Date: 2014/04/09
Model: IGRF2010_14

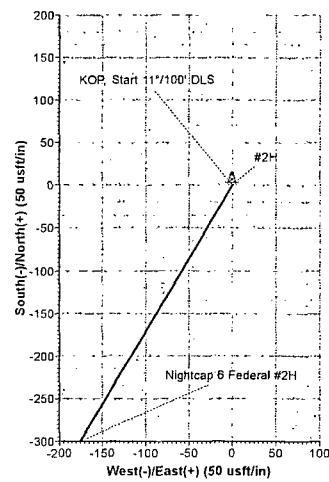


WELL DETAILS						
		Ground Level:		3523.70		
+N-S	+E-W	Northing	Easting	Latitude	Longitude	
0.00	0.00	587536.00	664634.40	32° 36' 50.78898 N	103° 47' 55.15652 W	

SECTION DETAILS									
Sec	MD	Inc	Azi	TVD	+N-S	+E-W	Dleg	TFace	Vsect
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	8555.00	0.00	0.00	8555.00	0.00	0.00	0.00	0.00	0.00
3	9300.45	82.00	210.25	9070.80	-387.33	-225.88	11.00	210.25	378.77
4	11230.45	82.00	210.25	9330.41	-2038.30	-1188.70	0.00	0.00	1982.73
5	11917.99	89.17	183.60	9393.25	-2687.95	-1385.59	4.00	-76.21	2622.85
6	15845.41	89.17	183.60	9450.00	-6607.20	-1632.30	0.00	0.00	6527.03

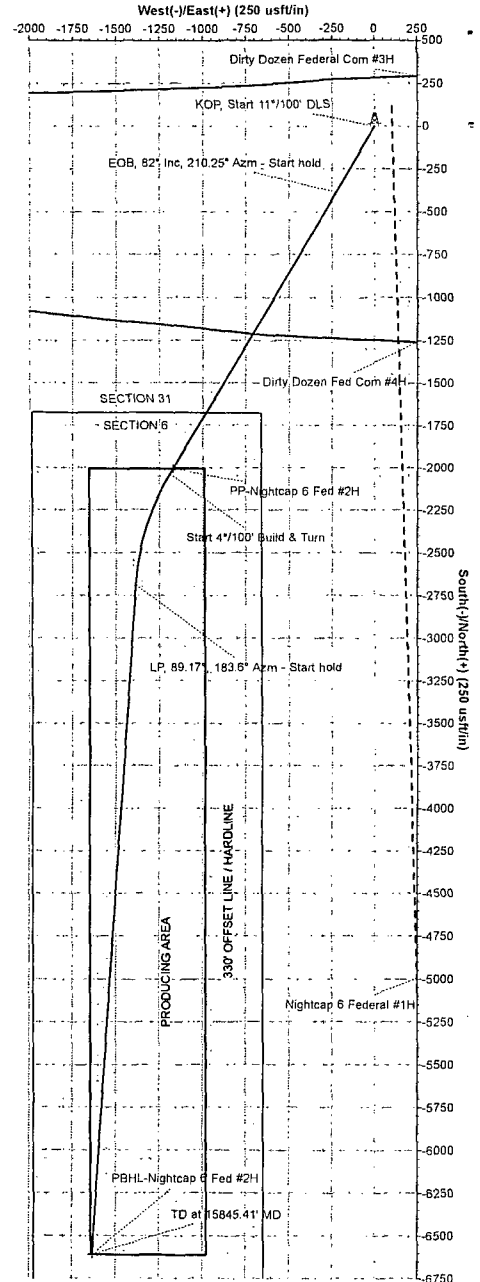
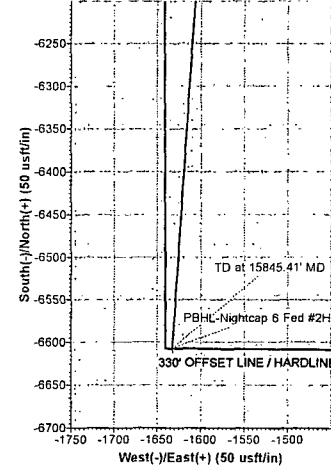
DESIGN TARGET DETAILS									
Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude	Shape	
PP-Nightcap 6 Fed #2H	8334.35	-2067.23	-1170.58	585528.77	663463.82	32° 36' 30.96461 N	103° 48' 8.95918 W	Point	
PBHL-Nightcap 6 Fed #2H	9450.00	-6607.20	-1632.30	580928.80	663002.10	32° 35' 45.6924 N	103° 48' 14.62457 W	Point	

LEGEND									
—	#1H, WB1, Plan #3 05-23-14 V0								
- - -	#4H, WB1, Plan #1 03-03-14 V0								
- - -	#4H, WB1, Surveys (Basic 46) V0								
- - -	#3H, WB1, Surveys V0								
- - -	Plan #3 02-23-14								



Map System: US State Plane 1927 (Exact solution)
Datum: NAD 1927 (NADCON CONUS)
Ellipsoid: Clarke 1866
Zone Name: New Mexico East 3001
Local Origin: Well #2H, Grid North
Latitude: 32° 36' 30.96461 N
Longitude: 103° 47' 55.15652 W
Grid East: 664634.40
Grid North: 587536.00
Scale Factor: 1.000
Geomagnetic Model: IGRF2010_14
Sample Date: 09-Apr-14
Magnetic Declination: 7.37°
Dip Angle from Horizontal: 60.44°
Magnetic Field Strength: 48544
To convert a Magnetic Direction to a Grid Direction, Add 7.09°
To convert a Magnetic Direction to a True Direction, Add 7.37° East
To convert a True Direction to a Grid Direction, Subtract 0.29°

FORMATION TOP DETAILS				
TVDPath	MDPath	Formation	DipAngle	DipDir
845.00	845.00	Rustler	0.83	177.42
936.00	936.00	TOS	0.83	177.42
2477.00	2477.00	Bottom of Salt/Tansil	0.83	177.42
2587.00	2587.00	Yates	0.83	177.42
2745.00	2745.00	Seven Rivers	0.83	177.42
2867.00	2867.00	Captain Reef	0.83	177.42
4347.00	4347.00	Base of Reef	0.83	177.42
5623.00	5623.00	Brushy Canyon	0.83	177.42
7303.00	7303.00	Bone Spring	0.83	177.42
8482.00	8482.00	FBSSG_Sand	0.83	177.42
9199.62	10226.02	SBSG_Sand	0.83	177.42





PHOENIX
TECHNOLOGY SERVICES

COG Operating LLC

Lea County, NM (NAD27 NME)

Nightcap 6 Federal

#2H

WB1

Plan: Plan #3 02-23-14

Planning Report

23 May, 2014





Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Project	Lea County, NM (NAD27 NME)		
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	Nightcap 6 Federal		
Site Position:	From: Map	Northing:	587,656.00 usft
		Easting:	664,734.50 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 36' 51.95144 N
		Longitude:	103° 47' 53.97918 W
		Grid Convergence:	0.29 °

Well	#2H				
Well Position	+N-S	0.00 usft	Northing:	587,536.00 usft	
	+E-W	0.00 usft	Easting:	664,634.40 usft	
Position Uncertainty	0.00 usft	Wellhead Elevation:	usft	Latitude:	32° 36' 50.76898 N
				Longitude:	103° 47' 55.15652 W
				Ground Level:	3,523.70 usft

Wellbore	WB1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010_14	2014/04/09	7.37	60.44	48,544

Design	Plan #3 02-23-14			
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	177.42

Survey Tool Program	Date	2014/05/23		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	15,845.41	Plan #3 02-23-14 (WB1)	MWD	MWD - Standard



Phoenix Technology Services
Planning Report



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Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey											
MD (usft)	Inc. (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec. (usft)	DLeg (°/100usft)	
0.00	0.00	0.00	-3,543.20	0.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
100.00	0.00	0.00	-3,443.20	100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
200.00	0.00	0.00	-3,343.20	200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
300.00	0.00	0.00	-3,243.20	300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
400.00	0.00	0.00	-3,143.20	400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
500.00	0.00	0.00	-3,043.20	500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
600.00	0.00	0.00	-2,943.20	600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
700.00	0.00	0.00	-2,843.20	700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
800.00	0.00	0.00	-2,743.20	800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
900.00	0.00	0.00	-2,643.20	900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,000.00	0.00	0.00	-2,543.20	1,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,100.00	0.00	0.00	-2,443.20	1,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,200.00	0.00	0.00	-2,343.20	1,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,300.00	0.00	0.00	-2,243.20	1,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,400.00	0.00	0.00	-2,143.20	1,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,500.00	0.00	0.00	-2,043.20	1,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,600.00	0.00	0.00	-1,943.20	1,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,700.00	0.00	0.00	-1,843.20	1,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,800.00	0.00	0.00	-1,743.20	1,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
1,900.00	0.00	0.00	-1,643.20	1,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,000.00	0.00	0.00	-1,543.20	2,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,100.00	0.00	0.00	-1,443.20	2,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,200.00	0.00	0.00	-1,343.20	2,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,300.00	0.00	0.00	-1,243.20	2,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,400.00	0.00	0.00	-1,143.20	2,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,500.00	0.00	0.00	-1,043.20	2,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,600.00	0.00	0.00	-943.20	2,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)	
2,700.00	0.00	0.00	-843.20	2,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,800.00	0.00	0.00	-743.20	2,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
2,900.00	0.00	0.00	-643.20	2,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,000.00	0.00	0.00	-543.20	3,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,100.00	0.00	0.00	-443.20	3,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,200.00	0.00	0.00	-343.20	3,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,300.00	0.00	0.00	-243.20	3,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,400.00	0.00	0.00	-143.20	3,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,500.00	0.00	0.00	-43.20	3,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,600.00	0.00	0.00	56.80	3,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,700.00	0.00	0.00	156.80	3,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,800.00	0.00	0.00	256.80	3,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
3,900.00	0.00	0.00	356.80	3,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,000.00	0.00	0.00	456.80	4,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,100.00	0.00	0.00	556.80	4,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,200.00	0.00	0.00	656.80	4,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,300.00	0.00	0.00	756.80	4,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,400.00	0.00	0.00	856.80	4,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,500.00	0.00	0.00	956.80	4,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,600.00	0.00	0.00	1,056.80	4,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,700.00	0.00	0.00	1,156.80	4,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,800.00	0.00	0.00	1,256.80	4,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
4,900.00	0.00	0.00	1,356.80	4,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,000.00	0.00	0.00	1,456.80	5,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,100.00	0.00	0.00	1,556.80	5,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,200.00	0.00	0.00	1,656.80	5,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,300.00	0.00	0.00	1,756.80	5,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)	
5,400.00	0.00	0.00	1,856.80	5,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,500.00	0.00	0.00	1,956.80	5,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,600.00	0.00	0.00	2,056.80	5,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,700.00	0.00	0.00	2,156.80	5,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,800.00	0.00	0.00	2,256.80	5,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
5,900.00	0.00	0.00	2,356.80	5,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,000.00	0.00	0.00	2,456.80	6,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,100.00	0.00	0.00	2,556.80	6,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,200.00	0.00	0.00	2,656.80	6,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,300.00	0.00	0.00	2,756.80	6,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,400.00	0.00	0.00	2,856.80	6,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,500.00	0.00	0.00	2,956.80	6,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,600.00	0.00	0.00	3,056.80	6,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,700.00	0.00	0.00	3,156.80	6,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,800.00	0.00	0.00	3,256.80	6,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
6,900.00	0.00	0.00	3,356.80	6,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,000.00	0.00	0.00	3,456.80	7,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,100.00	0.00	0.00	3,556.80	7,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,200.00	0.00	0.00	3,656.80	7,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,300.00	0.00	0.00	3,756.80	7,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,400.00	0.00	0.00	3,856.80	7,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,500.00	0.00	0.00	3,956.80	7,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,600.00	0.00	0.00	4,056.80	7,600.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,700.00	0.00	0.00	4,156.80	7,700.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,800.00	0.00	0.00	4,256.80	7,800.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
7,900.00	0.00	0.00	4,356.80	7,900.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,000.00	0.00	0.00	4,456.80	8,000.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	



Phoenix Technology Services

Planning Report



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Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)	
8,100.00	0.00	0.00	4,556.80	8,100.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,200.00	0.00	0.00	4,656.80	8,200.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,300.00	0.00	0.00	4,756.80	8,300.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,400.00	0.00	0.00	4,856.80	8,400.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,500.00	0.00	0.00	4,956.80	8,500.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
8,555.00	0.00	0.00	5,011.80	8,555.00	0.00	0.00	587,536.00	664,634.40	0.00	0.00	
KOP, Start 11°/100' DLS											
8,600.00	4.95	210.25	5,056.74	8,599.94	-1.68	-0.98	587,534.32	664,633.42	1.63	11.00	
8,650.00	10.45	210.25	5,106.27	8,649.47	-7.46	-4.35	587,528.54	664,630.05	7.26	11.00	
8,700.00	15.95	210.25	5,154.93	8,698.13	-17.32	-10.10	587,518.68	664,624.30	16.85	11.00	
8,750.00	21.45	210.25	5,202.28	8,745.48	-31.16	-18.17	587,504.84	664,616.23	30.31	11.00	
8,800.00	26.95	210.25	5,247.87	8,791.07	-48.86	-28.50	587,487.14	664,605.90	47.53	11.00	
8,850.00	32.45	210.25	5,291.28	8,834.48	-70.25	-40.97	587,465.75	664,593.43	68.34	11.00	
8,900.00	37.95	210.25	5,332.12	8,875.32	-95.14	-55.49	587,440.86	664,578.91	92.55	11.00	
8,950.00	43.45	210.25	5,370.01	8,913.21	-123.30	-71.90	587,412.70	664,562.50	119.94	11.00	
9,000.00	48.95	210.25	5,404.61	8,947.81	-154.46	-90.08	587,381.54	664,544.32	150.25	11.00	
9,050.00	54.45	210.25	5,435.58	8,978.78	-188.34	-109.84	587,347.66	664,524.56	183.21	11.00	
9,100.00	59.95	210.25	5,462.66	9,005.86	-224.63	-131.00	587,311.37	664,503.40	218.51	11.00	
9,150.00	65.45	210.25	5,485.58	9,028.78	-263.00	-153.38	587,273.00	664,481.02	255.83	11.00	
9,200.00	70.95	210.25	5,504.14	9,047.34	-303.09	-176.76	587,232.91	664,457.64	294.82	11.00	
9,250.00	76.45	210.25	5,518.17	9,061.37	-344.53	-200.92	587,191.47	664,433.48	335.13	11.00	
9,300.45	82.00	210.25	5,527.60	9,070.80	-387.33	-225.88	587,148.67	664,408.52	376.77	11.00	
EOB, 82° Inc, 210.25° Azm - Start hold											
9,400.00	82.00	210.25	5,541.46	9,084.66	-472.48	-275.54	587,063.52	664,358.86	459.60	0.00	
9,500.00	82.00	210.25	5,555.37	9,098.57	-558.02	-325.43	586,977.98	664,308.97	542.81	0.00	
9,600.00	82.00	210.25	5,569.29	9,112.49	-643.57	-375.32	586,892.43	664,259.08	626.02	0.00	
9,700.00	82.00	210.25	5,583.21	9,126.41	-729.11	-425.20	586,806.89	664,209.20	709.23	0.00	



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey											
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)	
9,800.00	82.00	210.25	5,597.12	9,140.32	-814.65	-475.09	586,721.35	664,159.31	792.44	0.00	
9,900.00	82.00	210.25	5,611.04	9,154.24	-900.19	-524.98	586,635.81	664,109.42	875.65	0.00	
10,000.00	82.00	210.25	5,624.96	9,168.16	-985.74	-574.87	586,550.26	664,059.53	958.86	0.00	
10,100.00	82.00	210.25	5,638.88	9,182.08	-1,071.28	-624.75	586,464.72	664,009.65	1,042.07	0.00	
10,200.00	82.00	210.25	5,652.79	9,195.99	-1,156.82	-674.64	586,379.18	663,959.76	1,125.28	0.00	
10,300.00	82.00	210.25	5,666.71	9,209.91	-1,242.37	-724.53	586,293.63	663,909.87	1,208.49	0.00	
10,400.00	82.00	210.25	5,680.63	9,223.83	-1,327.91	-774.41	586,208.09	663,859.99	1,291.70	0.00	
10,500.00	82.00	210.25	5,694.55	9,237.75	-1,413.45	-824.30	586,122.55	663,810.10	1,374.91	0.00	
10,600.00	82.00	210.25	5,708.46	9,251.66	-1,498.99	-874.19	586,037.01	663,760.21	1,458.12	0.00	
10,700.00	82.00	210.25	5,722.38	9,265.58	-1,584.54	-924.07	585,951.46	663,710.33	1,541.33	0.00	
10,800.00	82.00	210.25	5,736.30	9,279.50	-1,670.08	-973.96	585,865.92	663,660.44	1,624.55	0.00	
10,900.00	82.00	210.25	5,750.22	9,293.42	-1,755.62	-1,023.85	585,780.38	663,610.55	1,707.76	0.00	
11,000.00	82.00	210.25	5,764.13	9,307.33	-1,841.17	-1,073.74	585,694.83	663,560.66	1,790.97	0.00	
11,100.00	82.00	210.25	5,778.05	9,321.25	-1,926.71	-1,123.62	585,609.29	663,510.78	1,874.18	0.00	
11,200.00	82.00	210.25	5,791.97	9,335.17	-2,012.25	-1,173.51	585,523.75	663,460.89	1,957.39	0.00	
11,230.45	82.00	210.25	5,796.21	9,339.41	-2,038.30	-1,188.70	585,497.70	663,445.70	1,982.73	0.00	
Start 4°/100' Build & Turn											
11,300.00	82.67	207.53	5,805.48	9,348.68	-2,098.65	-1,222.00	585,437.35	663,412.40	2,041.51	4.00	
11,400.00	83.67	203.62	5,817.38	9,360.58	-2,188.19	-1,264.85	585,347.81	663,369.55	2,129.04	4.00	
11,500.00	84.69	199.74	5,827.53	9,370.73	-2,280.62	-1,301.59	585,255.38	663,332.81	2,219.72	4.00	
11,600.00	85.74	195.86	5,835.88	9,379.08	-2,375.48	-1,332.04	585,160.52	663,302.36	2,313.11	4.00	
11,700.00	86.80	192.00	5,842.39	9,385.59	-2,472.31	-1,356.06	585,063.69	663,278.34	2,408.77	4.00	
11,800.00	87.88	188.14	5,847.02	9,390.22	-2,570.65	-1,373.52	584,965.35	663,260.88	2,506.21	4.00	
11,900.00	88.98	184.29	5,849.76	9,392.96	-2,670.00	-1,384.35	584,866.00	663,250.05	2,604.98	4.00	
11,917.99	89.17	183.60	5,850.05	9,393.25	-2,687.95	-1,385.59	584,848.05	663,248.81	2,622.85	4.00	
LP, 89.17°, 183.6° Azm - Start hold											
12,000.00	89.17	183.60	5,851.24	9,394.44	-2,769.79	-1,390.74	584,766.21	663,243.66	2,704.37	0.00	



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey:										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)
12,100.00	89.17	183.60	5,852.68	9,395.88	-2,869.58	-1,397.02	584,666.42	663,237.38	2,803.78	0.00
12,200.00	89.17	183.60	5,854.13	9,397.33	-2,969.37	-1,403.30	584,566.63	663,231.10	2,903.19	0.00
12,300.00	89.17	183.60	5,855.57	9,398.77	-3,069.16	-1,409.59	584,466.84	663,224.81	3,002.60	0.00
12,400.00	89.17	183.60	5,857.02	9,400.22	-3,168.95	-1,415.87	584,367.05	663,218.53	3,102.01	0.00
12,500.00	89.17	183.60	5,858.46	9,401.66	-3,268.75	-1,422.15	584,267.25	663,212.25	3,201.42	0.00
12,600.00	89.17	183.60	5,859.91	9,403.11	-3,368.54	-1,428.43	584,167.46	663,205.97	3,300.82	0.00
12,700.00	89.17	183.60	5,861.35	9,404.55	-3,468.33	-1,434.71	584,067.67	663,199.69	3,400.23	0.00
12,800.00	89.17	183.60	5,862.80	9,406.00	-3,568.12	-1,440.99	583,967.88	663,193.41	3,499.64	0.00
12,900.00	89.17	183.60	5,864.24	9,407.44	-3,667.91	-1,447.28	583,868.09	663,187.12	3,599.05	0.00
13,000.00	89.17	183.60	5,865.69	9,408.89	-3,767.71	-1,453.56	583,768.29	663,180.84	3,698.46	0.00
13,100.00	89.17	183.60	5,867.13	9,410.33	-3,867.50	-1,459.84	583,668.50	663,174.56	3,797.86	0.00
13,200.00	89.17	183.60	5,868.58	9,411.78	-3,967.29	-1,466.12	583,568.71	663,168.28	3,897.27	0.00
13,300.00	89.17	183.60	5,870.02	9,413.22	-4,067.08	-1,472.40	583,468.92	663,162.00	3,996.68	0.00
13,400.00	89.17	183.60	5,871.47	9,414.67	-4,166.87	-1,478.69	583,369.13	663,155.71	4,096.09	0.00
13,500.00	89.17	183.60	5,872.91	9,416.11	-4,266.67	-1,484.97	583,269.33	663,149.43	4,195.50	0.00
13,600.00	89.17	183.60	5,874.36	9,417.56	-4,366.46	-1,491.25	583,169.54	663,143.15	4,294.90	0.00
13,700.00	89.17	183.60	5,875.80	9,419.00	-4,466.25	-1,497.53	583,069.75	663,136.87	4,394.31	0.00
13,800.00	89.17	183.60	5,877.25	9,420.45	-4,566.04	-1,503.81	582,969.96	663,130.59	4,493.72	0.00
13,900.00	89.17	183.60	5,878.69	9,421.89	-4,665.83	-1,510.09	582,870.17	663,124.31	4,593.13	0.00
14,000.00	89.17	183.60	5,880.14	9,423.34	-4,765.63	-1,516.38	582,770.37	663,118.02	4,692.54	0.00
14,100.00	89.17	183.60	5,881.58	9,424.78	-4,865.42	-1,522.66	582,670.58	663,111.74	4,791.95	0.00
14,200.00	89.17	183.60	5,883.03	9,426.23	-4,965.21	-1,528.94	582,570.79	663,105.46	4,891.35	0.00
14,300.00	89.17	183.60	5,884.47	9,427.67	-5,065.00	-1,535.22	582,471.00	663,099.18	4,990.76	0.00
14,400.00	89.17	183.60	5,885.92	9,429.12	-5,164.79	-1,541.50	582,371.21	663,092.90	5,090.17	0.00
14,500.00	89.17	183.60	5,887.36	9,430.56	-5,264.59	-1,547.78	582,271.41	663,086.62	5,189.58	0.00
14,600.00	89.17	183.60	5,888.81	9,432.01	-5,364.38	-1,554.07	582,171.62	663,080.33	5,288.99	0.00
14,700.00	89.17	183.60	5,890.25	9,433.45	-5,464.17	-1,560.35	582,071.83	663,074.05	5,388.39	0.00



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Planned Survey										
MD (usft)	Inc (°)	Azi (azimuth) (°)	TVDSS (usft)	TVD (usft)	N/S (usft)	E/W (usft)	Northing (usft)	Easting (usft)	V. Sec (usft)	DLeg (°/100usft)
14,800.00	89.17	183.60	5,891.70	9,434.90	-5,563.96	-1,566.63	581,972.04	663,067.77	5,487.80	0.00
14,900.00	89.17	183.60	5,893.14	9,436.34	-5,663.75	-1,572.91	581,872.25	663,061.49	5,587.21	0.00
15,000.00	89.17	183.60	5,894.58	9,437.78	-5,763.55	-1,579.19	581,772.45	663,055.21	5,686.62	0.00
15,100.00	89.17	183.60	5,896.03	9,439.23	-5,863.34	-1,585.48	581,672.66	663,048.92	5,786.03	0.00
15,200.00	89.17	183.60	5,897.47	9,440.67	-5,963.13	-1,591.76	581,572.87	663,042.64	5,885.43	0.00
15,300.00	89.17	183.60	5,898.92	9,442.12	-6,062.92	-1,598.04	581,473.08	663,036.36	5,984.84	0.00
15,400.00	89.17	183.60	5,900.36	9,443.56	-6,162.71	-1,604.32	581,373.29	663,030.08	6,084.25	0.00
15,500.00	89.17	183.60	5,901.81	9,445.01	-6,262.51	-1,610.60	581,273.49	663,023.80	6,183.66	0.00
15,600.00	89.17	183.60	5,903.25	9,446.45	-6,362.30	-1,616.88	581,173.70	663,017.52	6,283.07	0.00
15,700.00	89.17	183.60	5,904.70	9,447.90	-6,462.09	-1,623.17	581,073.91	663,011.23	6,382.48	0.00
15,800.00	89.17	183.60	5,906.14	9,449.34	-6,561.88	-1,629.45	580,974.12	663,004.95	6,481.88	0.00
15,845.41	89.17	183.60	5,906.80	9,450.00	-6,607.20	-1,632.30	580,928.80	663,002.10	6,527.03	0.00
TD at 15845.41' MD										

Formations					
Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
8,482.00	8,482.00	FBSG_Sand		0.83	177.42
936.00	936.00	TOS		0.83	177.42
2,477.00	2,477.00	Bottom of Salt/Tansill		0.83	177.42
2,587.00	2,587.00	Yates		0.83	177.42
2,745.00	2,745.00	Seven Rivers		0.83	177.42
4,347.00	4,347.00	Base of Reef		0.83	177.42
10,226.02	9,183.00	SBSG_Sand		0.83	177.42
7,303.00	7,303.00	Bone Spring		0.83	177.42
2,867.00	2,867.00	Capitan Reef		0.83	177.42
845.00	845.00	Rustler		0.83	177.42
5,623.00	5,623.00	Brushy Canyon		0.83	177.42



Phoenix Technology Services
Planning Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #2H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	KB @ 3543.20usft
Site:	Nightcap 6 Federal	MD Reference:	KB @ 3543.20usft
Well:	#2H	North Reference:	Grid
Wellbore:	WB1	Survey Calculation Method:	Minimum Curvature
Design:	Plan #3 02-23-14	Database:	Compass 5000 GCR DB

Plan Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
8,555.00	8,555.00	0.00	0.00	KOP, Start 11°/100' DLS
9,300.45	9,070.80	-387.33	-225.88	EOB, 82° Inc, 210.25° Azm - Start hold
11,230.45	9,339.41	-2,038.30	-1,188.70	Start 4°/100' Build & Turn
11,917.99	9,393.25	-2,687.95	-1,385.59	LP, 89.17°, 183.6° Azm - Start hold
15,845.41	9,450.00	-6,607.20	-1,632.30	TD at 15845.41' MD

Checked By: _____ Approved By: _____ Date: _____



New Mexico Office of the State Engineer **Water Column/Average Depth to Water**

No records found.

PLSS Search:

Township: 20S **Range:** 32E



New Mexico Office of the State Engineer **Water Column/Average Depth to Water**

No records found.

PLSS Search:

Section(s): 6

Township: 20S

Range: 32E



New Mexico Office of the State Engineer

Water Column/Average Depth to Water

No records found.

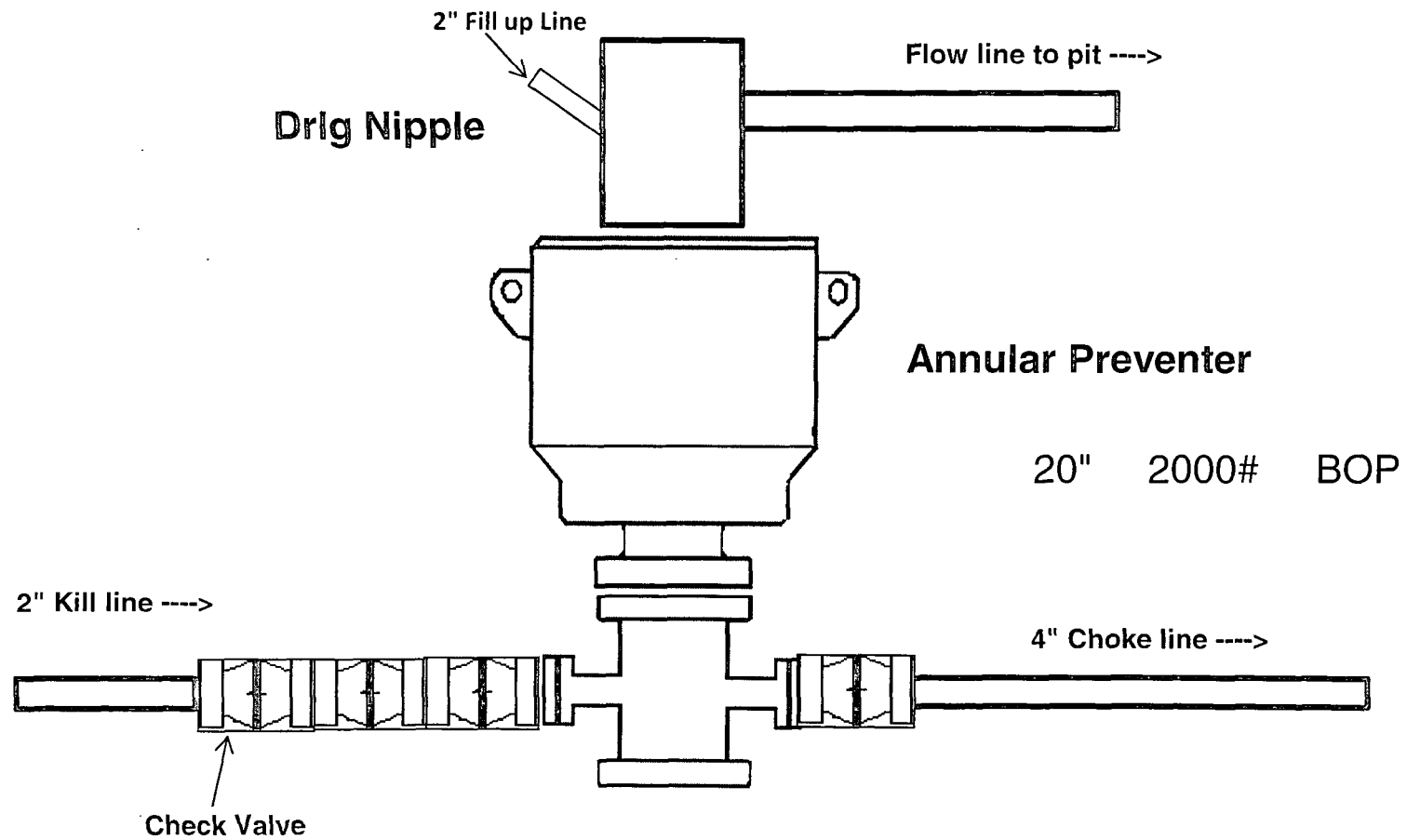
PLSS Search:

Section(s): 31

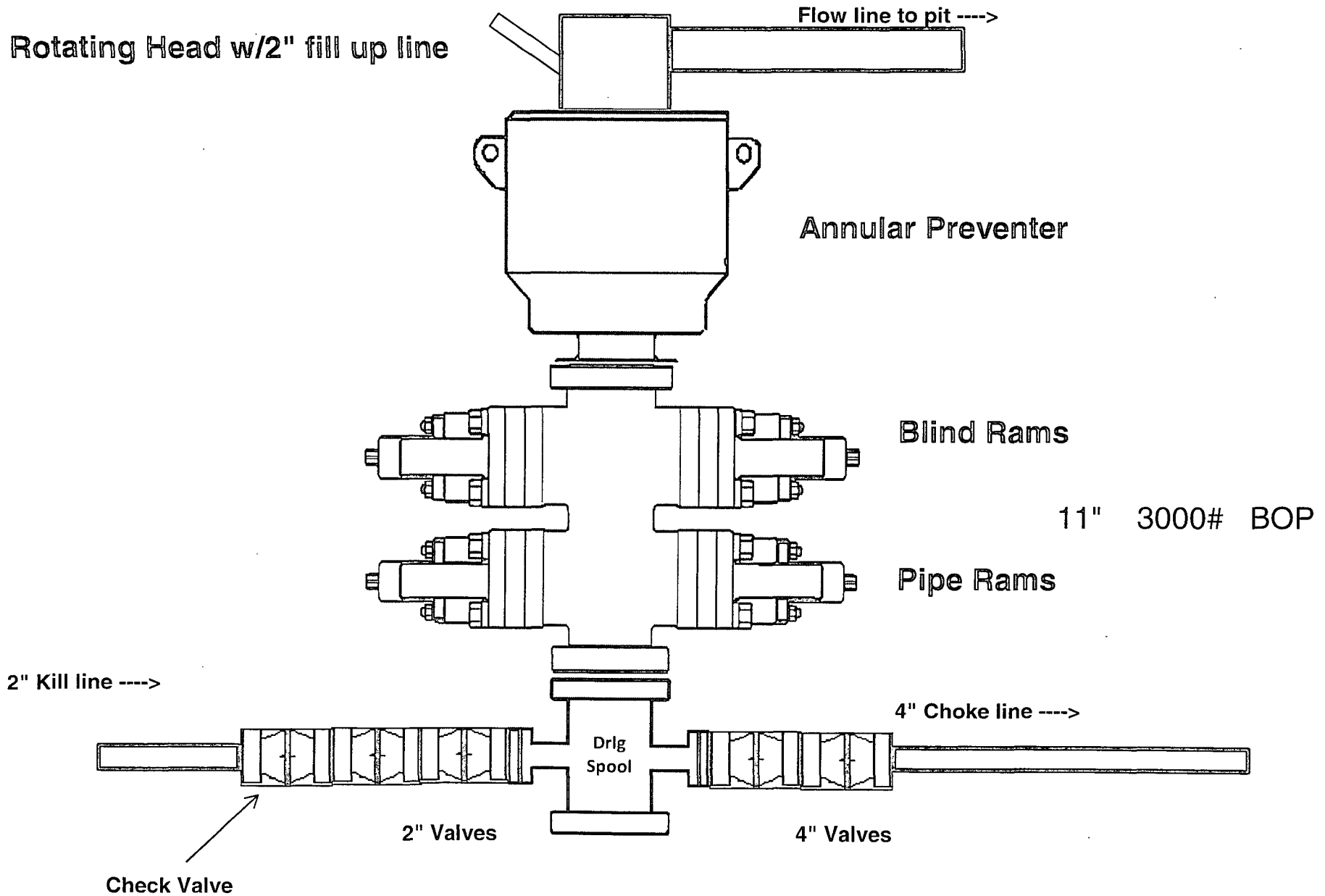
Township: 19S

Range: 32E

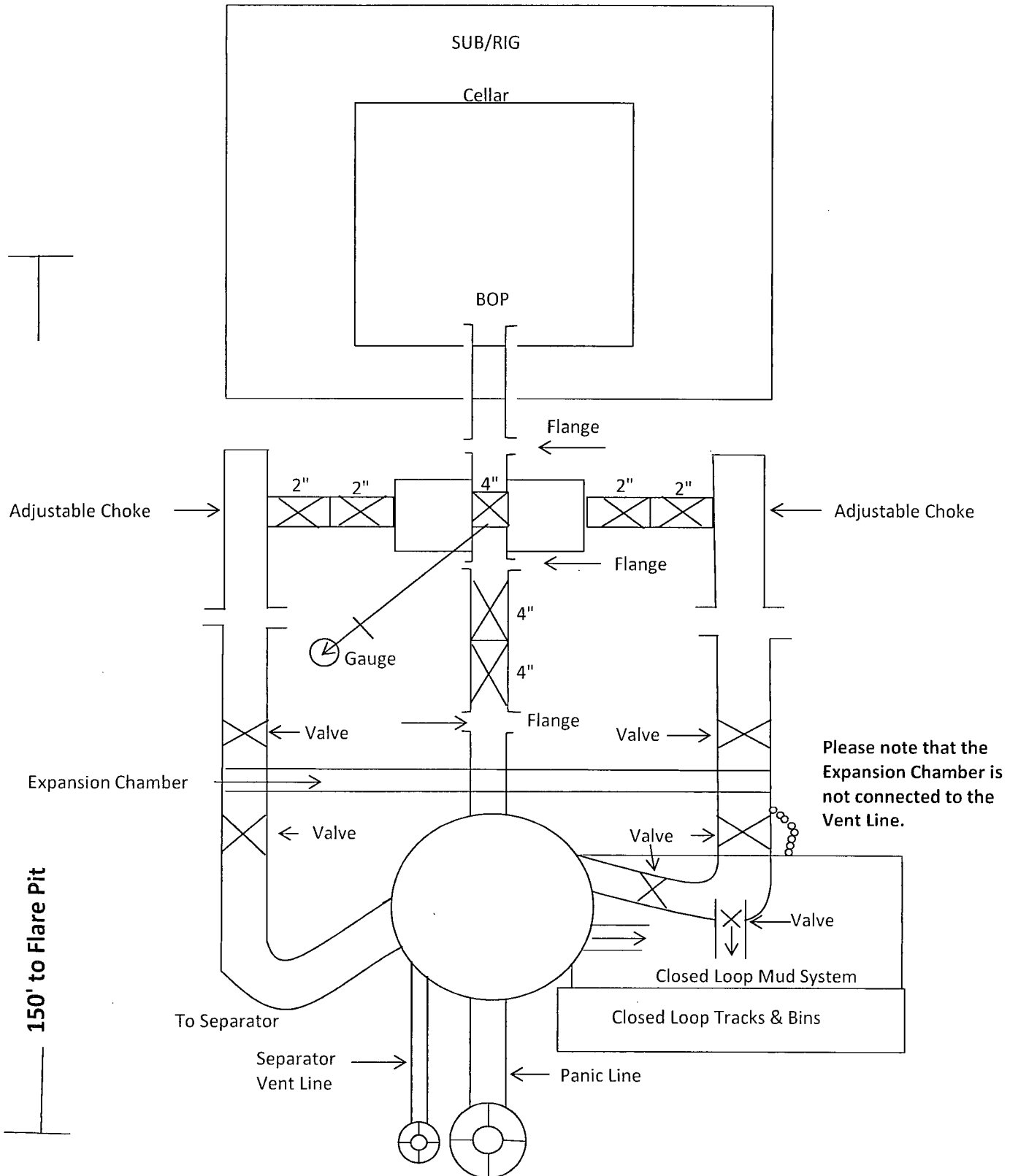
2,000 psi BOP Schematic



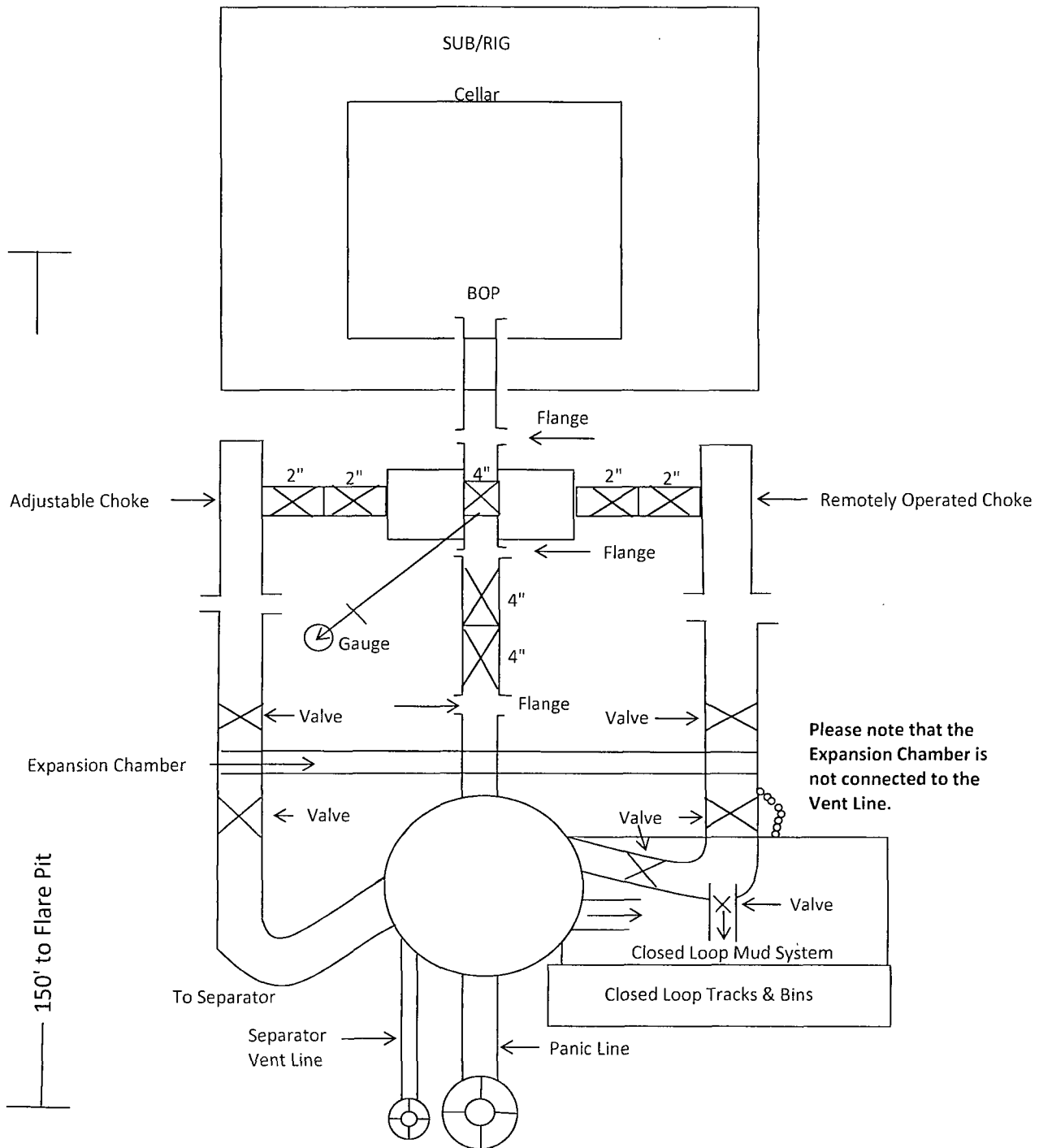
3,000 psi BOP Schematic



2M Choke Manifold Equipment



3M Choke Manifold Equipment



COG Operating LLC
Rig Plat & Closed Loop Equipment Diagram

Well pad will be 340' X 340'
with cellar in center of pad

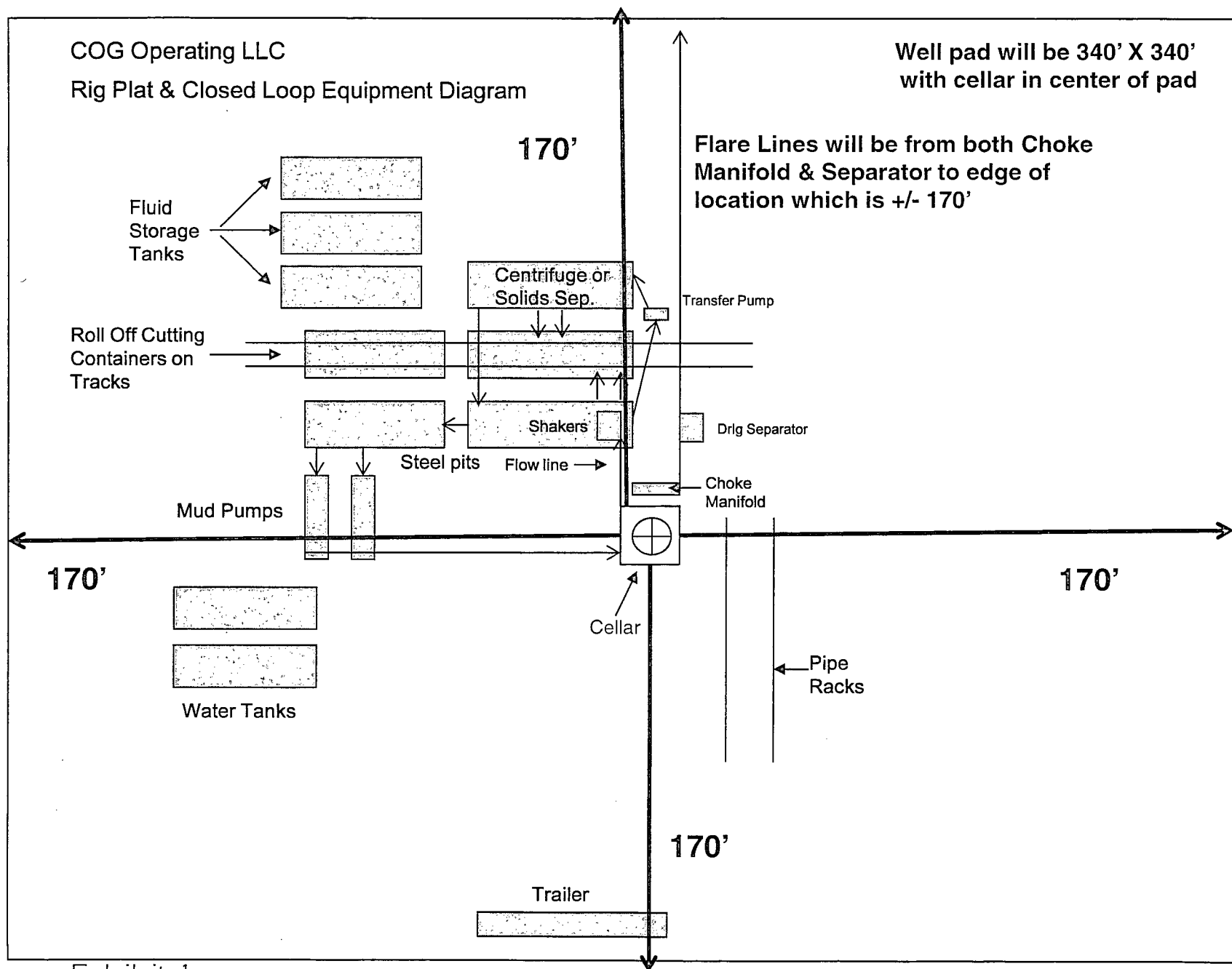


Exhibit 1

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

Well pad will be 340' X 340'
with cellar in center of pad

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

