14-441

Form 3160-3
(March 2012)

OCD Artesia

NM OIL CONSERVATION
ARTESIA DISTRICT
OCT 16 2014
RECEIVED

SECRETARY'S POTASH

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

TES 10-16-14

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

# APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.: SHL: NMNM015882, BHL: NMNM112273

6. If Indian, Allotee or Tribe Name:

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. <313801>
Mossy Federal #2H

2. Name of Operator
COG Operating LLC. <229137>

9. API Well No.
30-015-42736

3a. Address
2208 West Main Street
Artesia, NM 88210

3b. Phone No. *(include area code)*
575-748-6940

10. Field and Pool, or Exploratory
<49622>
Parkway; Bone Spring

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface: 1650' FNL & 330' FEL Unit Letter H (SENE) SHL Section 12-T20S-R29E
At proposed prod. Zone: 2260' FNL & 330' FEL Unit Letter H (SENE) BHL Section 7-T20S-R30E

11. Sec., T.R.M. or Blk and Survey or Area
Sec.12 - T20S - R29E

14. Distance in miles and direction from nearest town or post office*
Approximately 12 miles from Carlsbad

12. County or Parish: Eddy 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: 160
BHL: 637.92

17. Spacing Unit dedicated to this well
159.55

18. Distance from location* to nearest well, drilling, completed, applied for, on this lease, ft.: SHL: 696 ' (Proposed Mossy #1H) BHL: 969'

19. Proposed Depth
TVD: 8,450 MD: 13,421'

20. BLM/BIA Bond No. on file
NMB000740 &NMB000215

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
3271.8' GL

22. Approximate date work will start*
6/1/2014

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.
2. A Drilling Plan
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).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
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: 1/27/2014

Title: Regulatory Analyst

Approved by *(Signature)*: Steve Caffey
Name *(Printed/Typed)*:
Date: OCT 14 2014

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 theron.
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

## 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 30th day of April, 2014.

Signed: Melanie J. Parker

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

DISTRICT I
1625 N. FRENCH DR., HOBBS, NM 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II
1301 W. GRAND AVENUE, ARTESIA, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

DISTRICT III
1000 RIO BRAZOS RD., AZTEC, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1625 S. ST. FRANCIS DR., SANTA FE, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department
# OIL CONSERVATION DIVISION
11885 SOUTH ST. FRANCIS DR.
Santa Fe, New Mexico 87505

Form C-102
Revised August 1, 2011
Submit one copy to apprpriate

☐ AMENDED REPORT

## WELL LOCATION AND ACREAGE DEDICATION PLAT

| API Number | Pool Code | Pool Name |
|---|---|---|
| 30-015- 42736 | 49622 | Parkway; Bone Spring ✓ |

| Property Code | Property Name | Well Number |
|---|---|---|
| 313801 | MOSSY FEDERAL | 2H |

| OGRID No. | Operator Name | Elevation |
|---|---|---|
| 229137 | COG OPERATING, LLC | 3271.8 |

### Surface Location

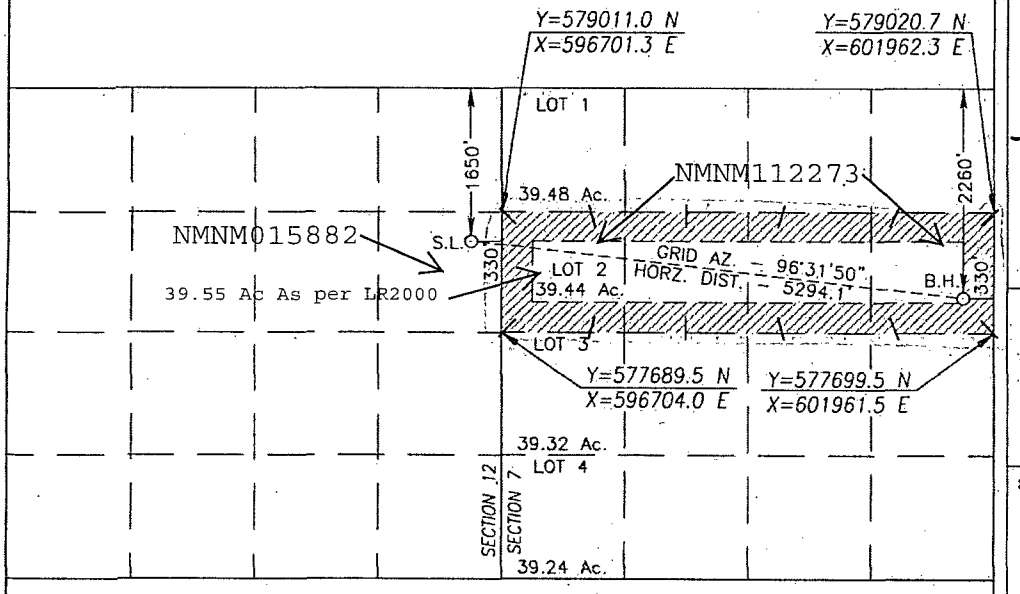
| UL or lot No. | Section | Township | Range | Lot Idn | Feet from the | North/South line | Feet from the | East/West line | County |
|---|---|---|---|---|---|---|---|---|---|
| H | 12 | 20-S | 29-E | | 1650 | NORTH | 330 | EAST | EDDY |

### Bottom Hole Location If Different From Surface

| UL or lot No. | Section | Township | Range | Lot Idn | Feet from the | North/South line | Feet from the | East/West line | County |
|---|---|---|---|---|---|---|---|---|---|
| H | 7 | 20-S | 30-E | | 2260 | NORTH | 330 | EAST | EDDY |

| Dedicated Acres | Joint or Infill | Consolidation Code | Order No. |
|---|---|---|---|
| 159.55 | | | |

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION




NAD 27
SURFACE LOCATION
Y=578682.9 N
X=596372.0 E
LAT.=32.590515° N
LONG.=104.020429° W

NAD 27
PROPOSED BOTTOM HOLE LOCATION
Y=578080.8 N
X=601631.7 E
LAT.=32.588817° N
LONG.=104.003358° W

### OPERATOR CERTIFICATION

*I hereby certify that the information herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.*

Melanie J Parker 4/30/14
Signature Date

Melanie J Parker
Printed Name

mparker@concho.com
E-mail Address

### SURVEYOR CERTIFICATION

*I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.*

APRIL 1, 2014
Date of Survey

Signature & Seal of Professional Surveyor

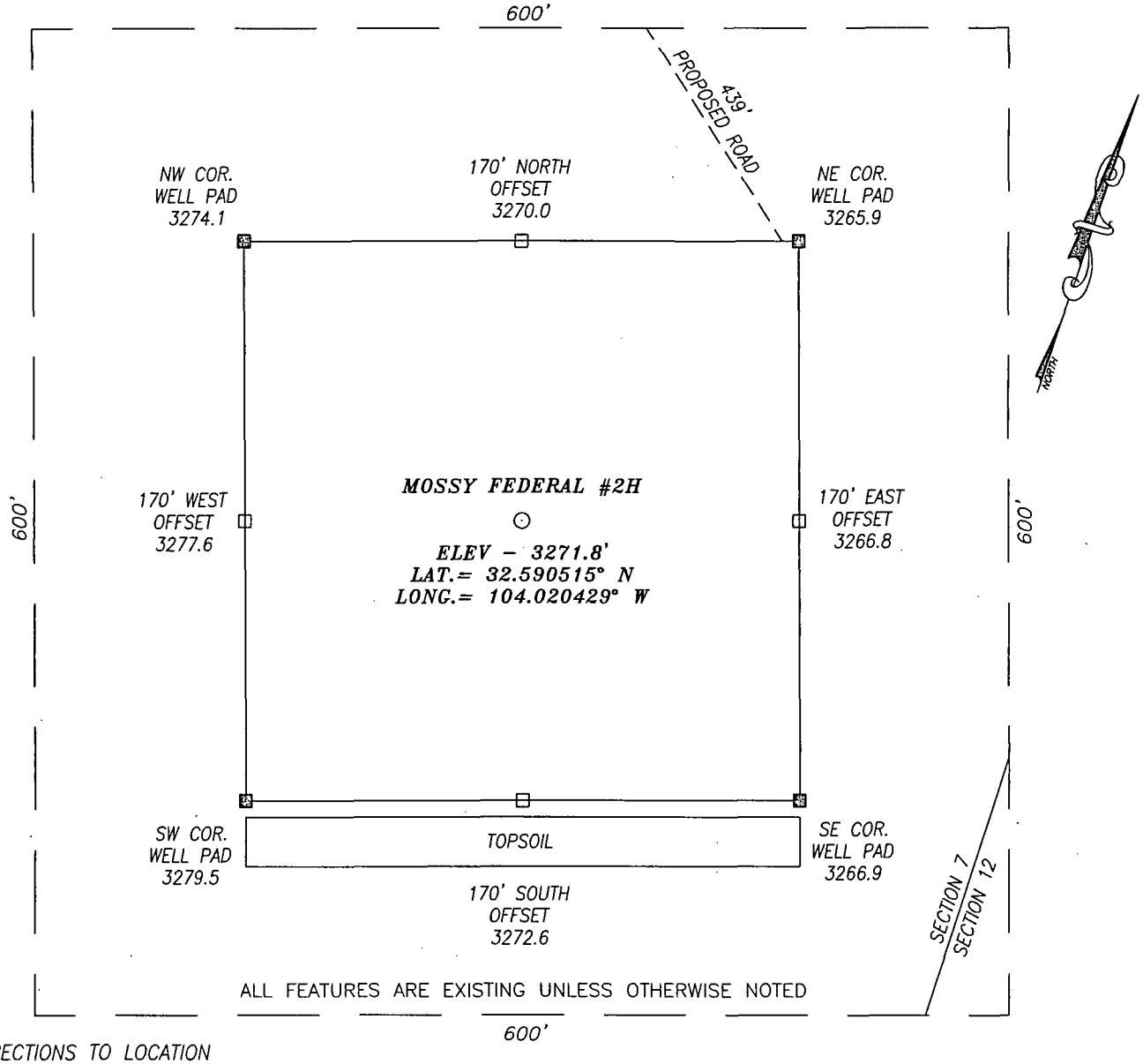
CHAD L. HARCROW
NEW MEXICO
17777
LICENSED PROFESSIONAL SURVEYOR

Chad Harcrow 4/23/14
Certificate No. CHAD HARCROW 17777

W.O. # 14-267 DRAWN BY: AM

# SECTION 12, TOWNSHIP 20 SOUTH, RANGE 29 EAST, N.M.P.M.,

EDDY COUNTY NEW MEXICO




DIRECTIONS TO LOCATION

FROM THE INTERSECTION CR #238 (BURTON FLAT RD) AND CR #239 (BUCKEYE RD) GO NORTH ALONG CR #238 (BURTON FLAT RD) FOR APPROX. 2.5 MILES; THEN TURN RIGHT (EAST) AND GO APPROX. 0.7 MILE; THEN TURN LEFT (NORTH) AND GO APPROX. 0.2 MILE; THEN TURN RIGHT (NORTHEAST) AND GO APPROX. 0.5 MILE; THEN TURN RIGHT (SOUTHEAST) AND GO APPROX. 0.2 MILE TO EXISTING YATES SLINKARD UR FED #4H WELL PAD; THEN GO TO NORTHEAST PAD CORNER; THEN PROPOSED WELL IS APPROX. 3030 FEET SOUTHEAST.

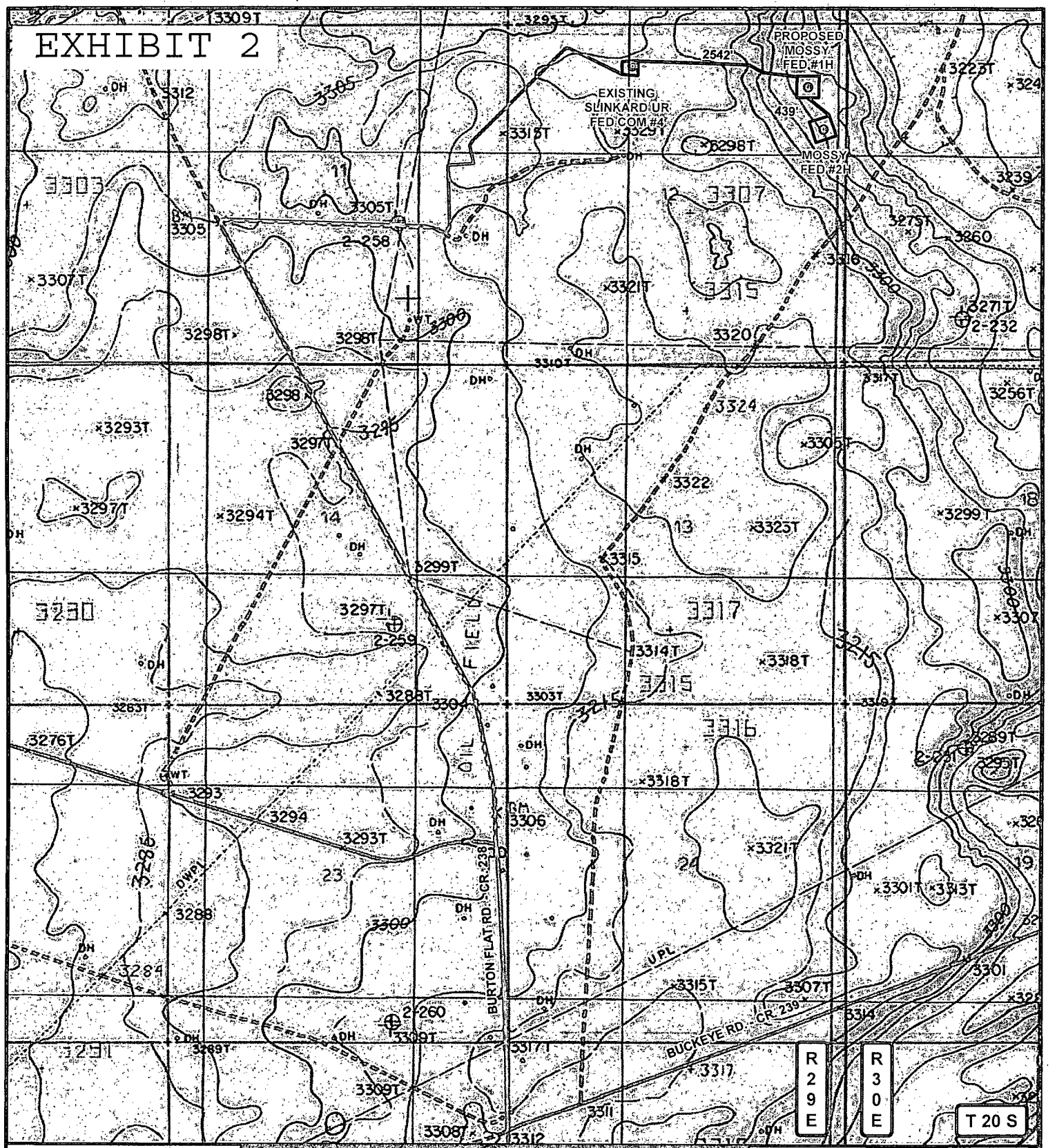
100 0 100 200 Feet

Scale: 1"=100'


HARCROW SURVEYING, LLC
2314 W. MAIN ST, ARTESIA, N.M. 88210
PH: (575) 513-2570 FAX: (575) 746-2158
chad_harcrow77@yahoo.com


| COG OPERATING, LLC | | |
|---|---|---|
| MOSSY FEDERAL #2H WELL<br>LOCATED 1650 FEET FROM THE NORTH LINE<br>AND 330 FEET FROM THE EAST LINE OF SECTION 12,<br>TOWNSHIP 20 SOUTH, RANGE 29 EAST, N.M.P.M.,<br>EDDY COUNTY, NEW MEXICO | | |
| SURVEY DATE: 4/1/2014 | | PAGE: 1 OF 1 |
| DRAFTING DATE: 4/9/2014 | | |
| APPROVED BY: CH | DRAWN BY: AM | FILE: 14-267 |

# EXHIBIT 2




LEGEND

- WELL
- WELLPAD
- PROPOSED ROAD
- EXISTING ROAD

| MOSSY FED #2H | | | |
|---|---|---|---|
| SEC: 12 | TWP: 20 S. | RGE: 29 E. | ELEVATION: 3271.8' |
| STATE: NEW MEXICO | COUNTY: EDDY | 1650' FNL & 330' FEL | |
| W.O. # 14-267 | LEASE: MOSSY FED | SURVEY: N.M.P.M | |

0 2,500 5,000 FEET

0 0.125 0.25 0.5 Miles 1 IN = 2,000 FT

LOCATION MAP IMAGERY 04/11/2014 S.P.

N

CONCHO

COG OPERATING, LLC

HARCROW SURVEYING, LLC
1107 WATSON, ARTESIA N.M. 88210
PH: (575) 513-2570 FAX: (575) 746-2158
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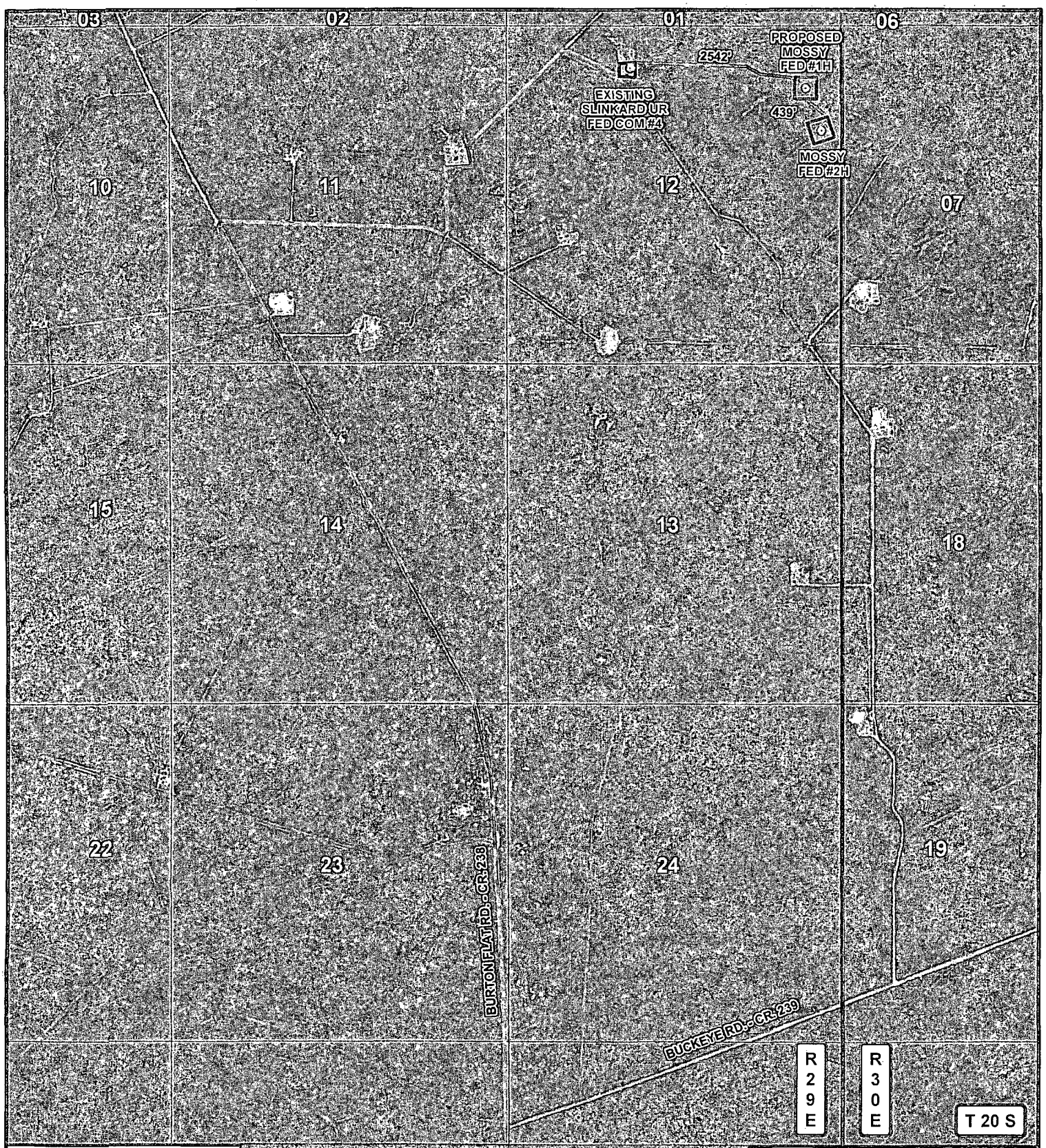


LEGEND

- WELL
- WELLPAD
- PROPOSED ROAD
- EXISTING ROAD

**MOSSY FED #2H**

SEC: 12 TWP: 20 S. RGE: 29 E. ELEVATION: 3271.8'

STATE: NEW MEXICO COUNTY: EDDY 1650' FNL & 330' FEL

W.O. # 14-267 LEASE: MOSSY FED SURVEY: N.M.P.M

0 2,500 5,000 FEET

0 0.125 0.25 0.5 Miles

1 IN = 2,000 FT

LOCATION MAP IMAGERY 04/11/2014 S.P.

N

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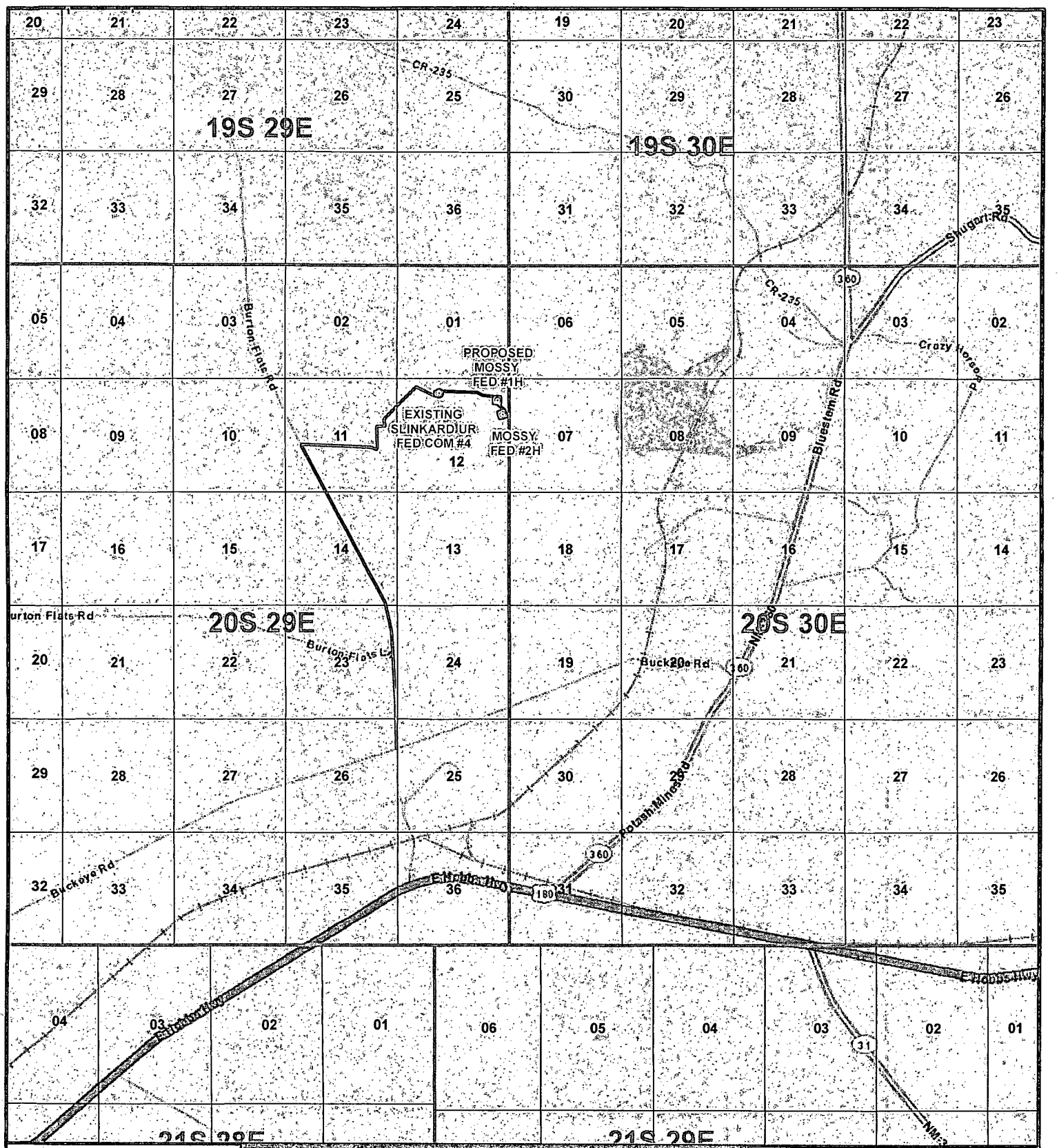


LEGEND

- WELL
- WELLPAD
- PROPOSED ROAD
- EXISTING ROAD

**MOSSY FED #2H**

SEC: 12 TWP: 20 S. RGE: 29 E. ELEVATION: 3271.8'

STATE: NEW MEXICO COUNTY: EDDY 1650' FNL & 330' FEL

W.O. # 14-267 LEASE: MOSSY FED SURVEY: N.M.P.M

0 2,500 5,000 7,500 10,000 12,500 15,000 FEET

0 0.4 0.8 1.6 Miles 1 IN = 6,000 FT

VICINITY MAP 04/11/2014 S.P.

CONCHO

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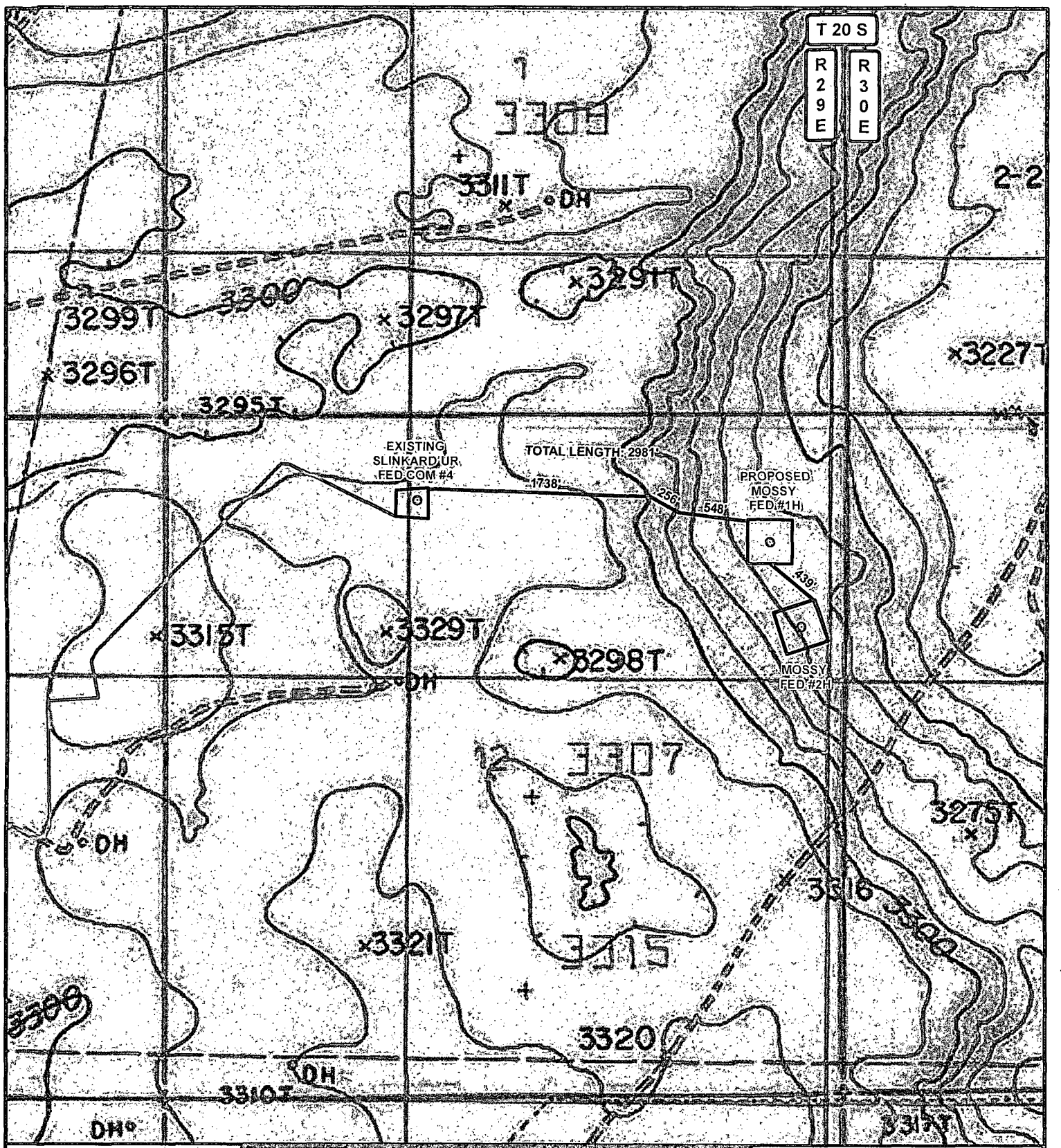


LEGEND

- WELL
- WELLPAD
- PROPOSED ROAD
- EXISTING ROAD

**MOSSY FED #2H**

| | | | |
|---|---|---|---|
| SEC: 12 | TWP: 20 S. | RGE: 29 E. | ELEVATION: 3271.8' |
| STATE: NEW MEXICO | COUNTY: EDDY | | 1650' FNL & 330' FEL |
| W.O. # 14-267 | LEASE: MOSSY FED | | SURVEY: N.M.P.M |

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT.

ROAD MAP TOPO 04/11/2014 SP

N

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107 WATSON, ARTESIA N.M. 88210
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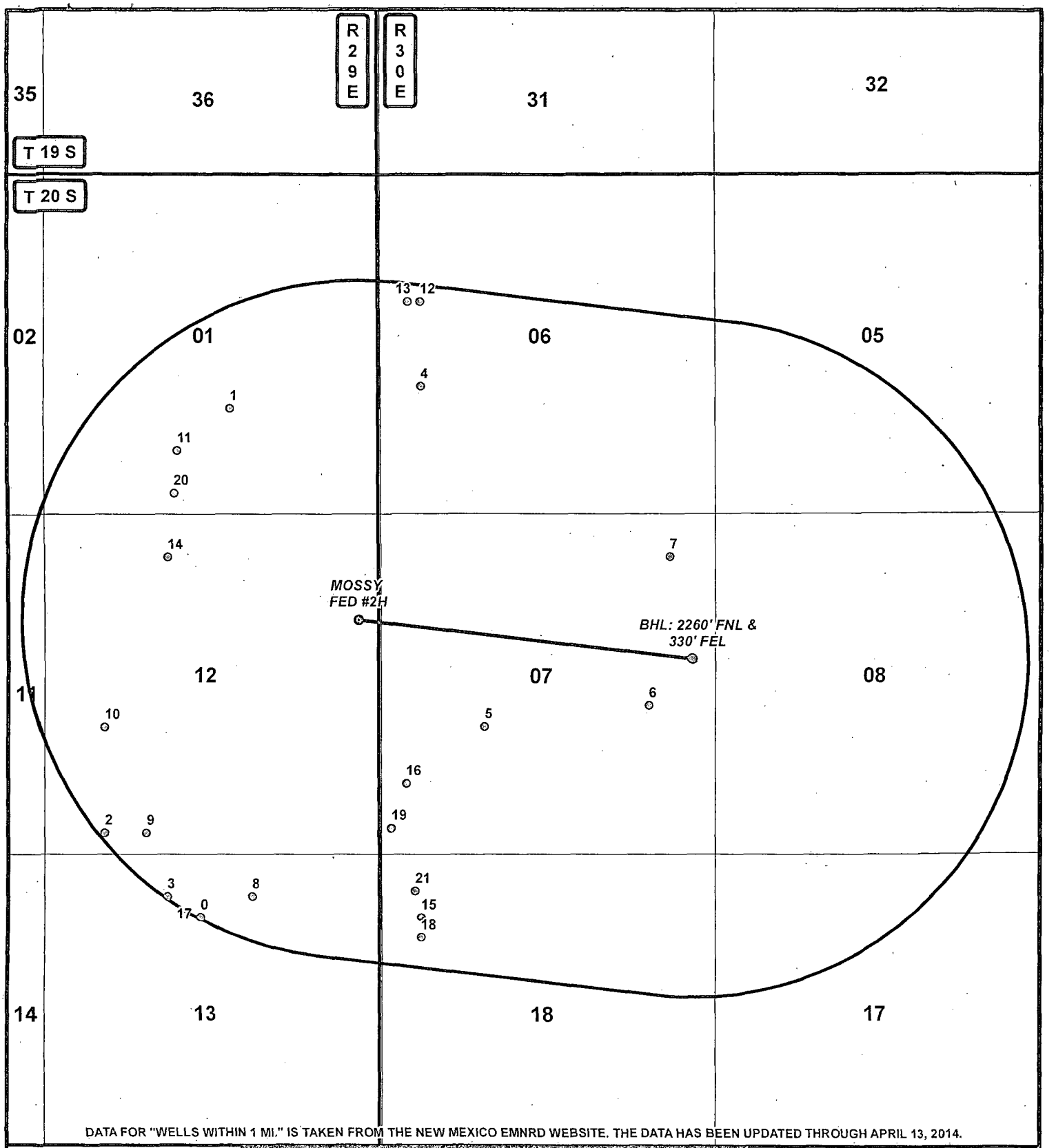


DATA FOR "WELLS WITHIN 1 MI." IS TAKEN FROM THE NEW MEXICO EMNRD WEBSITE. THE DATA HAS BEEN UPDATED THROUGH APRIL 13, 2014.

LEGEND

- WELL
- BOTTOMHOLE
- WELLS WITHIN 1 MI.
- 1 MI. BUFFER

**MOSSY FED #2H**

| | | | |
|---|---|---|---|
| SEC: 12 | TWP: 20 S. | RGE: 29 E. | ELEVATION: 3271.8' |
| STATE: NEW MEXICO | | COUNTY: EDDY | 1650' FNL & 330' FEL |
| W.O. # 14-364 | LEASE: MOSSY FED | | SURVEY: N.M.P.M |

0 2,500 5,000 FEET

0 0.125 0.25 0.5 Miles

1 IN = 2,000 FT

1 MILE MAP 04/30/2014 S.P.

CONCHO

COG OPERATING, LLC

N

HARCROW

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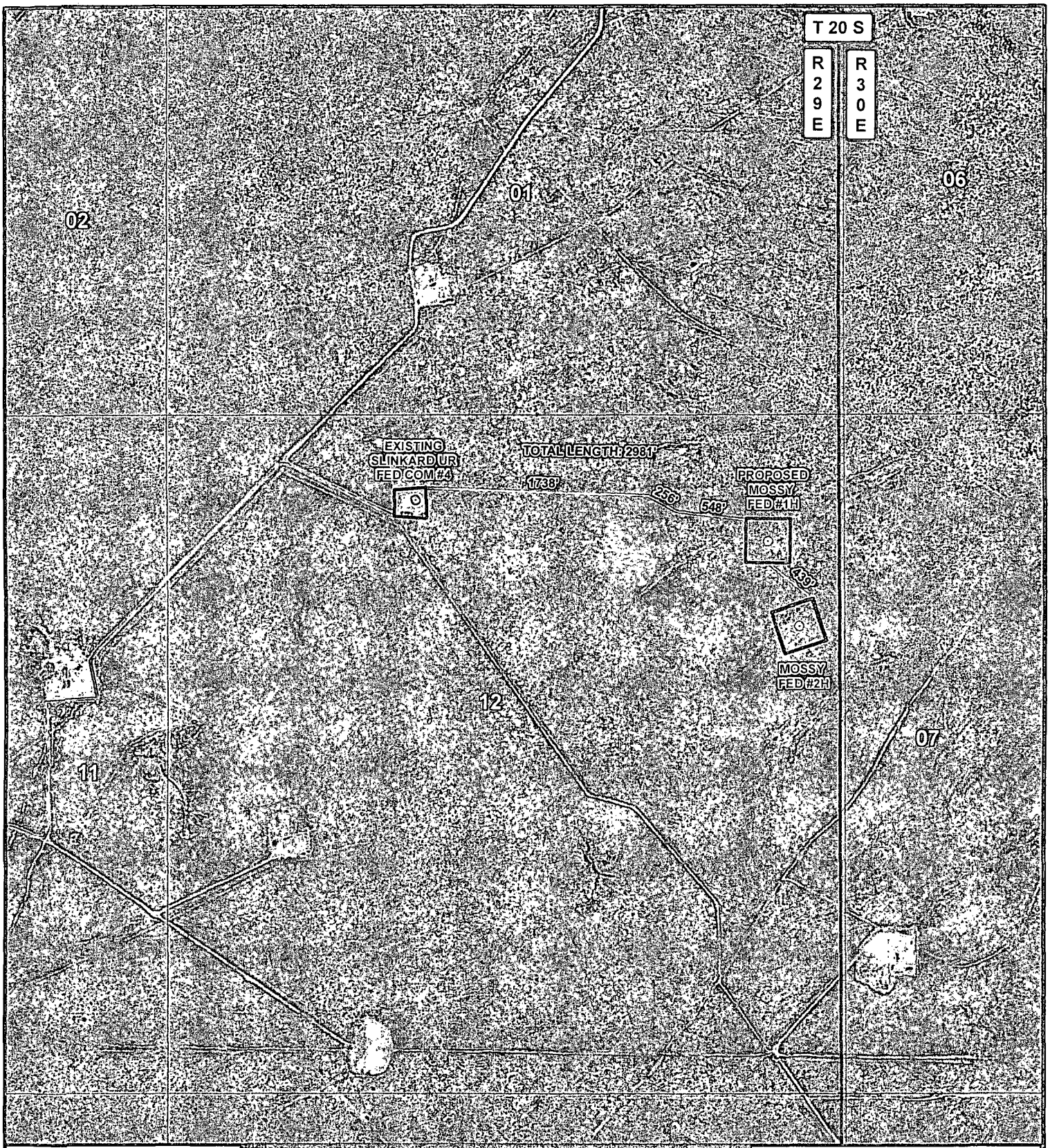
SURVEYING




LEGEND

- WELL
- WELLPAD
- PROPOSED ROAD
- EXISTING ROAD

# MOSSY FED #2H

| | | | |
|---|---|---|---|
| SEC: 12 | TWP: 20 S. | RGE: 29 E. | ELEVATION: 3271.8' |
| STATE: NEW MEXICO | | COUNTY: EDDY | 1650' FNL & 330' FEL |
| W.O. # 14-267 | | LEASE: MOSSY FED | SURVEY: N.M.P.M |

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

ROAD MAP IMAGERY 04/11/2014 SP

N

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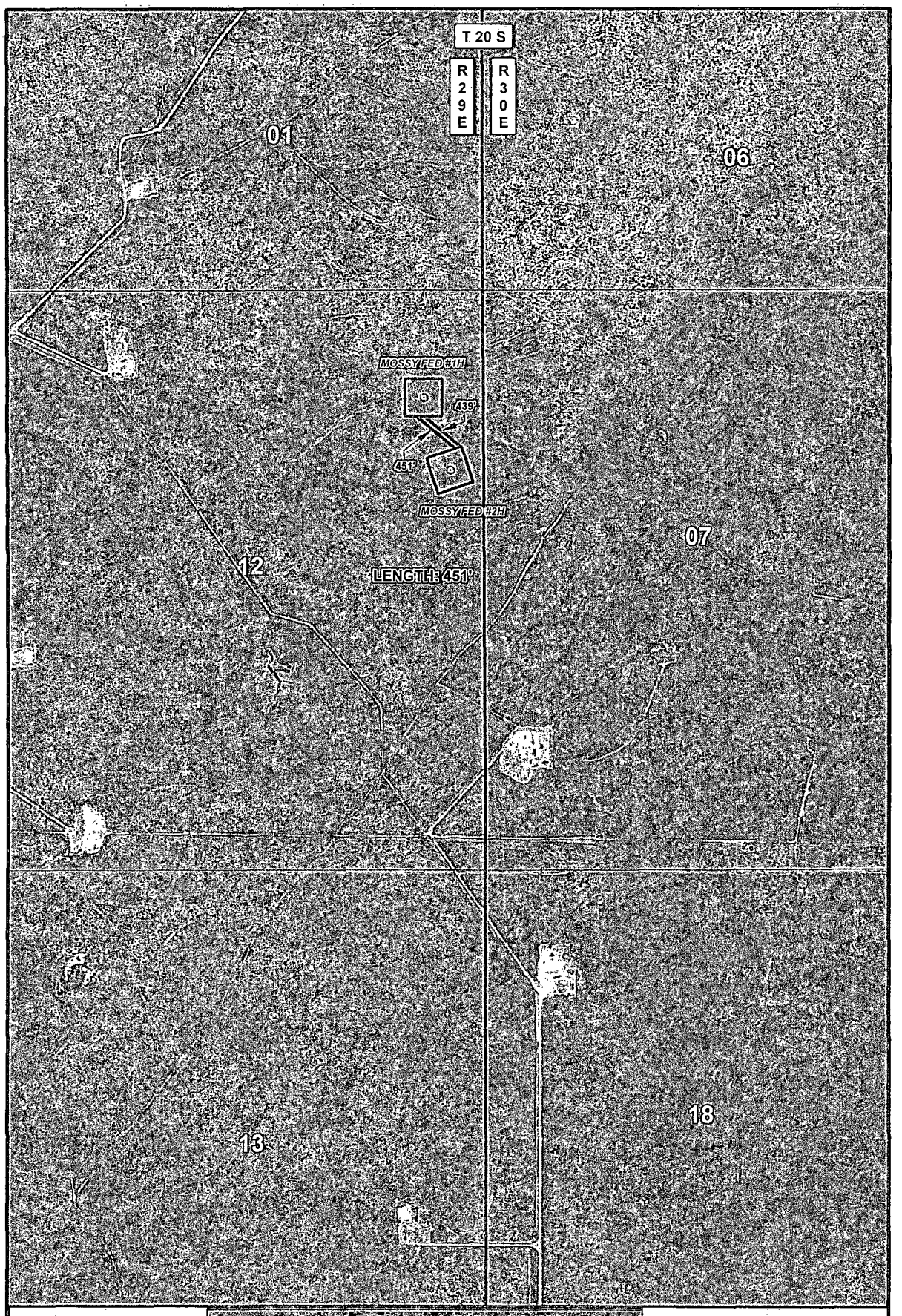


LEGEND

- FLOWLINE
- PROPOSED ROAD
- WELL
- WELLPAD

MOSSY FED #1H, #2H FLOWLINE

SECTION: 12 TOWNSHIP: 20 S. RANGE: 29 E. LENGTH: 451'

STATE: NEW MEXICO COUNTY: EDDY SURVEY: N.M.P.M

W.O. # 14-356 LEASE: MOSSY FED

0 2,500 FEET

0 0.05 0.1 0.2 Miles 1 IN = 1,000 FT

FLOWLINE MAP | AERIAL | 01/29/2014 | SLP

CONCHO

COG OPERATING, LLC

N

HARCROW SURVEYING

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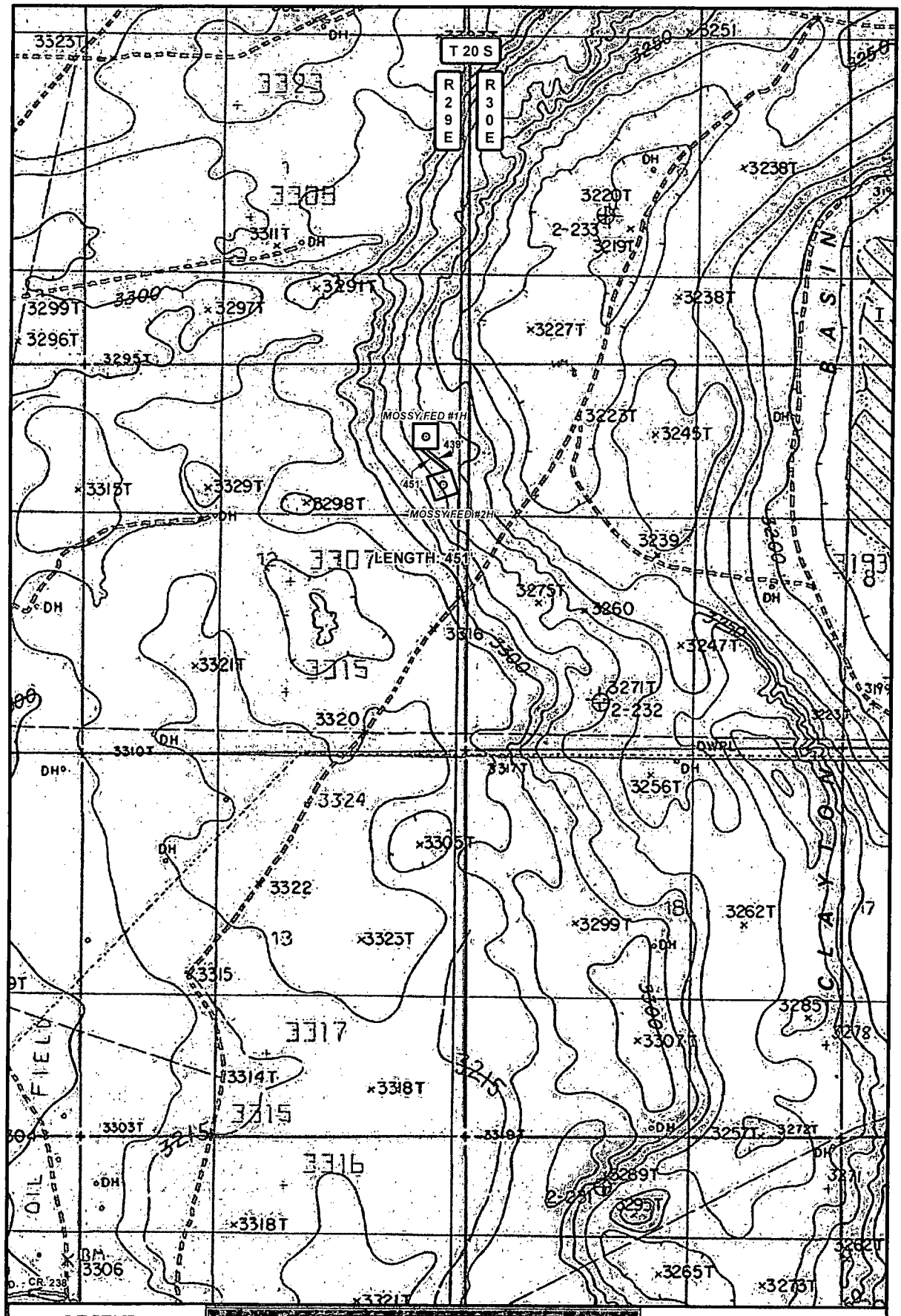


LEGEND

- FLOWLINE
- PROPOSED ROAD
- WELL
- WELLPAD

**MOSSY FED #1H, #2H FLOWLINE**

SECTION: 12 TOWNSHIP: 20 S. RANGE: 29 E. LENGTH: 451'

STATE: NEW MEXICO COUNTY: EDDY SURVEY: N.M.P.M

W.O. # 14-356 LEASE: MOSSY FED

0 2,500 FEET

0 0.1 0.2 0.4 Miles 1 IN = 1,500 FT

FLOWLINE MAP TOPO 04/29/2014 T. SP.

CONCHO

COG OPERATING, LLC

N HARCROW SURVEYING

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chad_harcrow77@yahoo.com

| FID | OPERATOR | WELL_NAME | LATITUDE | LONGITUDE | API | SECTION | TOWNSHIP | RANGE | FTG_NS | NS_CD | FTG_EW | EW_CD | TVD_DEPTH | COMPL_STAT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | YATES PETROLEUM CORPORATION | ZIA AHZ FEDERAL COM 002 | 32.577938 | -104.029074 | 3001540373 | 13 | 20.0S | 29E | 990 | N | 2490 | W | 40 | Plugged |
| 1 | NEIL WILLS ET AL | McCLEAN 001 | 32.599714 | -104.027494 | 3001503624 | 1 | 20.0S | 29E | 1652 | S | 2326 | E | 0 | Plugged |
| 2 | HASKINS PAUL E | MCKEE 001 | 32.581576 | -104.033959 | 3001503643 | 12 | 20.0S | 29E | 330 | S | 990 | W | 0 | Plugged |
| 3 | PAUL E HASKINS | TEXACO FED 001 | 32.578848 | -104.030736 | 3001503645 | 13 | 20.0S | 29E | 660 | N | 1980 | W | 0 | Plugged |
| 4 | NEIL WILLS ET AL | CHASE 001 | 32.600599 | -104.017749 | 3001504662 | 6 | 20.0S | 30E | 1980 | S | 660 | W | 0 | Plugged |
| 5 | ANDERSON-PRICHARD OIL CO | Federal 7 001 | 32.586077 | -104.014551 | 3001504663 | 7 | 20.0S | 30E | 1980 | S | 1650 | W | 0 | Plugged |
| 6 | A J HARDENDORF | RIGGS 001 | 32.586974 | -104.006098 | 3001504664 | 7 | 20.0S | 30E | 2310 | S | 990 | E | 0 | Plugged |
| 7 | GROVER-MANN BRO | RIGGS 001 | 32.593327 | -104.00499 | 3001504665 | 7 | 20.0S | 30E | 660 | N | 660 | E | 0 | Plugged |
| 8 | KERSEY & COMPANY | UNION 001 | 32.578839 | -104.02641 | 3001510326 | 13 | 20.0S | 29E | 660 | N | 1980 | E | 0 | Plugged |
| 9 | YATES PETROLEUM CORPORATION | ELAND AFC FEDERAL COM 001 | 32.581572 | -104.031806 | 3001525978 | 12 | 20.0S | 29E | 330 | S | 1650 | W | 11297 | Plugged |
| 10 | YATES PETROLEUM CORPORATION | SLINKARD UR FEDERAL 003 | 32.586112 | -104.033948 | 3001526038 | 12 | 20.0S | 29E | 1980 | S | 990 | W | 12280 | Active |
| 11 | CIMAREX ENERGY CO. OF COLORADO | SUPERIOR FEDERAL 008 | 32.597898 | -104.03019 | 3001526323 | 1 | 20.0S | 29E | 990 | S | 2130 | W | 11908 | Active |
| 12 | FORTSON OIL CO | SYLVITE FEDERAL 001 | 32.604226 | -104.017741 | 3001526503 | 6 | 20.0S | 30E | 1980 | N | 660 | W | 12090 | Plugged |
| 13 | FORTSON OIL CO | SYLVITE FEDERAL 002 | 32.604227 | -104.018371 | 3001526657 | 6 | 20.0S | 30E | 1980 | N | 467 | W | 4001 | Plugged |
| 14 | YATES PETROLEUM CORPORATION | SLINKARD UR FEDERAL COM 004 | 32.593363 | -104.030702 | 3001526762 | 12 | 20.0S | 29E | 660 | N | 1980 | W | 12175 | Active |
| 15 | COG OPERATING LLC | COINFLIP STATE 001 | 32.577916 | -104.017803 | 3001532958 | 18 | 20.0S | 30E | 990 | N | 660 | W | 12280 | Active |
| 16 | MEWBOURNE OIL CO | COLLINSOSCOPY FEDERAL 001 | 32.583648 | -104.018535 | 3001533758 | 7 | 20.0S | 30E | 1095 | S | 430 | W | 12400 | Active |
| 17 | YATES PETROLEUM CORPORATION | ZIA AHZ FEDERAL COM 002H | 32.577957 | -104.029074 | 3001540404 | 13 | 20.0S | 29E | 983 | N | 2490 | W | 8375 | New (Not drilled or compl) |
| 18 | COG OPERATING LLC | COINFLIP STATE COM 003H | 32.577037 | -104.017807 | 3001541938 | 18 | 20.0S | 30E | 1310 | N | 660 | W | 0 | New (Not drilled or compl) |
| 19 | MEWBOURNE OIL CO | TWO MESAS 7 MP FEDERAL 001H | 32.581752 | -104.019289 | 3001541420 | 7 | 20.0S | 30E | 405 | S | 200 | W | 84369 | New (Not drilled or compl) |
| 20 | CIMAREX ENERGY CO. OF COLORADO | SUPERIOR FEDERAL 011E | 32.596084 | -104.030364 | 3001539333 | 1 | 20.0S | 29E | 330 | S | 2080 | W | 0 | New (Not drilled or compl) |
| 21 | COG OPERATING LLC | COINFLIP STATE COM 002H | 32.579044 | -104.018092 | 3001541937 | 18 | 20.0S | 30E | 580 | N | 570 | W | 0 | New (Not drilled or compl) |

**ATTACHMENT TO FORM 3160-3**
**COG Operating, LLC**
**MOSSY FEDERAL #2H**
**SHL: 1650' FNL & 330' FEL, UNIT H**
**Sec 12 T20S R29E**
**BHL: 2260' FNL & 330' FEL, Unit H**
**Sec 7, T20S, R30E**
**Eddy County, NM**

1. Proration Unit Spacing: 159.55 Acres

2. Ground Elevation: 3271.8'

3. Proposed Depths: Horizontal: **KOP (kick off point) TVD= 7829' MD 7829'**
**EOC (end of curve) TVD=8350' MD= 8642'**
**Toe (end of lateral) TVD=8450' MD= 13421'**

4. Estimated tops of geological markers:

| | |
|---|---|
| Fresh Water | 60' |
| Rustler | 150' |
| Top of Salt | 428' |
| BOS/Top of Tansil | 1658' |
| Yates | 1742' |
| Seven Rivers | 2035' |
| Capitan Reef | 2132' |
| BOR/ Bell Canyon | 3151' |
| Cherry Canyon | 3481' |
| Brushy Canyon | 4485' |
| Bone Spring | 6061' |
| 1st.Bone Spring Sd. | 7254' |
| 2nd Bone Spring Sd. | 8074' |
| 3rd Bone Spring Sd. | 8993' |
| Wolfcamp | 9494' |
| Strawn | 10601' |

5. Possible mineral bearing formations:

| | | |
|---|---|---|
| Yates | 1742' | Oil/Gas |
| Seven Rivers | 2035' | Oil/Gas |
| Capitan Reef | 2132' | Brackish Water |
| BOR/ Bell Canyon | 3151' | Oil/Gas |
| Cherry Canyon | 3481' | Oil/Gas |
| Brushy Canyon | 4485' | Oil/Gas |
| Bone Spring | 6061' | Oil/Gas |
| 1st.Bone Spring Sd. | 7254' | Oil/Gas |
| 2nd Bone Spring Sd. | 8074' | Oil/Gas |
| 3rd Bone Spring Sd. | 8993' | Oil/Gas |
| Wolfcamp | 9494' | Oil/Gas |
| Strawn | 10601' | Oil/Gas |

No other formations are expected to give up oil, gas or fresh water in measurable quantities. Setting 20" casing to ~~220'~~ 275' (25' into Rustler) and circulating cement back to the surface will protect the surface fresh water sand. The Salt Section will be protected by setting 13 3/8" casing to 1720' (17' into Tansill) and circulating cement back to surface in a single stage job. The Capitan Reef will be isolated by setting 9 5/8" casing at 3216' (20' into Bell 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.

An 8 ¾" open hole will be drilled from 9 5/8" casing shoe to KOP and thru curve. At end of curve (EOC) the open hole will be reduced to 7 7/8" and drilled to TD. At TD 7" x 5 ½" tapered production casing will be installed ( at KOP the production casing will crossover from 7" to 5 ½") This tapered 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 |
|---|---|---|---|---|
| 0-220' 275 | Fresh Water | 8.3-8.8 | 28 | N.C. |
| 220'-1720' | Brine | 9.8-10.1 | 28 | N.C. |
| 1720'-3216' | Fresh Water | 8.3-9.0 | 30 | N.C. |
| 3216'-7829' | Cut Brine mud | 8.7-9.2 | 30 | N.C. |
| 7829'-8642' | Cut Brine mud | 8.7-9.2 | 30 | N.C. |
| 8642'-13421' | Cut Brine mud | 8.7-9.2 | 30 | 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 $H_2S$ circulated to surface. Proper mud weights, safe drilling practices and the use of $H_2S$ scavengers will minimize hazards when penetrating $H_2S$ bearing zones.

## 6. Proposed Casing Program

See COA

| Hole Size | Interval MD | OD Casing | Weight | Grade | Condition | Jt. | brst/clps/ten |
|---|---|---|---|---|---|---|---|
| 26" | 0-220' 275' | 20" 0-220' | 94# | J55 | New | ST&C | 9.59/5.35/43.51 |
| 17 ½" | 220-1720' | 13 3/8" 0-1720' | 54.5# | J55 | New | BT&C | 1.59/1.26/13.07 |
| 12 ¼" | 1720'-3216' | 9 5/8" 0-3216' | 40# | J/K55 | New | LT&C | 2.14/1.75/4.67 |
| 8 ¾" | 3216'-7829' | 7" 0-7829' | 26# | P110 | New | LT&C | 1.24/1.66/4.48 |
| 8 ¾" | 7829'-8642' | 5 ½" 7829'-8642' | 17# | P110 | New | LT&C | 1.81/1.33/3.52 |
| 7 7/8" | 8642'-13421' | 5 ½" 8642'-13421' | 17# | P110 | New | LT&C | 1.81/1.33/3.52 |

Production string will be a tapered string with 7" 26# P110 LTC run from surface to kick off point (7829') and then crossed over to 5 ½" 17# P110 LTC.

## 7. Proposed Cement Program

**20" SURFACE: (Circulate to Surface)**

See COA

| | | Description | Yield | Density | Water Requirements |
|---|---|---|---|---|---|
| Tail: 0'-220' 275' Excess 50% | 400 sks | Class "C" w/2% CaCl2 | 1.32 cf/sk | 14.8 ppg | 6.3 gal/sk. |

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

| | | | | | |
|---|---|---|---|---|---|
| Lead: 0'-1250' Excess 51% | 750 sks | Class "C"+ 4% Gel+ 2% CaCl2+ 0.25 ppsCF | 1.75 cf/sk | 13.5 ppg | 9.2 gal/sk. |
| Tail: 1250'-1720' Excess 46% | 400 sks | Class C w/2% CaCl2 | 1.32 cf/sk | 14.8 ppg | 6.3 gal/sk. |

Combined Excess 50%

**9 5/8" INTERMEDIATE:**

**Single Stage: (Circulate to Surface)**

| | | Description | Yield | Density | Water Requirement |
|---|---|---|---|---|---|
| 1st Lead: 0'-1720' Excess 14% | 300 sks | 50:50:10 C:Poz:Gel w/ 5% Salt+ 0.25% CF +5 pps LCM | 2.45 cf/sk | 11.8 ppg | 14.4 gal/sk. |
| 2nd Lead: 1720'-2500' Excess 101% | 200 sks | 50:50:10 C:Poz:Gel w/ 5% Salt+ 0.25% CF +5 pps LCM | 2.45 cf/sk | 11.8 ppg | 14.4 gal/sk. |
| Tail: 2500'-3216' Excess 78% | 325 sks | Class C w/2% CaCl2 | 1.32 cf/sk | 14.8 ppg | 6.3 gal/sk. |

Combined excess 66%

**7" X 5 ½" TAPERED PRODUCTION CASING:**

See COA

minimum of 50' above Capitan Reef

**Option #1: Single Stage (Cement cal to surface) (~~Minimum tie-back 200' above 9 5/8" casing shoe~~)**

| | | | | | |
|---|---|---|---|---|---|
| 1st Lead: 0'-4000' Excess 30% | 325 sks | EconoCem-H+ 0.5% Halad-322+ 5 pps Kol-Seal+ 0.25 pps D-Air 5000+ 0.2% HR-601 | 2.51 cf/sk | 11.9 ppg | 14.2 gal/sk. |
| 2nd Lead: 4000'-7829' Excess 42% | 325 sks | EconoCem-H+ 0.5% Halad-322+ 5 pps Kol-Seal+ 0.25 pps D-Air 5000+ 0.2% HR-601 | 2.51 cf/sk | 11.9 ppg | 14.2 gal/sk. |
| Tail: 7829'-13421' Excess 32% | 1100 sks | VersaCem+0.4% GasStop +0.3% CFR-3+1% Salt+ 0.1% HR-601 | 1.24 cf/sk | 14.4 ppg | 5.7 gal/sk. |

Combined Lead & Tail Excess: 32%

Note: 7" casing from surface to KOP. 5 ½" casing will be run from KOP at 7829' thru curve and lateral to TD of 13421' MD. Productive intervals will be isolated by cement as described above.

## 8. Pressure Control Equipment: (maximum anticipated surface pressure= 1860 psig)

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 nippled up on the 20" casing head and used to TD of 17 ½" hole. This unit will be hydraulically operated and will be hydrostatically tested by independent tester to 250/300 psig low and 1000 psig high. Choke line valve, chokes, upper Kelly cock valve, safety valve shall also be tested to 1000 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.

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 unit will be hydraulically operated and will be tested by independent tester using test plug to 250 psig/300 psig low and 2000 psig high. .Annular preventer 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.

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. Any time a component of the BOP stack or choke manifold is changed or installed BOPE will be re-tested as required.

**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 2000 psig for dual rams & 1000 psig for annulars 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 7829'. Kick off at +/- 7829', building curve at 11°/100' to 89.40° inclination, 96.53° az at 8642' MD/8350'TVD. Reduce hole size and drill 7 7/8" lateral section in a easterly direction for +/4779' lateral to TD at +/-13421' MD, 8400' TVD. Run 7" x 5-1/2" production casing. 7" to be run from surface to kickoff point and then changed over to 5 ½". 5 ½" casing will be run from kickoff point to td and both strings will be isolated by a single stage cement job. Cement calculated to surface. Minimum tie-back 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. The following logs will be run in the vertical portion of the hole KOP to surface: GR/CNL

B. The mud logging program will consist of lagged 10' samples from KOP to TD in Horizontal hole.

C. Drill Stem test is not anticipated.

D. No conventional coring is anticipated.

E. Further testing procedures will be determined after the 7" x 5 ½" production casing has been cemented at TD based on drill shows and log evaluation.

## 12. Abnormal Conditions, Pressures, Temperatures and Potential Hazards:

See COA

No abnormal pressures or temperatures are anticipated. The estimated bottom hole temperature at TD is 107° Fahrenheit and estimated maximum bottom hole pressure is 3659 psi. Wells in the Parkway area will penetrate formations that are known or could reasonably be expected to contain Hydrogen Sulfide. Therefore, a $H_2S$ 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 $H_2S$ 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 **April *30, 2014*** with drilling and completion operations lasting approximately ***90*** days.

GEG 1.22.14

# COG OPERATING, LLC

**Eddy County, NM**
**Mossy Fed 2H**
**2H**

**Lateral**

**Plan: Plan #3**

# Standard Planning Report

**24 April, 2014**

Section Distances

Sec12,T20S,R29E
SHL - Unit H
1649.5'FNL, 330.0'FEL

Sec7,T20S,R30E
PP
1725.2'FNL, 330.0'FWL
PBHL - Unit H
2260.0'FNL, 330.0'FEL

| | | | |
|---|---|---|---|
| **Database:** | EDM R5000.1 MULTI | **Local Co-ordinate Reference:** | Well 2H |
| **Company:** | COG OPERATING, LLC | **TVD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Project:** | Eddy County, NM | **MD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Site:** | Mossy Fed 2H | **North Reference:** | Grid |
| **Well:** | 2H | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | Lateral | | |
| **Design:** | Plan #3 | | |

**Project** Eddy County, NM

| | | | |
|---|---|---|---|
| **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** Mossy Fed 2H

| | | | | | |
|---|---|---|---|---|---|
| **Site Position:** | | **Northing:** | 578,682.90 usft | **Latitude:** | 32° 35' 25.86 N |
| **From:** | Map | **Easting:** | 596,372.00 usft | **Longitude:** | 104° 1' 13.55 W |
| **Position Uncertainty:** | 0.00 usft | **Slot Radius:** | 13.200 in | **Grid Convergence:** | 0.17 ° |

**Well** 2H

| | | | | | | |
|---|---|---|---|---|---|---|
| **Well Position** | **+N/-S** | 0.00 usft | **Northing:** | 578,682.90 usft | **Latitude:** | 32° 35' 25.86 N |
| | **+E/-W** | 0.00 usft | **Easting:** | 596,372.00 usft | **Longitude:** | 104° 1' 13.55 W |
| **Position Uncertainty** | | 0.00 usft | **Wellhead Elevation:** | | **Ground Level:** | 3,272.00 usft |

**Wellbore** Lateral

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|---|---|---|---|---|---|
| | IGRF2010 | 4/24/2014 | 7.47 | 60.38 | 48,503 |

**Design** Plan #3

| | | | | | |
|---|---|---|---|---|---|
| **Audit Notes:** | p2a for hardlines | | | | |
| **Version:** | | **Phase:** | PROTOTYPE | **Tie On Depth:** | 0.00 |

| Vertical Section: | Depth From (TVD) (usft) | +N/-S (usft) | +E/-W (usft) | Direction (°) |
|---|---|---|---|---|
| | -43.00 | 0.00 | 0.00 | 96.53 |

**Plan Sections**

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Dogleg Rate (°/100usft) | Build Rate (°/100usft) | Turn Rate (°/100usft) | TFO (°) | Target |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 7,829.16 | 0.00 | 0.00 | 7,829.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8,641.89 | 89.40 | 96.53 | 8,350.00 | -58.62 | 512.08 | 11.00 | 11.00 | 0.00 | 96.53 | |
| 13,420.78 | 89.40 | 96.53 | 8,400.00 | -602.10 | 5,259.70 | 0.00 | 0.00 | 0.00 | 0.00 | Mossy Fed 2H PBHL |

| | | | |
|---|---|---|---|
| **Database:** | EDM R5000.1 MULTI | **Local Co-ordinate Reference:** | Well 2H |
| **Company:** | COG OPERATING, LLC | **TVD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Project:** | Eddy County, NM | **MD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Site:** | Mossy Fed 2H | **North Reference:** | Grid |
| **Well:** | 2H | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | Lateral | | |
| **Design:** | Plan #3 | | |

**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 |
| 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 |
| 5,100.00 | 0.00 | 0.00 | 5,100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,200.00 | 0.00 | 0.00 | 5,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,300.00 | 0.00 | 0.00 | 5,300.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| Database: | EDM R5000.1 MULTI | Local Co-ordinate Reference: | Well 2H |
| Company: | COG OPERATING, LLC | TVD Reference: | 3272'GL+20'KB @ 3291.00usft (Planning) |
| Project: | Eddy County, NM | MD Reference: | 3272'GL+20'KB @ 3291.00usft (Planning) |
| Site: | Mossy Fed 2H | North Reference: | Grid |
| Well: | 2H | Survey Calculation Method: | Minimum Curvature |
| Wellbore: | Lateral | | |
| Design: | Plan #3 | | |

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) |
|---|---|---|---|---|---|---|---|---|---|
| 5,400.00 | 0.00 | 0.00 | 5,400.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,500.00 | 0.00 | 0.00 | 5,500.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,600.00 | 0.00 | 0.00 | 5,600.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,700.00 | 0.00 | 0.00 | 5,700.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,800.00 | 0.00 | 0.00 | 5,800.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 5,900.00 | 0.00 | 0.00 | 5,900.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,000.00 | 0.00 | 0.00 | 6,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,100.00 | 0.00 | 0.00 | 6,100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,200.00 | 0.00 | 0.00 | 6,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,300.00 | 0.00 | 0.00 | 6,300.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,400.00 | 0.00 | 0.00 | 6,400.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,500.00 | 0.00 | 0.00 | 6,500.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,600.00 | 0.00 | 0.00 | 6,600.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,700.00 | 0.00 | 0.00 | 6,700.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,800.00 | 0.00 | 0.00 | 6,800.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6,900.00 | 0.00 | 0.00 | 6,900.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,000.00 | 0.00 | 0.00 | 7,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,100.00 | 0.00 | 0.00 | 7,100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,200.00 | 0.00 | 0.00 | 7,200.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,300.00 | 0.00 | 0.00 | 7,300.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,400.00 | 0.00 | 0.00 | 7,400.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,500.00 | 0.00 | 0.00 | 7,500.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,600.00 | 0.00 | 0.00 | 7,600.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,700.00 | 0.00 | 0.00 | 7,700.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,800.00 | 0.00 | 0.00 | 7,800.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7,829.16 | 0.00 | 0.00 | 7,829.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Start Build 11.00 | | | | | | | | | |
| 7,850.00 | 2.29 | 96.53 | 7,849.99 | -0.05 | 0.41 | 0.42 | 11.00 | 11.00 | 0.00 |
| 7,900.00 | 7.79 | 96.53 | 7,899.78 | -0.55 | 4.78 | 4.81 | 11.00 | 11.00 | 0.00 |
| 7,950.00 | 13.29 | 96.53 | 7,948.92 | -1.59 | 13.86 | 13.96 | 11.00 | 11.00 | 0.00 |
| 8,000.00 | 18.79 | 96.53 | 7,996.95 | -3.16 | 27.59 | 27.77 | 11.00 | 11.00 | 0.00 |
| 8,050.00 | 24.29 | 96.53 | 8,043.44 | -5.25 | 45.82 | 46.12 | 11.00 | 11.00 | 0.00 |
| 8,100.00 | 29.79 | 96.53 | 8,087.96 | -7.83 | 68.40 | 68.84 | 11.00 | 11.00 | 0.00 |
| 8,150.00 | 35.29 | 96.53 | 8,130.09 | -10.89 | 95.11 | 95.73 | 11.00 | 11.00 | 0.00 |
| 8,200.00 | 40.79 | 96.53 | 8,169.45 | -14.39 | 125.71 | 126.53 | 11.00 | 11.00 | 0.00 |
| 8,250.00 | 46.29 | 96.53 | 8,205.68 | -18.31 | 159.92 | 160.96 | 11.00 | 11.00 | 0.00 |
| 8,300.00 | 51.79 | 96.53 | 8,238.45 | -22.60 | 197.42 | 198.71 | 11.00 | 11.00 | 0.00 |
| 8,350.00 | 57.29 | 96.53 | 8,267.44 | -27.23 | 237.87 | 239.42 | 11.00 | 11.00 | 0.00 |
| 8,400.00 | 62.79 | 96.53 | 8,292.40 | -32.15 | 280.89 | 282.72 | 11.00 | 11.00 | 0.00 |
| 8,450.00 | 68.29 | 96.53 | 8,313.09 | -37.33 | 326.09 | 328.22 | 11.00 | 11.00 | 0.00 |
| 8,500.00 | 73.79 | 96.53 | 8,329.33 | -42.71 | 373.05 | 375.49 | 11.00 | 11.00 | 0.00 |
| 8,550.00 | 79.29 | 96.53 | 8,340.96 | -48.23 | 421.35 | 424.10 | 11.00 | 11.00 | 0.00 |
| 8,600.00 | 84.79 | 96.53 | 8,347.88 | -53.86 | 470.53 | 473.60 | 11.00 | 11.00 | 0.00 |
| 8,641.89 | 89.40 | 96.53 | 8,350.00 | -58.62 | 512.08 | 515.42 | 11.00 | 11.00 | 0.00 |
| Start 4778.89 hold at 8641.89 MD | | | | | | | | | |
| 8,700.00 | 89.40 | 96.53 | 8,350.61 | -65.23 | 569.81 | 573.53 | 0.00 | 0.00 | 0.00 |
| 8,800.00 | 89.40 | 96.53 | 8,351.65 | -76.60 | 669.15 | 673.52 | 0.00 | 0.00 | 0.00 |
| 8,900.00 | 89.40 | 96.53 | 8,352.70 | -87.97 | 768.50 | 773.52 | 0.00 | 0.00 | 0.00 |
| 9,000.00 | 89.40 | 96.53 | 8,353.75 | -99.35 | 867.85 | 873.51 | 0.00 | 0.00 | 0.00 |
| 9,100.00 | 89.40 | 96.53 | 8,354.79 | -110.72 | 967.19 | 973.51 | 0.00 | 0.00 | 0.00 |
| 9,200.00 | 89.40 | 96.53 | 8,355.84 | -122.09 | 1,066.54 | 1,073.50 | 0.00 | 0.00 | 0.00 |
| 9,300.00 | 89.40 | 96.53 | 8,356.88 | -133.46 | 1,165.88 | 1,173.50 | 0.00 | 0.00 | 0.00 |
| 9,400.00 | 89.40 | 96.53 | 8,357.93 | -144.84 | 1,265.23 | 1,273.49 | 0.00 | 0.00 | 0.00 |

| | | | |
|---|---|---|---|
| Database: | EDM R5000.1 MULTI | Local Co-ordinate Reference: | Well 2H |
| Company: | COG OPERATING, LLC | TVD Reference: | 3272'GL+20'KB @ 3291.00usft (Planning) |
| Project: | Eddy County, NM | MD Reference: | 3272'GL+20'KB @ 3291.00usft (Planning) |
| Site: | Mossy Fed 2H | North Reference: | Grid |
| Well: | 2H | Survey Calculation Method: | Minimum Curvature |
| Wellbore: | Lateral | | |
| Design: | Plan #3 | | |

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) |
|---|---|---|---|---|---|---|---|---|---|
| 9,500.00 | 89.40 | 96.53 | 8,358.98 | -156.21 | 1,364.57 | 1,373.49 | 0.00 | 0.00 | 0.00 |
| 9,600.00 | 89.40 | 96.53 | 8,360.02 | -167.58 | 1,463.92 | 1,473.48 | 0.00 | 0.00 | 0.00 |
| 9,700.00 | 89.40 | 96.53 | 8,361.07 | -178.95 | 1,563.27 | 1,573.48 | 0.00 | 0.00 | 0.00 |
| 9,800.00 | 89.40 | 96.53 | 8,362.12 | -190.33 | 1,662.61 | 1,673.47 | 0.00 | 0.00 | 0.00 |
| 9,900.00 | 89.40 | 96.53 | 8,363.16 | -201.70 | 1,761.96 | 1,773.46 | 0.00 | 0.00 | 0.00 |
| 10,000.00 | 89.40 | 96.53 | 8,364.21 | -213.07 | 1,861.30 | 1,873.46 | 0.00 | 0.00 | 0.00 |
| 10,100.00 | 89.40 | 96.53 | 8,365.25 | -224.44 | 1,960.65 | 1,973.45 | 0.00 | 0.00 | 0.00 |
| 10,200.00 | 89.40 | 96.53 | 8,366.30 | -235.82 | 2,059.99 | 2,073.45 | 0.00 | 0.00 | 0.00 |
| 10,300.00 | 89.40 | 96.53 | 8,367.35 | -247.19 | 2,159.34 | 2,173.44 | 0.00 | 0.00 | 0.00 |
| 10,400.00 | 89.40 | 96.53 | 8,368.39 | -258.56 | 2,258.69 | 2,273.44 | 0.00 | 0.00 | 0.00 |
| 10,500.00 | 89.40 | 96.53 | 8,369.44 | -269.93 | 2,358.03 | 2,373.43 | 0.00 | 0.00 | 0.00 |
| 10,600.00 | 89.40 | 96.53 | 8,370.49 | -281.31 | 2,457.38 | 2,473.43 | 0.00 | 0.00 | 0.00 |
| 10,700.00 | 89.40 | 96.53 | 8,371.53 | -292.68 | 2,556.72 | 2,573.42 | 0.00 | 0.00 | 0.00 |
| 10,800.00 | 89.40 | 96.53 | 8,372.58 | -304.05 | 2,656.07 | 2,673.41 | 0.00 | 0.00 | 0.00 |
| 10,900.00 | 89.40 | 96.53 | 8,373.63 | -315.42 | 2,755.41 | 2,773.41 | 0.00 | 0.00 | 0.00 |
| 11,000.00 | 89.40 | 96.53 | 8,374.67 | -326.80 | 2,854.76 | 2,873.40 | 0.00 | 0.00 | 0.00 |
| 11,100.00 | 89.40 | 96.53 | 8,375.72 | -338.17 | 2,954.11 | 2,973.40 | 0.00 | 0.00 | 0.00 |
| 11,200.00 | 89.40 | 96.53 | 8,376.76 | -349.54 | 3,053.45 | 3,073.39 | 0.00 | 0.00 | 0.00 |
| 11,300.00 | 89.40 | 96.53 | 8,377.81 | -360.91 | 3,152.80 | 3,173.39 | 0.00 | 0.00 | 0.00 |
| 11,400.00 | 89.40 | 96.53 | 8,378.86 | -372.29 | 3,252.14 | 3,273.38 | 0.00 | 0.00 | 0.00 |
| 11,500.00 | 89.40 | 96.53 | 8,379.90 | -383.66 | 3,351.49 | 3,373.38 | 0.00 | 0.00 | 0.00 |
| 11,600.00 | 89.40 | 96.53 | 8,380.95 | -395.03 | 3,450.83 | 3,473.37 | 0.00 | 0.00 | 0.00 |
| 11,700.00 | 89.40 | 96.53 | 8,382.00 | -406.40 | 3,550.18 | 3,573.37 | 0.00 | 0.00 | 0.00 |
| 11,800.00 | 89.40 | 96.53 | 8,383.04 | -417.78 | 3,649.53 | 3,673.36 | 0.00 | 0.00 | 0.00 |
| 11,900.00 | 89.40 | 96.53 | 8,384.09 | -429.15 | 3,748.87 | 3,773.35 | 0.00 | 0.00 | 0.00 |
| 12,000.00 | 89.40 | 96.53 | 8,385.13 | -440.52 | 3,848.22 | 3,873.35 | 0.00 | 0.00 | 0.00 |
| 12,100.00 | 89.40 | 96.53 | 8,386.18 | -451.89 | 3,947.56 | 3,973.34 | 0.00 | 0.00 | 0.00 |
| 12,200.00 | 89.40 | 96.53 | 8,387.23 | -463.27 | 4,046.91 | 4,073.34 | 0.00 | 0.00 | 0.00 |
| 12,300.00 | 89.40 | 96.53 | 8,388.27 | -474.64 | 4,146.25 | 4,173.33 | 0.00 | 0.00 | 0.00 |
| 12,400.00 | 89.40 | 96.53 | 8,389.32 | -486.01 | 4,245.60 | 4,273.33 | 0.00 | 0.00 | 0.00 |
| 12,500.00 | 89.40 | 96.53 | 8,390.37 | -497.38 | 4,344.95 | 4,373.32 | 0.00 | 0.00 | 0.00 |
| 12,600.00 | 89.40 | 96.53 | 8,391.41 | -508.76 | 4,444.29 | 4,473.32 | 0.00 | 0.00 | 0.00 |
| 12,700.00 | 89.40 | 96.53 | 8,392.46 | -520.13 | 4,543.64 | 4,573.31 | 0.00 | 0.00 | 0.00 |
| 12,800.00 | 89.40 | 96.53 | 8,393.50 | -531.50 | 4,642.98 | 4,673.31 | 0.00 | 0.00 | 0.00 |
| 12,900.00 | 89.40 | 96.53 | 8,394.55 | -542.87 | 4,742.33 | 4,773.30 | 0.00 | 0.00 | 0.00 |
| 13,000.00 | 89.40 | 96.53 | 8,395.60 | -554.25 | 4,841.67 | 4,873.29 | 0.00 | 0.00 | 0.00 |
| 13,100.00 | 89.40 | 96.53 | 8,396.64 | -565.62 | 4,941.02 | 4,973.29 | 0.00 | 0.00 | 0.00 |
| 13,200.00 | 89.40 | 96.53 | 8,397.69 | -576.99 | 5,040.37 | 5,073.28 | 0.00 | 0.00 | 0.00 |
| 13,300.00 | 89.40 | 96.53 | 8,398.74 | -588.36 | 5,139.71 | 5,173.28 | 0.00 | 0.00 | 0.00 |
| 13,400.00 | 89.40 | 96.53 | 8,399.78 | -599.74 | 5,239.06 | 5,273.27 | 0.00 | 0.00 | 0.00 |
| 13,420.78 | 89.40 | 96.53 | 8,400.00 | -602.10 | 5,259.70 | 5,294.05 | 0.00 | 0.00 | 0.00 |
| TD at 13420.78 | | | | | | | | | |

| | | | |
|---|---|---|---|
| **Database:** | EDM R5000.1 MULTI | **Local Co-ordinate Reference:** | Well 2H |
| **Company:** | COG OPERATING, LLC | **TVD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Project:** | Eddy County, NM | **MD Reference:** | 3272'GL+20'KB @ 3291.00usft (Planning) |
| **Site:** | Mossy Fed 2H | **North Reference:** | Grid |
| **Well:** | 2H | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | Lateral | | |
| **Design:** | Plan #3 | | |

**Design Targets**

| Target Name<br>- hit/miss target<br>- Shape | Dip Angle (°) | Dip Dir. (°) | TVD (usft) | +N/-S (usft) | +E/-W (usft) | Northing (usft) | Easting (usft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|
| Mossy Fed 2H PP<br>- plan misses target center by 664.44usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)<br>- Point | 0.00 | 0.01 | 0.00 | -75.57 | 660.13 | 578,607.34 | 597,032.13 | 32° 35' 25.09 N | 104° 1' 5.83 W |
| Mossy Fed 2H Surface<br>- plan hits target center<br>- Point | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 578,682.90 | 596,372.00 | 32° 35' 25.86 N | 104° 1' 13.55 W |
| Mossy Fed 2H PBHL<br>- plan hits target center<br>- Point | 0.00 | 0.01 | 8,400.00 | -602.10 | 5,259.70 | 578,080.80 | 601,631.70 | 32° 35' 19.74 N | 104° 0' 12.09 W |

**Plan Annotations**

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates +N/-S (usft) | Local Coordinates +E/-W (usft) | Comment |
|---|---|---|---|---|
| 7,829.16 | 7,829.16 | 0.00 | 0.00 | Start Build 11.00 |
| 8,641.89 | 8,350.00 | -58.62 | 512.08 | Start 4778.89 hold at 8641.89 MD |
| 13,420.78 | 8,400.00 | -602.10 | 5,259.70 | TD at 13420.78 |

# COG OPERATING, LLC

Field: Eddy County, NM
Site: Mossy Fed 2H
Well: 2H
Wellbore: Lateral
Plan: Plan #3

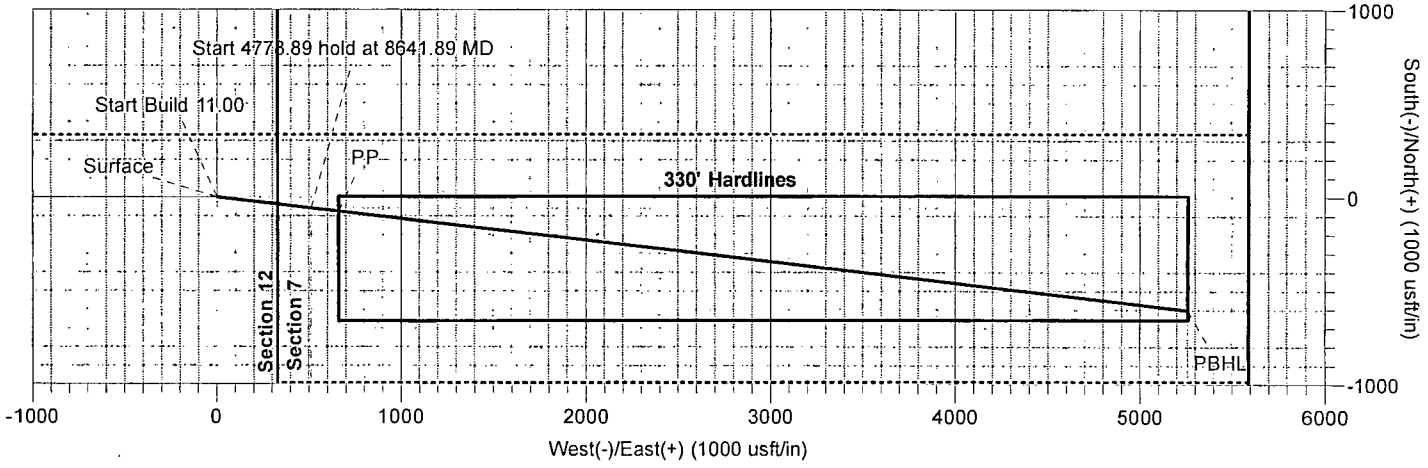
**Section Distances**

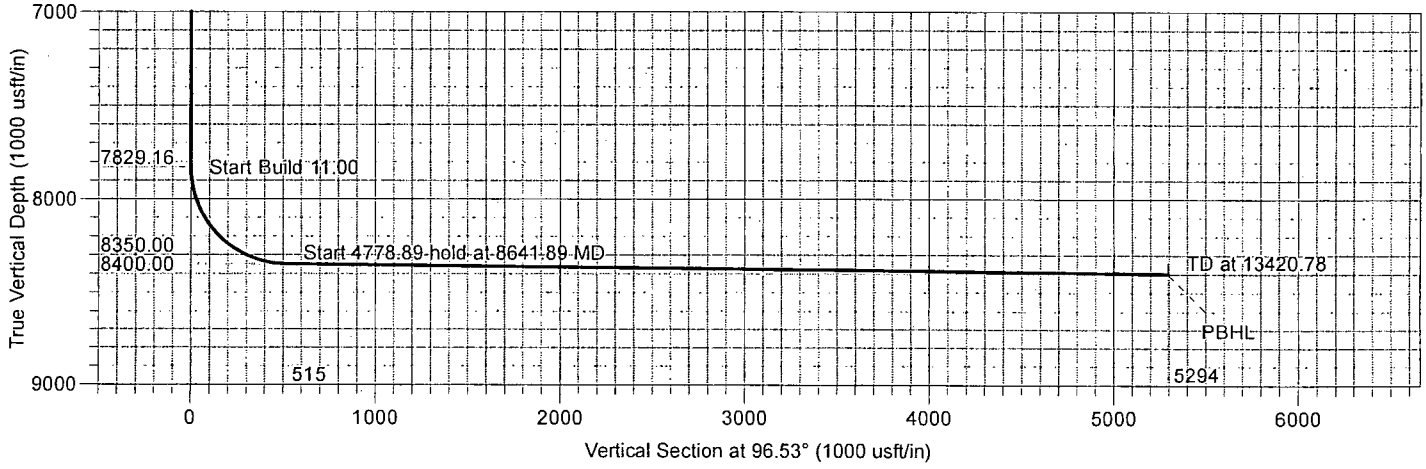
**Sec12,T20S,R29E**
**SHL - Unit H**
**1649.5'FNL, 330.0'FEL**

**Sec7,T20S,R30E**
**PP**
**1725.2'FNL, 330.0'FWL**
**PBHL - Unit H**
**2260.0'FNL, 330.0'FEL**


Azimuths to Grid North
True North: -0.17°
Magnetic North: 7.30°

Magnetic Field
Strength: 48503.1snT
Dip Angle: 60.38°
Date: 4/24/2014
Model: IGRF2010




TARGET DETAILS

| Name | TVD | +N/-S | +E/-W | Northing | Easting | Latitude | Longitude | Shape |
|---|---|---|---|---|---|---|---|---|
| Mossy Fed 2H PP | 0.00 | -75.57 | 660.13 | 578607.33 | 597032.13 | 32° 35' 25.09 N | 104° 1' 5.83 W | Point |
| Mossy Fed 2H Surface | 0.00 | 0.00 | 0.00 | 578682.90 | 596372.00 | 32° 35' 25.86 N | 104° 1' 13.55 W | Point |
| Mossy Fed 2H PBHL | 8400.00 | -602.10 | 5259.70 | 578080.80 | 601631.70 | 32° 35' 19.74 N | 104° 0' 12.09 W | Point |

SECTION DETAILS

| Sec | MD | Inc | Azi | TVD | +N/-S | +E/-W | Dleg | TFace | VSect | Target |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 2 | 7829.16 | 0.00 | 0.00 | 7829.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 3 | 8641.89 | 89.40 | 96.53 | 8350.00 | -58.62 | 512.08 | 11.00 | 96.53 | 515.42 | |
| 4 | 13420.78 | 89.40 | 96.53 | 8400.00 | -602.10 | 5259.70 | 0.00 | 0.00 | 5294.05 | Mossy Fed 2H PBHL |


Archer

ARCHER DIRECTIONAL DRILLING SERVICES
12101 Cutten Rd. Houston, Texas 77066
Phone: 281-301-2600 Fax: 281-301-2795


Design: Plan #3 (2H/Lateral)
Created By: Ivonne Gonzalez
Date: 17:00, April 24 2014

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

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

| POD Number | POD Sub-Code | basin | County | Q 64 | Q 16 | Q 4 | Sec | Tws | Rng | X | Y | Depth Well | Depth Water | Water Column |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C 03265 POD1 | | CUB | ED | 1 | 1 | 3 | 20 | 20S | 29E | 584052 | 3602648* | 89 | 52 | 37 |
| CP 00698 | | | ED | 2 | 3 | 1 | 03 | 20S | 29E | 587445 | 3608005 | | | |
| CP 00698 | C | | ED | 2 | 3 | 1 | 03 | 20S | 29E | 587445 | 3608005 | | | |
| CP 00740 | | | ED | 2 | 3 | 3 | 12 | 20S | 29E | 590669 | 3605509* | 150 | | |
| CP 00745 | | | ED | 4 | 1 | 3 | 12 | 20S | 29E | 590653 | 3605782 | 232 | | |
| CP 00759 | | | ED | | 4 | 2 | 28 | 20S | 29E | 586984 | 3601360* | 205 | 90 | 115 |
| CP 00830 | | | LE | | 2 | 1 | 04 | 20S | 29E | 586118 | 3608193* | 120 | | |
| CP 00831 | | | LE | | 2 | 2 | 10 | 20S | 29E | 588548 | 3606605* | 100 | | |
| CP 00832 | | | LE | | 2 | 3 | 12 | 20S | 29E | 590971 | 3605815* | 200 | | |
| CP 00833 | | | LE | | 1 | 2 | 16 | 20S | 29E | 586548 | 3604978* | 100 | | |
| CP 00936 POD1 | | | ED | 3 | 4 | 2 | 30 | 20S | 29E | 583661 | 3601238* | 70 | 52 | 18 |
| CP 01201 POD1 | | | ED | 2 | 2 | 1 | 18 | 20S | 29E | 582983 | 3605121 | 119 | 49 | 70 |

Average Depth to Water: **60 feet**
Minimum Depth: **49 feet**
Maximum Depth: **90 feet**

**Record Count:** 12

**PLSS Search:**

**Township:** 20S **Range:** 29E

***UTM location was derived from PLSS - see Help**

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

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

| POD Number | POD Sub-basin | County | Q 64 | Q 16 | Q 4 | Sec | Tws | Rng | X | Y | Depth Well | Depth Water | Water Column |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CP 00740 | | ED | 2 | 3 | 3 | 12 | 20S | 29E | 590669 | 3605509* | 150 | | |
| CP 00745 | | ED | 4 | 1 | 3 | 12 | 20S | 29E | 590653 | 3605782 | 232 | | |
| CP 00832 | | LE | | 2 | 3 | 12 | 20S | 29E | 590971 | 3605815* | 200 | | |

Average Depth to Water: --

Minimum Depth: --

Maximum Depth: --

**Record Count:** 3

**PLSS Search:**

**Section(s):** 12 **Township:** 20S **Range:** 29E

***UTM location was derived from PLSS - see Help**

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

No records found.

**PLSS Search:**

**Section(s):** 7 **Township:** 20S **Range:** 30E

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

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

| POD Number | POD Sub-Code | basin | County | Q 64 | Q 16 | Q 4 | Sec | Tws | Rng | X | Y | Depth Well | Depth Water | Water Column |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CP 00419 | | | ED | 4 | 3 | | 32 | 20S | 30E | 594250 | 3599003* | 262 | 170 | 92 |
| CP 00431 | | | ED | | 2 | 3 | 33 | 20S | 30E | 595857 | 3599419* | 235 | 195 | 40 |
| CP 00532 | | | ED | 4 | 3 | 4 | 21 | 20S | 30E | 596328 | 3602138* | 335 | 150 | 185 |
| CP 00551 | | | ED | 1 | 1 | 1 | 33 | 20S | 30E | 595343 | 3600320* | 286 | 187 | 99 |
| CP 00775 | | | ED | 2 | 1 | 4 | 11 | 20S | 30E | 599515 | 3605981* | 350 | 40 | 310 |
| CP 00834 | | | LE | | 2 | 3 | 06 | 20S | 30E | 592566 | 3607436* | 120 | | |

Average Depth to Water: **148 feet**

Minimum Depth: **40 feet**

Maximum Depth: **195 feet**

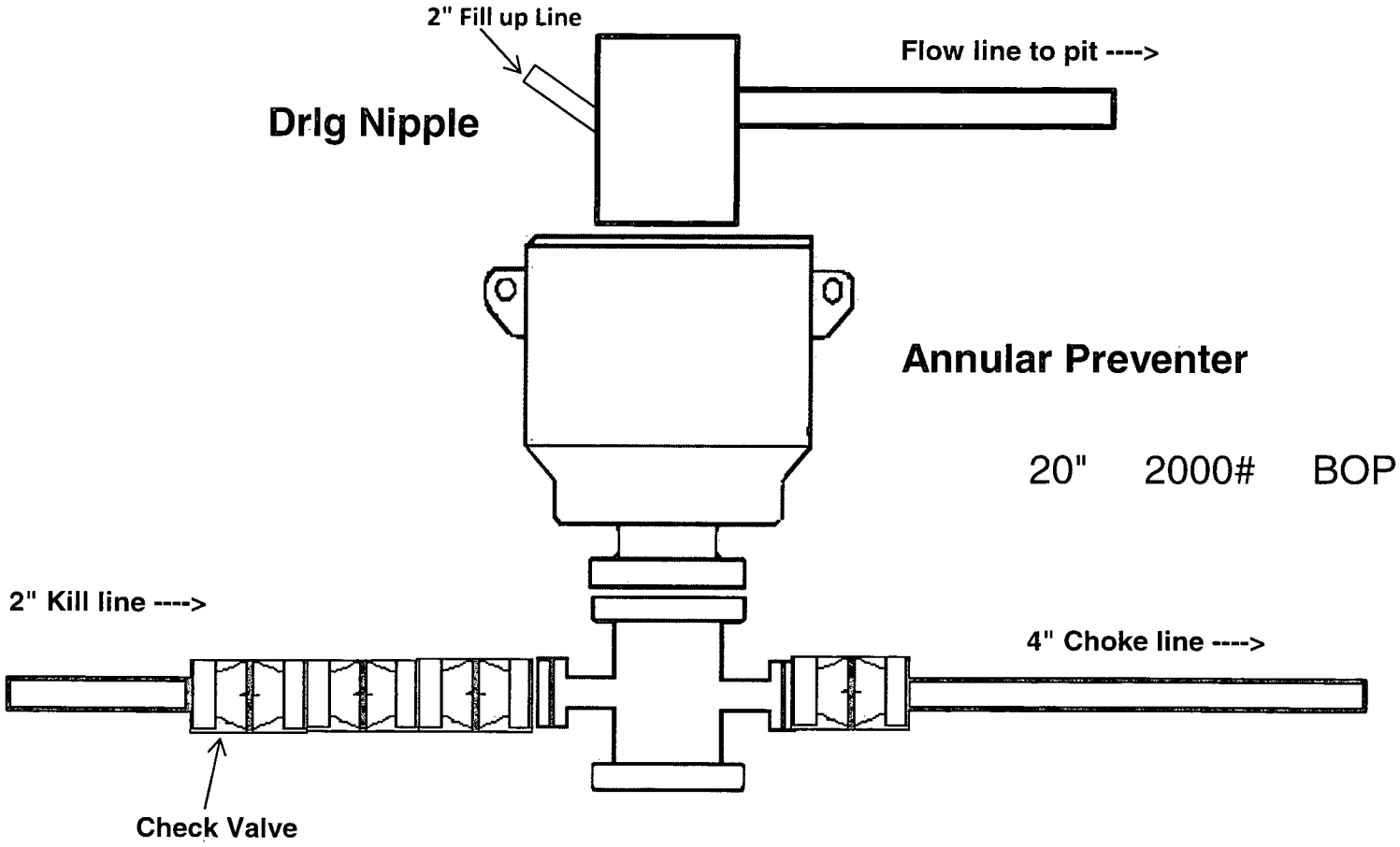
**Record Count:** 6

**PLSS Search:**

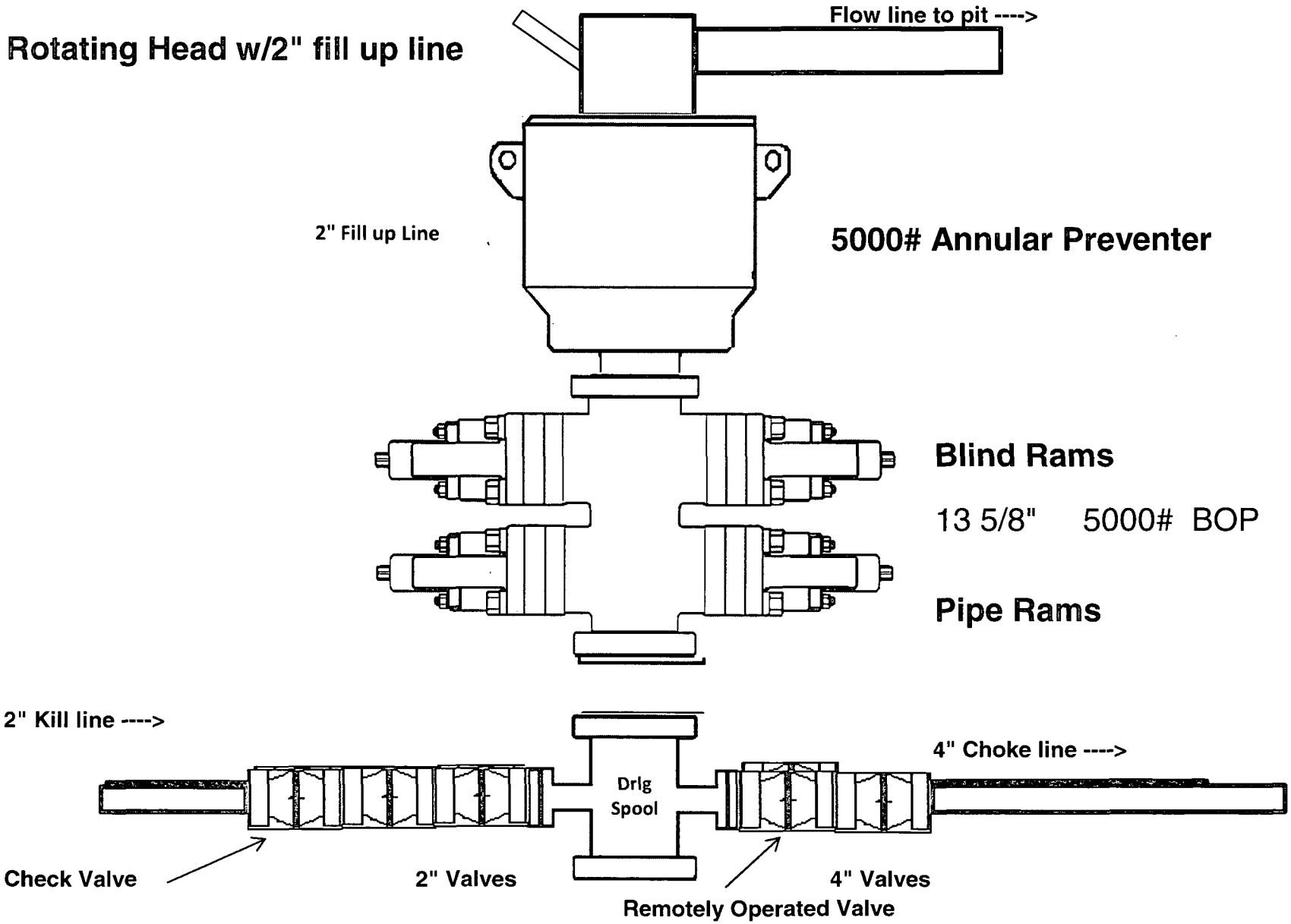
**Township:** 20S **Range:** 30E

***UTM location was derived from PLSS - see Help**

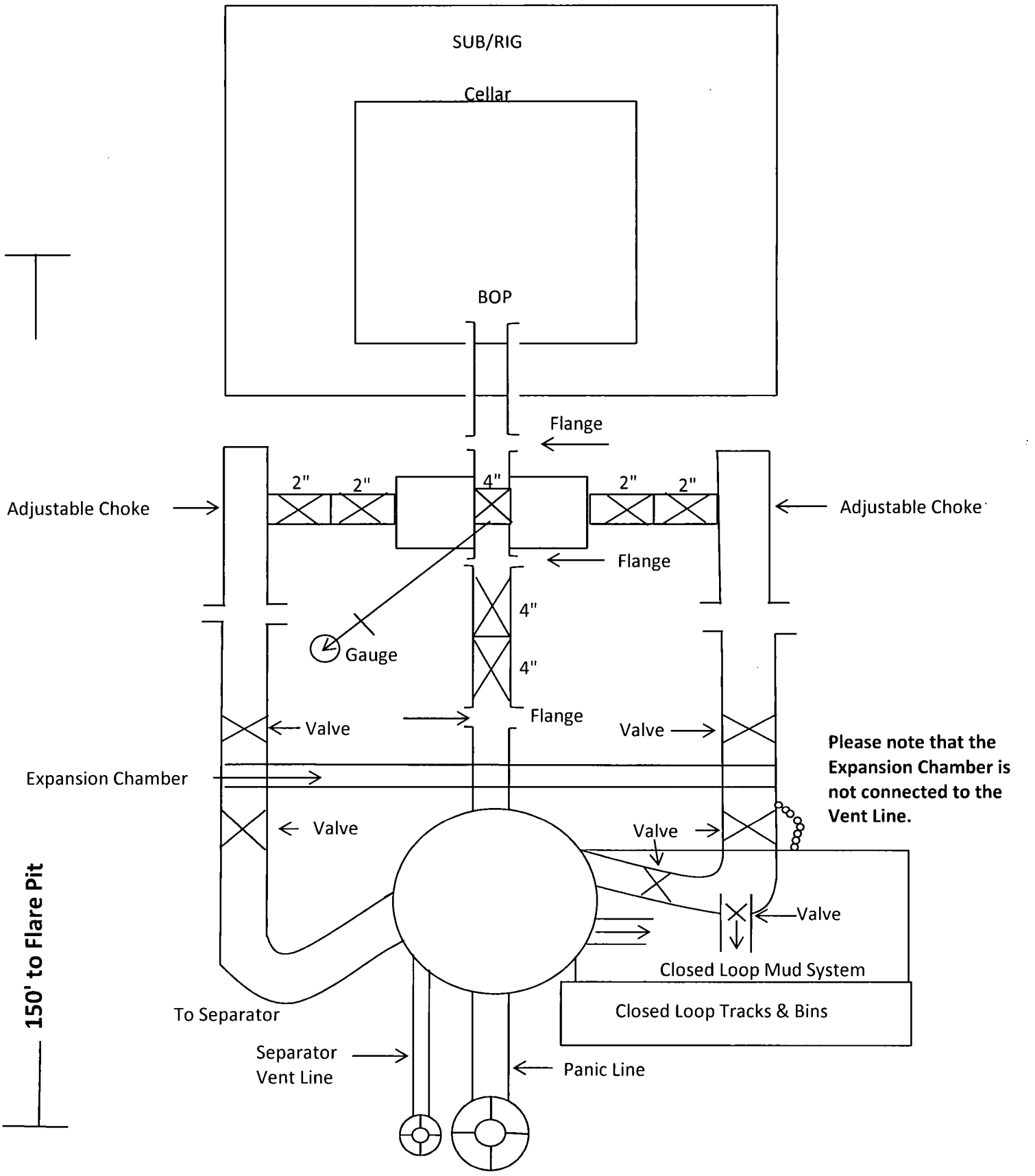
# 2,000 psi BOP Schematic



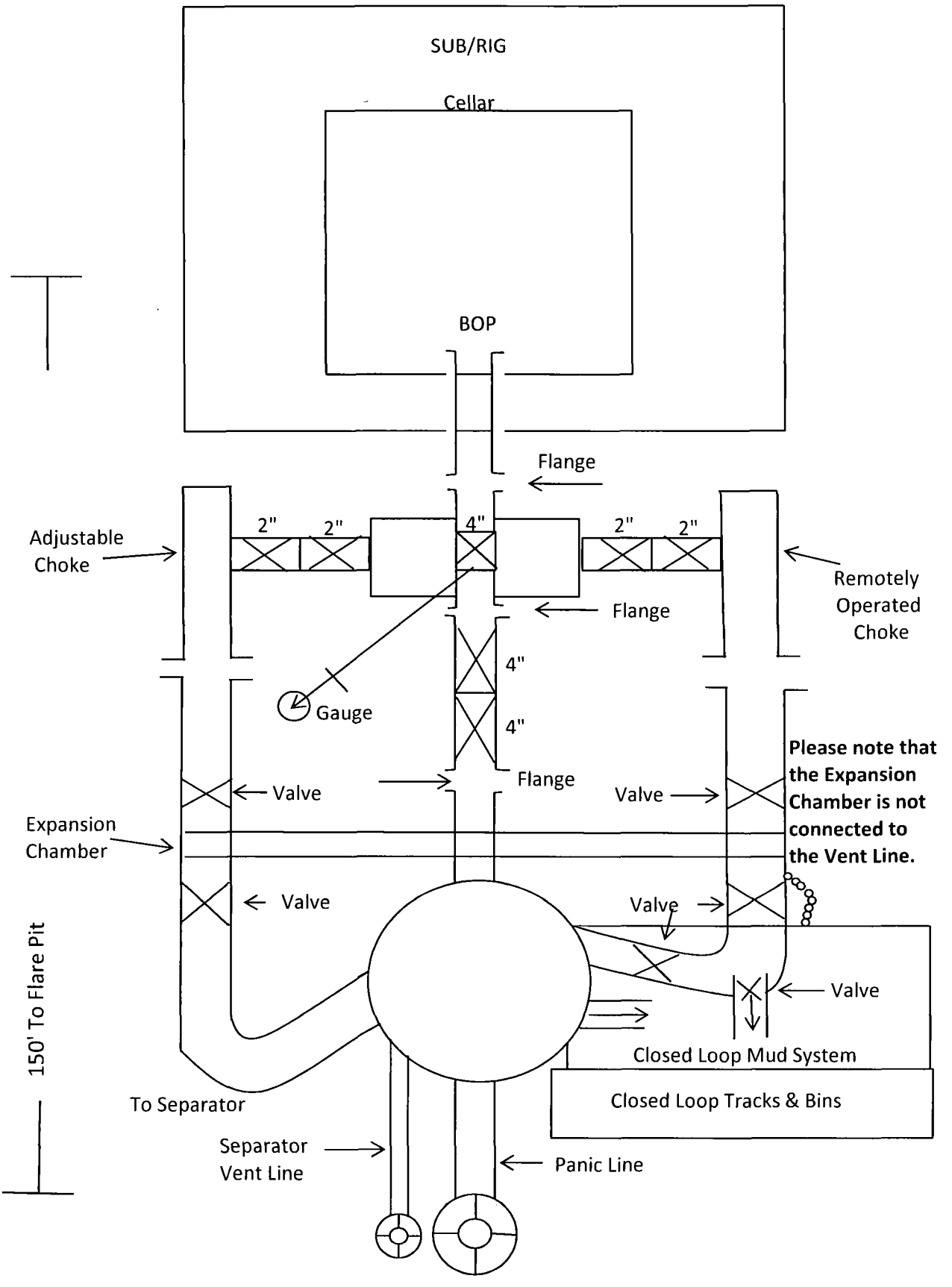
# 5,000 psi BOP Schematic



# 2M Choke Manifold Equipment



# 5M 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**

**Flare Lines will be from both Choke Manifold & Separator to edge of location which is +/- 170'**

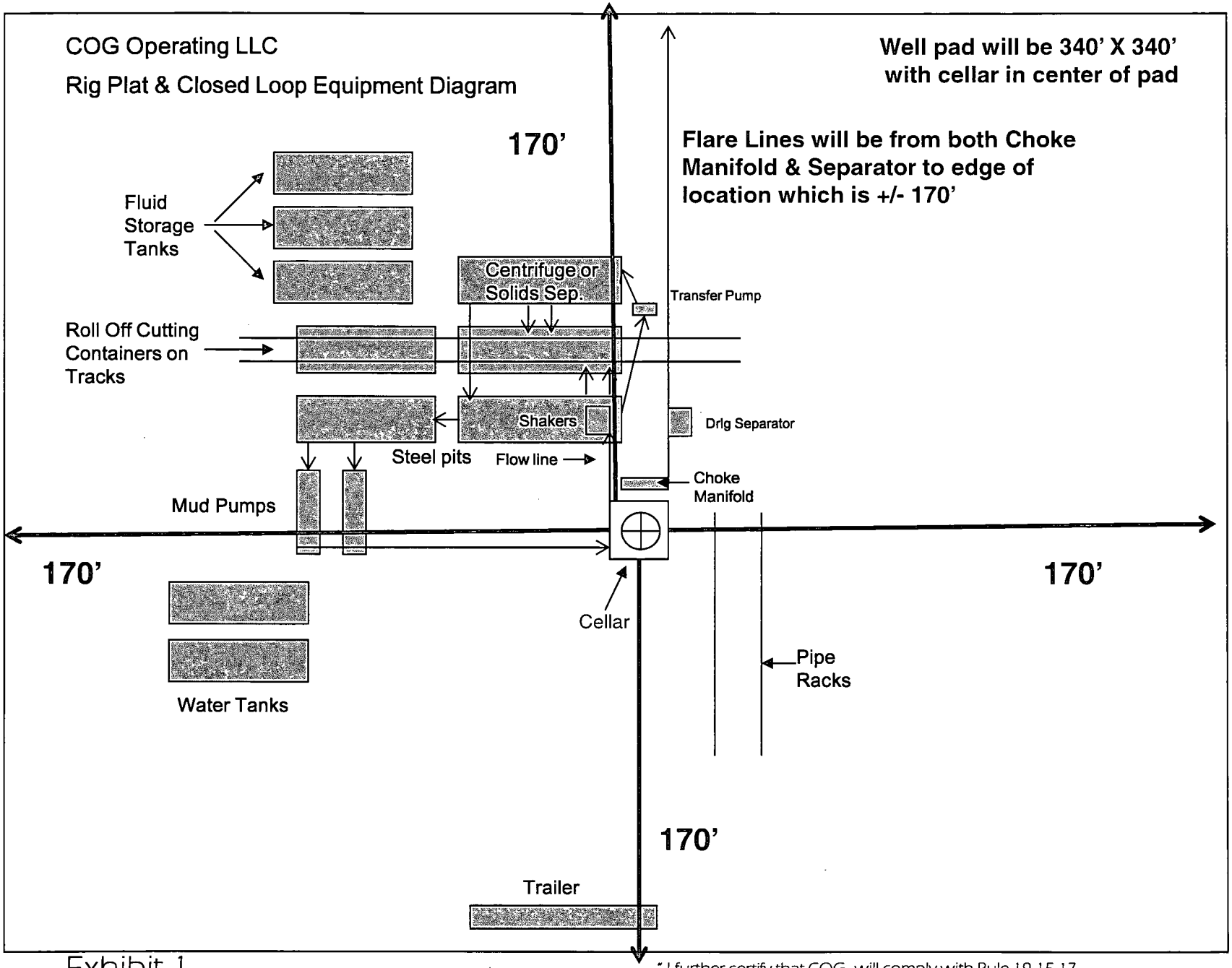


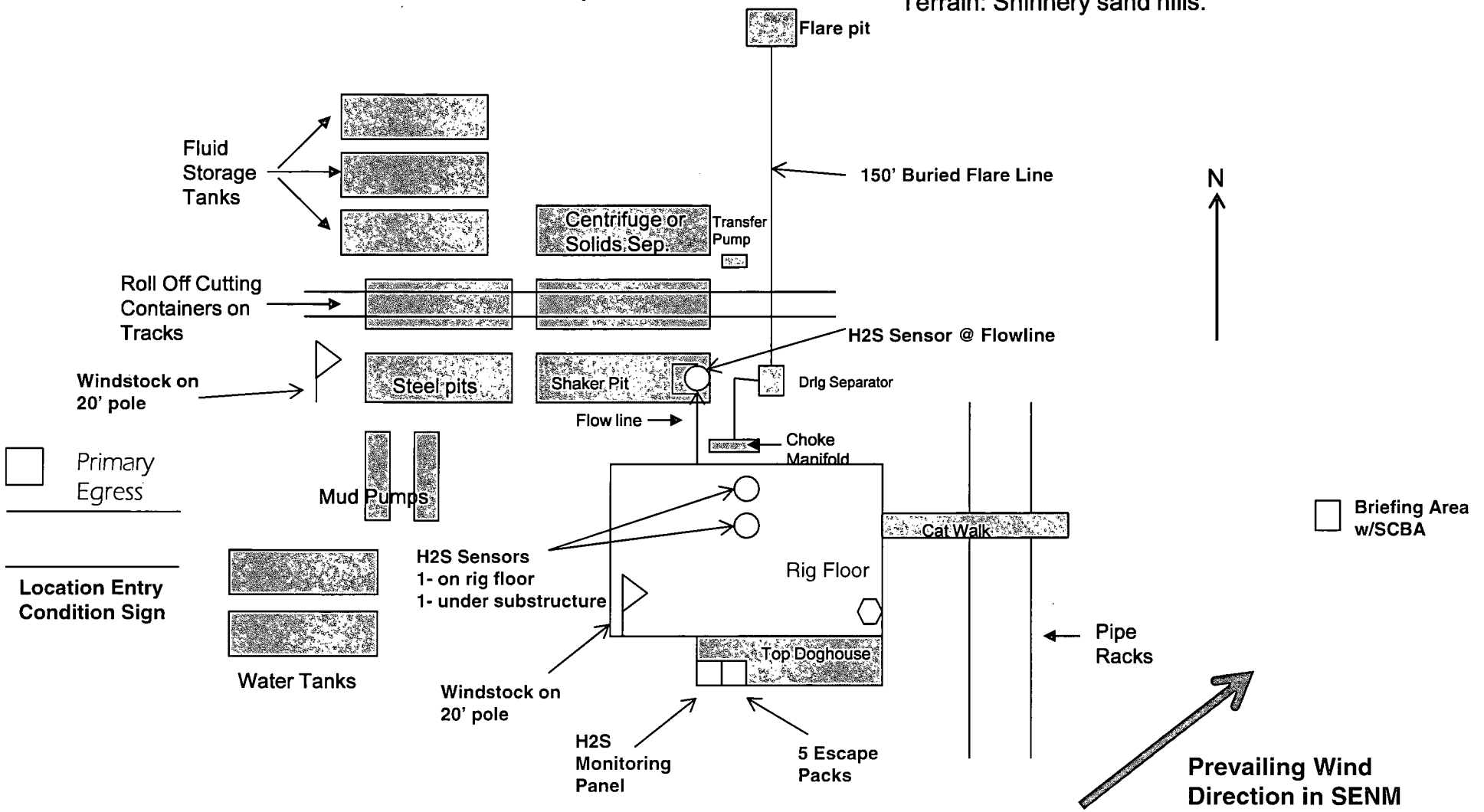

Exhibit 1

"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
$H_2S$ Equipment Schematic
Terrain: Shinnery sand hills.

Secondary egress.



**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 ($H_2S$).
b. The proper use and maintenance of personal protective equipment and life support systems.
c. The proper use of $H_2S$ 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 $H_2S$ 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. $H_2S$ SAFETY EQUIPMENT AND SYSTEMS

Note: All $H_2S$ 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.

# WARNING

**YOU ARE ENTERING AN $H_2S$ 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

| | OFFICE | MOBILE |
|---|---|---|
| COG OPERATING LLC OFFICE | 575-748-6940 | |
| SHERYL BAKER | 575-748-6940 | 432-934-1873 |
| KENT GREENWAY | 575-746-2010 | 432-557-1694 |
| SETH WILD | 432-683-7443 | 432-528-3633 |
| WALTER ROYE | 575-748-6940 | 432-934-1886 |

# EMERGENCY RESPONSE NUMBERS

| | OFFICE |
|---|---|
| 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 |

CONCHO

COG Operating LLC
2208 West Main
Artesia, NM 88210

# Production Facility Layout

Mossy Federal #2H
SHL: Sec 12-T20S-R29E
BHL: Sec 7-T20S-R20E

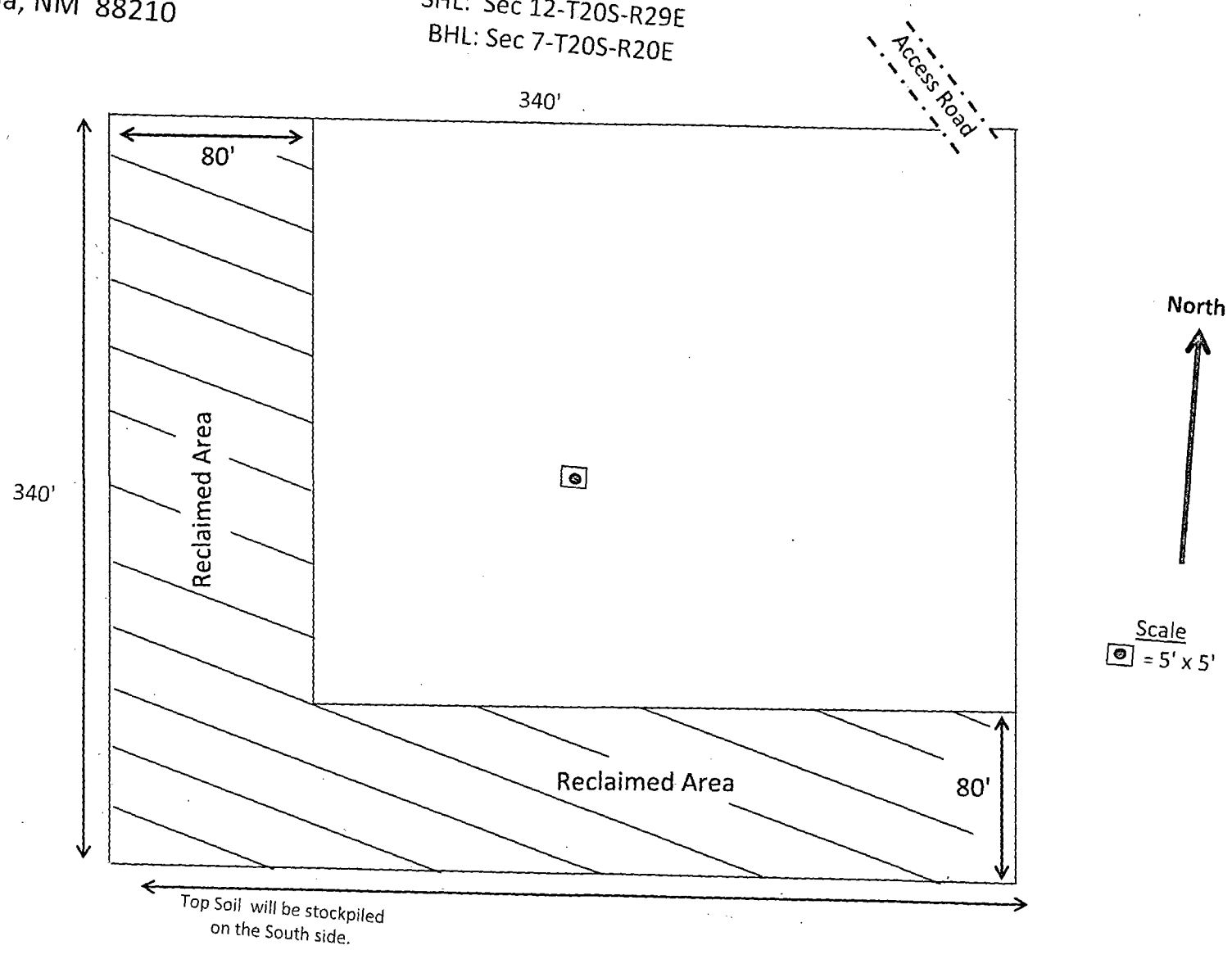



Exhibit 3

# Surface Use & Operating Plan

## Mossy Federal #2H

- Surface Tenant: Richardson Cattle Co., P O Box 487, Carlsbad, NM 88221.
- New Road: 2981'
- Flow Line: Will follow road to facility at the Mossy Federal #1H.
- Facilities: Will utilize facilities at the Mossy Federal #1H.

### Well Site Information

V Door: East

Topsoil: South

Interim Reclamation: South & West

### Notes

**Onsite**: On-site was done by Indra Dahal (BLM); Rand French (COG) on December 10, 2013.

## SURFACE USE AND OPERATING PLAN

### 1. Existing & Proposed Access Roads

A. The well site survey and elevation plat for the proposed well is attached with this application. It was staked by Harcrow Surveying, Artesia, NM.

B. All roads to the location are shown on the Location Verification Map Exhibit 2. The existing lease roads are illustrated and are adequate for travel during drilling and production operations. Upgrading existing roads prior to drilling the well will be done where necessary. The road route to the well site is depicted in Exhibit #2. The road shown in Exhibit #2 will be used to access the well.

C. Directions to location: See 600 x 600 plat

D. Routine grading and maintenance of existing roads will be conducted as necessary to maintain their condition as long as any operations continue on this lease. Roads will be maintained according to specifications in section 2A of this Surface Use and Operating Plan.

### 2. Proposed Access Road:

The Location Verification Map shows that 2981' of new access road will be required for this location. If any road is required it will be constructed as follows:

The maximum width of the running surface will be 14'. The road will be crowned, ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope and 4 feet wide. Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage, and to be consistent with local drainage patterns.

A. The average grade will be less than 1%.

B. No turnouts are planned.

C. No culverts, cattleguard, gates, low water crossings or fence cuts are necessary.

D. Surfacing material will consist of native caliche. Caliche will be obtained from the actual well site if available. If not available onsite, caliche will be hauled from the nearest BLM approved caliche pit.

**3. Location of Existing Well:**

The One-Mile Radius Map shows existing wells within a one-mile radius of surface hole location and the bottom hole location.

**4. Location of Existing and/or Proposed Facilities:**

A. If the well is productive, contemplated facilities will be as follows:

1) A tank battery and facilities are proposed at the Mossy Federal #1H location

2) Production will be sent to the Mossy Federal #1H facility. A surface flow line of approximately 451' of 2 7/8" steel pipe carrying oil, gas and water under a maximum pressure of 125 psi will follow the access road to the Mossy Federal #1H. The flow line is be layed a safe distance, estimated at 5-10' from the road.

3) The tank battery and facilities including all flow lines and piping will be installed according to API specifications.

4) Any additional caliche will be obtained from the actual well site. If caliche does not exist or is not plentiful from the well site, the caliche will be hauled from a BLM approved caliche pit. Any additional construction materials will be purchased from contractors.

5) It will be necessary to run electric power if this well is productive. Power will be provided by Xcel Energy and they will submit a separate plan and ROW for service to the well location.

6) If the well is productive, rehabilitation plans will include the following:

- The original topsoil from the well site will be returned to the location, and the site will be re-contoured as close as possible to the original site.

**5. Location and Type of Water Supply:**

The well will be drilled with combination brine and fresh water mud system as outlined in the drilling program. The water will be obtained from commercial water stations in the area and hauled to location by transport truck over the existing and proposed access roads shown in Exhibit #2. If a commercial fresh water source is nearby, fast line may be laid along existing road ROW's and fresh water pumped to the well. No water well will be drilled on the location.

**6. Source of Construction Materials and Location "Turn-Over" Procedure:**

Obtaining caliche: One primary way of obtaining caliche to build locations and roads will be by "turning over" the location. This means, caliche will be obtained from the actual well site. A caliche permit will be obtained from BLM prior to obtaining caliche. 2400 cubic yards is the maximum amount of caliche needed for pad and roads. Amount will vary for each pad. The procedure below has been approved by BLM personnel:

A. The top 6 inches of topsoil is pushed off and stockpiled along the side of the location.

B. An approximate 160' X 160' area is used within the proposed well site to remove caliche.

C. Subsoil is removed and stockpiled within the surveyed well pad.

D. When caliche is found, material will be stock piled within the pad site to build the location and road.

E. Then subsoil is pushed back in the hole and caliche is spread accordingly across entire location and road.

F. Once well is drilled, the stock piled top soil will be used for interim reclamation and spread along areas where caliche is picked up and the location size is reduced.

G. Neither caliche, nor subsoil will be stock piled outside of the well pad. Topsoil will be stockpiled along the edge of the pad as depicted in the Well Site Layout or survey plat.

In the event that no caliche is found onsite, caliche will be hauled in from a BLM approved caliche pit or other established mineral pit. A BLM mineral material permit will be acquired prior to obtaining any mineral material from BLM pits or land.

**7. Methods of Handling Water Disposal:**

A. The well will be drilled utilizing a closed loop mud system. Drill cuttings will be held in roll-off style mud boxes and taken to an NMOCD approved disposal site.

B. Drilling fluids will be contained in steel mud pits.

C. Water produced from the well during completion will be held temporarily in steel tanks and then taken to an NMOCD approved commercial disposal facility.

D. Garbage and trash produced during drilling or completion operations will be collected in a trash bin and hauled to an approved landfill. No toxic waste or hazardous chemicals will be produced by this operation.

E. Human waste and grey water will need to be properly contained and disposed of. Proper disposal and elimination of waste and grey water may include but are not limited to portable septic systems and/or portable waste gathering systems (i.e. portable toilets).

F. After the rig is moved out and the well is either completed or abandoned, all waste materials will be cleaned up within 30 days. In the event of a dry hole only a dry hole marker will remain.

**8. Ancillary Facilities:**

No airstrip, campsite or other facilities will be built as a result of the operation on this well.

**9. Well Site Layout:**

A. The drill pad layout, with elevations staked by Harcrow Surveying, is shown in the Elevation Plat. Dimensions of the pad and pits are shown on the Rig Layout. V door direction is East. Topsoil, if available, will be stockpiled per BLM specifications. Because the pad is almost level no major cuts will be required.

B. The Rig Layout Closed-Loop exhibit shows the proposed orientation of closed loop system and access road. No permanent living facilities are planned, but a temporary foreman/toolpusher's trailer will be on location during the drilling operations.

**10. Plans for Restoration of the Surface:**

A. Interim Reclamation will take place after the well has been completed. The pad will be downsized by reclaiming the areas not needed for production operations. The portions of the pad that are 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 to either build another pad site or for road repairs within the lease. The stockpiled topsoil will then be spread out reclaimed area and reseeded with a BLM approved seed mixture. In the event that the well must be worked over or maintained, it may be necessary to drive, park, and/or operate machinery on reclaimed land. This area will be repaired or reclaimed after work is complete.

B. Final Reclamation: Upon plugging and abandoning the well all caliche for well pad and lease road will be removed and surface will be recountoured to reflect its surroundings as much as possible. Caliche will be recycled for road repair or reused for another well pad within the lease. If any topsoil remains, it will be spread out and the area will be re-seeded with a BLM approved mixture and re-vegetated as per BLM orders.

**11. Surface Ownership:**

A. The surface is owned by U.S. Government and is administered by the Bureau of Land Management. The surface is multiple uses with the primary uses of the region for grazing of livestock and the production of oil and gas.

B. The surface tenant is Richardson Cattle Co., P O Box 487, Carlsbad, NM 88221.

C. The proposed road routes and surface location will be restored as directed by the BLM.

**12. Other Information:**

A. The area around the well site is grassland and the topsoil is sandy. The vegetation is moderately sparse with native prairie grasses, some mesquite and shinnery oak. No wildlife was observed but it is likely that mule deer, rabbits, coyotes and rodents traverse the area.

B. There is no permanent or live water in the immediate area.

C. There are no dwellings within 2 miles of this location.

D. If needed, a Cultural Resources Examination is being prepared by Boone Arch Services of NM, LLC., 2030 North Canal, Carlsbad, New Mexico, 88220, phone # 575-885-1352 and the results will be forwarded to your office in the near future. Otherwise, **COG will be participating in the Permian Basin MOA Program.**

E. The oil and gas lessees of record of the surface lease are Marigold LLLP, Santo Legado LLLP, and Tulipan LLC. COG Operating LLC is currently in communication with the lessees of record in an effort to obtain their permission to utilize the proposed surface location. Confirmation of their permission will be forwarded to BLM as soon as it is available.

**13. Bond Coverage:**

Bond Coverage is Statewide Bonds # NMB000740 and NMB000215

**14. Lessee's and Operator's Representative:**

The COG Operating LLC representative responsible for assuring compliance with the surface use plan is as follows:

Sheryl Baker
Drilling Superintendent
COG Operating LLC
2208 West Main Street
Artesia, NM 88210
Phone (575) 748-6940 (office)
(432) 934-1873 (cell)

Ray Peterson
Drilling Manager
COG Operating LLC
One Concho Center
600 W Illinois Ave
Midland, TX 79701
Phone (432) 685-4304 (office)
(432) 818-2254 (business)

# PECOS DISTRICT
# CONDITIONS OF APPROVAL

| | |
|---|---|
| OPERATOR'S NAME: | **COG Operting, LLC** |
| LEASE NO.: | **NMNM-112273** |
| WELL NAME & NO.: | **Mossy Federal 2H** |
| SURFACE HOLE FOOTAGE: | **1650' FNL & 0330' FEL** |
| BOTTOM HOLE FOOTAGE: | **2260' FNL & 0330' FEL Sec.7, T.20S., R30E** |
| LOCATION: | **Section 12, T. 20 S., R 29 E., NMPM** |
| COUNTY: | **Eddy County, New Mexico** |

## TABLE OF CONTENTS

Standard Conditions of Approval (COA) apply to this APD. If any deviations to these standards exist or special COAs are required, the section with the deviation or requirement will be checked below.

## I. GENERAL PROVISIONS

The approval of the Application For Permit To Drill (APD) is in compliance with all applicable laws and regulations: 43 Code of Federal Regulations 3160, the lease terms, Onshore Oil and Gas Orders, Notices To Lessees, New Mexico Oil Conservation Division (NMOCD) Rules, National Historical Preservation Act As Amended, and instructions and orders of the Authorized Officer. Any request for a variance shall be submitted to the Authorized Officer on Form 3160-5, Sundry Notices and Report on Wells.

## II. PERMIT EXPIRATION

If the permit terminates prior to drilling and drilling cannot be commenced within 60 days after expiration, an operator is required to submit Form 3160-5, Sundry Notices and Reports on Wells, requesting surface reclamation requirements for any surface disturbance. However, if the operator will be able to initiate drilling within 60 days after the expiration of the permit, the operator must have set the conductor pipe in order to allow for an extension of 60 days beyond the expiration date of the APD. (Filing of a Sundry Notice is required for this 60 day extension.)

## III. ARCHAEOLOGICAL, PALEONTOLOGY & HISTORICAL SITES

Any cultural and/or paleontological resource discovered by the operator or by any person working on the operator's behalf shall immediately report such findings to the Authorized Officer. The operator is fully accountable for the actions of their contractors and subcontractors. The operator shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery shall be made by the Authorized Officer to determine the appropriate actions that shall be required to prevent the loss of significant cultural or scientific values of the discovery. The operator shall be held responsible for the cost of the proper mitigation measures that the Authorized Officer assesses after consultation with the operator on the evaluation and decisions of the discovery. Any unauthorized collection or disturbance of cultural or paleontological resources may result in a shutdown order by the Authorized Officer.

## IV. NOXIOUS WEEDS

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, pads, associated pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

## V. SPECIAL REQUIREMENT(S)

**NO pipelines, facilities, powerlines, or any other new infrastructure servicing this well will be allowed to follow the existing pipeline heading southeast due to the vicinity to a large significant cave.**

## Cave and Karst

** Depending on location, additional Drilling, Casing, and Cementing procedures may be required by engineering to protect critical karst groundwater recharge areas.

### Cave/Karst Surface Mitigation

The following stipulations will be applied to minimize impacts during construction, drilling and production.

**Construction:**
In the advent that any underground voids are opened up during construction activities, construction activities will be halted and the BLM will be notified immediately.

**No Blasting:**
No blasting will be utilized for pad construction. The pad will be constructed and leveled by adding the necessary fill and caliche.

**Pad Berming:**
The pad will be bermed to prevent oil, salt, and other chemical contaminants from leaving the pad. All sides will be bermed.

**Tank Battery Liners and Berms:**
Tank battery locations will be lined and bermed. A 20 mil permanent liner will be installed with a 4 oz. felt backing to prevent tears or punctures. Tank battery berms must be large enough to contain 1 ½ times the content of the largest tank.

**Leak Detection System:**
A method of detecting leaks is required. The method could incorporate gauges to measure loss, situating values and lines so they can be visually inspected, or installing electronic sensors to alarm when a leak is present. Leak detection plan will be submitted to BLM for approval.

**Automatic Shut-off Systems**:

Automatic shut off, check values, or similar systems will be installed for pipelines and tanks to minimize the effects of catastrophic line failures used in production or drilling.

## Cave/Karst Subsurface Mitigation

The following stipulations will be applied to protect cave/karst and ground water concerns:

**Rotary Drilling with Fresh Water:**
Fresh water will be used as a circulating medium in zones where caves or karst features are expected. SEE ALSO: Drilling COAs for this well.

**Directional Drilling:**
Kick off for directional drilling will occur at least 100 feet below the bottom of the cave occurrence zone. SEE ALSO: Drilling COAs for this well.

**Lost Circulation:**
ALL lost circulation zones from the surface to the base of the cave occurrence zone will be logged and reported in the drilling report.

Regardless of the type of drilling machinery used, if a void of four feet or more and circulation losses greater than 70 percent occur simultaneously while drilling in any cave-bearing zone, the BLM will be notified immediately by the operator. The BLM will assess the situation and work with the operator on corrective actions to resolve the problem.

**Abandonment Cementing:**
Upon well abandonment in high cave karst areas additional plugging conditions of approval may be required. The BLM will assess the situation and work with the operator to ensure proper plugging of the wellbore.

**Pressure Testing:**
Annual pressure monitoring will be performed by the operator on all casing annuli and reported in a sundry notice. If the test results indicated a casing failure has occurred, remedial action will be undertaken to correct the problem to the BLM's approval.

# VI. CONSTRUCTION

## A. NOTIFICATION

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the Carlsbad Field Office at (575) 234-5909 at least 3 working days prior to commencing construction of the access road and/or well pad.

When construction operations are being conducted on this well, the operator shall have the approved APD and Conditions of Approval (COA) on the well site and they shall be made available upon request by the Authorized Officer.

## B. TOPSOIL

The operator shall strip the top portion of the soil (root zone) from the entire well pad area and stockpile the topsoil along the edge of the well pad as depicted in the APD. The root zone is typically six (6) inches in depth. All the stockpiled topsoil will be redistributed over the interim reclamation areas. Topsoil shall not be used for berming the pad or facilities. For final reclamation, the topsoil shall be spread over the entire pad area for seeding preparation.

Other subsoil (below six inches) stockpiles must be completely segregated from the topsoil stockpile. Large rocks or subsoil clods (not evident in the surrounding terrain) must be buried within the approved area for interim and final reclamation.

## C. CLOSED LOOP SYSTEM

Tanks are required for drilling operations: No Pits.

The operator shall properly dispose of drilling contents at an authorized disposal site.

## D. FEDERAL MINERAL MATERIALS PIT

Payment shall be made to the BLM prior to removal of any federal mineral materials. Call the Carlsbad Field Office at (575) 234-5972.

## E. WELL PAD SURFACING

Surfacing of the well pad is not required.

If the operator elects to surface the well pad, the surfacing material may be required to be removed at the time of reclamation.The well pad shall be constructed in a manner which creates the smallest possible surface disturbance, consistent with safety and operational needs.

## F. EXCLOSURE FENCING (CELLARS & PITS)

**Exclosure Fencing**
The operator will install and maintain exclosure fencing for all open well cellars to prevent access to public, livestock, and large forms of wildlife before and after drilling operations until the pit is free of fluids and the operator initiates backfilling. (For examples of exclosure fencing design, refer to BLM's Oil and Gas Gold Book, Exclosure Fence Illustrations, Figure 1, Page 18.)

## G. ON LEASE ACCESS ROADS

**Road Width**
The access road shall have a driving surface that creates the smallest possible surface disturbance and does not exceed fourteen (14) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed twenty-five (25) feet.

**Surfacing**
Surfacing material is not required on the new access road driving surface. If the operator elects to surface the new access road or pad, the surfacing material may be required to be removed at the time of reclamation.

Where possible, no improvements should be made on the unsurfaced access road other than to remove vegetation as necessary, road irregularities, safety issues, or to fill low areas that may sustain standing water.

The Authorized Officer reserves the right to require surfacing of any portion of the access road at any time deemed necessary. Surfacing may be required in the event the road deteriorates, erodes, road traffic increases, or it is determined to be beneficial for future field development. The surfacing depth and type of material will be determined at the time of notification.

**Crowning**
Crowning shall be done on the access road driving surface. The road crown shall have a grade of approximately 2% (i.e., a 1" crown on a 14' wide road). The road shall conform to Figure 1; cross section and plans for typical road construction.

**Ditching**
Ditching shall be required on both sides of the road.

**Turnouts**
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

**Drainage**

Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outsloping and insloping, lead-off ditches, culvert installation, and low water crossings).

A typical lead-off ditch has a minimum depth of 1 foot below and a berm of 6 inches above natural ground level. The berm shall be on the down-slope side of the lead-off ditch.

**Cross Section of a Typical Lead-off Ditch**

All lead-off ditches shall be graded to drain water with a 1 percent minimum to 3 percent maximum ditch slope. The spacing interval are variable for lead-off ditches and shall be determined according to the formula for spacing intervals of lead-off ditches, but may be amended depending upon existing soil types and centerline road slope (in %);

**Formula for Spacing Interval of Lead-off Ditches**

Example - On a 4% road slope that is 400 feet long, the water flow shall drain water into a lead-off ditch. Spacing interval shall be determined by the following formula:

400 foot road with 4% road slope: $\frac{400'}{4\%} + 100' = 200'$ lead-off ditch interval

**Cattleguards**

An appropriately sized cattleguard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattleguards on the access road route shall be repaired or replaced if they are damaged or have deteriorated beyond practical use. The operator shall be responsible for the condition of the existing cattleguards that are in place and are utilized during lease operations.

**Fence Requirement**

Where entry is granted across a fence line, the fence shall be braced and tied off on both sides of the passageway prior to cutting. The operator shall notify the private surface landowner or the grazing allotment holder prior to crossing any fences.

**Public Access**

Public access on this road shall not be restricted by the operator without specific written approval granted by the Authorized Officer.

# I. DRILLING

## A. DRILLING OPERATIONS 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)

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

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.**

2. 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. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a "Major" violation.**

3. 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 is located, this does not include the dog house or stairway area.

4. **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.**

B. CASING

**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.**

**Centralizers required on surface casing per Onshore Order 2.III.B.1.f.**

**Wait on cement (WOC) time prior to drilling out for a primary cement job will be a minimum 18 hours for a water basin, 24 hours in the potash area, or 500 pounds compressive strength, whichever is greater for all casing strings. DURING THIS WOC TIME, NO DRILL PIPE, ETC. SHALL BE RUN IN THE HOLE. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. IF OPERATOR DOES NOT HAVE THE WELL SPECIFIC CEMENT DETAILS ONSITE PRIOR TO PUMPING THE CEMENT FOR EACH CASING STRING, THE WOC WILL BE 30 HOURS. See individual casing strings for details regarding lead cement slurry requirements.**

**No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.**

**Secretary's Potash**
**High Cave/Karst**
**Capitan Reef**
**Possible water flows in the Artesia Group, Salado, and Capitan Reef.**
**Possible lost circulation in the Artesia Group, Rustler, Capitan Reef, and Delaware.**

**A MINIMUM OF TWO CASING STRINGS CEMENTED TO SURFACE IS REQUIRED IN HIGH CAVE/KARST AREAS. THE CEMENT MUST BE IN A SOLID SHEATH. THEREFORE, ONE INCH OPERATIONS ARE NOT SUFFICIENT TO PROTECT CAVE KARST RESOURCES. A CASING DESIGN THAT HAS A ONE INCH JOB PERFORMED DOES NOT COUNT AS A SOLID SHEATH.**

1. The **20** inch surface casing shall be set at approximately **275** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface. **If salt is encountered, set casing at least 25 feet above the salt. Excess calculates to negative 4% - Additional cement will be required**

    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 is to include the lead cement slurry.**

    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.

2. The minimum required fill of cement behind the **13-3/8** inch 1st 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 and potash.**

3. The minimum required fill of cement behind the **9-5/8** inch 2nd 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 Capitan Reef and potash.**

**Formation below the 9-5/8" shoe to be tested according to Onshore Order 2.III.B.1.i. Test to be done as a mud equivalency test using the mud weight necessary for the pore pressure of the formation below the shoe and the mud weight for the bottom of the hole. Report results to BLM office.**

**Centralizers required on horizontal leg, must be type for horizontal service and a minimum of one every other joint.**

4. The minimum required fill of cement behind the **7 X 5-1/2** inch production casing is:

    ☒ Cement should tie-back at least **50 feet above the Capitan Reef** (Top of Capitan Reef estimated at 1865'). Operator shall provide method of verification.

5. 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.

## C. 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. 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.

3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the **9-5/8** intermediate casing shoe shall be **5000 (5M)** psi. **5M 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. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.

    a. 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.

    b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**.

    c. 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.

    d. The results of the test shall be reported to the appropriate BLM office.

    e. 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.**

    f. 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.

## D. DRILL STEM TEST

If drill stem tests are performed, Onshore Order 2.III.D shall be followed.

## E. 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.

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# II. PRODUCTION (POST DRILLING)

## A. WELL STRUCTURES & FACILITIES

**Placement of Production Facilities**
Production facilities should be placed on the well pad to allow for maximum interim recontouring and revegetation of the well location.

**Exclosure Netting (Open-top Tanks)**
Immediately following active drilling or completion operations, the operator will take actions necessary to prevent wildlife and livestock access, including avian wildlife, to all open-topped tanks that contain or have the potential to contain salinity sufficient to cause harm to wildlife or livestock, hydrocarbons, or Resource Conservation and Recovery Act of 1976-exempt hazardous substances. At a minimum, the operator will net, screen, or cover open-topped tanks to exclude wildlife and livestock and prevent mortality. If the operator uses netting, the operator will cover and secure the open portion of the tank to prevent wildlife entry. The operator will net, screen, or cover the tanks until the operator removes the tanks from the location or the tanks no longer contain substances that could be harmful to wildlife or livestock. Use a maximum netting mesh size of 1 ½ inches. The netting must not be in contact with fluids and must not have holes or gaps.

**Chemical and Fuel Secondary Containment and Exclosure Screening**
The operator will prevent all hazardous, poisonous, flammable, and toxic substances from coming into contact with soil and water. At a minimum, the operator will install and maintain an impervious secondary containment system for any tank or barrel containing hazardous, poisonous, flammable, or toxic substances sufficient to contain the contents of the tank or barrel and any drips, leaks, and anticipated precipitation. The operator will dispose of fluids within the containment system that do not meet applicable state or U. S. Environmental Protection Agency livestock water standards in accordance with state law; the operator must not drain the fluids to the soil or ground. The operator will design, construct, and maintain all secondary containment systems to prevent wildlife and livestock exposure to harmful substances. At a minimum, the operator will install effective wildlife and livestock exclosure systems such as fencing, netting, expanded metal mesh, lids, and grate covers. Use a maximum netting mesh size of 1 ½ inches.

**Open-Vent Exhaust Stack Exclosures**
The operator will construct, modify, equip, and maintain all open-vent exhaust stacks on production equipment to prevent birds and bats from entering, and to discourage perching, roosting, and nesting. (*Recommended exclosure structures on open-vent exhaust stacks are in the shape of a cone.*) Production equipment includes, but may not be limited to, tanks, heater-treaters, separators, dehydrators, flare stacks, in-line units, and compressor mufflers.

**Containment Structures**
Proposed production facilities such as storage tanks and other vessels will have a secondary containment structure that is constructed to hold the capacity of 1.5 times the largest tank, plus freeboard to account for precipitation, unless more stringent protective requirements are deemed necessary.

**Painting Requirement**
All above-ground structures including meter housing that are not subject to safety requirements shall be painted a flat non-reflective paint color, **Shale Green** from the BLM Standard Environmental Color Chart (CC-001: June 2008).

## B. PIPELINES

### STANDARD STIPULATIONS FOR SURFACE INSTALLED PIPELINES

**A copy of the application (Grant, Sundry Notice, APD) and attachments, including stipulations, survey plat and/or map, will be on location during construction. BLM personnel may request to you a copy of your permit during construction to ensure compliance with all stipulations.**

Holder agrees to comply with the following stipulations to the satisfaction of the Authorized Officer:

1. The holder shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under this grant.

2. The holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC 2601 et seq. (1982) with regards to any toxic substances that are used, generated by or stored on the right-of-way or on facilities authorized under this right-of-way grant. (See 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the authorized officer concurrent with the filing of the reports to the involved Federal agency or State government.

3. The holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq. or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, et seq.) on the Right-of-Way (unless the release or threatened release is wholly unrelated to activity of the Right-of-Way holder's activity on the Right-of-Way), or resulting from the activity of the Right-of-Way holder on the Right-of-Way. This agreement applies without regard to whether a release is caused by the holder, its agent, or unrelated third parties.

4. The holder shall be liable for damage or injury to the United States to the extent provided by 43 CFR Sec. 2883.1-4. The holder shall be held to a standard of strict liability for damage or injury to the United States resulting from pipe rupture, fire, or spills caused or substantially aggravated by any of the following within the right-of-way or permit area:

a. Activities of the holder including, but not limited to construction, operation, maintenance, and termination of the facility.
b. Activities of other parties including, but not limited to:
    (1) Land clearing.
    (2) Earth-disturbing and earth-moving work.
    (3) Blasting.
    (4) Vandalism and sabotage.
c. Acts of God.

The maximum limitation for such strict liability damages shall not exceed one million dollars ($1,000,000) for any one event, and any liability in excess of such amount shall be determined by the ordinary rules of negligence of the jurisdiction in which the damage or injury occurred.

This section shall not impose strict liability for damage or injury resulting primarily from an act of war or from the negligent acts or omissions of the United States.

5. If, during any phase of the construction, operation, maintenance, or termination of the pipeline, any oil, salt water, or other pollutant should be discharged from the pipeline system, impacting Federal lands, the control and total removal, disposal, and cleaning up of such oil, salt water, or other pollutant, wherever found, shall be the responsibility of the holder, regardless of fault. Upon failure of the holder to control, dispose of, or clean up such discharge on or affecting Federal lands, or to repair all damages resulting therefrom, on the Federal lands, the Authorized Officer may take such measures as he deems necessary to control and clean up the discharge and restore the area, including, where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of the holder. Such action by the Authorized Officer shall not relieve the holder of any responsibility as provided herein.

6. All construction and maintenance activity will be confined to the authorized right-of-way width of **20** feet. If the pipeline route follows an existing road or buried pipeline right-of-way, the surface pipeline must be installed no farther than 10 feet from the edge of the road or buried pipeline right-of-way. If existing surface pipelines prevent this distance, the proposed surface pipeline must be installed immediately adjacent to the outer surface pipeline. All construction and maintenance activity will be confined to existing roads or right-of-ways.

7. No blading or clearing of any vegetation will be allowed unless approved in writing by the Authorized Officer.

8. The holder shall install the pipeline on the surface in such a manner that will minimize suspension of the pipeline across low areas in the terrain. In hummocky of duney areas, the pipeline will be "snaked" around hummocks and dunes rather then suspended across these features.

9. The pipeline shall be buried with a minimum of **24** inches under all roads, "two-tracks," and trails. Burial of the pipe will continue for 20 feet on each side of each crossing. The condition of the road, upon completion of construction, shall be returned to at least its former state with no bumps or dips remaining in the road surface.

10. The holder shall minimize disturbance to existing fences and other improvements on public lands. The holder is required to promptly repair improvements to at least their former state. Functional use of these improvements will be maintained at all times. The holder will contact the owner of any improvements prior to disturbing them. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting of the fence. No permanent gates will be allowed unless approved by the Authorized Officer.

11. In those areas where erosion control structures are required to stabilize soil conditions, the holder will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

12. Excluding the pipe, all above-ground structures not subject to safety requirement shall be painted by the holder to blend with the natural color of the landscape. The paint used shall be a color which simulates "Standard Environmental Colors" – **Shale Green**, Munsell Soil Color No. 5Y 4/2; designated by the Rocky Mountain Five State Interagency Committee.

13. The pipeline will be identified by signs at the point of origin and completion of the right-of-way and at all road crossings. At a minimum, signs will state the holder's name, BLM serial number, and the product being transported. Signs will be maintained in a legible condition for the life of the pipeline.

14. The holder shall not use the pipeline route as a road for purposes other than routine maintenance as determined necessary by the Authorized Officer in consultation with the holder. The holder will take whatever steps are necessary to ensure that the pipeline route is not used as a roadway.

15. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the holder.

16. The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, powerline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

17. Surface pipelines must be less than or equal to 4 inches and a working pressure below 125 psi.

## III. INTERIM RECLAMATION

During the life of the development, all disturbed areas not needed for active support of production operations should undergo interim reclamation in order to minimize the environmental impacts of development on other resources and uses.

Within six (6) months of well completion, operators should work with BLM surface management specialists (Jim Amos: 575-234-5909) to devise the best strategies to reduce the size of the location. Interim reclamation should allow for remedial well operations, as well as safe and efficient removal of oil and gas.

During reclamation, the removal of caliche is important to increasing the success of revegetating the site. Removed caliche that is free of contaminants may be used for road repairs, fire walls or for building other roads and locations. In order to operate the well or complete workover operations, it may be necessary to drive, park and operate on restored interim vegetation within the previously disturbed area. Disturbing revegetated areas for production or workover operations will be allowed. If there is significant disturbance and loss of vegetation, the area will need to be revegetated. Communicate with the appropriate BLM office for any exceptions/exemptions if needed.

All disturbed areas after they have been satisfactorily prepared need to be reseeded with the seed mixture provided below.

Upon completion of interim reclamation, the operator shall submit a Sundry Notices and Reports on Wells, Subsequent Report of Reclamation (Form 3160-5).

## X. FINAL ABANDONMENT & RECLAMATION

At final abandonment, well locations, production facilities, and access roads must undergo "final" reclamation so that the character and productivity of the land are restored.

Earthwork for final reclamation must be completed within six (6) months of well plugging. All pads, pits, facility locations and roads must be reclaimed to a satisfactory revegetated, safe, and stable condition, unless an agreement is made with the landowner or BLM to keep the road and/or pad intact.

After all disturbed areas have been satisfactorily prepared, these areas need to be revegetated with the seed mixture provided below. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods. Seeding may need to be repeated until revegetation is successful, as determined by the BLM.

Operators shall contact a BLM surface protection specialist prior to surface abandonment operations for site specific objectives (Jim Amos: 575-234-5909).

Seed Mixture 1, for Loamy Sites

The holder shall seed all disturbed areas with the seed mixture listed below. The seed mixture shall be planted in the amounts specified in pounds of pure live seed (PLS)* per acre. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed will be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed will be either certified or registered seed. The seed container will be tagged in accordance with State law(s) and available for inspection by the authorized officer.

Seed will be planted using a drill equipped with a depth regulator to ensure proper depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture will be evenly and uniformly planted over the disturbed area (small/heavier seeds have a tendency to drop the bottom of the drill and are planted first). The holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed will be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre are to be doubled. The seeding will be repeated until a satisfactory stand is established as determined by the authorized officer. Evaluation of growth will not be made before completion of at least one full growing season after seeding.

Species to be planted in pounds of pure live seed* per acre:

| Species | lb/acre |
|---|---|
| Plains lovegrass (Eragrostis intermedia) | 0.5 |
| Sand dropseed (Sporobolus cryptandrus) | 1.0 |
| Sideoats grama (Bouteloua curtipendula) | 5.0 |
| Plains bristlegrass (Setaria macrostachya) | 2.0 |

*Pounds of pure live seed:

Pounds of seed **x** percent purity **x** percent germination = pounds pure live seed