Form 3160-3
(March 2012)

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

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
NMNM121474

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.
COPPERHEAD 31 FEDERAL COM 21H

2. Name of Operator
COG PRODUCTION LLC

9. API Well No.
30-015-44118

3a. Address
2208 West Main Street Artesia NM 88210

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

10. Field and Pool, or Exploratory
PURPLE SAGE / WOLFCAMP

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface NWNE / 210 FNL / 1650 FEL / LAT 32.02031 / LONG -104.02052
At proposed prod. zone LOT 6 / 200 FSL / 1980 FEL / LAT 32.000638 / LONG -104.021702

11. Sec., T. R. M. or Blk. and Survey or Area
SEC 30 / T26S / R29E / NMP

14. Distance in miles and direction from nearest town or post office*
15 miles

12. County or Parish
EDDY

13. State
NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
210 feet

16. No. of acres in lease
51.87

17. Spacing Unit dedicated to this well
451.87

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
888 feet

19. Proposed Depth
10680 feet / 17739 feet

20. BLM/BIA Bond No. on file
FED: NMB000860

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
2929 feet

22. Approximate date work will start*
03/01/2017

23. Estimated duration
30 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must 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 must 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 BLM.

25. Signature	Name *(Printed/Typed)*	Date
(Electronic Submission)	Mayte Reyes / Ph: (575)748-6945	02/20/2017

Title
Regulatory Analyst

Approved by *(Signature)*	Name *(Printed/Typed)*	Date
(Electronic Submission)	Ty Allen / Ph: (575)234-5978	04/25/2017

Title	Office
Wildlife Biologist	CARLSBAD

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

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

(Continued on page 2)

*(Instructions on page 2)

APPROVED WITH CONDITIONS

RWP 5-8-17

COG Production LLC – Copperhead 31 Federal Com 21H

1. Geologic Formations

TVD of target	10,680' EOL	Pilot hole depth	NA
MD at TD:	17,739'	Deepest expected fresh water:	78

Basin

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	917	Water	
Top of Salt	1026	Salt	
Base of Salt	2543	Salt	
Delaware - Lamar	2728	Oil/Gas	
Bone Spring	6424	Oil/Gas	
Wolfcamp	9541	Oil/Gas	
Wolfcamp B	10154	Oil/Gas	
Wolfcamp C	10281	Oil/Gas	
Wolfcamp D	10642	Target Oil/Gas	
Wolfcamp E	10961	Oil/Gas	
Penn	11197	Not Penetrated	

2. Casing Program → SEE COA

Hole Size	Casing Interval From	Casing Interval To	Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
13.5"	0	~~950'~~ 285'	10.75"	45.5	HCN80	BTC	6.71	1.07	24.2
9.625"	0	~~10,000'~~ 9841'	7.625"	29.7	HCP110	BTC	1.37	1.38	2.93
6.75"	0	9,500'	5.5"	23	HCP110	BTC	2.55	2.42	2.63
6.75"	9,500'	17,739'	5"	18	HCP110	BTC	2.11	2.05	32.2
				BLM Minimum Safety Factor			1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse.

Intermediate burst based on 0.8 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.

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

The 5" casing will be run back 500' into the int casing to ensure the coupling OD clearance is greater than .422" for the cement bond tie in.

AFMSS

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

tor Certification Data Report

04/26/2017

Operator Certification

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

NAME: Mayte Reyes **Signed on:** 02/20/2017

Title: Regulatory Analyst

Street Address: 2208 W Main Street

City: Artesia **State:** NM **Zip:** 88210

Phone: (575)748-6945

Email address: Mreyes1@concho.com

Field Representative

Representative Name: Rand French

Street Address: 2208 West Main Street

City: Artesia **State:** NM **Zip:** 88210

Phone: (575)748-6940

Email address: rfrench@concho.com

AFMSS

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

Application Data Report
04/26/2017

APD ID: 10400011656 **Submission Date:** 02/20/2017

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Well Type: OIL WELL **Well Work Type:** Drill

Section 1 - General

APD ID: 10400011656 **Tie to previous NOS?** **Submission Date:** 02/20/2017

BLM Office: CARLSBAD **User:** Mayte Reyes **Title:** Regulatory Analyst

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMNM121474 **Lease Acres:** 51.87

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? NO **Federal or Indian agreement:**

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? NO **APD Operator:** COG PRODUCTION LLC

Operator letter of designation:

Keep application confidential? YES

Operator Info

Operator Organization Name: COG PRODUCTION LLC

Operator Address: 2208 West Main Street

Zip: 88210

Operator PO Box:

Operator City: Artesia **State:** NM

Operator Phone: (575)748-6940

Operator Internet Address: mreyes1@concho.com

Section 2 - Well Information

Well in Master Development Plan? NO **Mater Development Plan name:**

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** PURPLE SAGE **Pool Name:** WOLFCAMP

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

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

Describe other minerals:

Is the proposed well in a Helium production area? N **Use Existing Well Pad?** NO **New surface disturbance?**

Type of Well Pad: SINGLE WELL **Multiple Well Pad Name:** **Number:**

Well Class: HORIZONTAL **Number of Legs:**

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: EXPLORATORY (WILDCAT)

Describe sub-type:

Distance to town: 15 Miles **Distance to nearest well:** 888 FT **Distance to lease line:** 210 FT

Reservoir well spacing assigned acres Measurement: 451.87 Acres

Well plat: COG Copperhead 21H_C102_02-20-2017.pdf

Well work start Date: 03/01/2017 **Duration:** 30 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number:

	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.02031	**Longitude:** -104.02052	
SHL	**Elevation:** 2929	**MD:** 0	**TVD:** 0
Leg #: 1	**Lease Type:** FEE	**Lease #:** FEE	
	NS-Foot: 210	**NS Indicator:** FNL	
	EW-Foot: 1650	**EW Indicator:** FEL	
	Twsp: 26S	**Range:** 29E	**Section:** 30
	Aliquot: NWNE	**Lot:**	**Tract:**

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.02031	**Longitude:** -104.02052	
KOP	**Elevation:** 2929	**MD:** 0	**TVD:** 0
Leg #: 1	**Lease Type:** FEE	**Lease #:** FEE	
	NS-Foot: 210	**NS Indicator:** FNL	
	EW-Foot: 1650	**EW Indicator:** FEL	
	Twsp: 26S	**Range:** 29E	**Section:** 30
	Aliquot: NWNE	**Lot:**	**Tract:**
	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.00246	**Longitude:** -104.021691	
PPP	**Elevation:** -7755	**MD:** 17000	**TVD:** 10684
Leg #: 1	**Lease Type:** FEDERAL	**Lease #:** NMNM121474	
	NS-Foot: 1320	**NS Indicator:** FSL	
	EW-Foot: 1980	**EW Indicator:** FEL	
	Twsp: 26S	**Range:** 29E	**Section:** 31
	Aliquot:	**Lot:** 6	**Tract:**
	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.019986	**Longitude:** -104.021587	
PPP	**Elevation:** -7317	**MD:** 10246	**TVD:** 10246
Leg #: 1	**Lease Type:** FEE	**Lease #:** FEE	
	NS-Foot: 330	**NS Indicator:** FNL	
	EW-Foot: 1980	**EW Indicator:** FEL	
	Twsp: 26S	**Range:** 29E	**Section:** 30
	Aliquot: NWNE	**Lot:**	**Tract:**
	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.000995	**Longitude:** -104.0217	
EXIT	**Elevation:** -7751	**MD:** 17550	**TVD:** 10680
Leg #: 1	**Lease Type:** FEDERAL	**Lease #:** NMNM121474	
	NS-Foot: 330	**NS Indicator:** FSL	
	EW-Foot: 1980	**EW Indicator:** FEL	

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

	Twsp: 26S	**Range:** 29E	**Section:** 31
	Aliquot:	**Lot:** 6	**Tract:**
	STATE: NEW MEXICO	**Meridian:** NEW MEXICO PRINCIPAL	**County:** EDDY
	Latitude: 32.000638	**Longitude:** -104.021702	
BHL	**Elevation:** -7751	**MD:** 17739	**TVD:** 10680
Leg #: 1	**Lease Type:** FEDERAL	**Lease #:** NMNM121474	
	NS-Foot: 200	**NS Indicator:** FSL	
	EW-Foot: 1980	**EW Indicator:** FEL	
	Twsp: 26S	**Range:** 29E	**Section:** 31
	Aliquot:	**Lot:** 6	**Tract:**

APD ID: 10400011656 **Submission Date:** 02/20/2017

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Well Type: OIL WELL **Well Work Type:** Drill

Section 1 - Geologic Formations

ID: Surface formation **Name:** UNKNOWN

Lithology(ies):

Elevation: 0 **True Vertical Depth:** 0 **Measured Depth:** 0

Mineral Resource(s):

NONE

Is this a producing formation? N

ID: Formation 1 **Name:** RUSTLER

Lithology(ies):

Elevation: -917 **True Vertical Depth:** 917 **Measured Depth:** 917

Mineral Resource(s):

NONE

Is this a producing formation? N

ID: Formation 2 **Name:** TOP SALT

Lithology(ies):

Elevation: -1026 **True Vertical Depth:** 1026 **Measured Depth:** 1026

Mineral Resource(s):

NONE

Is this a producing formation? N

ID: Formation 3 **Name:** BASE OF SALT

Lithology(ies):

Elevation: -2543 **True Vertical Depth:** 2543 **Measured Depth:** 2543

Mineral Resource(s):

NONE

Is this a producing formation? N

ID: Formation 4 **Name:** LAMAR

Lithology(ies):

Elevation: -2728 **True Vertical Depth:** 2728 **Measured Depth:** 2728

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 5 **Name:** BONE SPRING

Lithology(ies):

Elevation: -6424 **True Vertical Depth:** 6424 **Measured Depth:** 6424

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 6 **Name:** WOLFCAMP

Lithology(ies):

Elevation: -9541 **True Vertical Depth:** 9541 **Measured Depth:** 9541

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 7 **Name:** WOLFCAMP

Lithology(ies):

Elevation: -10154 **True Vertical Depth:** 10154 **Measured Depth:** 10154

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 8 **Name:** WOLFCAMP

Lithology(ies):

Elevation: -10281 **True Vertical Depth:** 10281 **Measured Depth:** 10281

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 9 **Name:** WOLFCAMP

Lithology(ies):

Elevation: -10642 **True Vertical Depth:** 10642 **Measured Depth:** 10642

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? Y

ID: Formation 10 **Name:** WOLFCAMP

Lithology(ies):

Elevation: -10961 **True Vertical Depth:** 10961 **Measured Depth:** 10961

Mineral Resource(s):

NATURAL GAS

OIL

Is this a producing formation? N

ID: Formation 11 **Name:** PENN

Lithology(ies):

Elevation: -11197 **True Vertical Depth:** 11197 **Measured Depth:** 11197

Mineral Resource(s):

NONE

Is this a producing formation? N

Section 2 - Blowout Prevention

Pressure Rating (PSI): 3M **Rating Depth:** 10000

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

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.
Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG Copperhead 21H_3M Choke_02-20-2017.pdf

BOP Diagram Attachment:

COG Copperhead 21H_3M BOP_02-20-2017.pdf

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Pressure Rating (PSI): 5M **Rating Depth:** 10680

Equipment: Annular. The BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold.
Requesting Variance? NO

Variance request: A variance is requested for the use of a flexible choke line from the BOP to choke manifold. See attached for specs and hydrostatic test chart.
Testing Procedure: BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all of the components installed will be functional and tested.

Choke Diagram Attachment:

COG Copperhead 21H_5M Choke_02-20-2017.pdf

BOP Diagram Attachment:

COG Copperhead 21H_5M BOP_02-20-2017.pdf

Section 3 - Casing

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

String Type: SURFACE **Other String Type:**

Hole Size: 13.5

Top setting depth MD: 0 **Top setting depth TVD:** 0

Top setting depth MSL: -7751

Bottom setting depth MD: 950 **Bottom setting depth TVD:** 950

Bottom setting depth MSL: -8636

Calculated casing length MD: 950

Casing Size: 10.75 **Other Size**

Grade: HCN-80 **Other Grade:**

Weight: 45.5

Joint Type: OTHER **Other Joint Type:** BTC

Condition: NEW

Inspection Document:

Standard: API

Spec Document:

Tapered String?: N

Tapered String Spec:

Safety Factors

Collapse Design Safety Factor: 6.71 **Burst Design Safety Factor:** 1.07

Joint Tensile Design Safety Factor type: DRY **Joint Tensile Design Safety Factor:** 24.2

Body Tensile Design Safety Factor type: DRY **Body Tensile Design Safety Factor:** 24.2

Casing Design Assumptions and Worksheet(s):

COG Copperhead 21H_Casing Prog_02-20-2017.pdf

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

String Type: INTERMEDIATE **Other String Type:**

Hole Size: 9.625

Top setting depth MD: 0 **Top setting depth TVD:** 0

Top setting depth MSL: -7751

Bottom setting depth MD: 10000 **Bottom setting depth TVD:** 10000

Bottom setting depth MSL: -19951

Calculated casing length MD: 10000

Casing Size: 7.625 **Other Size**

Grade: HCP-110 **Other Grade:**

Weight: 29.7

Joint Type: OTHER **Other Joint Type:** BTC

Condition: NEW

Inspection Document:

Standard: API

Spec Document:

Tapered String?: N

Tapered String Spec:

Safety Factors

Collapse Design Safety Factor: 1.37 **Burst Design Safety Factor:** 1.38

Joint Tensile Design Safety Factor type: DRY **Joint Tensile Design Safety Factor:** 2.93

Body Tensile Design Safety Factor type: DRY **Body Tensile Design Safety Factor:** 2.93

Casing Design Assumptions and Worksheet(s):

COG Copperhead 21H_Casing Prog_02-20-2017.pdf

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

String Type: PRODUCTION **Other String Type:**

Hole Size: 6.75

Top setting depth MD: 0 **Top setting depth TVD:** 0

Top setting depth MSL: -7751

Bottom setting depth MD: 17739 **Bottom setting depth TVD:** 17739

Bottom setting depth MSL: -30521

Calculated casing length MD: 17739

Casing Size: 5.0 **Other Size**

Grade: HCP-110 **Other Grade:**

Weight: 18

Joint Type: OTHER **Other Joint Type:** BTC

Condition: NEW

Inspection Document:

Standard: API

Spec Document:

Tapered String?: N

Tapered String Spec:

Safety Factors

Collapse Design Safety Factor: 2.11 **Burst Design Safety Factor:** 2.05

Joint Tensile Design Safety Factor type: DRY **Joint Tensile Design Safety Factor:** 32.2

Body Tensile Design Safety Factor type: DRY **Body Tensile Design Safety Factor:** 32.2

Casing Design Assumptions and Worksheet(s):

COG Copperhead 21H_Casing Prog_02-20-2017.pdf

Section 4 - Cement

Casing String Type: SURFACE

Stage Tool Depth:

Lead

Top MD of Segment: 0 **Bottom MD Segment:** 950 **Cement Type:** Class C
Additives: 4% Gel + 1% CaCl2 **Quantity (sks):** 200 **Yield (cu.ff./sk):** 1.75
Density: 13.5 **Volume (cu.ft.):** 350 **Percent Excess:** 70

Tail

Top MD of Segment: 0 **Bottom MD Segment:** 950 **Cement Type:** C
Additives: 2% CaCl2 **Quantity (sks):** 200 **Yield (cu.ff./sk):** 1.34
Density: 14.8 **Volume (cu.ft.):** 268 **Percent Excess:** 50

Casing String Type: INTERMEDIATE

Stage Tool Depth:

Lead

Top MD of Segment: 0 **Bottom MD Segment:** 10000 **Cement Type:** Tuned Light Blend
Additives: No Additives. **Quantity (sks):** 800 **Yield (cu.ff./sk):** 3.48
Density: 10.3 **Volume (cu.ft.):** 2784 **Percent Excess:** 40

Tail

Top MD of Segment: 0 **Bottom MD Segment:** 10000 **Cement Type:** Class H
Additives: No Additives. **Quantity (sks):** 275 **Yield (cu.ff./sk):** 1.1
Density: 16.4 **Volume (cu.ft.):** 302 **Percent Excess:** 40

Casing String Type: PRODUCTION

Stage Tool Depth:

Lead

Top MD of Segment: 0 **Bottom MD Segment:** 17739 **Cement Type:** Lead: 50:50:10 H Blend
Additives: No additives **Quantity (sks):** 400 **Yield (cu.ff./sk):** 2.5
Density: 11.9 **Volume (cu.ft.):** 1000 **Percent Excess:** 30

Tail

Top MD of Segment: 0 **Bottom MD Segment:** 17739 **Cement Type:** Tail: Versacem 50:50:2 Class H
Additives: 1% Salt **Quantity (sks):** 950 **Yield (cu.ff./sk):** 1.24
Density: 14.4 **Volume (cu.ft.):** 1178 **Percent Excess:** 30

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

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

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

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

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

Circulating Medium Table

Top Depth: 950 **Bottom Depth:** 10000

Mud Type: OTHER Brine Diesel Emulsion

Min Weight (lbs./gal.): 8.8 **Max Weight (lbs./gal.):** 9.4

Density (lbs/cu.ft.): **Gel Strength (lbs/100 sq.ft.):**

PH: **Viscosity (CP):**

Filtration (cc): **Salinity (ppm):**

Additional Characteristics: Brine Diesel Emulsion

Top Depth: 10000 **Bottom Depth:** 17739

Mud Type: OIL-BASED MUD

Min Weight (lbs./gal.): 11 **Max Weight (lbs./gal.):** 12.2

Density (lbs/cu.ft.): **Gel Strength (lbs/100 sq.ft.):**

PH: **Viscosity (CP):**

Filtration (cc): **Salinity (ppm):**

Additional Characteristics:

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Top Depth: 0 **Bottom Depth:** 950

Mud Type: OTHER Fresh water gel

Min Weight (lbs./gal.): 8.6 **Max Weight (lbs./gal.):** 8.8

Density (lbs/cu.ft.): **Gel Strength (lbs/100 sq.ft.):**

PH: **Viscosity (CP):**

Filtration (cc): **Salinity (ppm):**

Additional Characteristics: Fresh water gel

Section 6 - Test, Logging, Coring

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

None planned

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

CNL,GR

Coring operation description for the well:

None planned

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 6775 **Anticipated Surface Pressure:** 4424.52

Anticipated Bottom Hole Temperature(F): 165

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

Describe:

Contingency Plans geoharzards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

COG Copperhead 21H_H2S Plan_02-20-2017.pdf

COG Copperhead 21H_H2S Schem_02-20-2017.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

COG Copperhead 21H_Directional Plan_02-20-2017.pdf

Other proposed operations facets description:

None

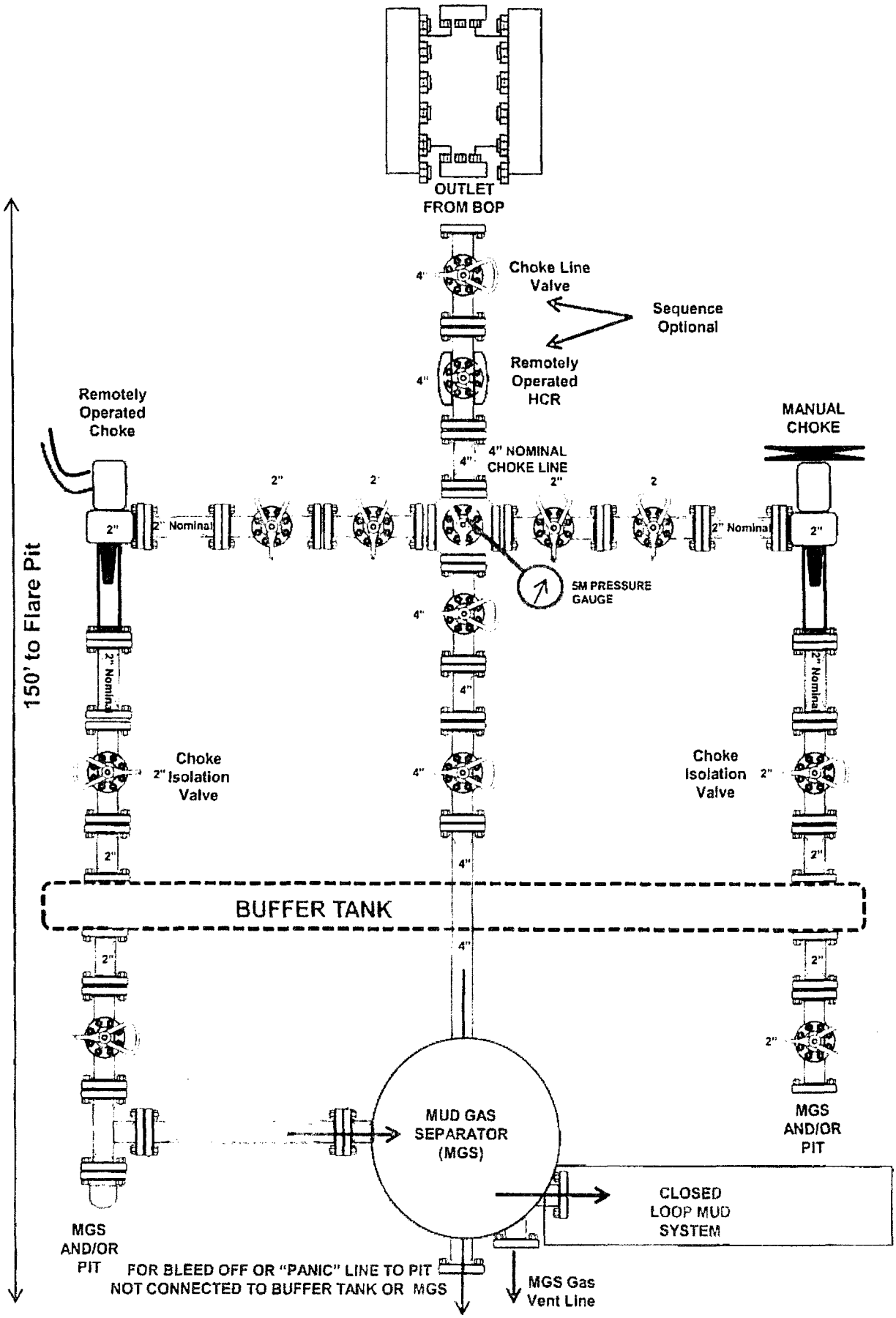
Other proposed operations facets attachment:

COG Copperhead 21H_Drill Prog_02-20-2017.pdf

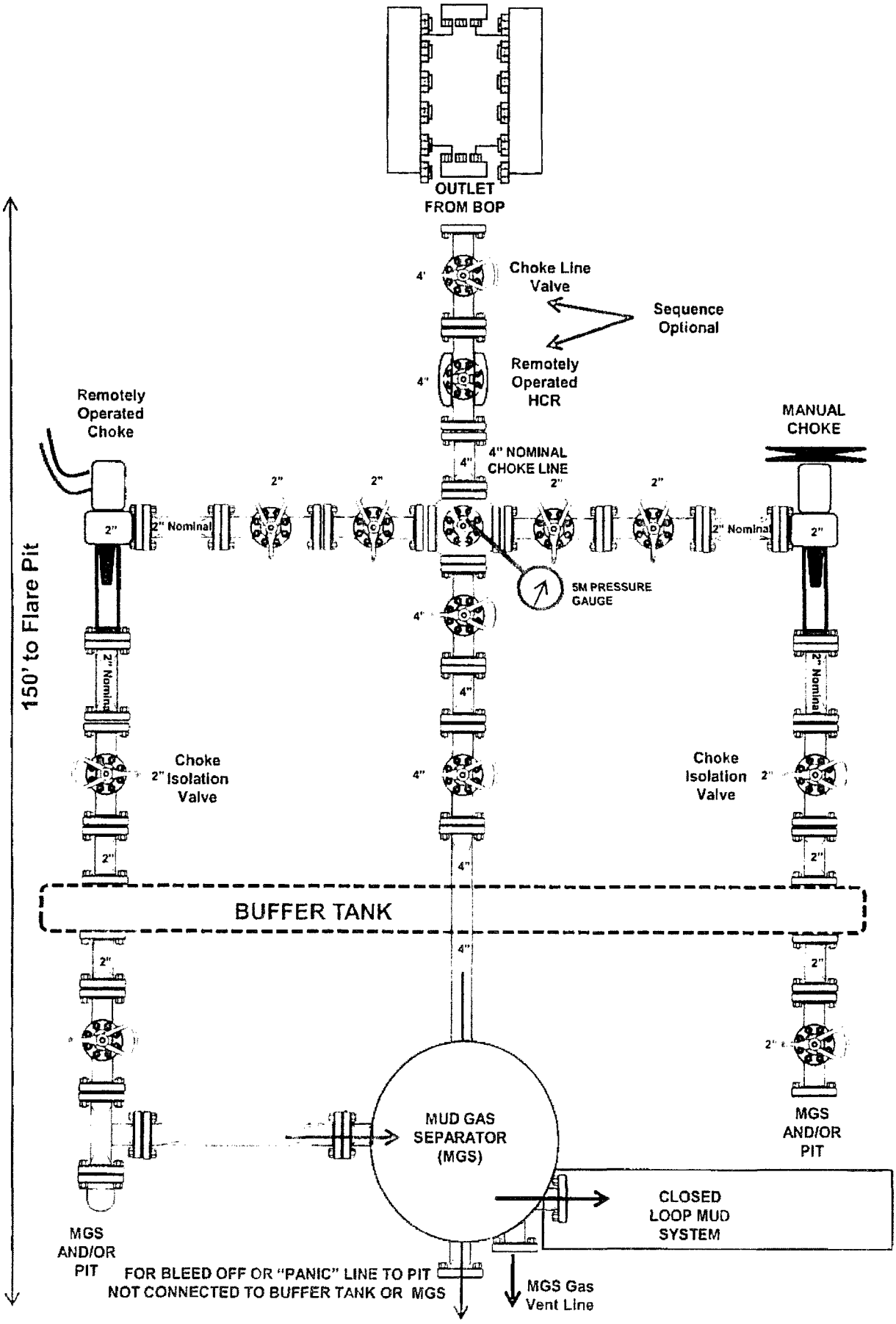
Other Variance attachment:

COG Copperhead 21H_Flex Hose_02-20-2017.pdf

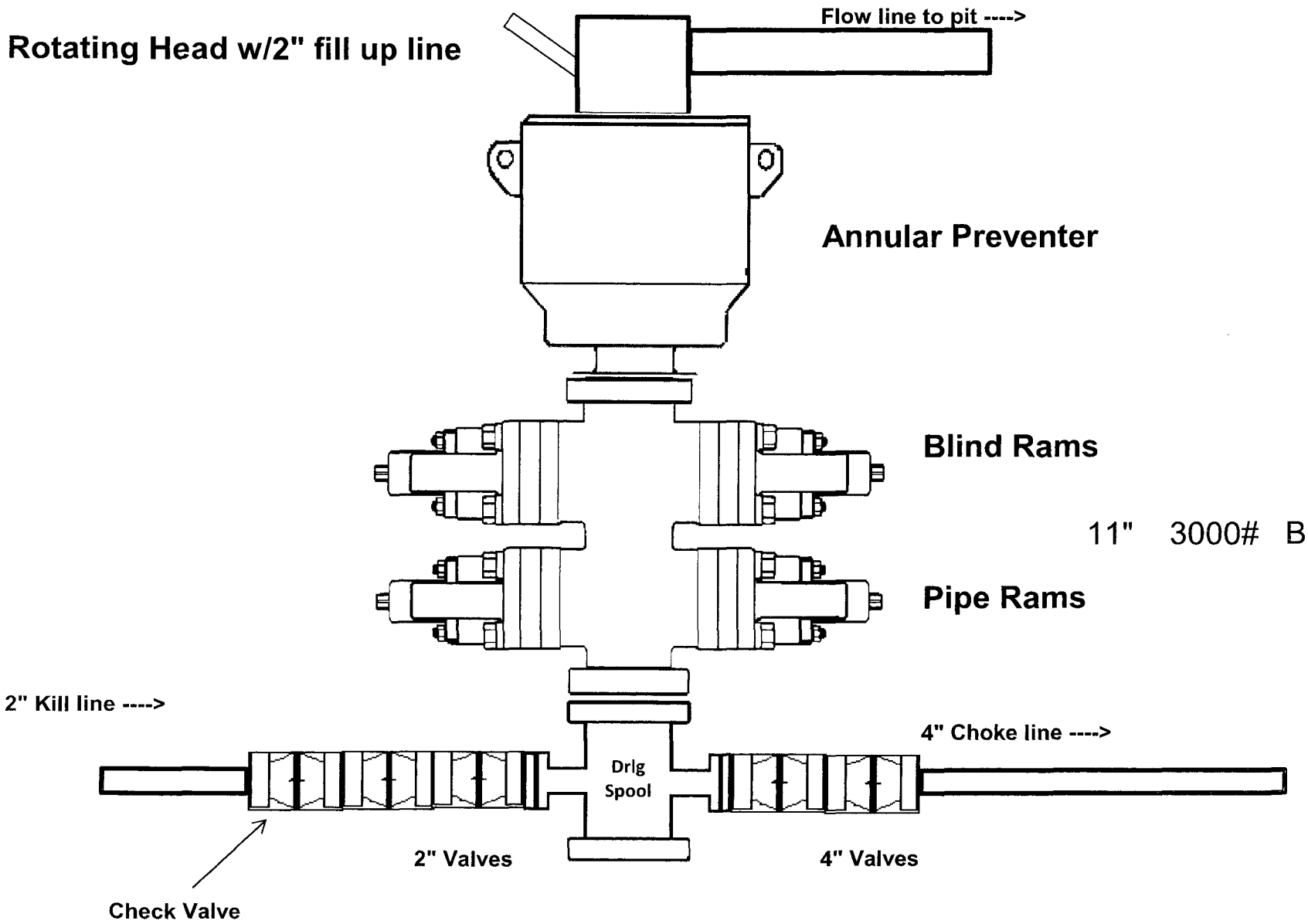
3M Choke Manifold Equipment (WITH MGS + CLOSED LOOP)



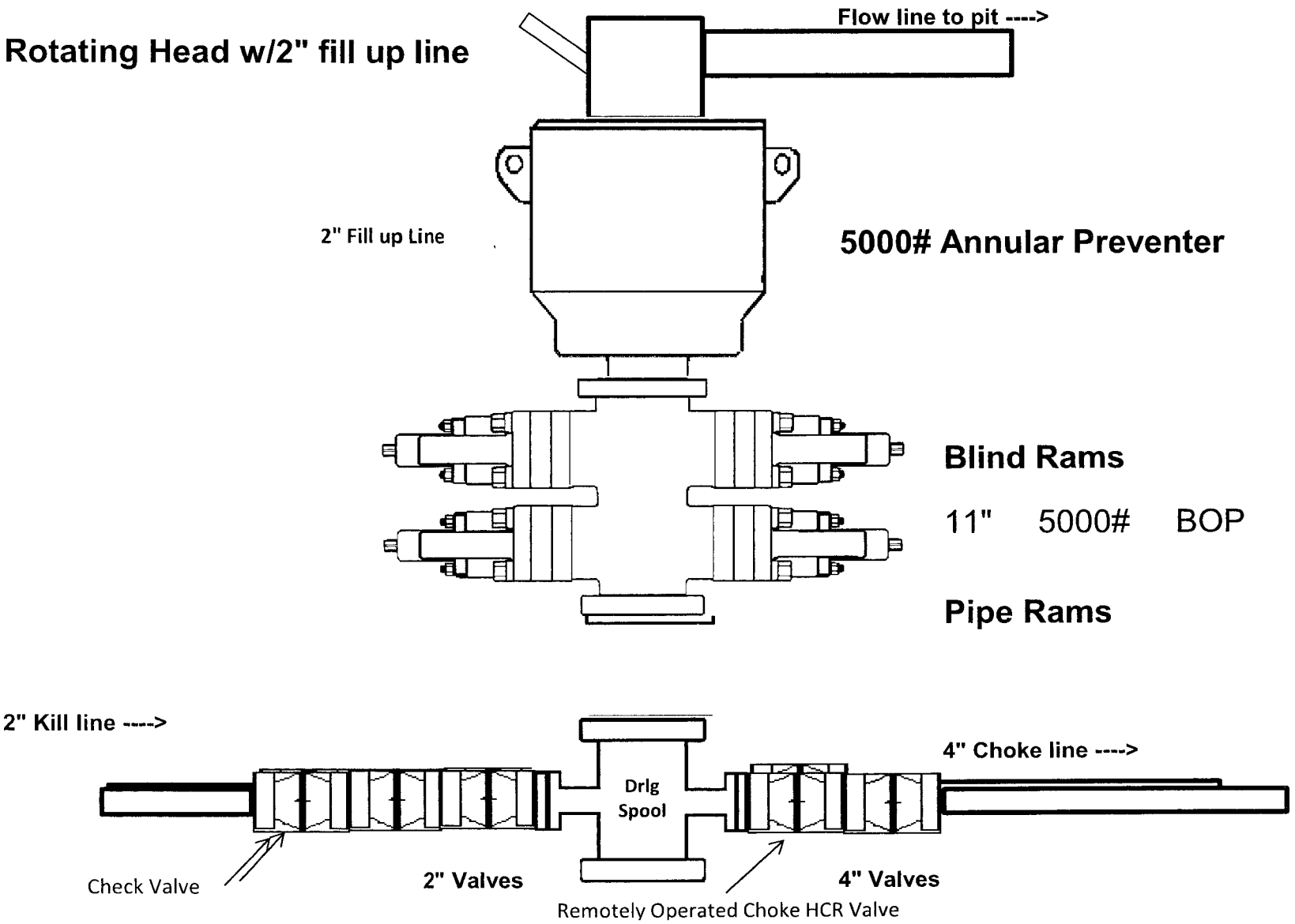
5M Choke Manifold Equipment (WITH MGS + CLOSED LOOP)



3,000 psi BOP Schematic



5,000 psi BOP Schematic



COG PRODUCTION 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 PRODUCTION 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 PRODUCTION LLC

1-575-748-6940

EMERGENCY CALL LIST

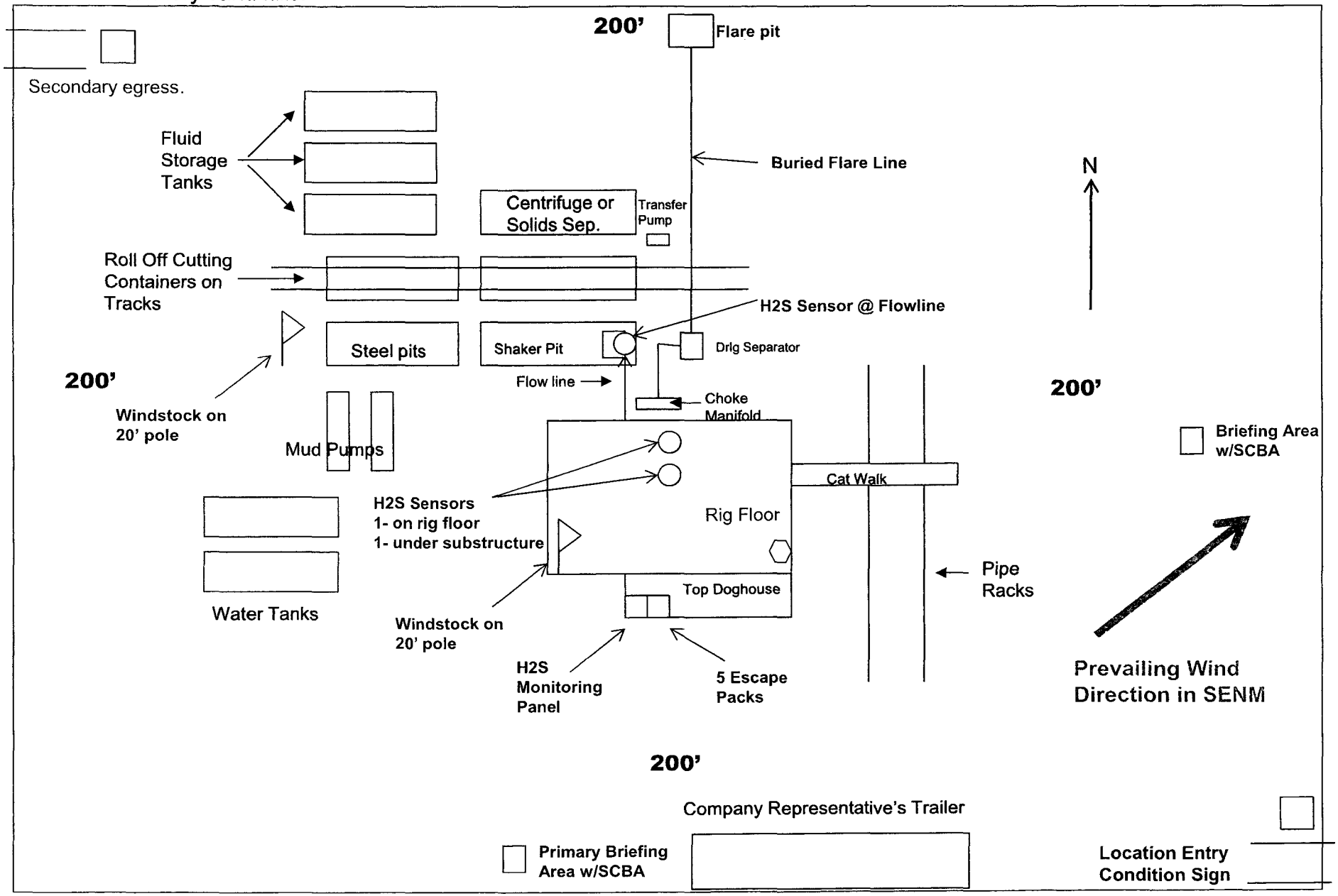
	OFFICE	MOBILE
COG PRODUCTION LLC OFFICE	575-748-6940	
SETH WILD	432-683-7443	432-528-3633
WALTER ROYE	575-748-6940	432-934-1886

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

COG Production LLC
H_2S Equipment Schematic
Terrain: Shinnery sand hills.

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



COG PRODUCTION LLC
Project: Lea County, NM (NAD27 NME)
Site: Sec. 30, T 26 S. , R 29 E
Well: Copperhead 31 Fed Com 21H
Wellbore: Wellbore #1
Plan: Plan #1 (Copperhead 31 Fed Com 21H/Wellbore #1)
Latshaw 44

INTEGRITY Directional Services

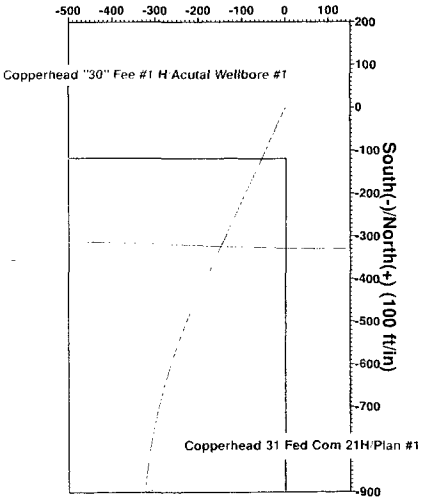
WELL DETAILS: Copperhead 31 Fed Com 21H

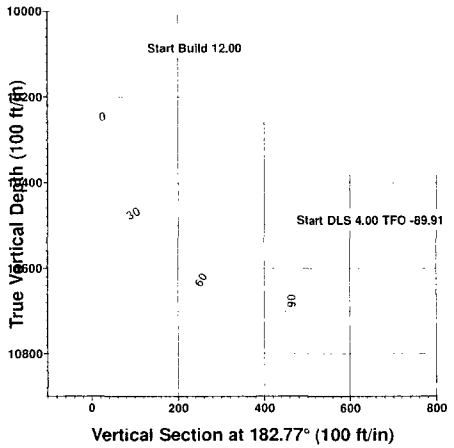
Ground Elevation:: 2988.80
RKB Elevation: KB=25' @ 3013.80ft (Latshaw 44)
Rig Name: Latshaw 44

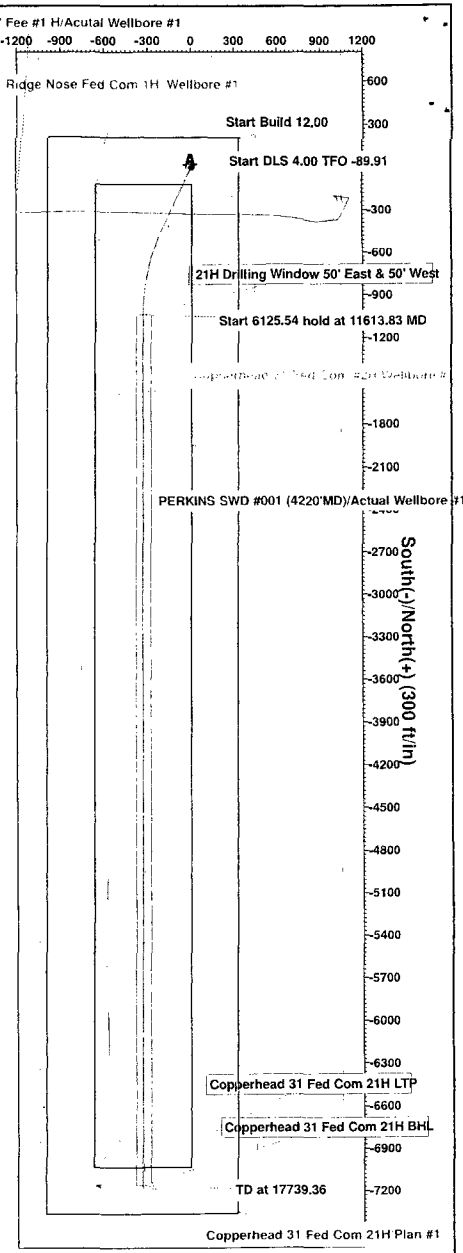
Northing	Easting	Latitude	Longitude
371210.7000	597099.3000	32° 1' 12.667 N	104° 1' 12.131 W

Planned Section Details

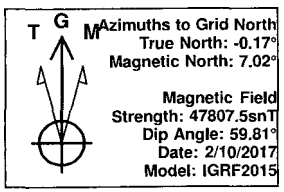
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	10246.54	0.00	0.00	10246.54	0.00	0.00	0.00	0.00	0.00
3	10999.62	90.37	204.70	10724.00	-436.58	-200.81	12.00	204.70	445.77
4	11613.83	90.37	180.13	10719.95	-1031.82	-331.85	4.00	-89.91	1046.64
5	17739.36	90.37	180.13	10680.00	-7157.21	-345.90	0.00	0.00	7165.57







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



Azimuths to Grid North
True North: -0.17°
Magnetic North: 7.02°

Magnetic Field
Strength: 47807.5snT
Dip Angle: 59.81°
Date: 2/10/2017
Model: IGRF2015

COG Production L L C

Lea County, NM (NAD27 NME)
Sec. 30, T 26 S. , R 29 E
Copperhead 31 Fed Com 21H

Wellbore #1

Plan: Plan #1

Standard Survey Report

10 February, 2017

INTEGRITY
Directional Services

Integrity Directional Services, LLC

Survey Report

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
Project:	Lea County, NM (NAD27 NME)	**TVD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Site:	Sec. 30, T 26 S. , R 29 E	**MD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

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

Site Sec. 30, T 26 S. , R 29 E

Site Position:		**Northing:**	371,210.7000 usft	**Latitude:**	32° 1' 12.667 N
From:	Map	**Easting:**	597,099.3000 usft	**Longitude:**	104° 1' 12.131 W
Position Uncertainty:	0.00 ft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	0.17 °

Well Copperhead 31 Fed Com 21H

Well Position	**+N/-S**	0.00 ft	**Northing:**	371,210.7000 usft	**Latitude:**	32° 1' 12.667 N
	+E/-W	0.00 ft	**Easting:**	597,099.3000 usft	**Longitude:**	104° 1' 12.131 W
Position Uncertainty		0.00 ft	**Wellhead Elevation:**	0.00 ft	**Ground Level:**	2,988.80 ft

Wellbore Wellbore #1

Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	IGRF2015	2/10/2017	7.18	59.81	47,807

Design Plan #1

Audit Notes:

Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00
Vertical Section:	**Depth From (TVD) (ft)**	**+N/-S (ft)**	**+E/-W (ft)**	**Direction (°)**	
	-1.00	0.00	0.00	182.77	

Survey Tool Program **Date** 2/10/2017

From (ft)	**To (ft)**	**Survey (Wellbore)**	**Tool Name**	**Description**
0.00	17,739.37	Plan #1 (Wellbore #1)	MWD	MWD - Standard

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	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

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
Project:	Lea County, NM (NAD27 NME)	**TVD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Site:	Sec. 30, T 26 S. , R 29 E	**MD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	0.00	0.00	1,900.00	0.00	0.00	0.00	0.00	0.00	0.00
2,000.00	0.00	0.00	2,000.00	0.00	0.00	0.00	0.00	0.00	0.00
2,100.00	0.00	0.00	2,100.00	0.00	0.00	0.00	0.00	0.00	0.00
2,200.00	0.00	0.00	2,200.00	0.00	0.00	0.00	0.00	0.00	0.00
2,300.00	0.00	0.00	2,300.00	0.00	0.00	0.00	0.00	0.00	0.00
2,400.00	0.00	0.00	2,400.00	0.00	0.00	0.00	0.00	0.00	0.00
2,500.00	0.00	0.00	2,500.00	0.00	0.00	0.00	0.00	0.00	0.00
2,600.00	0.00	0.00	2,600.00	0.00	0.00	0.00	0.00	0.00	0.00
2,700.00	0.00	0.00	2,700.00	0.00	0.00	0.00	0.00	0.00	0.00
2,800.00	0.00	0.00	2,800.00	0.00	0.00	0.00	0.00	0.00	0.00
2,900.00	0.00	0.00	2,900.00	0.00	0.00	0.00	0.00	0.00	0.00
3,000.00	0.00	0.00	3,000.00	0.00	0.00	0.00	0.00	0.00	0.00
3,100.00	0.00	0.00	3,100.00	0.00	0.00	0.00	0.00	0.00	0.00
3,200.00	0.00	0.00	3,200.00	0.00	0.00	0.00	0.00	0.00	0.00
3,300.00	0.00	0.00	3,300.00	0.00	0.00	0.00	0.00	0.00	0.00
3,400.00	0.00	0.00	3,400.00	0.00	0.00	0.00	0.00	0.00	0.00
3,500.00	0.00	0.00	3,500.00	0.00	0.00	0.00	0.00	0.00	0.00
3,600.00	0.00	0.00	3,600.00	0.00	0.00	0.00	0.00	0.00	0.00
3,700.00	0.00	0.00	3,700.00	0.00	0.00	0.00	0.00	0.00	0.00
3,800.00	0.00	0.00	3,800.00	0.00	0.00	0.00	0.00	0.00	0.00
3,900.00	0.00	0.00	3,900.00	0.00	0.00	0.00	0.00	0.00	0.00
4,000.00	0.00	0.00	4,000.00	0.00	0.00	0.00	0.00	0.00	0.00
4,100.00	0.00	0.00	4,100.00	0.00	0.00	0.00	0.00	0.00	0.00
4,200.00	0.00	0.00	4,200.00	0.00	0.00	0.00	0.00	0.00	0.00
4,300.00	0.00	0.00	4,300.00	0.00	0.00	0.00	0.00	0.00	0.00
4,400.00	0.00	0.00	4,400.00	0.00	0.00	0.00	0.00	0.00	0.00
4,500.00	0.00	0.00	4,500.00	0.00	0.00	0.00	0.00	0.00	0.00
4,600.00	0.00	0.00	4,600.00	0.00	0.00	0.00	0.00	0.00	0.00
4,700.00	0.00	0.00	4,700.00	0.00	0.00	0.00	0.00	0.00	0.00
4,800.00	0.00	0.00	4,800.00	0.00	0.00	0.00	0.00	0.00	0.00
4,900.00	0.00	0.00	4,900.00	0.00	0.00	0.00	0.00	0.00	0.00
5,000.00	0.00	0.00	5,000.00	0.00	0.00	0.00	0.00	0.00	0.00
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

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
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Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	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
7,900.00	0.00	0.00	7,900.00	0.00	0.00	0.00	0.00	0.00	0.00
8,000.00	0.00	0.00	8,000.00	0.00	0.00	0.00	0.00	0.00	0.00
8,100.00	0.00	0.00	8,100.00	0.00	0.00	0.00	0.00	0.00	0.00
8,200.00	0.00	0.00	8,200.00	0.00	0.00	0.00	0.00	0.00	0.00
8,300.00	0.00	0.00	8,300.00	0.00	0.00	0.00	0.00	0.00	0.00
8,400.00	0.00	0.00	8,400.00	0.00	0.00	0.00	0.00	0.00	0.00
8,500.00	0.00	0.00	8,500.00	0.00	0.00	0.00	0.00	0.00	0.00
8,600.00	0.00	0.00	8,600.00	0.00	0.00	0.00	0.00	0.00	0.00
8,700.00	0.00	0.00	8,700.00	0.00	0.00	0.00	0.00	0.00	0.00
8,800.00	0.00	0.00	8,800.00	0.00	0.00	0.00	0.00	0.00	0.00
8,900.00	0.00	0.00	8,900.00	0.00	0.00	0.00	0.00	0.00	0.00
9,000.00	0.00	0.00	9,000.00	0.00	0.00	0.00	0.00	0.00	0.00
9,100.00	0.00	0.00	9,100.00	0.00	0.00	0.00	0.00	0.00	0.00
9,200.00	0.00	0.00	9,200.00	0.00	0.00	0.00	0.00	0.00	0.00
9,300.00	0.00	0.00	9,300.00	0.00	0.00	0.00	0.00	0.00	0.00
9,400.00	0.00	0.00	9,400.00	0.00	0.00	0.00	0.00	0.00	0.00
9,500.00	0.00	0.00	9,500.00	0.00	0.00	0.00	0.00	0.00	0.00
9,600.00	0.00	0.00	9,600.00	0.00	0.00	0.00	0.00	0.00	0.00

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
Project:	Lea County, NM (NAD27 NME)	**TVD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Site:	Sec. 30, T 26 S. , R 29 E	**MD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,700.00	0.00	0.00	9,700.00	0.00	0.00	0.00	0.00	0.00	0.00
9,800.00	0.00	0.00	9,800.00	0.00	0.00	0.00	0.00	0.00	0.00
9,900.00	0.00	0.00	9,900.00	0.00	0.00	0.00	0.00	0.00	0.00
10,000.00	0.00	0.00	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00
10,100.00	0.00	0.00	10,100.00	0.00	0.00	0.00	0.00	0.00	0.00
10,200.00	0.00	0.00	10,200.00	0.00	0.00	0.00	0.00	0.00	0.00
10,246.54	0.00	0.00	10,246.54	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 12.00									
10,300.00	6.42	204.70	10,299.89	-2.72	-1.25	2.77	12.00	12.00	0.00
10,400.00	18.42	204.70	10,397.37	-22.21	-10.22	22.68	12.00	12.00	0.00
10,500.00	30.42	204.70	10,488.26	-59.70	-27.46	60.95	12.00	12.00	0.00
10,600.00	42.42	204.70	10,568.59	-113.53	-52.22	115.92	12.00	12.00	0.00
10,700.00	54.42	204.70	10,634.84	-181.36	-83.42	185.18	12.00	12.00	0.00
10,800.00	66.42	204.70	10,684.12	-260.22	-119.69	265.70	12.00	12.00	0.00
10,900.00	78.42	204.70	10,714.28	-346.67	-159.45	353.96	12.00	12.00	0.00
10,999.63	90.37	204.70	10,724.00	-436.58	-200.81	445.77	12.00	12.00	0.00
Start DLS 4.00 TFO -89.91									
11,000.00	90.37	204.68	10,723.99	-436.92	-200.96	446.12	4.00	0.01	-4.00
11,100.00	90.38	200.68	10,723.34	-529.17	-239.52	540.11	4.00	0.01	-4.00
11,200.00	90.38	196.68	10,722.68	-623.88	-271.55	636.26	4.00	0.00	-4.00
11,300.00	90.38	192.68	10,722.02	-720.59	-296.89	734.08	4.00	0.00	-4.00
11,400.00	90.38	188.68	10,721.36	-818.83	-315.43	833.10	4.00	0.00	-4.00
11,500.00	90.38	184.68	10,720.70	-918.13	-327.07	932.85	4.00	0.00	-4.00
11,600.00	90.37	180.68	10,720.04	-1,018.00	-331.75	1,032.82	4.00	0.00	-4.00
11,613.83	90.37	180.13	10,719.95	-1,031.82	-331.85	1,046.64	4.00	0.00	-4.00
Start 6125.54 hold at 11613.83 MD									
11,700.00	90.37	180.13	10,719.39	-1,117.99	-332.05	1,132.72	0.00	0.00	0.00
11,800.00	90.37	180.13	10,718.73	-1,217.99	-332.28	1,232.61	0.00	0.00	0.00
11,900.00	90.37	180.13	10,718.08	-1,317.99	-332.51	1,332.50	0.00	0.00	0.00
12,000.00	90.37	180.13	10,717.43	-1,417.99	-332.73	1,432.40	0.00	0.00	0.00
12,100.00	90.37	180.13	10,716.78	-1,517.98	-332.96	1,532.29	0.00	0.00	0.00
12,200.00	90.37	180.13	10,716.13	-1,617.98	-333.19	1,632.18	0.00	0.00	0.00
12,300.00	90.37	180.13	10,715.47	-1,717.98	-333.42	1,732.07	0.00	0.00	0.00
12,400.00	90.37	180.13	10,714.82	-1,817.98	-333.65	1,831.96	0.00	0.00	0.00
12,500.00	90.37	180.13	10,714.17	-1,917.97	-333.88	1,931.86	0.00	0.00	0.00
12,600.00	90.37	180.13	10,713.52	-2,017.97	-334.11	2,031.75	0.00	0.00	0.00
12,700.00	90.37	180.13	10,712.86	-2,117.97	-334.34	2,131.64	0.00	0.00	0.00
12,800.00	90.37	180.13	10,712.21	-2,217.97	-334.57	2,231.53	0.00	0.00	0.00
12,900.00	90.37	180.13	10,711.56	-2,317.97	-334.80	2,331.42	0.00	0.00	0.00
13,000.00	90.37	180.13	10,710.91	-2,417.96	-335.03	2,431.32	0.00	0.00	0.00
13,100.00	90.37	180.13	10,710.26	-2,517.96	-335.26	2,531.21	0.00	0.00	0.00
13,200.00	90.37	180.13	10,709.60	-2,617.96	-335.49	2,631.10	0.00	0.00	0.00
13,300.00	90.37	180.13	10,708.95	-2,717.96	-335.72	2,730.99	0.00	0.00	0.00
13,400.00	90.37	180.13	10,708.30	-2,817.95	-335.95	2,830.89	0.00	0.00	0.00

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
Project:	Lea County, NM (NAD27 NME)	**TVD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Site:	Sec. 30, T 26 S. , R 29 E	**MD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,500.00	90.37	180.13	10,707.65	-2,917.95	-336.18	2,930.78	0.00	0.00	0.00
13,600.00	90.37	180.13	10,707.00	-3,017.95	-336.41	3,030.67	0.00	0.00	0.00
13,700.00	90.37	180.13	10,706.34	-3,117.95	-336.63	3,130.56	0.00	0.00	0.00
13,800.00	90.37	180.13	10,705.69	-3,217.94	-336.86	3,230.45	0.00	0.00	0.00
13,900.00	90.37	180.13	10,705.04	-3,317.94	-337.09	3,330.35	0.00	0.00	0.00
14,000.00	90.37	180.13	10,704.39	-3,417.94	-337.32	3,430.24	0.00	0.00	0.00
14,100.00	90.37	180.13	10,703.73	-3,517.94	-337.55	3,530.13	0.00	0.00	0.00
14,200.00	90.37	180.13	10,703.08	-3,617.93	-337.78	3,630.02	0.00	0.00	0.00
14,300.00	90.37	180.13	10,702.43	-3,717.93	-338.01	3,729.91	0.00	0.00	0.00
14,400.00	90.37	180.13	10,701.78	-3,817.93	-338.24	3,829.81	0.00	0.00	0.00
14,500.00	90.37	180.13	10,701.13	-3,917.93	-338.47	3,929.70	0.00	0.00	0.00
14,600.00	90.37	180.13	10,700.47	-4,017.92	-338.70	4,029.59	0.00	0.00	0.00
14,700.00	90.37	180.13	10,699.82	-4,117.92	-338.93	4,129.48	0.00	0.00	0.00
14,800.00	90.37	180.13	10,699.17	-4,217.92	-339.16	4,229.37	0.00	0.00	0.00
14,900.00	90.37	180.13	10,698.52	-4,317.92	-339.39	4,329.27	0.00	0.00	0.00
15,000.00	90.37	180.13	10,697.87	-4,417.92	-339.62	4,429.16	0.00	0.00	0.00
15,100.00	90.37	180.13	10,697.21	-4,517.91	-339.85	4,529.05	0.00	0.00	0.00
15,200.00	90.37	180.13	10,696.56	-4,617.91	-340.08	4,628.94	0.00	0.00	0.00
15,300.00	90.37	180.13	10,695.91	-4,717.91	-340.30	4,728.84	0.00	0.00	0.00
15,400.00	90.37	180.13	10,695.26	-4,817.91	-340.53	4,828.73	0.00	0.00	0.00
15,500.00	90.37	180.13	10,694.60	-4,917.90	-340.76	4,928.62	0.00	0.00	0.00
15,600.00	90.37	180.13	10,693.95	-5,017.90	-340.99	5,028.51	0.00	0.00	0.00
15,700.00	90.37	180.13	10,693.30	-5,117.90	-341.22	5,128.40	0.00	0.00	0.00
15,800.00	90.37	180.13	10,692.65	-5,217.90	-341.45	5,228.30	0.00	0.00	0.00
15,900.00	90.37	180.13	10,692.00	-5,317.89	-341.68	5,328.19	0.00	0.00	0.00
16,000.00	90.37	180.13	10,691.34	-5,417.89	-341.91	5,428.08	0.00	0.00	0.00
16,100.00	90.37	180.13	10,690.69	-5,517.89	-342.14	5,527.97	0.00	0.00	0.00
16,200.00	90.37	180.13	10,690.04	-5,617.89	-342.37	5,627.86	0.00	0.00	0.00
16,300.00	90.37	180.13	10,689.39	-5,717.88	-342.60	5,727.76	0.00	0.00	0.00
16,400.00	90.37	180.13	10,688.73	-5,817.88	-342.83	5,827.65	0.00	0.00	0.00
16,500.00	90.37	180.13	10,688.08	-5,917.88	-343.06	5,927.54	0.00	0.00	0.00
16,600.00	90.37	180.13	10,687.43	-6,017.88	-343.29	6,027.43	0.00	0.00	0.00
16,700.00	90.37	180.13	10,686.78	-6,117.87	-343.52	6,127.32	0.00	0.00	0.00
16,800.00	90.37	180.13	10,686.13	-6,217.87	-343.75	6,227.22	0.00	0.00	0.00
16,900.00	90.37	180.13	10,685.47	-6,317.87	-343.98	6,327.11	0.00	0.00	0.00
17,000.00	90.37	180.13	10,684.82	-6,417.87	-344.20	6,427.00	0.00	0.00	0.00
17,100.00	90.37	180.13	10,684.17	-6,517.86	-344.43	6,526.89	0.00	0.00	0.00
17,200.00	90.37	180.13	10,683.52	-6,617.86	-344.66	6,626.79	0.00	0.00	0.00
17,300.00	90.37	180.13	10,682.87	-6,717.86	-344.89	6,726.68	0.00	0.00	0.00
17,400.00	90.37	180.13	10,682.21	-6,817.86	-345.12	6,826.57	0.00	0.00	0.00
17,500.00	90.37	180.13	10,681.56	-6,917.86	-345.35	6,926.46	0.00	0.00	0.00
17,600.00	90.37	180.13	10,680.91	-7,017.85	-345.58	7,026.35	0.00	0.00	0.00
17,700.00	90.37	180.13	10,680.26	-7,117.85	-345.81	7,126.25	0.00	0.00	0.00

Integrity Directional Services, LLC

Survey Report

Company:	COG Production L L C	**Local Co-ordinate Reference:**	Well Copperhead 31 Fed Com 21H
Project:	Lea County, NM (NAD27 NME)	**TVD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Site:	Sec. 30, T 26 S. , R 29 E	**MD Reference:**	KB=25' @ 3013.80ft (Latshaw 44)
Well:	Copperhead 31 Fed Com 21H	**North Reference:**	Grid
Wellbore:	Wellbore #1	**Survey Calculation Method:**	Minimum Curvature
Design:	Plan #1	**Database:**	EDM 5000.1 Multi User Db

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
17,739.37	90.37	180.13	10,680.00	-7,157.21	-345.90	7,165.57	0.00	0.00	0.00
TD at 17739.36									

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
21H Drilling Window	0.00	180.13	-1.00	-1,031.82	-331.85	370,178.8820	596,767.4506	32° 1' 2.465 N	104° 1' 16.020 W
- plan misses target center by 1083.87ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Rectangle (sides W100.00 H6,125.54 D0.00)									
Copperhead 31 Fed C	0.00	0.00	10,680.00	-7,157.21	-345.90	364,053.5000	596,753.4000	32° 0' 1.845 N	104° 1' 16.389 W
- plan hits target center									
- Point									
Copperhead 31 Fed C	0.00	0.00	10,680.85	-7,027.20	-339.71	364,183.5126	596,759.5900	32° 0' 3.132 N	104° 1' 16.313 W
- plan misses target center by 5.89ft at 17609.34ft MD (10680.85 TVD, -7027.19 N, -345.60 E)									
- Point									

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
10,247	10,247	0	0	Start Build 12.00
11,000	10,724	-437	-201	Start DLS 4.00 TFO -89.91
11,614	10,720	-1032	-332	Start 6125.54 hold at 11613.83 MD
17,739	10,680	-7157	-346	TD at 17739.36

Checked By: _____ Approved By: _____ Date: _____

COG production LLC – Copperhead 31 Federal Com 21H

Casing Program

Hole Size	Casing Interval		Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
	From	To							
13.5"	0	950'	10.75"	45.5	HCN80	BTC	6.71	1.07	24.2
9.625"	0	10,000'	7.625"	29.7	HCP110	BTC	1.37	1.38	2.93
6.75"	0	9,500'	5.5"	23	HCP110	BTC	2.55	2.42	2.63
6.75"	9,500'	17,739'	5"	18	HCP110	BTC	2.11	2.05	32.2
				BLM Minimum Safety Factor			1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse.

Intermediate burst based on 0.8 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.

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

The 5" casing will be run back 500' into the int casing to ensure the coupling OD clearance is greater than .422" for the cement bond tie in.

COG Production LLC – Copperhead 31 Federal Com 21H

1. Geologic Formations

TVD of target	10,680' EOL	Pilot hole depth	NA
MD at TD:	17,739'	Deepest expected fresh water:	78

Basin

Formation	Depth (TVD) from KB	Water/Mineral Bearing/ Target Zone?	Hazards*
Quaternary Fill	Surface	Water	
Rustler	917	Water	
Top of Salt	1026	Salt	
Base of Salt	2543	Salt	
Delaware - Lamar	2728	Oil/Gas	
Bone Spring	6424	Oil/Gas	
Wolfcamp	9541	Oil/Gas	
Wolfcamp B	10154	Oil/Gas	
Wolfcamp C	10281	Oil/Gas	
Wolfcamp D	10642	Target Oil/Gas	
Wolfcamp E	10961	Oil/Gas	
Penn	11197	Not Penetrated	

2. Casing Program

Hole Size	Casing Interval From	Casing Interval To	Csg. Size	Weight (lbs)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
13.5"	0	950'	10.75"	45.5	HCN80	BTC	6.71	1.07	24.2
9.625"	0	10,000'	7.625"	29.7	HCP110	BTC	1.37	1.38	2.93
6.75"	0	9,500'	5.5"	23	HCP110	BTC	2.55	2.42	2.63
6.75"	9,500'	17,739'	5"	18	HCP110	BTC	2.11	2.05	32.2
				BLM Minimum Safety Factor			1.125	1	1.6 Dry 1.8 Wet

Intermediate casing will be kept at least 1/3 full while running casing.to mitigate collapse.

Intermediate burst based on 0.8 frac gradient at the shoe with Gas Gradient 0.1 psi/ft to surface.

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

The 5" casing will be run back 500' into the int casing to ensure the coupling OD clearance is greater than .422" for the cement bond tie in.

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

3. Cementing Program

Casing	# Sks	Wt. lb/ gal	Yld ft3/ sack	H_20 gal/sk	500# Comp. Strength (hours)	Slurry Description
Surf.	200	13.5	1.75	9	12	Lead: Class C + 4% Gel + 2% CaCl2
	200	14.8	1.34	6.34	8	Tail: Class C + 2% CaCl2
Inter.	800	10.3	3.48	21.7	48	Lead: Tuned Light Blend
	275	16.4	1.1	5.5	8	Tail: Class H
5.5 Prod	400	11.9	2.5	19.6	48	Lead: 50:50:10 H Blend
	950	14.4	1.24	5.7	19	Tail: Versacem 50:50:2 Class H + 1% Salt

Volumes Subject to Observed Hole Conditions and/or Fluid Caliper Results
Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Casing String	TOC	% Excess
Surface	0'	70%
1st Intermediate	0'	40%
Production	4330'	30% OH in Lateral (KOP to EOL)

4. Pressure Control Equipment

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

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	✓	Tested to:
9.875"	11"	3M	Annular	X	50% test pressure
			Blind Ram	X	WP
			Pipe Ram	X	
			Double Ram		
			Other*		
6-7/5"	11"	5M.	Annular	x	50% testing pressure
			Blind Ram	x	WP
			Pipe Ram	x	
			Double Ram		
			Other*		

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

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

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

5. Mud Program

Depth		Type	Weight (ppg)	Viscosity	Water Loss
From	To				
0	Surf. Shoe	FW Gel	8.6-8.8	28-34	N/C
Surf csg	Int shoe	Brine Diesel Emulsion	8.8 – 9.4	28-34	N/C
Int shoe	Lateral TD	OBM	11.0 – 12.2	30-50	10-30

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

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

6. Logging and Testing Procedures

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

Additional logs planned		Interval
N	Resistivity	
N	Density	
N	CBL	
N	Mud log	
N	PEX	

7. Drilling Conditions

Condition	Specify what type and where?
BH Pressure at deepest TVD	6775 psi at 10680' TVD
Abnormal Temperature	NO 165 Deg. F.

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

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

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

8. Other facets of operation

Attachments

- Directional Plan
- Anti-Collision Report
- Flex Hose Variance
- BOP & Choke Schematics
- C102 and supporting maps
- Rig plat
- H2S schematic
- H2S contingency plan
- Interim reclamation plat

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: LATSHAW DRILLING	*Customer P.O.#* RIG#44
Sales Order # 242739	*Date Assembled:* 2/9/2015

Specifications

Hose Assembly Type:	Choke & Kill		
Assembly Serial #	292614-1	*Hose Lot # and Date Code*	10900-08/13
Hose Working Pressure (psi)	10000	*Test Pressure (psi)*	15000

We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

Comments:

Approved By	*Date*
Ryan Adams	2/10/2015

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: LATSHAW DRILLING	*Customer P.O.#* RIG#44
Sales Order # 242739	*Date Assembled:* 2/9/2015

Specifications

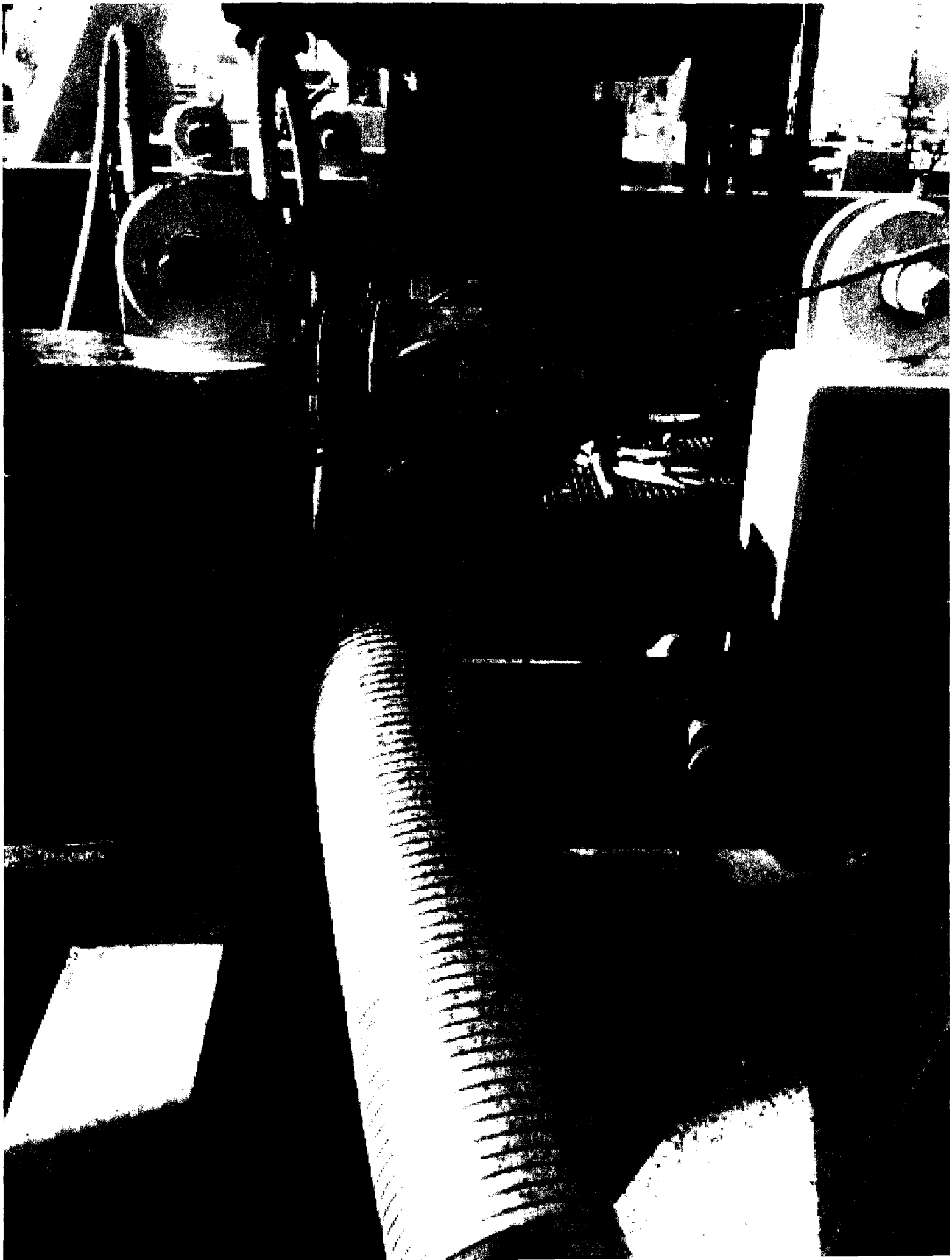
Hose Assembly Type:	Choke & Kill		
Assembly Serial #	292614-2	*Hose Lot # and Date Code*	11794-10/14
Hose Working Pressure (psi)	10000	*Test Pressure (psi)*	15000

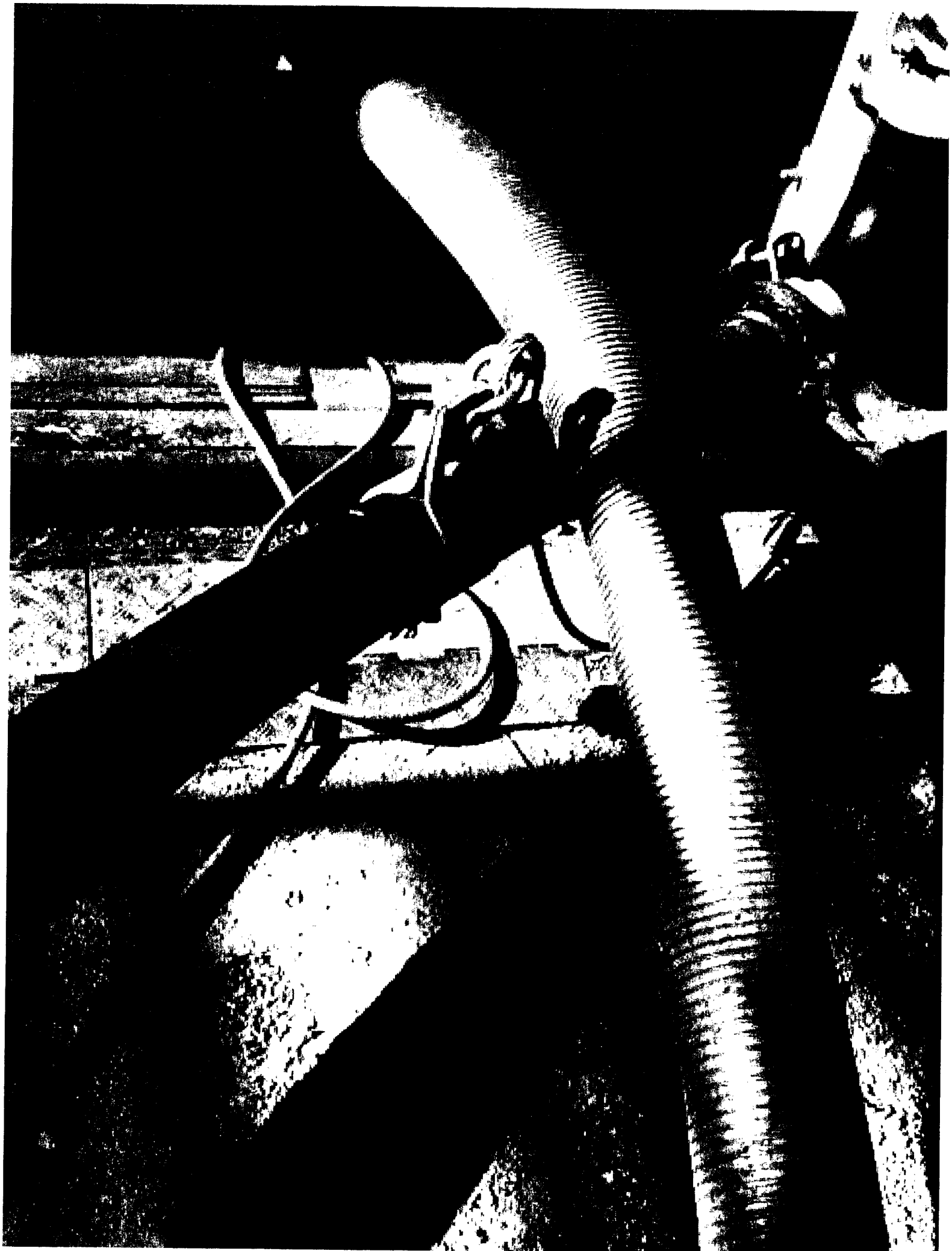
We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

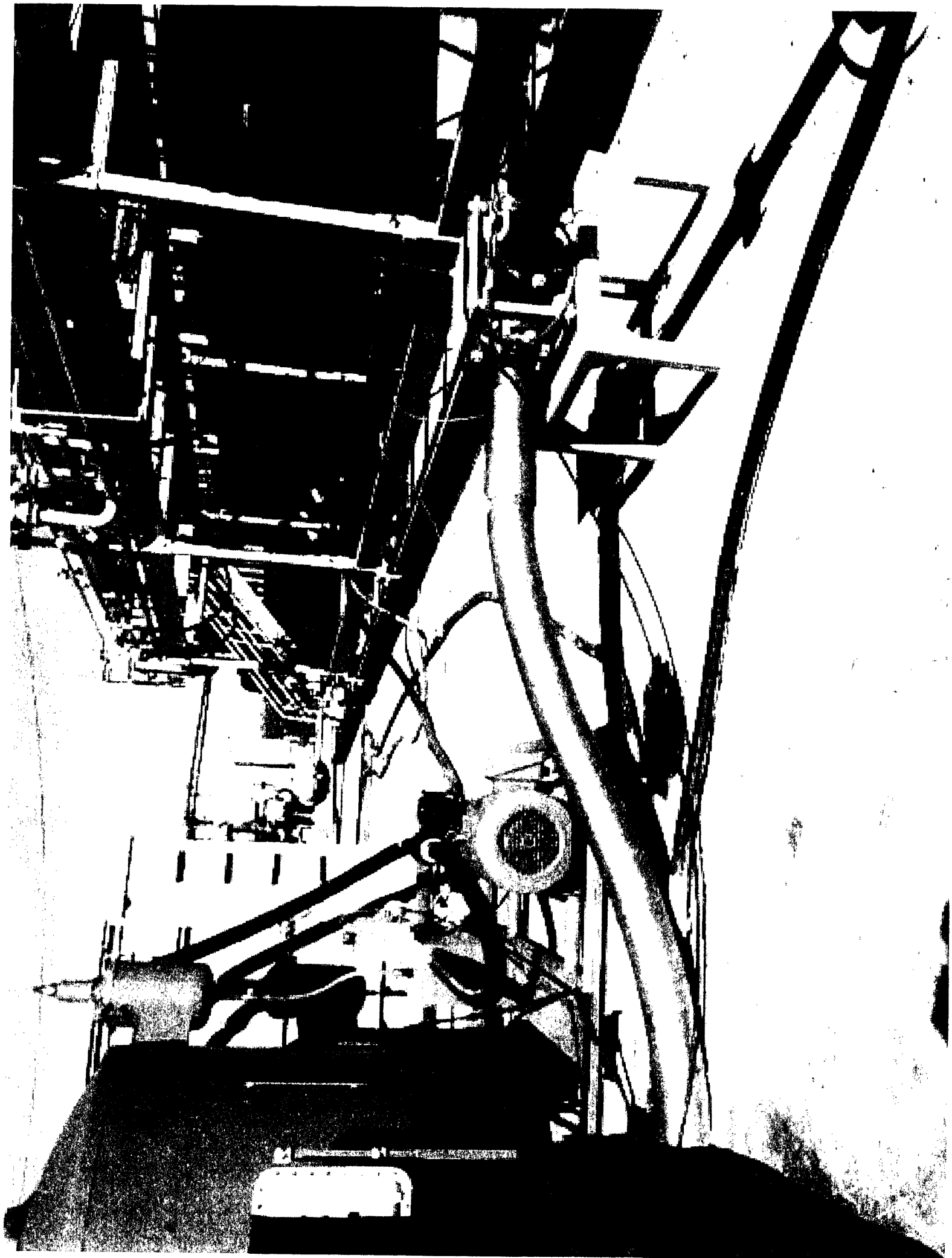
Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

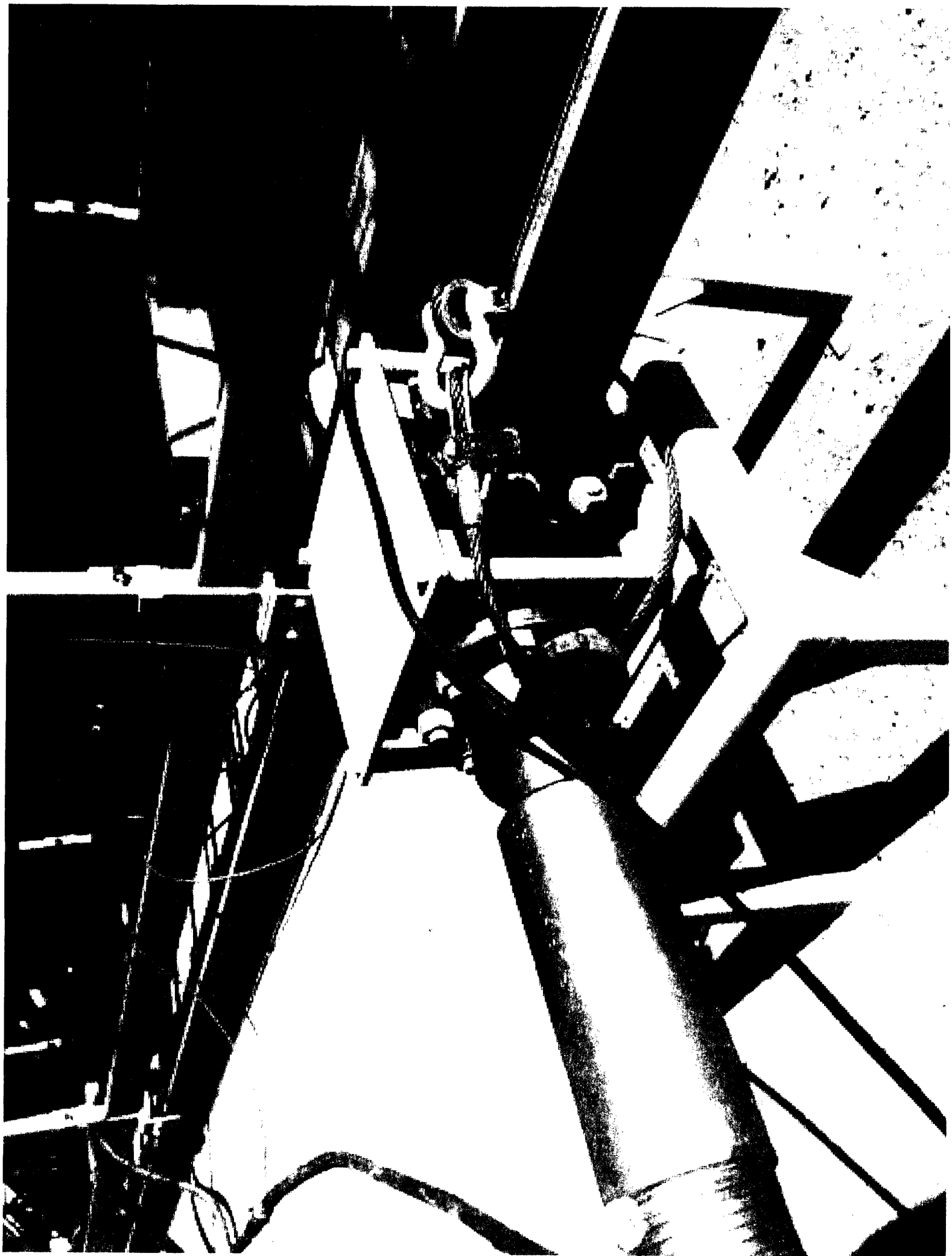
Comments:

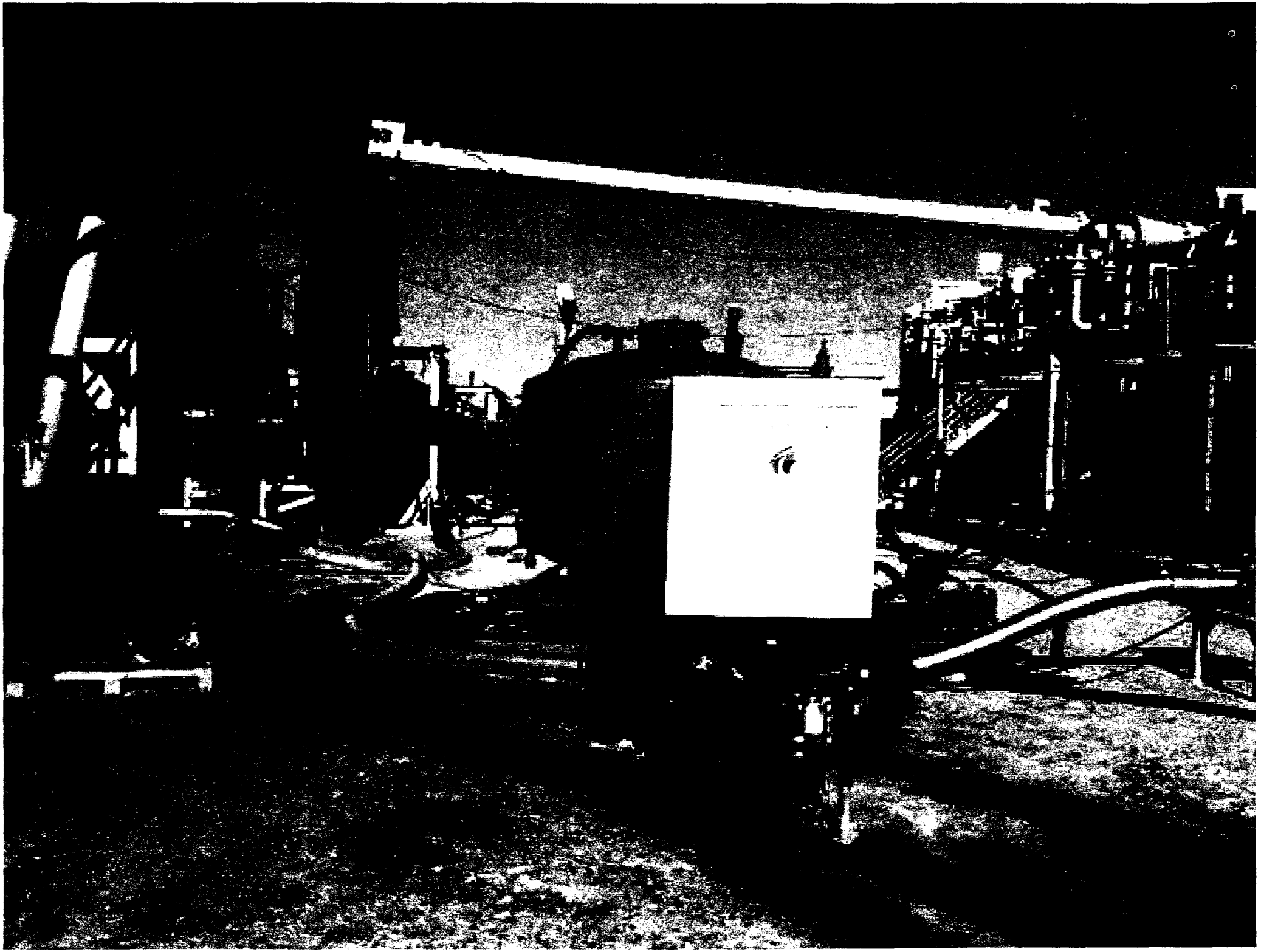
Approved By	*Date*
	2/10/2015











APD ID: 10400011656 **Submission Date:** 02/20/2017

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Well Type: OIL WELL **Well Work Type:** Drill

Section 1 - Existing Roads

Will existing roads be used? NO

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

COG Copperhead 21H_Maps_02-20-2017.pdf

New road type: RESOURCE

Length: 504.5 Feet **Width (ft.):** 30

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

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 14

New road access erosion control: Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage, and to be consistent with local drainage patterns.
New road access plan or profile prepared? NO

New road access plan attachment:

Access road engineering design? NO

Access road engineering design attachment:

Access surfacing type: OTHER

Access topsoil source: ONSITE

Access surfacing type description: Caliche

Access onsite topsoil source depth: 6

Offsite topsoil source description:

Onsite topsoil removal process: Blading

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

Access miscellaneous information:

Number of access turnouts: **Access turnout map:**

Drainage Control

New road drainage crossing: OTHER

Drainage Control comments: None necessary

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

Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Additional Attachment(s):

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

COG Copperhead 21H_1 Mile Map Data_02-20-2017.pdf

Existing Wells description:

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

Submit or defer a Proposed Production Facilities plan? DEFER

Estimated Production Facilities description: Production will be sent to the existing Central Tank Battery facility located at the Copperhead 31 Federal Com #3H Section 30, T26S, R29E.

Section 5 - Location and Types of Water Supply

Water Source Table

Water source use type: ICE PAD CONSTRUCTION & MAINTENANCE, STIMULATION, SURFACE CASING
Describe type: Fresh water will be furnished by the C-3824 water well. The water will be purchased from Vision Resources 2512 Hepler Rd Carlsbad, NM 88221, 575-236-6041
Source latitude:

Water source type: OTHER

Source longitude:

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: PRIVATE

Water source transport method: PIPELINE

Source transportation land ownership: PRIVATE

Water source volume (barrels): 450000 **Source volume (acre-feet):** 58.001892

Source volume (gal): 18900000

Water source use type: INTERMEDIATE/PRODUCTION CASING **Water source type:** OTHER

Describe type: Brine water will be provided by Malaga Brine Station. Brine water will be purchased from Mesquite SWD Inc., P O Box 1479, Carlsbad, NM 88221. Phone: 575-706-1840 **Source longitude:**

Source latitude:

Source datum:

Water source permit type: PRIVATE CONTRACT

Source land ownership: COMMERCIAL

Water source transport method: TRUCKING

Source transportation land ownership: COMMERCIAL

Water source volume (barrels): 30000 **Source volume (acre-feet):** 3.866793

Source volume (gal): 1260000

Water source and transportation map:

COG Copperhead 21H_Brine H2O_02-20-2017.pdf

COG Copperhead 21H_Fresh H2O_02-20-2017.pdf

Water source comments: Fresh water will be furnished by the C-3824 water well. The water will be purchased from Vision Resources 2512 Hepler Rd Carlsbad, NM 88221, 575-236-6041. Brine water will be provided by Malaga Brine Station. Brine water will be purchased from Mesquite SWD Inc., P O Box 1479, Carlsbad, NM 88221. Phone: 575-706-1840

New water well? NO

New Water Well Info

Well latitude: **Well Longitude:** **Well datum:**

Well target aquifer:

Est. depth to top of aquifer(ft): **Est thickness of aquifer:**

Aquifer comments:

Aquifer documentation:

Well depth (ft): **Well casing type:**

Well casing outside diameter (in.): **Well casing inside diameter (in.):**

New water well casing? **Used casing source:**

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Drilling method: **Drill material:**

Grout material: **Grout depth:**

Casing length (ft.): **Casing top depth (ft.):**

Well Production type: **Completion Method:**

Water well additional information:

State appropriation permit:

Additional information attachment:

Section 6 - Construction Materials

Construction Materials description: Caliche will be obtained from the actual well site. If caliche does not exist or is not plentiful from the well site, the caliche source will be caliche pit from from Draper Brantley located in Section 15. T23S. R28E. Draper Brantley address is 706 Riverside Drive, Carlsbad, NM 88220. (575) 706-3169.
Construction Materials source location attachment:

Section 7 - Methods for Handling Waste

Waste type: SEWAGE

Waste content description: Human waste and gray water

Amount of waste: 1000 gallons

Waste disposal frequency : One Time Only

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

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

Disposal location description: Trucked to an approved disposal facility

Waste type: DRILLING

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

Amount of waste: 6000 barrels

Waste disposal frequency : One Time Only

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

Safe containmant attachment:

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

Disposal location description: Trucked to an approved disposal facility

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Waste type: GARBAGE

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

Amount of waste: 500 pounds

Waste disposal frequency : One Time Only

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

Safe containmant attachment:

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

Disposal type description:

Disposal location description: Trucked to an approved disposal facility.

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

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

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

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

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? YES

Description of cuttings location Roll off cutting containers on tracks

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

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

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

WCuttings area liner

Cuttings area liner specifications and installation description

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Section 8 - Ancillary Facilities

Are you requesting any Ancillary Facilities?: YES

Ancillary Facilities attachment:

Azores Federal 6H GCP_02-20-2017.pdf

Comments: Gas Capture Plan attached

Section 9 - Well Site Layout

Well Site Layout Diagram:

COG Copperhead 21H_Prod Facility_02-20-2017.pdf

Comments: COG Production LLC does operate an oil production facility on this lease. If the well is productive, contemplated facilities will be as follows: Will utilize tank battery and facilities at the existing Copperhead 31 Federal Com #3H tank battery. Production will be sent to the Copperhead 31 Federal Com #3H Central Tank Battery facility. A surface flow line of approximately 849.7' 3" steel pipe carrying oil, gas and water under a maximum pressure of 125 psi will go to the facility at the Copperhead 31 Federal Com #3H Central Tank Battery location. We plan to install a 4" surface polyethylene pipe transporting Gas Lift Gas from the Copperhead 31 Federal Com #3H Central Tank Battery to the Copperhead 31 Federal Com #21H. The surface Gas Lift Gas pipe of approximately 849.7' under a maximum pressure of 125 psi will be installed as per the flowline plat.

Section 10 - Plans for Surface Reclamation

Type of disturbance: NEW

Recontouring attachment:

Drainage/Erosion control construction: If needed, immediately following pad construction approximately 400' of straw waddles will be placed on the north side and 400' on the west side of the location, excluding the access road to reduce sediment impacts to fragile/sensitive soils.
Drainage/Erosion control reclamation: N/A

Wellpad long term disturbance (acres): 2.94

Wellpad short term disturbance (acres): 3.67

Access road long term disturbance (acres): 0.16

Access road short term disturbance (acres): 0.16

Pipeline long term disturbance (acres): 0

Pipeline short term disturbance (acres): 0

Other long term disturbance (acres): 0

Other short term disturbance (acres): 0

Total long term disturbance: 3.1

Total short term disturbance: 3.83

Reconstruction method: Portions of the pad not needed for production operations will be re-contoured to its original state as much as possible. The caliche that is removed will be reused. The stockpiled topsoil will be spread out over reclaimed area and reseeded with BLM approved seed mixture.
Topsoil redistribution: West 80'

Soil treatment: None

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

Existing Vegetation at the well pad attachment:

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

Existing Vegetation Community at the road attachment:

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

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

Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances: N/A

Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? NO

Seed harvest description:

Seed harvest description attachment:

Seed Management

Seed Table

Seed type:

Seed source:

Seed name:

Source name:

Source address:

Source phone:

Seed cultivar:

Seed use location:

PLS pounds per acre:

Proposed seeding season:

Seed Summary

Total pounds/Acre:

Seed Type	Pounds/Acre

Seed reclamation attachment:

Operator Contact/Responsible Official Contact Info

First Name: Rand

Last Name: French

Phone: (432)254-5556

Email: rfrench@concho.com

Seedbed prep:

Seed BMP:

Seed method:

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: N/A

Weed treatment plan attachment:

Monitoring plan description: N/A

Monitoring plan attachment:

Success standards: N/A

Pit closure description: N/A

Pit closure attachment:

COG Copperhead 21H_Closed Loop_02-20-2017.pdf

Section 11 - Surface Ownership

Disturbance type: WELL PAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Operator Name: COG PRODUCTION LLC

Well Name: COPPERHEAD 31 FEDERAL COM **Well Number:** 21H

Fee Owner: Franklin Terry Perkins, Jr. **Fee Owner Address:** 1921 Autumn Drive, Kellar, TX 76262

Phone: (817)269-1440 **Email:**

Surface use plan certification: NO

Surface use plan certification document:

Surface access agreement or bond: Agreement

Surface Access Agreement Need description: COG and Franklin Terry Perkins, Jr. has an approved surface used agreement dated on February 15th, 2011.

Surface Access Bond BLM or Forest Service:

BLM Surface Access Bond number:

USFS Surface access bond number:

Section 12 - Other Information

Right of Way needed? NO **Use APD as ROW?**

ROW Type(s):

ROW Applications

SUPO Additional Information:

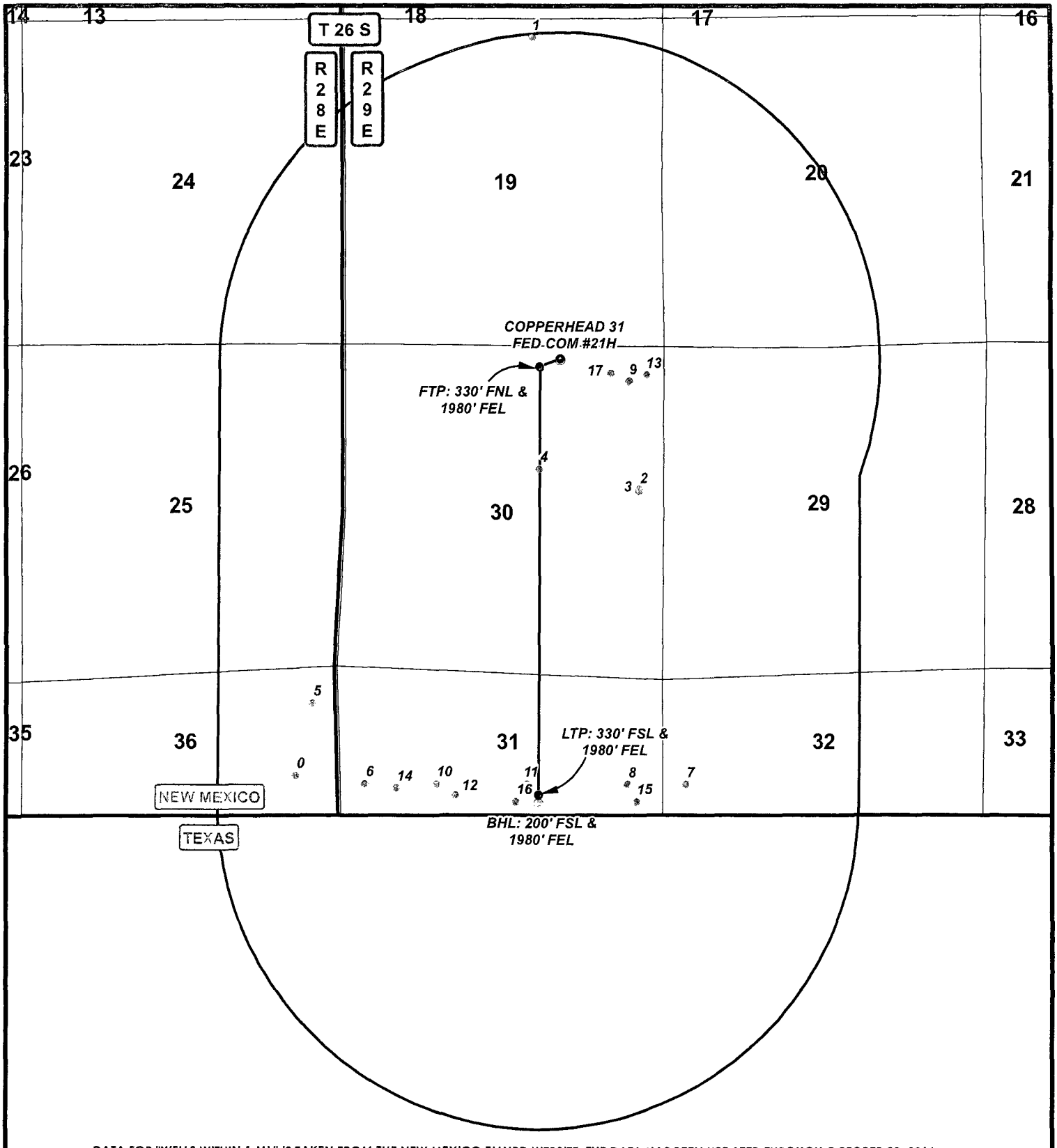
Use a previously conducted onsite? NO

Previous Onsite information:

Other SUPO Attachment

COG Copperhead 21H_Certification_02-20-2017.pdf

COG Copperhead 21H_Pipeline_02-20-2017.pdf



DATA FOR "WELLS WITHIN 1 MI." IS TAKEN FROM THE NEW MEXICO EMNRD WEBSITE. THE DATA HAS BEEN UPDATED THROUGH OCTOBER 29, 2016.

LEGEND

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

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		SURVEY: N.M.P.M

0 2,500 5,000 FEET

0 0.15 0.3 0.6 Miles

1 IN = 2,500 FT

1 MILE MAP 02/08/2017 J.H.

N

CONCHO

COG PRODUCTION, LLC

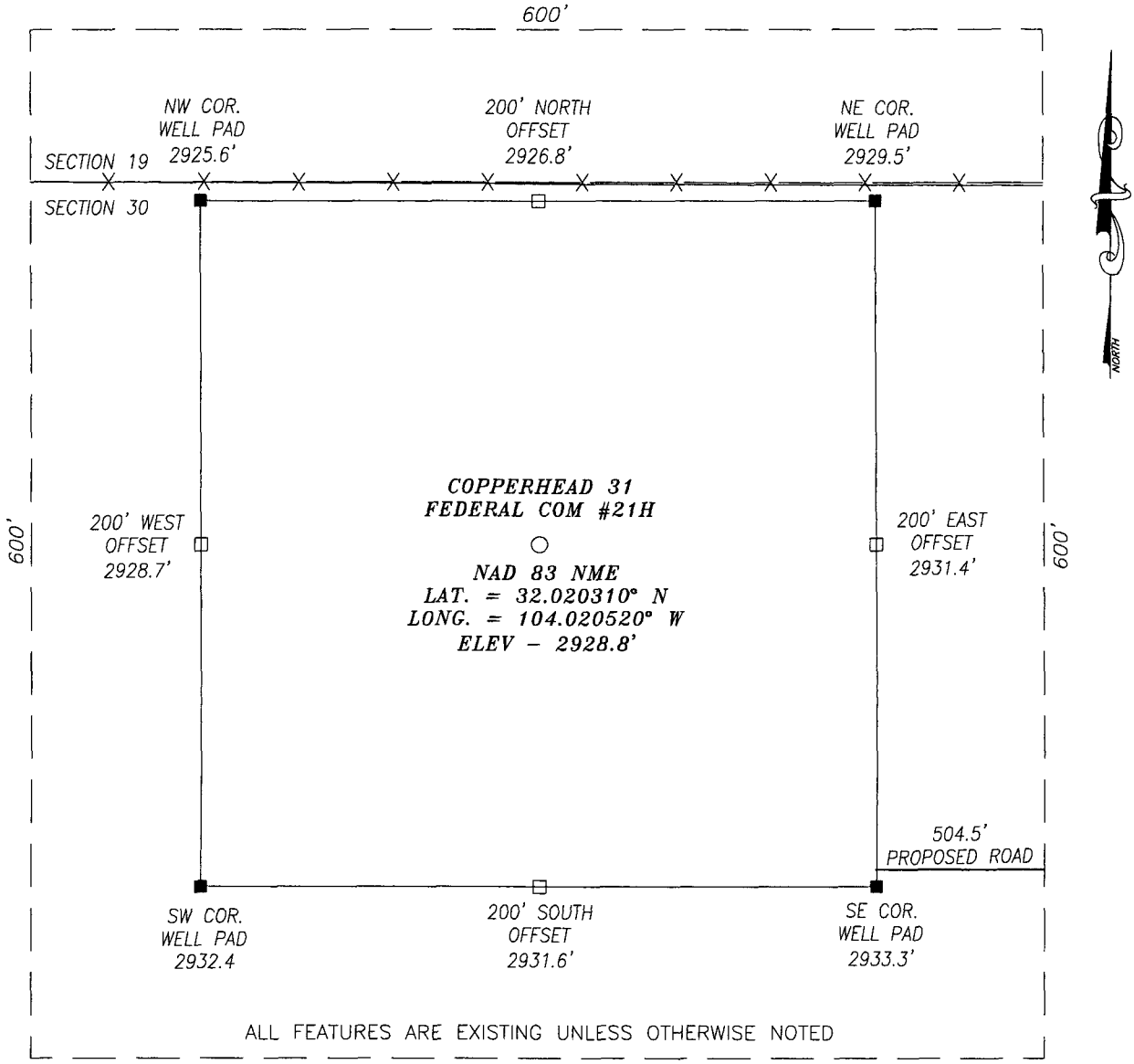
HARCROW SURVEYING, LLC.
2314 W. MAIN ST, ARTESIA, NM 88210
PH: (575) 746-2158 FAX: (575) 746-2158
c.harcrow@harcrowsurveying.com

COPPERHEAD 31 FEDERAL COM #21H 1 MILE WELLS (17-161)

FID	OPERATOR	WELL_NAME	LATITUDE	LONGITUDE	API	SECTION	TOWNSHIP	RANGE	FTG_NS	NS_CD	FTG_EW	EW_CD	COMPL_STAT
0	JACK S REEVES	ST CUCCIA 001	32.001829	-104.034571	3001502538	36	26.0S	28E	1748	N	660	E	Plugged
1	SIGNAL OIL & GAS	CLARK BAKER 001	32.034576	-104.022007	3001503737	19	26.0S	29E	300	N	2096	E	Plugged
2	ALLAR CO	PERKINS 001	32.014497	-104.016297	3001510780	30	26.0S	29E	2318	N	330	E	Plugged
3	ALLAR CO	PERKINS 001	32.014566	-104.016296	3001510836	30	26.0S	29E	2293	N	330	E	Plugged
4	ORLA PETCO INC	PERKINS 001	32.015457	-104.021637	3001523849	30	26.0S	29E	1980	N	1980	E	Plugged
5	YATES PETROLEUM CORPORATION	BUHO BQH STATE 002	32.00504	-104.033692	3001537941	36	26.0S	28E	535	N	330	E	Plugged
6	COG PRODUCTION, LLC	COPPERHEAD FEE A 001H	32.001457	-104.030918	3001538227	31	26.0S	29E	480	S	480	W	New (Not drilled or compl)
7	COG PRODUCTION, LLC	SIDEWINDER 001H	32.001453	-104.013837	3001538500	32	26.0S	29E	480	S	480	W	New (Not drilled or compl)
8	COG PRODUCTION, LLC	COPPERHEAD 31 FEDERAL COM 001H	32.001454	-104.016949	3001538532	31	26.0S	29E	480	S	480	E	New (Not drilled or compl)
9	COG PRODUCTION, LLC	COPPERHEAD 30 FEE 001H	32.019311	-104.016856	3001539542	30	26.0S	29E	480	N	480	E	New (Not drilled or compl)
10	COG PRODUCTION, LLC	COPPERHEAD FEE A 002H	32.001456	-104.027122	3001539787	31	26.0S	29E	480	S	1650	W	New (Not drilled or compl)
11	COG PRODUCTION, LLC	COPPERHEAD 31 FEDERAL COM 002H	32.001455	-104.02233	3001539791	31	26.0S	29E	480	S	2140	E	New (Not drilled or compl)
12	COG PRODUCTION, LLC	COPPERHEAD FEE A 004H	32.000961	-104.02608	3001541210	31	26.0S	29E	300	S	1965	W	New (Not drilled or compl)
13	COG PRODUCTION, LLC	COPPERHEAD 30 FEE 002H	32.019583	-104.015915	3001541211	30	26.0S	29E	380	N	190	E	New (Not drilled or compl)
14	COG PRODUCTION, LLC	COPPERHEAD FEE A 003H	32.001278	-104.029256	3001542327	31	26.0S	29E	415	S	990	W	New (Not drilled or compl)
15	COG PRODUCTION, LLC	COPPERHEAD 31 FEDERAL COM 003H	32.000684	-104.016466	3001542379	31	26.0S	29E	200	S	330	E	New (Not drilled or compl)
16	COG PRODUCTION, LLC	RIDGE NOSE FEDERAL COM 001H	32.000686	-104.022885	3001542391	31	26.0S	29E	200	S	2310	E	New (Not drilled or compl)
17	COG PRODUCTION, LLC	COPPERHEAD 31 FEE 003H	32.019673	-104.017804	3001543924	30	26.0S	29E	349	N	773	E	New (Not drilled or compl)

SECTION 30, TOWNSHIP 26 SOUTH, RANGE 29 EAST, N.M.P.M.,

EDDY COUNTY NEW MEXICO



DIRECTIONS TO LOCATION

FROM THE INTERSECTION OF HIGHWAY 285 AND CR 726 (CATFISH RD) TURN LEFT (EAST) ONTO CR 726 AND TRAVEL APPROX. 1.7 MILES; THEN TURN LEFT (NORTH) AND TRAVEL APPROX. 375 FEET TO A Y; THEN STAY LEFT AT Y AND TRAVEL APPROX. 1.6 MILES; THEN STAY RIGHT AT Y AND TRAVEL APPROX. 0.3 MILES; THEN TURN RIGHT (NORTHEAST) AND TRAVEL APPROX. 0.4 MILES TO THE EXISTING COPPERHEAD 31 FED COM #3H WELL PAD. PROPOSED WELL IS APPROX. 700 FEET WEST OF NORTHWEST CORNER OF EXISITNG PAD.

CERTIFICATION

I, CHAD HARCROW, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

CHAD L. HARCROW NEW MEXICO 17777 LICENSED PROFESSIONAL SURVEYOR

Chad Harcrow 12/14/16

CHAD HARCROW N.M.P.S. NO. 17777 DATE

HARCROW SURVEYING, LLC
2314 W. MAIN ST, ARTESIA, N.M. 88210
PH: (575) 746-2158 FAX: (575) 746-2158
c.harcrow@harcrowsurveying.com

100 0 100 200 Feet

Scale: 1"=100'

COG PRODUCTION, LLC

COPPERHEAD 31 FEDERAL COM #21H WELL
LOCATED 210 FEET FROM THE NORTH LINE
AND 1650 FEET FROM THE EAST LINE OF SECTION 30,
TOWNSHIP 26 SOUTH, RANGE 29 EAST, N.M.P.M.,
EDDY COUNTY, NEW MEXICO

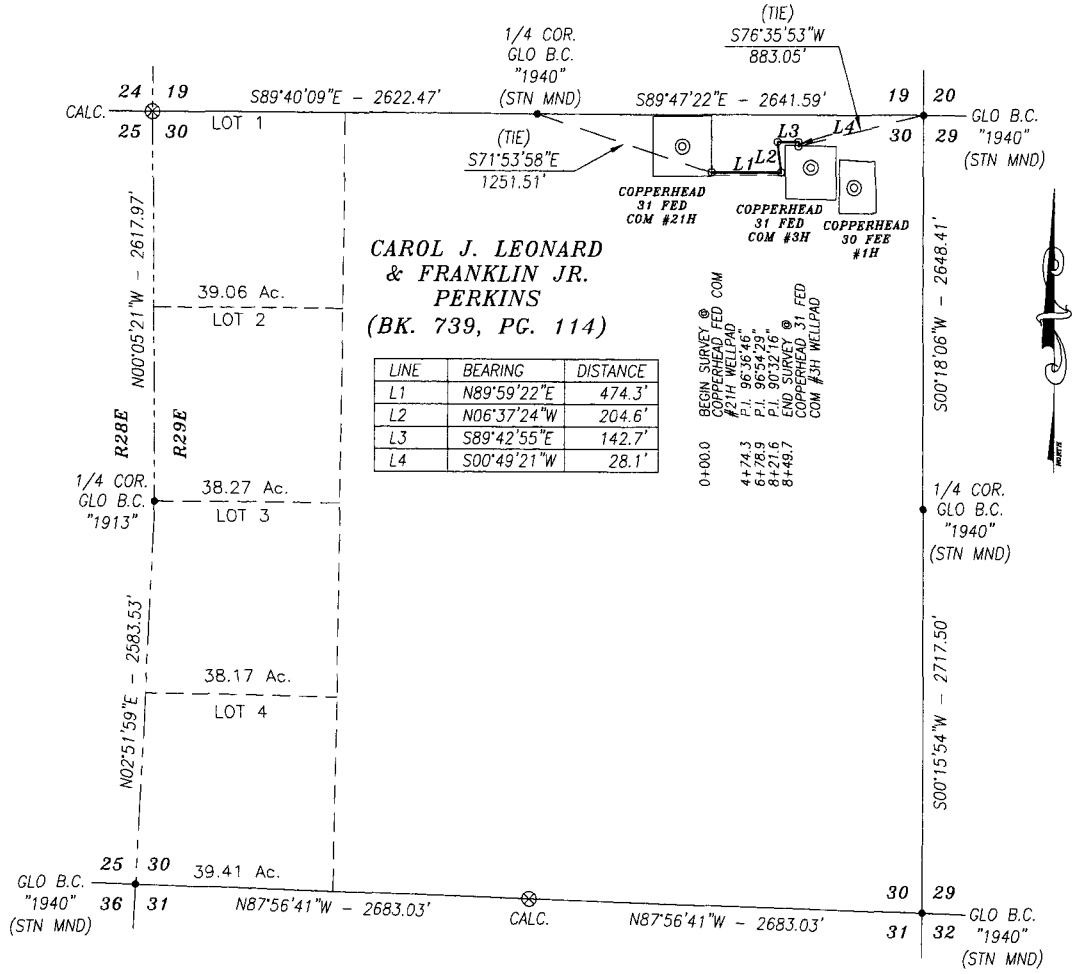
SURVEY DATE: NOVEMBER 30, 2016		PAGE: 1 OF 1
DRAFTING DATE: DECEMBER 8, 2016		
APPROVED BY: CH	DRAWN BY: VD	FILE: 16-1004

FLOWLINE PLAT
COG PRODUCTION, LLC.

A PROPOSED FLOWLINE FROM THE COPPERHEAD 31 FED COM #21H TO THE COPPERHEAD 31 FED COM #3H IN

SECTION 30, TOWNSHIP 26 SOUTH, RANGE 29 EAST, N.M.P.M.,

EDDY COUNTY, NEW MEXICO.



LINE	BEARING	DISTANCE
L1	N89°59'22"E	474.3'
L2	N06°37'24"W	204.6'
L3	S89°42'55"E	142.7'
L4	S00°49'21"W	28.1'

DESCRIPTION

A STRIP OF LAND 30.0 FEET WIDE AND 849.7 FEET OR 51.50 RODS OR 0.161 MILES IN LENGTH CROSSING FEE LAND IN SECTION 30, TOWNSHIP 26 SOUTH, RANGE 29 EAST, EDDY COUNTY, NEW MEXICO AND BEING 15.0 FEET LEFT AND 15.0 FEET RIGHT OF THE ABOVE PLATTED CENTERLINE SURVEY.

BASIS OF BEARING:
BEARINGS SHOWN HEREON ARE MERCATOR GRID AND CONFORM TO THE NEW MEXICO COORDINATE SYSTEM "NEW MEXICO EAST ZONE" NORTH AMERICAN DATUM 1983. DISTANCES ARE SURFACE VALUES.

CERTIFICATION
I, CHAD HARCROW, A NEW MEXICO REGISTERED PROFESSIONAL SURVEYOR CERTIFY THAT I DIRECTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR SURVEYING IN NEW MEXICO.

CHAD L. HARCROW NEW MEXICO 17777 LICENSED PROFESSIONAL SURVEYOR

Chad Harcrow 2/20/17

CHAD HARCROW N.M.P.S. NO. 17777 DATE

HARCROW SURVEYING, LLC
2314 W. MAIN ST, ARTESIA, N.M. 88210
PH: (575) 746-2158 FAX: (575) 746-2158
c.harcrow@harcrowsurveying.com

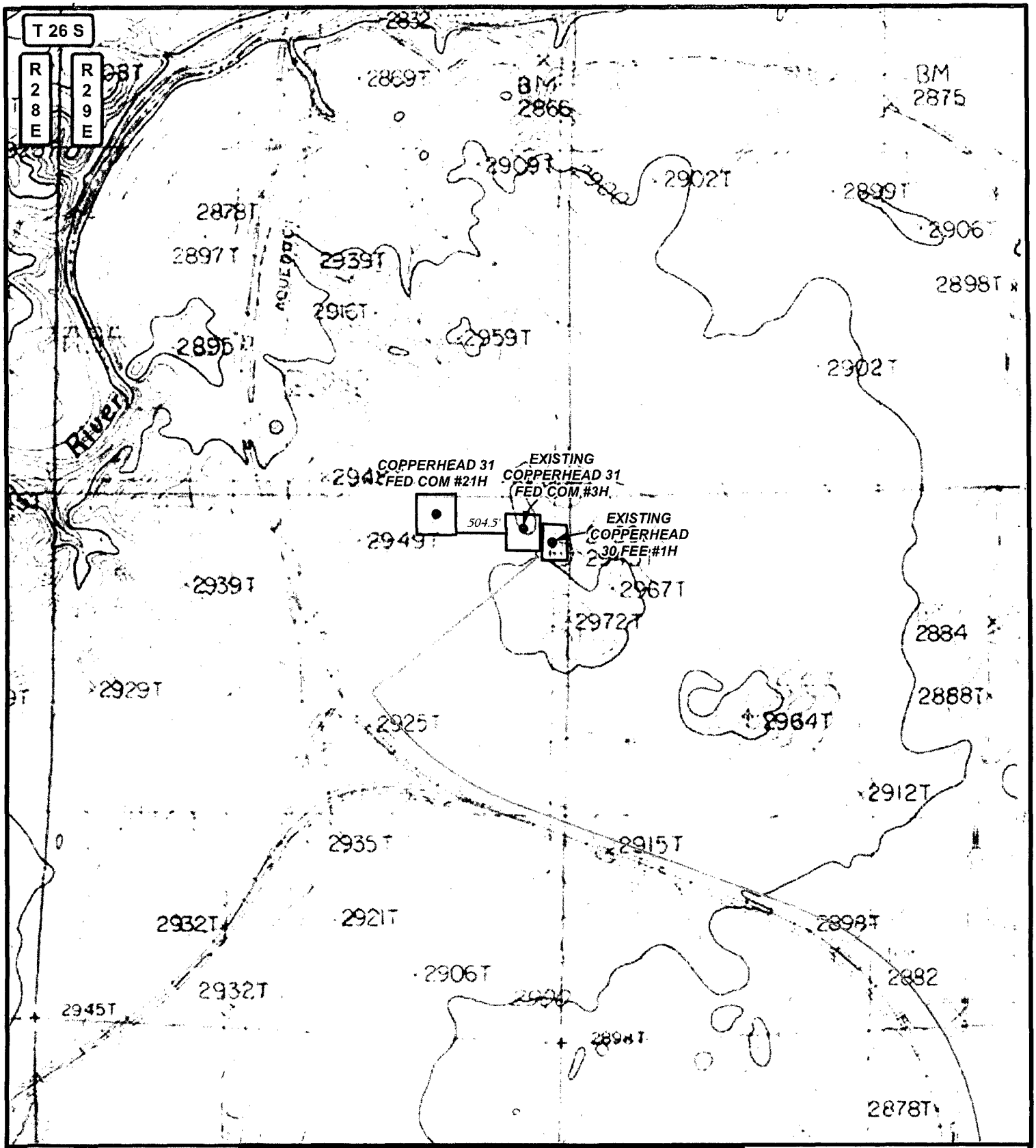
1000 0 1000 2000 FEET

SCALE: 1"=1000'

COG PRODUCTION, LLC

SURVEY OF A PROPOSED FLOWLINE LOCATED IN SECTION 30, TOWNSHIP 26 SOUTH, RANGE 29 EAST, NMPM, EDDY COUNTY, NEW MEXICO

SURVEY DATE: FEBRUARY 17, 2017		
DRAFTING DATE: FEBRUARY 20, 2017		PAGE 1 OF 1
APPROVED BY: CH	DRAWN BY: JH	FILE: 17-217



LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		SURVEY: N.M.P.M

0 2,500 FEET

0 0.1 0.2 0.4 Miles

1 IN = 1,500 FT

LOCATION MAP | TOPO ROAD | 02/08/2017 | J.H.

N

CONCHO

COG PRODUCTION, LLC

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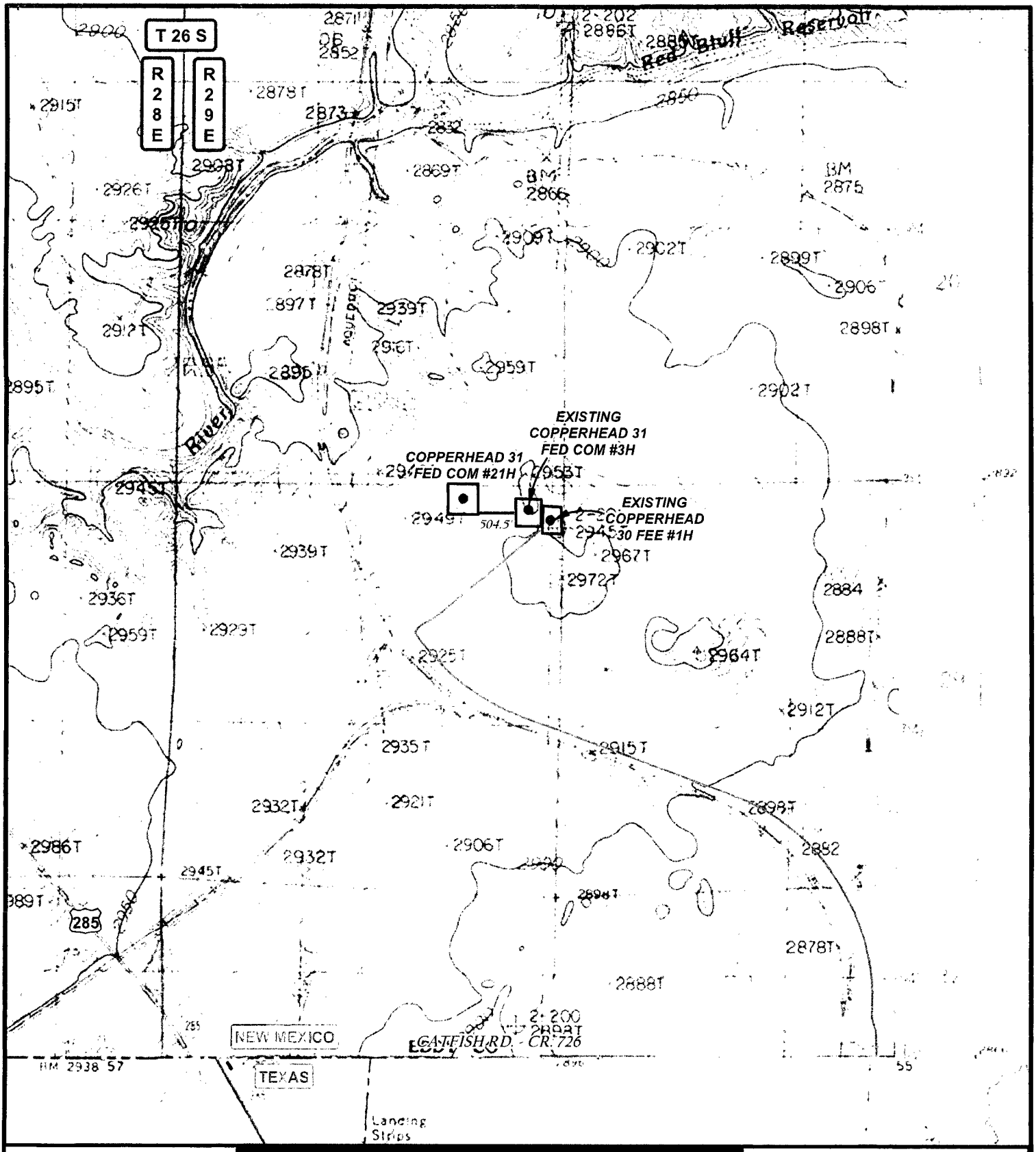

LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO	COUNTY: EDDY		210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		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 | TOPO | 02/08/2017 | J.H.

N

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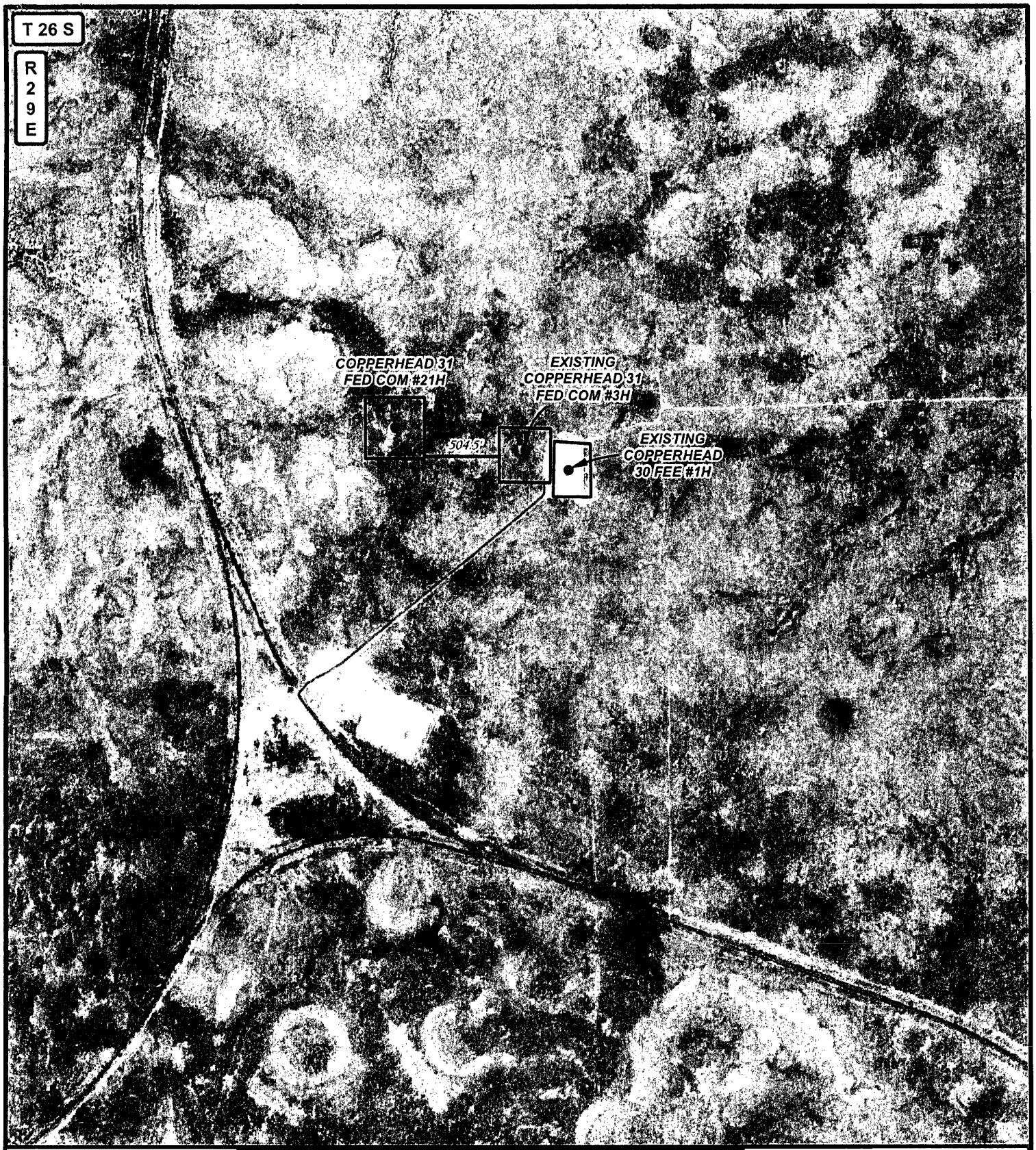

LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		SURVEY: N.M.P.M

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

LOCATION MAP | IMAGERY ROAD | 02/08/2017 | J.H.

N

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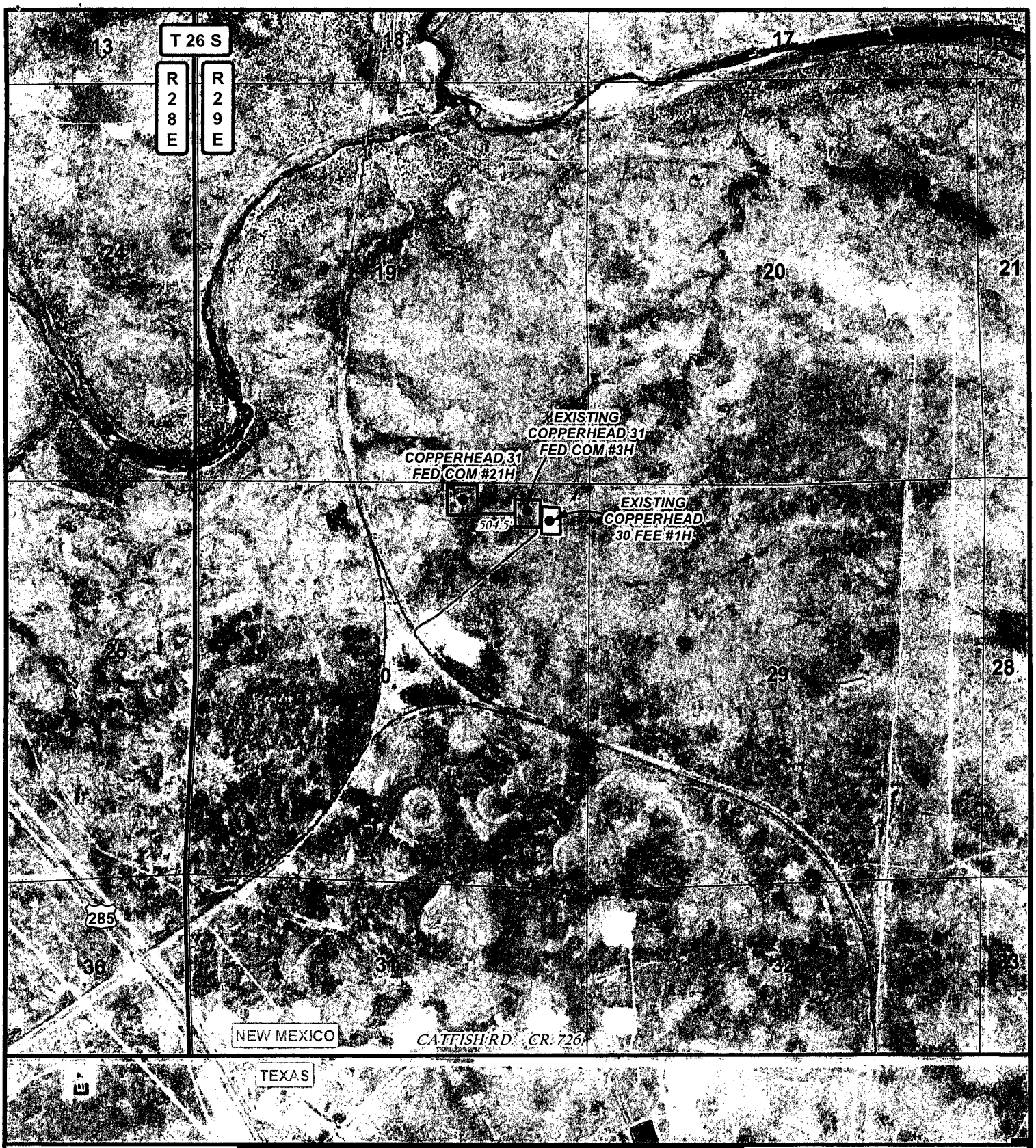

LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		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 02/08/2017 J.H.

N

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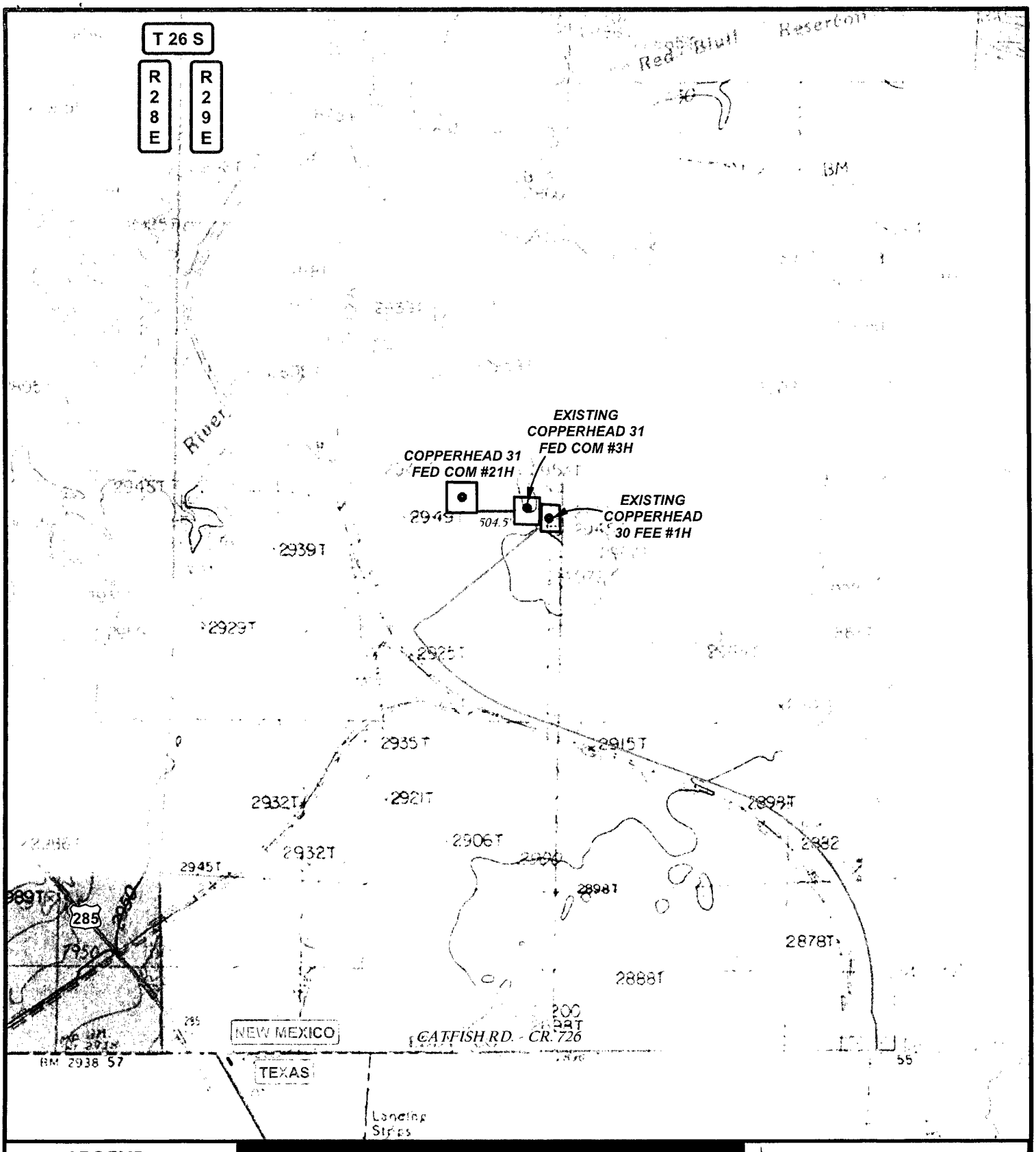

LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD
- PRIVATE
- STATE OF NM
- US BLM

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		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 | LAND STATUS | 02/08/2017 | J.H.

N

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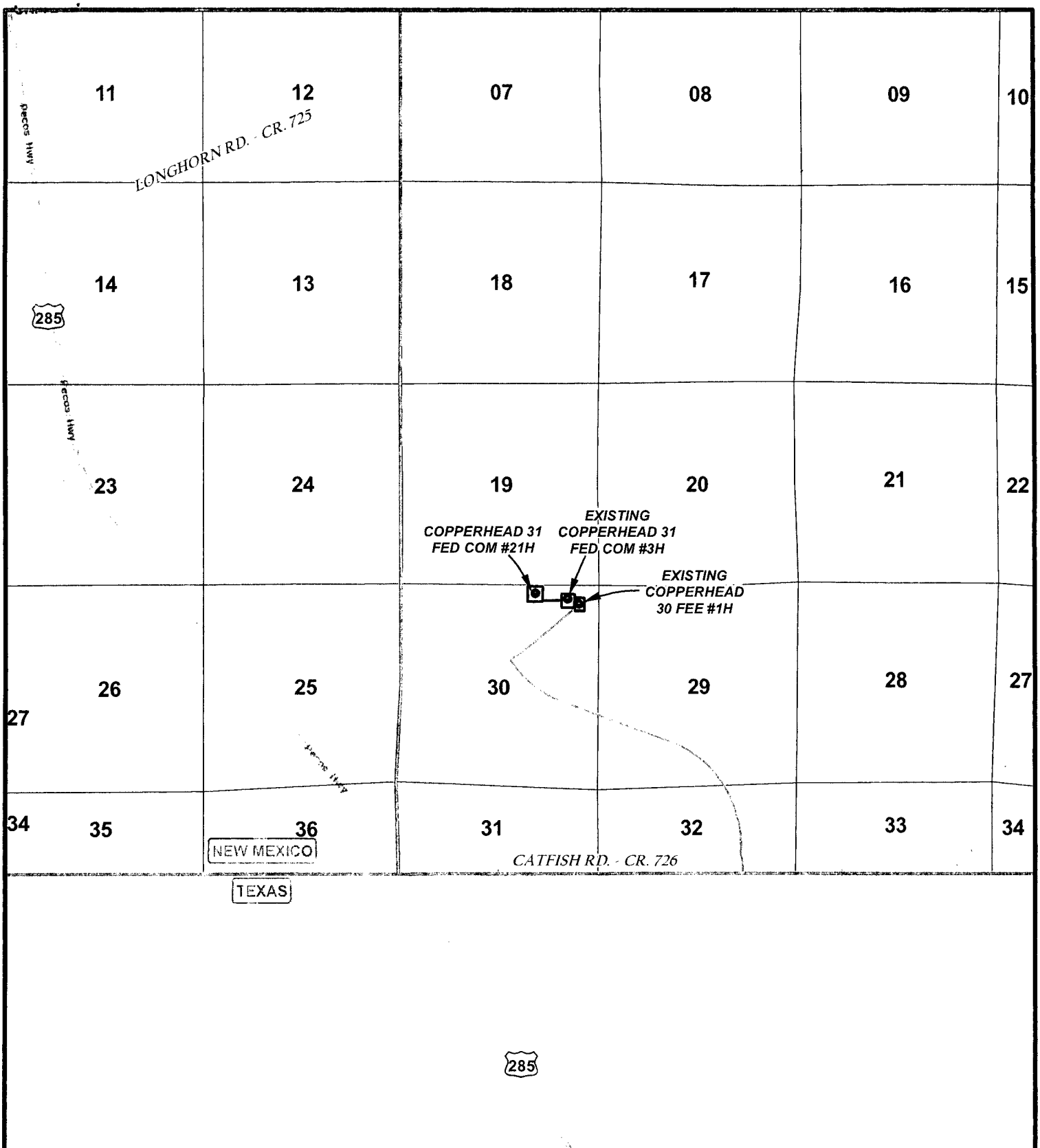

LEGEND

- WELL
- WELLPAD
- EXISTING ROAD
- PROPOSED ROAD

COPPERHEAD 31 FEDERAL COM #21H

SEC: 30	TWP: 26 S.	RGE: 29 E.	ELEVATION: 2928.8'
STATE: NEW MEXICO		COUNTY: EDDY	210' FNL & 1650' FEL
W.O. # 17-161	LEASE: COPPERHEAD 31 FED COM		SURVEY: N.M.P.M

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

0 0.275 0.55 1.1 Miles

1 IN = 4,000 FT

LOCATION MAP | VICINITY | 02/08/2017 | J.H.

N

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c.harcrow@harcrowsurveying.com

Copperhead 31 Fed Com #21H
To Malaga II Brine

Date: 2/17/2017
Author: Whytnie McDonald
State: New Mexico
County: Eddy

Disclaimer: This is not a legal survey document

Map Legend

Route

N
W E
S

0 0.75 1.5 3 4.5 6
Miles

Copperhead 31 Fed Com #21H
Water Transfer Route

Date: 2/17/2017
Author: Whytnie McDonald
State: New Mexico
County: Eddy

Disclaimer: This is not a legal survey document

Map Legend

Route

N
W E
S

0 0.75 1.5 3 4.5 6
Miles

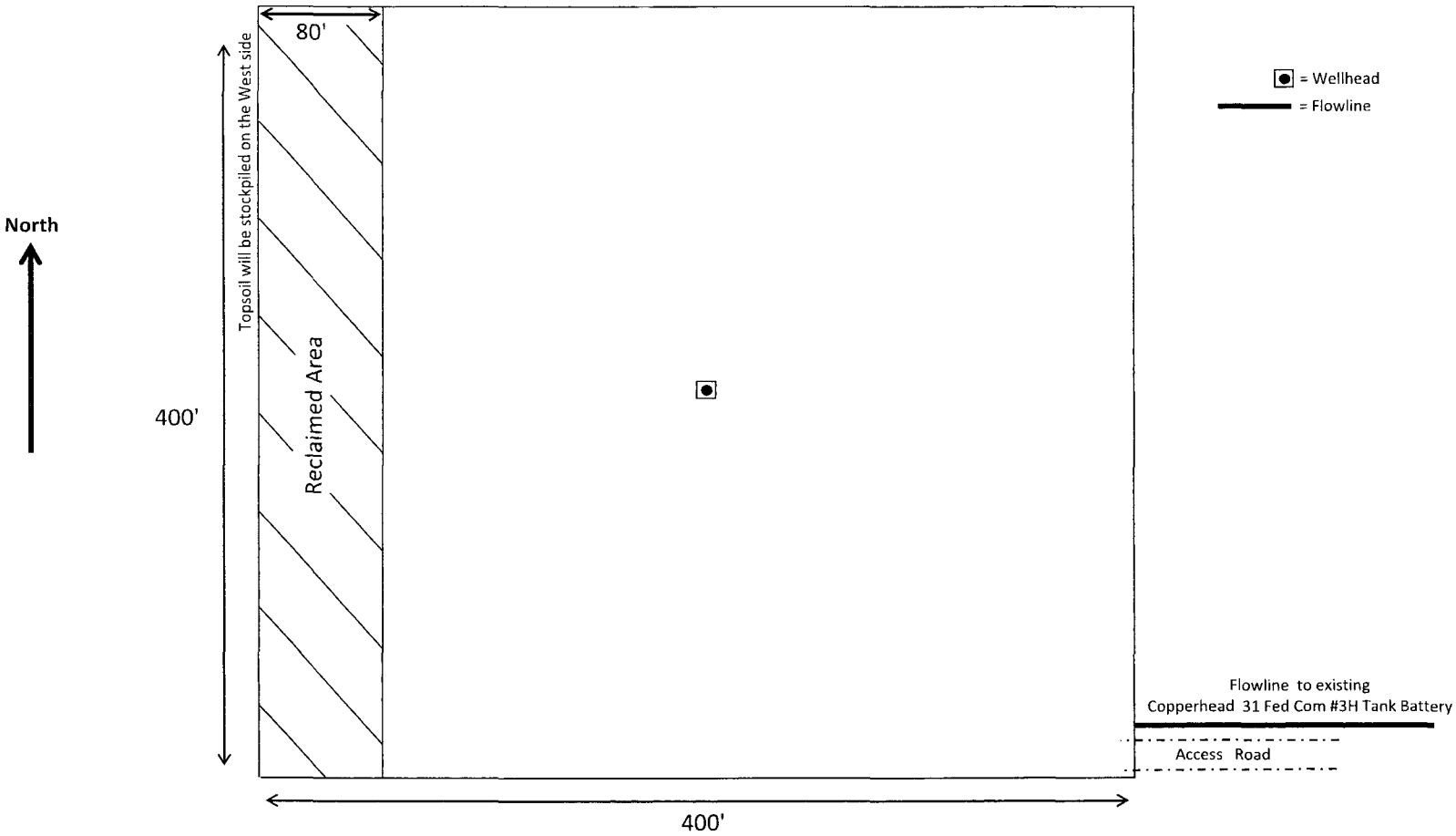
CONCHO

COG Production LLC
2208 West Main Street
Artesia, NM 88210

Well Site Layout
Production Facility Layout

Copperhead 31 Federal Com #21H
Section 30 - T26S - R29E

Exhibit 3

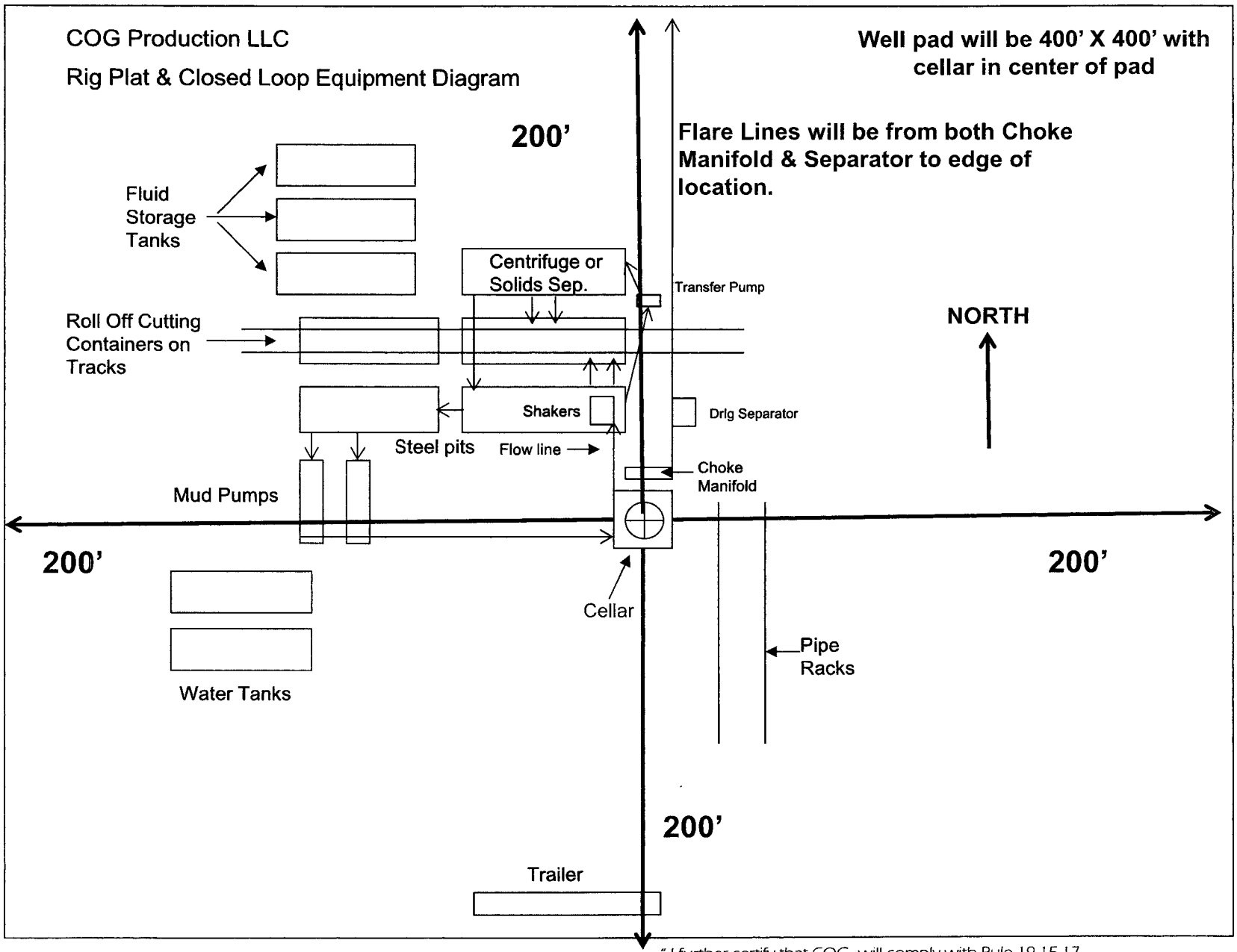


COG Production LLC

Rig Plat & Closed Loop Equipment Diagram

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

Flare Lines will be from both Choke Manifold & Separator to edge of location.



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

LEGEND

- WELL
- WELLPAD
- FLOWLINE

COPPERHEAD 31 FEDERAL COM #3H FLOWLINE

SECTION: 30	TOWNSHIP: 26 S.	RANGE: 29 E.
STATE: NEW MEXICO	COUNTY: EDDY	SURVEY: N.M.P.M
W.O. # 17-217	LEASE: COPPERHEAD 31 FED COM	

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

PIPELINE OVERVIEW IMAGERY 02/20/2017 J.H.

CONCHO

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N

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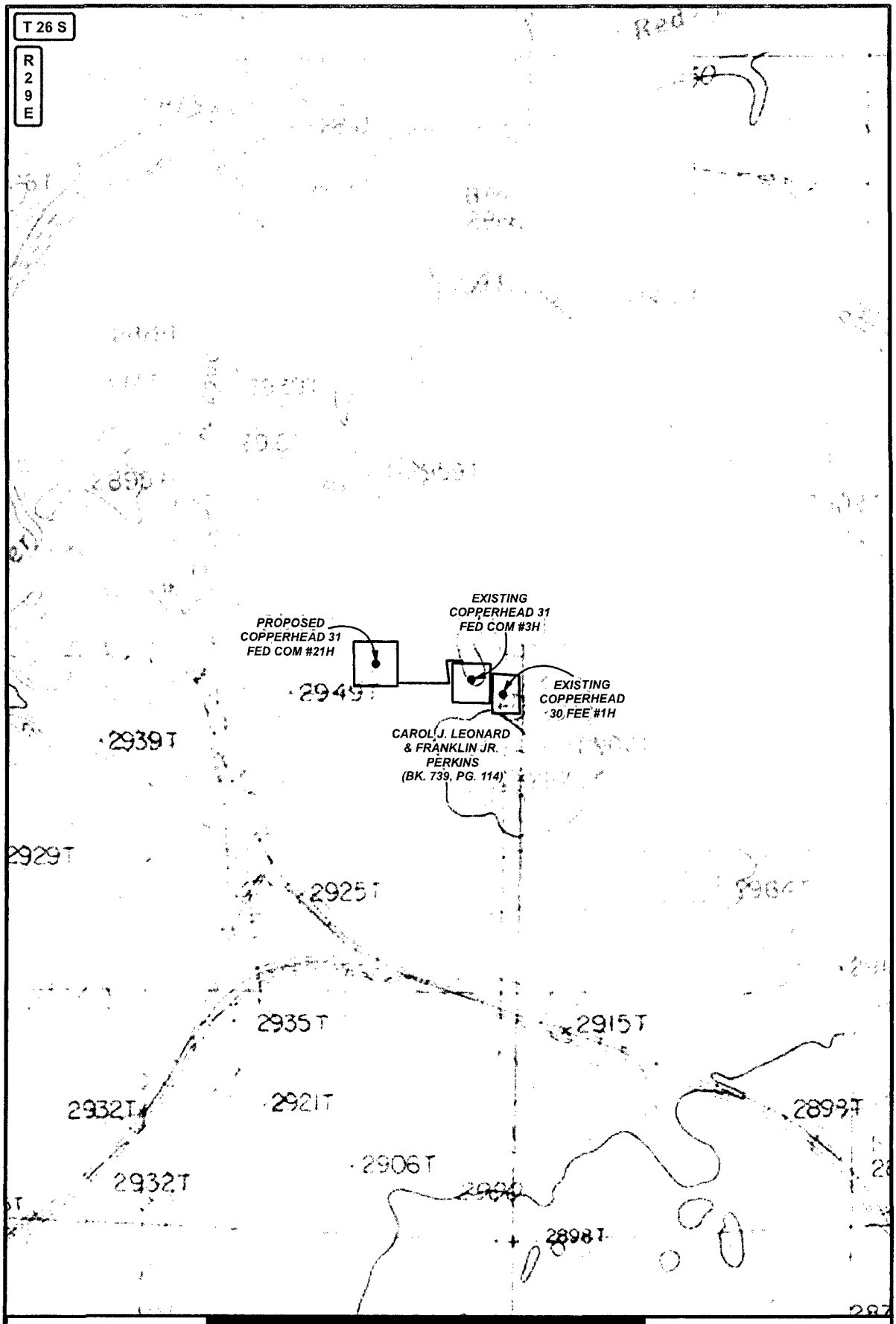

LEGEND

- WELL
- WELLPAD
- FLOWLINE
- PRIVATE
- US BLM

COPPERHEAD 31 FEDERAL COM #3H FLOWLINE

SECTION: 30	TOWNSHIP: 26 S.	RANGE: 29 E.
STATE: NEW MEXICO	COUNTY: EDDY	SURVEY: N.M.P.M
W.O. # 17-217	LEASE: COPPERHEAD 31 FED COM	

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

PIPELINE OVERVIEW | LAND STATUS | 02/20/2017 | J.H.

N

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LEGEND

- WELL
- WELLPAD
- FLOWLINE

COPPERHEAD 31 FEDERAL COM #3H FLOWLINE

SECTION: 30	TOWNSHIP: 26 S.	RANGE: 29 E.
STATE: NEW MEXICO	COUNTY: EDDY	SURVEY: N.M.P.M
W.O. # 17-217	LEASE: COPPERHEAD 31 FED COM	

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

PIPELINE OVERVIEW IMAGERY 02/20/2017 J.H.

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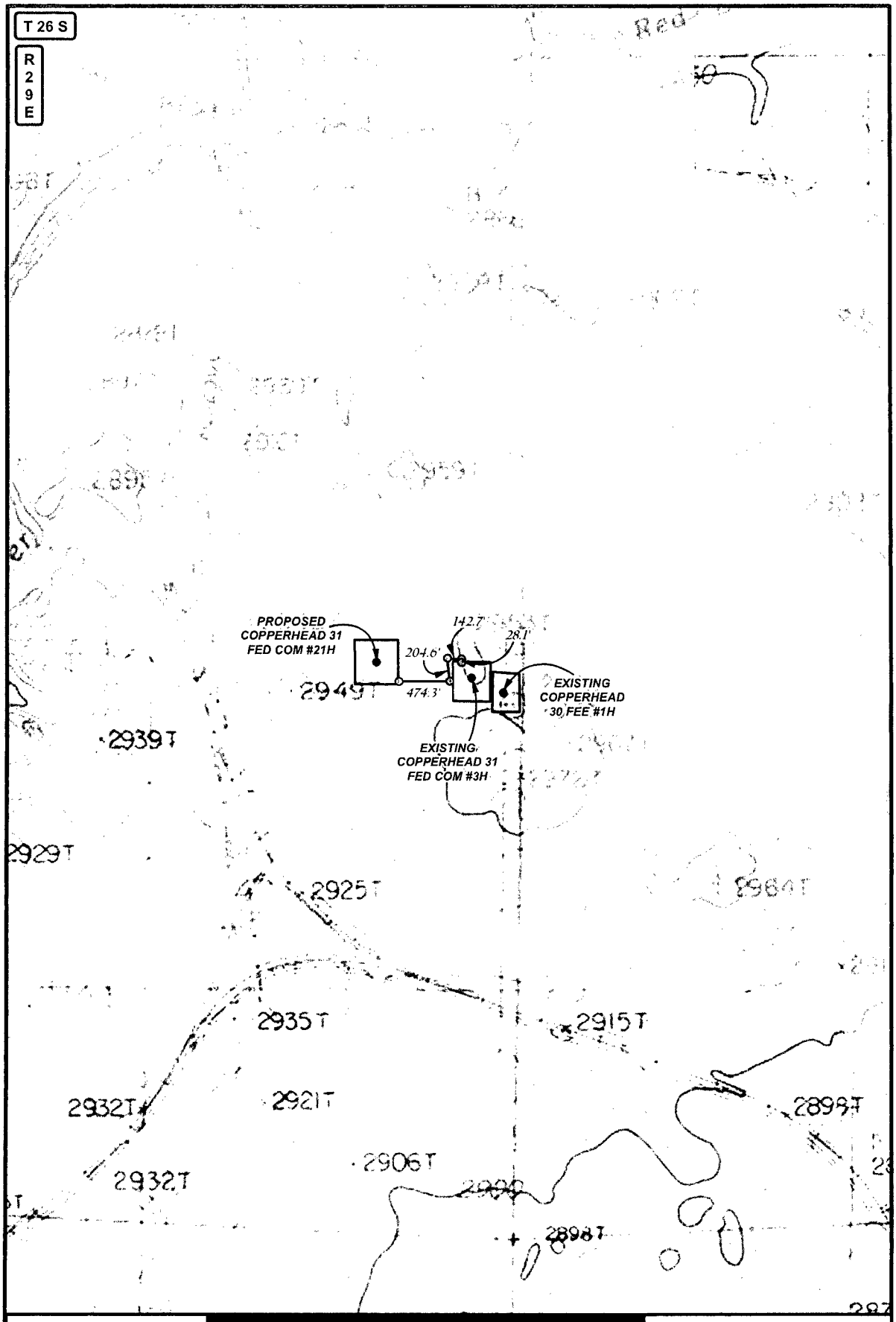

LEGEND

- WELL
- WELLPAD
- FLOWLINE
- PRIVATE
- US BLM

COPPERHEAD 31 FEDERAL COM #3H FLOWLINE

SECTION: 30	TOWNSHIP: 26 S.	RANGE: 29 E.
STATE: NEW MEXICO	COUNTY: EDDY	SURVEY: N.M.P.M
W.O. # 17-217	LEASE: COPPERHEAD 31 FED COM	

0 2,500 FEET

0 0.05 0.1 0.2 Miles

1 IN = 1,000 FT

PIPELINE OVERVIEW | LAND STATUS | 02/20/2017 | J.H.

CONCHO

COG PRODUCTION, LLC

N

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PH: (575) 746-2158 FAX: (575) 746-2158
c.harcrow@harcrowsurveying.com

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 Production 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 16th day of FEBRUARY, 2017.

Signed: Mayte Reyes

Printed Name: Mayte Reyes
Position: Regulatory Analyst
Address: 2208 W. Main Street, Artesia, NM 88210
Telephone: (575) 748-6945
E-mail: mreyes1@concho.com
Field Representative (if not above signatory): Rand French
Telephone: (575) 748-6940. E-mail: rfrench@concho.com

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Submit Original
to Appropriate
District Office

GAS CAPTURE PLAN

Date: 2/20/2017

☒ Original
☐ Amended - Reason for Amendment:

Operator & OGRID No.: COG Production LLC, OGRID 217955

This Gas Capture Plan outlines actions to be taken by the Operator to reduce well/production facility flaring/venting for new completion (new drill, recomplete to new zone, re-frac) activity.

Note: Form C-129 must be submitted and approved prior to exceeding 60 days allowed by Rule (Subsection A of 19.15.18.12 NMAC).

Well(s)/Production Facility – Name of facility

The well(s) that will be located at the production facility are shown in the table below.

Well Name	API	Well Location (ULSTR)	Footages	Expected MCF/D	Flared or Vented	Comments
Azores Federal #611	30-025-	B-29-24S-32E	210' FNL & 1850' FEL	1830 MCF		Gas will connect on existing Azores 3H facility

Gathering System and Pipeline Notification

Well(s) will be connected to a production facility after flowback operations are complete, if gas transporter system is in place. The gas produced from production facility is dedicated to **LUCID**, and will be connected to **LUCID** low/high pressure gathering system located in **Lea** County, New Mexico. It will require **+ - 0 to 1800'** of pipeline to connect the facility to low/high pressure gathering system. **COG Production LLC** provides (periodically) to **LUCID** a drilling, completion and estimated first production date for wells that are scheduled to be drilled in the foreseeable future. In addition, **COG Production LLC** and **LUCID** have periodic conference calls to discuss changes to drilling and completion schedules. Gas from these wells will be processed at **Red Hills** Processing Plant located in **Sec 13, Twn. 24S, Rng. 33E, Lea** County, **New Mexico.** The actual flow of the gas will be based on compression operating parameters and gathering system pressures.

Flowback Strategy

After the fracture treatment/completion operations, well(s) will be produced to temporary production tanks and gas will be flared or vented. During flowback, the fluids and sand content will be monitored. When the produced fluids contain minimal sand, the wells will be turned to production facilities. Gas sales should start as soon as the wells start flowing through the production facilities, unless there are operational issues on Gas Transporter system at that time. Based on current information, it is Operator's belief the system can take this gas upon completion of the well(s).

Safety requirements during cleanout operations from the use of underbalanced air cleanout systems may necessitate that sand and non-pipeline quality gas be vented and/or flared rather than sold on a temporary basis.

Alternatives to Reduce Flaring

Below are alternatives considered from a conceptual standpoint to reduce the amount of gas flared.

- Power Generation – On lease
  - Only a portion of gas is consumed operating the generator, remainder of gas will be flared
- Compressed Natural Gas – On lease
  - Gas flared would be minimal, but might be uneconomical to operate when gas volume declines
- NGL Removal – On lease
  - Plants are expensive, residue gas is still flared, and uneconomical to operate when gas volume declines

Section 1 - General

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

Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

Lined pit Monitor description:

Lined pit Monitor attachment:

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

Is the reclamation bond a rider under the BLM bond?

Lined pit bond number:

Lined pit bond amount:

Additional bond information attachment:

Section 3 - Unlined Pits

Would you like to utilize Unlined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit specifications:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule attachment:

Unlined pit reclamation description:

Unlined pit reclamation attachment:

Unlined pit Monitor description:

Unlined pit Monitor attachment:

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

Beneficial use user confirmation:

Estimated depth of the shallowest aquifer (feet):

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

TDS lab results:

Geologic and hydrologic evidence:

State authorization:

Unlined Produced Water Pit Estimated percolation:

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

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information attachment:

Section 4 - Injection

Would you like to utilize Injection PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number:

Injection well name:

Assigned injection well API number?

Injection well API number:

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection attachment:

Underground Injection Control (UIC) Permit?

UIC Permit attachment:

Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 - Other

Would you like to utilize Other PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Other PWD discharge volume (bbl/day):

Other PWD type description:

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

AFMSS

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

Bond Info Data Report
04/26/2017

Bond Information

Federal/Indian APD: FED

BLM Bond number: NMB000860

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment:

PECOS DISTRICT
DRILLING OPERATIONS
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	COG Operating, LLC
LEASE NO.:	NMNM121474
WELL NAME & NO.:	21H-Copperhead Federal Com
SURFACE HOLE FOOTAGE:	210'/N & 1650'/E
BOTTOM HOLE FOOTAGE	200'/S & 1980'/E
LOCATION:	Section 30, T.26 S., R.29 E., NMPM
COUNTY:	Eddy County, New Mexico

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. **Although Hydrogen Sulfide has not been reported in the area, it is always a potential hazard. It is recommended that monitoring equipment be onsite for potential Hydrogen Sulfide. 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, report measured amounts 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) for Water Basin:
After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least 8 hours. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements.

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

Medium Cave Karst
Possibility of water flows in the Castile and Salado
Possibility of lost circulation in the Salado and Delaware
Abnormal pressure may be encountered within the 3rd Bone Spring Sandstone and Wolfcamp formations.

1. The **10-3/4** inch surface casing shall be set at approximately **285** feet and cemented to the surface. **If salt is encountered, set casing at least 25 feet above the salt.**

    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 **7 5/8** inch intermediate casing, which shall be set at approximately **9841** feet, is:

   ☒ Cement to surface. If cement does not circulate, contact the appropriate BLM office.

Formation below the 7 5/8 inch 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 (not the mud weight required to prevent dissolving the salt formation) and the mud weight for the bottom of the hole. Report results to BLM office.

If cement does not circulate to surface on the intermediate casing, the cement on the production casing must come to surface.

3. The minimum required fill of cement behind the **5-1/2 X 5.0** inch production casing is:

   ☒ Cement should tie-back at least **200** feet into the previous string. Operator shall provide method of verification.

4. 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 53.

2. Variance approved to use flex line from BOP to choke manifold. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored

according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. **Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review. These documents shall be posted in the company man's trailer and on the rig floor.** If the BLM inspector questions the straightness of the hose, a BLM engineer will be contacted and will review in the field or via picture supplied by inspector to determine if changes are required (operator shall expect delays if this occurs).

3. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the **10-3/4"** surface casing shoe shall be **3000 (3M)** psi.

4. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the **7-5/8"** 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.**

5. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.

    a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

    b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (8 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).

    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.

g. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the **Wolfcamp** formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

D. DRILLING MUD

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

E. DRILL STEM TEST

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

F. 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.

G. SPECIAL REQUIREMENT(S)

Communitization Agreement

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

- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.

- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

MHH 04192017

PECOS DISTRICT
SURFACE USE
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	COG Operating, LLC
LEASE NO.:	NMNM121474
WELL NAME & NO.:	21H-Copperhead Federal Com
SURFACE HOLE FOOTAGE:	210'/N & 1650'/E
BOTTOM HOLE FOOTAGE	200'/S & 1980'/E
LOCATION:	Section 30, T.26 S., R.29 E., NMPM
COUNTY:	Eddy County, New Mexico

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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.

☐ **General Provisions**
☐ **Permit Expiration**
☐ **Archaeology, Paleontology, and Historical Sites**
☐ **Noxious Weeds**
☒ **Special Requirements**
- Watershed
- Cave/Karst

☐ **Construction**
- Notification
- Topsoil
- Closed Loop System
- Federal Mineral Material Pits
- Well Pads
- Roads

☐ **Road Section Diagram**
☒ **Production (Post Drilling)**
- Well Structures & Facilities
- Pipelines

☐ **Interim Reclamation**
☐ **Final Abandonment & Reclamation**

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)

Watershed

- The entire well pad will be bermed to prevent oil, salt, and other chemical contaminants from leaving the well pad. Topsoil shall not be used to construct the berm. No water flow from the uphill side(s) of the pad shall be allowed to enter the well pad. The berm shall be maintained through the life of the well and after interim reclamation has been completed.
- Any water erosion that may occur due to the construction of the well pad during the life of the well will be quickly corrected and proper measures will be taken to prevent future erosion.

Cave 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 entire perimeter of the well pad will be bermed to prevent oil, salt, and other chemical contaminants from leaving the well pad.

- The compacted berm shall be constructed at a minimum of 12 inches high with impermeable mineral material (e.g. caliche).
- No water flow from the uphill side(s) of the pad shall be allowed to enter the well pad.
- The topsoil stockpile shall be located outside the bermed well pad.
- Topsoil, either from the well pad or surrounding area, shall not be used to construct the berm.
- No storm drains, tubing or openings shall be placed in the berm.
- If fluid collects within the bermed area, the fluid must be vacuumed into a safe container and disposed of properly at a state approved facility.
- The integrity of the berm shall be maintained around the surfaced pad throughout the life of the well and around the downsized pad after interim reclamation has been completed.

- Any access road entering the well pad shall be constructed so that the integrity of the berm height surrounding the well pad is not compromised. (Any access road crossing the berm cannot be lower than the berm height.)

Tank Battery Liners and Berms:
Tank battery locations and all facilities 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.

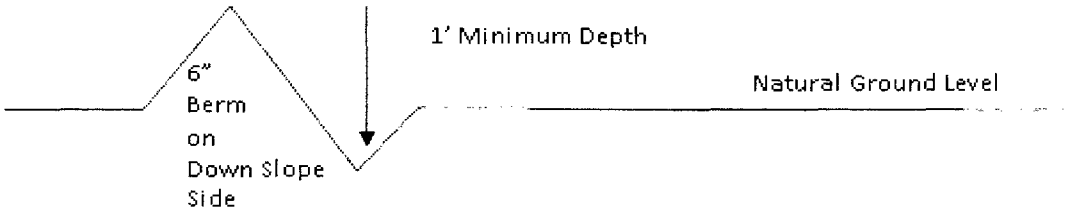
Turnouts
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

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

Cattle guards

An appropriately sized cattle guard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattle guards 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 cattle guards 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.

Construction Steps

1. Salvage topsoil
2. Construct road
3. Redistribute topsoil
4. Revegetate slopes

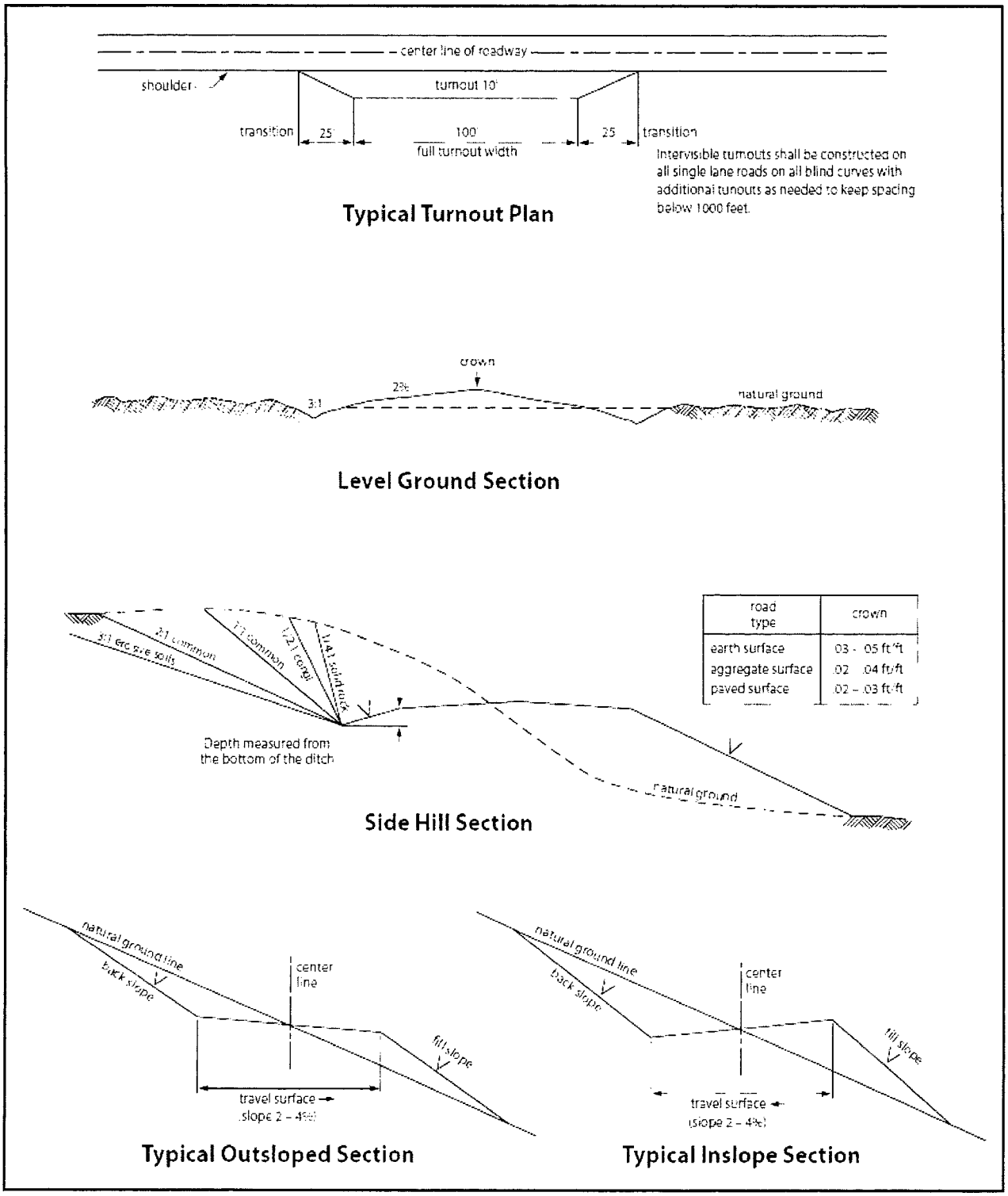


Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.

VII. 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 Grant and attachments, including stipulations, survey plat(s) and/or map(s), shall be on location during construction. BLM personnel may request to review 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. 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. Holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, Holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC § 2601 *et seq.* (1982) with regard 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 in particular, 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. 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 provision applies without regard to whether a release is caused by Holder, its agent, or unrelated third

parties.

4. Holder shall be liable for damage or injury to the United States to the extent provided by 43 CFR Sec. 2883.1-4. 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 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 Holder, regardless of fault. Upon failure of 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/she 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 Holder. Such action by the Authorized Officer shall not relieve Holder of any responsibility as provided herein.

6. All construction and maintenance activity shall 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 shall 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 shall be installed immediately adjacent to the outer surface pipeline. All construction and maintenance activity shall be confined to existing roads or right-of-ways.

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

8. 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 shall be "snaked" around hummocks and dunes rather than 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 shall be less than or equal to 4 inches and a working pressure below 125 psi.

VIII. 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).

IX. 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

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 shall 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 shall be either certified or registered seed. The seed container shall be tagged in accordance with State law(s) and available for inspection by the Authorized Officer.

Seed shall 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 shall 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). Holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed shall be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre shall be doubled. The seeding shall be repeated until a satisfactory stand is established as determined by the Authorized Officer. Evaluation of growth may 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