

Results of Directional Survey

API number:	30-025-40390		
OGRID:		Operator:	COG PRODUCTION, LLC
		Property:	REDHEAD 31 FEDERAL # 1H

surface	ULSTR:	D	31	T 24S	R 32E
				330 FNL	990 FWL

BH Loc	ULSTR:	M	31	T 24S	R 32E
14760 MD		10467.0	TVD	382 FSL	989 FWL
				4898 FNL	

Top Perf/OH	ULSTR:	D	31	T 24S	R 32E
10620 MD		10447.7	TVD	764 FNL	890 FWL

Bot Perf/OH	ULSTR:	M	31	T 24S	R 32E
14670 MD		10469.0	TVD	472 FSL	989 FWL
				4808 FNL	

	MD	N/S	E/W	VD
	10599	-414.24	-99.69	10441.99
TOP PERFS/OH	10620	-434.45	-99.89	10447.67
	10630	-444.07	-99.98	10450.38
	14588	-4396.25	-0.95	10470.32
BOT PERFS/OH	14670	-4478.23	-0.95	10469.03
	14683	-4491.23	-0.95	10468.83

NEXT TO LAST	14683	-4491.23	-0.95	10468.83
LAST READING	14760	-4568.20	-1.20	10467.00
TD	14760	-4568.20	-1.20	10467.00

Surface Location	330	FN	990	FW
Projected BHL	4898	FN	989	FW
Location of				
Top Perfs/OH	764	FN	890	FW
Bottom Perfs/OH	4808	FN	989	FW

SUMMARY of Subsurface Locations

Surface Location	D-31-24S-32E	330	FN	990	FW	Vert. Depth
Top Perfs/OH	D-31-24S-32E	764	FN	890	FW	10447.67
Bottom Perfs/OH	M-31-24S-32E	4808	FN	989	FW	10469.03
Projected TD	M-31-24S-32E	4898	FN	989	FW	10467.00

MAY 02 2013

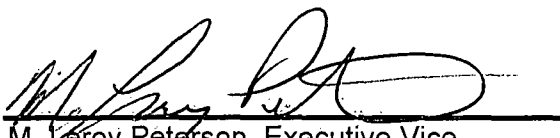
OPERATOR: COG Operating, LLC
WELL/LEASE: Redhead 31 Federal # 1 H
COUNTY: Lea Co., New Mexico
Sec. 31, T24S, R32E

SUR: D-31-24s-32e, 330/N & 990/W
BHL: M-31-24s-32e, 4898/N & 989/W
API # 30-025-40390

**STATE OF NEW MEXICO
DEVIATION REPORT**

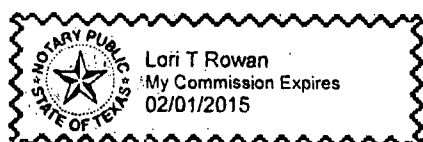
<u>Depth</u>	<u>Deviation</u>	<u>Depth</u>	<u>Deviation</u>
290	1	3,632	1 1/4
520	1/2	3,727	1
720	3/4	3,823	1/2
879	1	3,918	1/4
1,164	1	4,013	1/4
1,259	3/4	4,108	1/2
1,544	3/4	4,202	1
1,640	1/2	4,420	1 3/4
1,827	1/2	4,994	1
1,921	1/4	5,467	1 1/4
2,016	1/2	5,942	1
2,112	1/4	6,442	1 1/2
2,207	1/4	6,925	3/4
2,302	1/4	7,496	1 1/4
2,589	1/4	7,969	1 1/2
2,778	1/4	8,922	2 1/4
2,969	3/4	9,208	1 1/2
3,064	1	9,708	1 1/2
3,160	1 1/2	9,815	1 3/4
3,253	1 1/2	9,909	2
3,348	1 1/4	10,151	1 1/4
3,442	1 1/2	10,400	2
3,538	1 1/2		

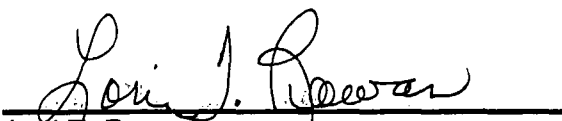
Patriot Drilling, LLC

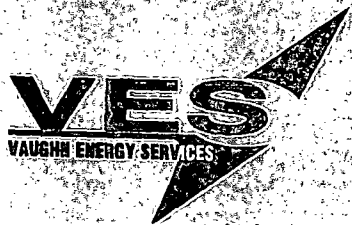

M. Leroy Peterson, Executive Vice-
President

The foregoing instrument was acknowledged before me on this 15th day of
November, 2012 by M. Leroy Peterson, Executive Vice-President of Patriot Drilling,

My Commission Expires: 02/01/2015




Lori T. Rowan
Notary Public for Ector Co., Texas



A GYRO TECHNOLOGIES INC. COMPANY

PO Box 261021
Corpus Christi, Texas 78426
(361) 767-0602 • (800) 606-GYRO • Fax (361) 767-0612

November 5, 2012

COG Operating LLC (Concho)
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanica Castillo

RE: Redhead 31 Federal No. 001H

SUR: D-31-24s-32e, 330/N & 990/W
BHL: M-31-24s-32e, 4898/N & 989/W
API # 30-025-40390

Please find enclosed a copy of the survey from 0.00' to 9500.00' ran on the above referenced well.

If I can be of any further service please do not hesitate to call me at 800-606-4976

Sincerely,

Keith Havelka
Operations

Company: COG Operating LLC (Concho)
Lease/Well: Redhead 31 Federal / No: 001H



Rig Name: Patriot 2
State/County: New Mexico / Lea
Latitude: 32.18; Longitude: -103.72
GRID North is 0.33 Degrees East of True North
VS-Azi: 0.00 Degrees

Depth Reference : RKB= 16'

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: redhead 31 fed 1h ed.ut

Minimum Curvature Method

Report Date/Time: 11/5/2012 / 08:29

Vaughn Energy Services

Gardendale, Texas

432-563-5444

Surveyor: Chris Carroll

Redhead 31 Federal No: 001H / API 30-025-40390

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	****
100.00	0.14	275.25	100.00	0.01	-0.12	0.12	275.25	0.14
200.00	0.24	222.94	200.00	-0.13	-0.38	0.40	250.69	0.19
300.00	0.09	309.70	300.00	-0.23	-0.59	0.63	248.23	0.25
400.00	0.20	321.58	400.00	-0.05	-0.76	0.76	266.43	0.10
500.00	0.31	345.32	500.00	0.35	-0.93	0.99	290.48	0.15
600.00	0.63	312.03	599.99	0.98	-1.41	1.71	304.75	0.41
700.00	0.54	334.14	699.99	1.77	-2.02	2.69	311.20	0.24
800.00	0.57	314.88	799.98	2.55	-2.58	3.63	314.62	0.19
900.00	0.86	312.46	899.98	3.41	-3.49	4.88	314.32	0.29
1000.00	0.65	308.99	999.97	4.27	-4.49	6.20	313.61	0.22
1100.00	0.58	307.22	1099.96	4.93	-5.33	7.26	312.81	0.08
1200.00	0.70	291.37	1199.96	5.46	-6.29	8.33	310.93	0.22
1300.00	0.76	298.67	1299.95	6.00	-7.44	9.56	308.86	0.11
1400.00	0.54	319.47	1399.94	6.67	-8.33	10.67	308.70	0.32
1500.00	0.38	318.40	1499.94	7.28	-8.86	11.46	309.42	0.15
1600.00	0.28	330.96	1599.94	7.74	-9.20	12.02	310.09	0.13
1700.00	0.42	320.86	1699.94	8.23	-9.54	12.60	310.79	0.15
1800.00	0.10	331.37	1799.93	8.59	-9.81	13.04	311.20	0.32

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	0.18	282.35	1899.93	8.69	-10.00	13.25	310.99	0.14
2000.00	0.26	339.59	1999.93	8.94	-10.24	13.59	311.13	0.23
2100.00	0.16	103.25	2099.93	9.13	-10.19	13.68	311.86	0.37
2200.00	0.18	322.29	2199.93	9.22	-10.15	13.71	312.25	0.32
2300.00	0.16	238.62	2299.93	9.27	-10.37	13.91	311.80	0.23
2400.00	0.10	149.04	2399.93	9.12	-10.45	13.87	311.13	0.19
2500.00	0.11	81.53	2499.93	9.06	-10.30	13.72	311.33	0.12
2600.00	0.21	306.09	2599.93	9.18	-10.35	13.84	311.57	0.30
2700.00	0.14	154.84	2699.93	9.18	-10.45	13.91	311.31	0.33
2800.00	0.04	341.21	2799.93	9.11	-10.41	13.83	311.18	0.17
2900.00	0.39	68.95	2899.93	9.26	-10.10	13.70	312.51	0.39
3000.00	0.41	90.93	2999.93	9.38	-9.42	13.29	314.86	0.16
3100.00	0.85	88.98	3099.92	9.38	-8.32	12.54	318.45	0.44
3200.00	1.45	74.16	3199.90	9.74	-6.36	11.63	326.85	0.66
3300.00	1.23	74.90	3299.87	10.36	-4.11	11.15	338.36	0.22
3400.00	1.09	63.87	3399.85	11.06	-2.22	11.28	348.65	0.26
3500.00	1.41	66.81	3499.83	11.97	-0.24	11.97	358.87	0.32
3600.00	1.32	62.73	3599.80	12.98	1.92	13.12	8.40	0.13
3700.00	0.91	52.00	3699.78	14.00	3.57	14.45	14.31	0.46
3800.00	0.61	27.99	3799.77	14.96	4.45	15.61	16.56	0.43
3900.00	0.35	50.10	3899.77	15.63	4.93	16.39	17.52	0.31
4000.00	0.14	41.69	3999.77	15.91	5.25	16.76	18.25	0.22
4100.00	0.35	178.14	4099.77	15.70	5.34	16.58	18.78	0.46
4200.00	1.05	181.39	4199.76	14.47	5.33	15.42	20.20	0.70
4300.00	1.23	177.70	4299.74	12.48	5.35	13.58	23.19	0.20
4400.00	1.31	187.01	4399.72	10.27	5.25	11.54	27.08	0.22
4500.00	0.99	199.16	4499.70	8.32	4.83	9.62	30.12	0.40
4600.00	0.87	203.08	4599.68	6.81	4.25	8.03	31.96	0.14
4700.00	0.84	205.70	4699.67	5.45	3.63	6.55	33.68	0.05
4800.00	0.78	217.77	4799.66	4.25	2.90	5.14	34.27	0.18
4900.00	0.72	215.57	4899.65	3.20	2.11	3.84	33.43	0.07
5000.00	0.92	219.41	4999.64	2.07	1.24	2.41	30.89	0.21
5100.00	0.67	220.82	5099.63	1.01	0.35	1.07	18.98	0.25
5200.00	0.83	232.22	5199.62	0.12	-0.60	0.62	281.59	0.22
5300.00	0.67	236.03	5299.62	-0.64	-1.66	1.78	248.80	0.17
5400.00	0.72	231.33	5399.61	-1.36	-2.63	2.96	242.64	0.08
5500.00	0.82	236.92	5499.60	-2.15	-3.73	4.30	240.04	0.12
5600.00	0.74	247.38	5599.59	-2.79	-4.92	5.65	240.47	0.16
5700.00	0.74	227.70	5699.58	-3.47	-5.99	6.92	239.94	0.25

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
5800.00	0.70	237.98	5799.57	-4.22	-6.98	8.16	238.84	0.13
5900.00	0.84	242.84	5899.57	-4.88	-8.15	9.50	239.09	0.15
6000.00	0.94	258.36	5999.55	-5.38	-9.61	11.02	240.75	0.26
6100.00	0.99	255.23	6099.54	-5.77	-11.25	12.64	242.85	0.07
6200.00	0.58	254.75	6199.53	-6.12	-12.57	13.98	244.04	0.41
6300.00	0.95	244.99	6299.52	-6.60	-13.80	15.30	244.44	0.39
6400.00	0.67	263.38	6399.51	-7.02	-15.13	16.68	245.12	0.38
6500.00	0.48	249.14	6499.51	-7.23	-16.10	17.65	245.81	0.24
6600.00	0.28	205.19	6599.50	-7.60	-16.59	18.25	245.39	0.34
6700.00	0.27	232.16	6699.50	-7.96	-16.88	18.67	244.74	0.13
6800.00	0.48	221.42	6799.50	-8.42	-17.35	19.29	244.10	0.22
6900.00	0.59	194.10	6899.50	-9.23	-17.75	20.01	242.52	0.27
7000.00	0.54	218.95	6999.49	-10.10	-18.17	20.79	240.94	0.25
7100.00	0.36	205.99	7099.49	-10.75	-18.61	21.49	239.98	0.21
7200.00	0.48	195.90	7199.49	-11.44	-18.86	22.06	238.76	0.14
7300.00	0.80	211.63	7299.48	-12.44	-19.35	23.00	237.25	0.36
7400.00	0.67	189.68	7399.47	-13.61	-19.81	24.03	235.51	0.31
7500.00	0.89	205.88	7499.46	-14.88	-20.24	25.12	233.69	0.31
7600.00	0.88	185.91	7599.45	-16.34	-20.66	26.34	231.66	0.31
7700.00	0.91	197.83	7699.44	-17.86	-20.98	27.55	229.60	0.19
7800.00	0.76	188.65	7799.43	-19.26	-21.32	28.74	227.91	0.20
7900.00	0.97	194.91	7899.42	-20.73	-21.64	29.97	226.23	0.23
8000.00	1.00	207.59	7999.40	-22.31	-22.26	31.52	224.93	0.22
8100.00	0.91	207.41	8099.39	-23.79	-23.03	33.11	224.07	0.08
8200.00	0.94	200.19	8199.38	-25.27	-23.68	34.63	223.14	0.12
8300.00	1.20	206.54	8299.36	-26.98	-24.43	36.39	222.17	0.29
8400.00	1.34	212.99	8399.33	-28.89	-25.53	38.56	221.47	0.20
8500.00	1.30	231.40	8499.31	-30.58	-27.06	40.83	221.50	0.42
8600.00	1.47	238.63	8599.28	-31.96	-29.04	43.18	222.26	0.24
8700.00	1.13	264.32	8699.25	-32.72	-31.12	45.16	223.56	0.67
8800.00	1.64	249.98	8799.22	-33.31	-33.45	47.21	225.12	0.61
8900.00	2.38	231.77	8899.16	-35.09	-36.43	50.58	226.08	0.97
9000.00	2.11	223.30	8999.09	-37.72	-39.33	54.49	226.20	0.43
9100.00	1.58	234.94	9099.03	-39.85	-41.73	57.70	226.31	0.65
9200.00	1.89	256.06	9198.99	-41.05	-44.46	60.51	227.28	0.70
9300.00	1.86	250.48	9298.93	-41.99	-47.59	63.46	228.58	0.18
9400.00	1.63	236.41	9398.89	-43.32	-50.31	66.39	229.27	0.49
9500.00	1.86	244.66	9498.84	-44.80	-52.96	69.37	229.77	0.34



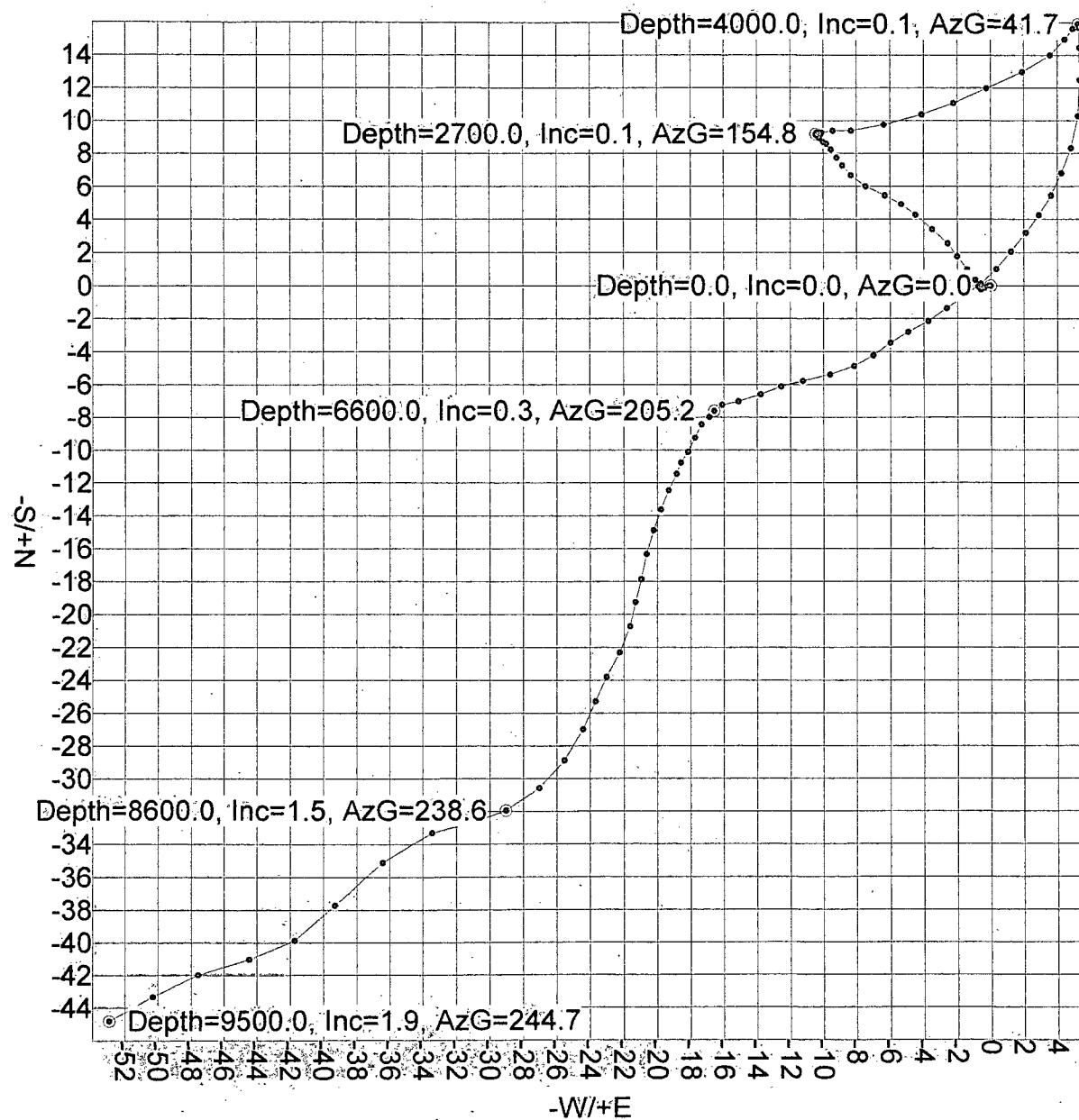
Vaughn Energy Services

Gardendale, Texas

432-563-5444

Surveyor: Chris Carroll

Redhead 31 Federal No. 001.H / API 30-025-40390



VES Survey Date: 10/29/2012



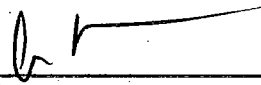
Archer Directional Drilling Services.
911 Regional Park Drive
Houston, Texas 77060
Tel: 281-934-9600
Fax: 281-951-2101

MWD Survey Certification

State of New Mexico
County of Lea

SUR: D-31-24s-32e, 330/N & 990/W
BHL: M-31-24s-32e, 4898/N & 989/W
API # 30-025-40390

I, Amador Baggerly, certify that; I am employed by Archer Directional Drilling Services; that I did on the day(s) of 10/31/12 through 11/10/12 and 10/30/12 through 11/12/12, conduct or supervise the taking of MWD surveys from a depth of 879 feet to a depth of 4404 feet; surveys from a depth of 9674 feet to a depth of 14703 feet; that the data is true, correct, complete and within the limitations of the tool as set forth by Archer Directional Drilling Services; that I am authorized and qualified to make this report; that these surveys were conducted at the request of COG Operating, LLC for the Redhead 31 Federal # 1H (API # 30-025- 40390), Well located in Lea County, New Mexico; and that I have reviewed this report and find that it conforms to the principles and procedures as set forth by Archer Directional Drilling Services.



Amador Baggerly
MWD Coordinator



Archer Directional Drilling Services.
911 Regional Park Drive
Houston, Texas 77060
Tel: 281-934-9600
Fax: 281-951-2101

COG Operating, LLC
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

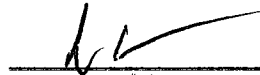
November 20, 2012

Re: COG Operating, LLC
Redhead 31 Federal # 1H
Rig: Patriot #2
Lea County, New Mexico
API # 30-025-40390

Enclosed please find the original of the surveys performed on the referenced well by Archer Directional Drilling Services. Other information required by your office is as follows:

<u>Name & Title Of Surveyor</u>	<u>Wellhole Number</u>	<u>Survey Depths</u>	<u>Dates Performed</u>	<u>Type Survey</u>
Donnie Wells Field Engineer	Original Hole	879-4404	10/19/12-10/22/12	MWD
		9674-14703	10/30/12-11/12/12	

If additional information is required, please contact the undersigned at the letterhead address and phone number.



Amador Baggerly
MWD Coordinator



Company: COG Operating, LLC

Job Number:

03947-433-22

Calculation Method

Minimum Curvature

Well: Redhead 31 Federal #1H

Mag Decl.:

7.16

Proposed Azimuth

180.3

Location: Lea County, New Mexico

Dir Driller:

Levi Galvin

Depth Reference

KBG

Rig: Patriot #2

MWD Eng:

Donnie Wells

Tie Into: Gyro Survey

Job Date: 10/19/12 - 10/22/12

Survey Number	Survey Depth (ft)	Inclination (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Direction Azimuth			
Tie In	779.00	0.8	306	0	779	0	0:00 0	0:00 0					
1	879	0.8	306.0	100	878.99	-0.82	0.82 N	1.13 W	1.40	306.00	0.00	0.00	0.00
2	974	0.9	291.4	95	973.98	-1.47	1.48 N	2.36 W	2.79	302.13	0.25	0.11	-15.37
3	1069	0.8	301.9	95	1068.97	-2.09	2.11 N	3.62 W	4.19	300.19	0.19	0.11	11.05
4	1164	0.9	286.1	95	1163.96	-2.64	2.66 N	4.90 W	5.58	298.53	0.27	0.11	-16.63
5	1259	0.7	277.0	95	1258.95	-2.91	2.94 N	6.19 W	6.85	295.40	0.25	-0.21	-9.58
6	1355	0.7	299.7	96	1354.94	-3.27	3.30 N	7.28 W	8.00	294.39	0.29	0.00	-23.65
7	1449	0.7	320.1	94	1448.94	-3.99	4.03 N	8.15 W	9.09	296.30	0.26	0.00	21.70
8	1544	0.7	307.5	95	1543.93	-4.79	4.83 N	8.98 W	10.20	298.25	0.16	0.00	-13.26
9	1639	0.5	291.2	95	1638.92	-5.28	5.33 N	9.83 W	11.18	298.47	0.27	-0.21	-17.16
10	1734	0.4	253.7	95	1733.92	-5.34	5.39 N	10.53 W	11.83	297.08	0.32	-0.11	-39.47
11	1829	0.4	280.1	95	1828.92	-5.30	5.35 N	11.18 W	12.39	295.58	0.19	0.00	27.79
12	1923	0.2	264.6	94	1922.92	-5.34	5.39 N	11.67 W	12.85	294.81	0.23	-0.21	-16.49
13	2018	0.4	6.3	95	2017.92	-5.65	5.71 N	11.79 W	13.10	295.82	0.51	0.21	-271.89
14	2113	0.1	316.8	95	2112.91	-6.04	6.10 N	11.81 W	13.29	297.30	0.36	-0.32	326.84
15	2209	0.2	251.4	96	2208.91	-6.05	6.10 N	12.03 W	13.49	296.91	0.19	0.10	-68.13
16	2304	0.1	177.9	95	2303.91	-5.91	5.97 N	12.18 W	13.57	296.10	0.21	-0.11	-77.37
17	2398	0.1	291.1	94	2397.91	-5.86	5.92 N	12.26 W	13.61	295.77	0.18	0.00	120.43
18	2494	0.1	230.1	96	2493.91	-5.84	5.89 N	12.40 W	13.73	295.42	0.11	0.00	-63.54
19	2589	0.1	253.7	95	2588.91	-5.76	5.82 N	12.54 W	13.83	294.88	0.04	0.00	24.84
20	2684	0.0	345.7	95	2683.91	-5.74	5.79 N	12.62 W	13.89	294.65	0.11	-0.11	96.84
21	2779	0.0	97.2	95	2778.91	-5.74	5.79 N	12.62 W	13.89	294.65	0.00	0.00	-261.58
22	2874	0.4	107.3	95	2873.91	-5.64	5.69 N	12.31 W	13.56	294.83	0.42	0.42	10.63
23	2969	0.7	108.2	95	2968.91	-5.36	5.41 N	11.44 W	12.66	295.33	0.32	0.32	0.95
24	3065	1.1	85.7	96	3064.90	-5.26	5.30 N	9.96 W	11.28	298.02	0.55	0.42	-23.44
25	3160	1.4	74.5	95	3159.87	-5.64	5.68 N	7.93 W	9.76	305.59	0.41	0.32	-111.79
26	3255	1.4	68.2	95	3254.85	-6.39	6.42 N	5.74 W	8.61	318.21	0.16	0.00	-6.63
27	3349	1.3	70.4	94	3348.82	-7.19	7.20 N	3.67 W	8.08	333.02	0.12	-0.11	-2.34
28	3444	1.6	64.7	95	3443.79	-8.13	8.13 N	1.45 W	8.26	349.86	0.35	0.32	-6.00
29	3539	1.6	57.9	95	3538.75	-9.41	9.40 N	0.87 E	9.44	5.28	0.20	0.00	-7.16
30	3634	1.2	58.9	95	3633.72	-10.64	10.62 N	2.84 E	11.00	14.99	0.42	-0.42	1.05
31	3729	0.9	31.5	95	3728.71	-11.79	11.77 N	4.09 E	12.46	19.14	0.61	-0.32	-28.84
32	3824	0.6	33.4	95	3823.70	-12.85	12.82 N	4.75 E	13.68	20.32	0.32	-0.32	2.00
33	3919	0.1	76.4	95	3918.70	-13.28	13.26 N	5.10 E	14.21	21.05	0.56	-0.53	45.26
34	4014	0.2	87.9	95	4013.70	-13.31	13.28 N	5.35 E	14.32	21.93	0.11	0.11	-12.11
35	4109	0.6	177.5	95	4108.70	-12.82	12.79 N	5.54 E	13.94	23.40	0.66	0.42	94.32
36	4204	1.1	175.8	95	4203.68	-11.41	11.39 N	5.63 E	12.70	26.29	0.53	0.53	-1.79

ArcherCompany: COG Operating, LLCJob Number: 03947-433-22

Calculation Method

Minimum Curvature

Well: Redhead 31 Federal #1HMag Decl.: 7.16

Proposed Azimuth

180.3Location: Lea County, New MexicoDir Driller: Levi Galvin

Depth Reference

KBGRig: Patriot #2MWD Eng: Donnie WellsTie Into: Gyro SurveyJob Date: 10/19/12 - 10/22/12

Survey Number	Survey Depth (ft)	Inclina- tion (deg)	Azimuth (deg)	Course Length (ft)	True Vertical Depth (ft)	Vertical Section (ft)	Coordinates		Closure		Dogleg Severity (d/100')	Build Rate (d/100')	Walk Rate (d/100')
							N/S (ft)	E/W (ft)	Distance (ft)	Direction Azimuth			
Proj.	4404	1.1	175.8	200	4403.65	-7.59	7.56 N	5.91 E	9.59	38.01	0.00	0.00	0.00

Archer Survey Report

Company: COG Operating, LLC

Location: 32.180067° N / 103.719287° W

Well: Redhead 31 Federal #1H

Rig: Patriot #2

API or UWI: 30-025-40390

Job Number: 03947-433-22

State: New Mexico

Operator: Donnie Wells

County: LEA

Magnetic Declination: 7.16

Comment 10/30/12 - 11/12/12

Proposed Azimuth: 180.26

North Reference: GRID

Tiein Survey Data:

MD	Inclination	Azimuth	TVD	NS	EW
9500.00	1.86	244.66	9498.80	-44.80	-53.00

MD	Inclination	Azimuth	TVD	NS	EW	CA	CD	VS	DLS
9674.00	2.10	237.10	9672.70	-47.74	-58.23	230.65	75.30	48.00	0.20
9815.00	1.60	234.40	9813.62	-50.29	-62.00	230.95	79.83	50.57	0.36
9909.00	2.10	235.10	9907.57	-52.04	-64.48	231.09	82.86	52.33	0.53
9999.00	5.10	199.40	9997.39	-56.76	-67.16	229.80	87.93	57.06	4.01
10030.00	10.20	197.80	10028.11	-60.67	-68.46	228.45	91.47	60.98	16.46
10062.00	14.80	194.70	10059.34	-67.33	-70.36	226.26	97.38	67.65	14.52
10093.00	19.00	193.20	10089.00	-76.07	-72.52	223.63	105.10	76.40	13.62
10125.00	23.00	192.30	10118.86	-87.26	-75.04	220.70	115.09	87.60	12.54
10156.00	26.10	192.30	10147.06	-99.84	-77.79	217.92	126.57	100.19	10.00
10188.00	29.00	192.10	10175.43	-114.31	-80.91	215.29	140.05	114.67	9.07
10220.00	31.60	190.10	10203.05	-130.15	-84.01	212.84	154.91	130.53	8.71
10251.00	34.70	188.00	10229.01	-146.89	-86.66	210.54	170.55	147.28	10.66
10283.00	37.60	186.20	10254.84	-165.62	-88.98	208.25	188.01	166.02	9.65
10315.00	40.60	184.30	10279.67	-185.71	-90.82	206.06	206.73	186.12	10.09
10346.00	43.40	184.10	10302.71	-206.39	-92.34	204.10	226.11	206.81	9.04
10377.00	46.30	184.70	10324.69	-228.19	-94.02	202.39	246.80	228.61	9.45
10409.00	49.40	183.60	10346.16	-251.85	-95.73	200.81	269.43	252.28	10.02
10441.00	52.00	182.30	10366.42	-276.58	-97.00	199.33	293.09	277.01	8.71
10472.00	54.60	181.20	10384.95	-301.42	-97.75	197.97	316.87	301.86	8.86
10504.00	58.30	180.60	10402.63	-328.08	-98.17	196.66	342.45	328.52	11.67
10535.00	62.60	180.70	10417.92	-355.04	-98.48	195.50	368.44	355.48	13.87
10567.00	68.10	181.40	10431.26	-384.11	-99.01	194.45	396.66	384.55	17.30
10599.00	72.70	181.20	10441.99	-414.24	-99.69	193.53	426.06	414.68	14.39
10630.00	75.90	179.90	10450.38	-444.07	-99.98	192.69	455.19	444.52	11.08
10662.00	77.70	178.30	10457.69	-475.22	-99.49	191.82	485.52	475.67	7.44
10694.00	79.50	177.00	10464.01	-506.56	-98.20	190.97	515.99	507.00	6.89
10726.00	81.30	176.60	10469.35	-538.06	-96.44	190.16	546.64	538.50	5.76
10758.00	82.90	176.50	10473.75	-569.70	-94.53	189.42	577.49	570.12	5.01
10789.00	84.10	176.40	10477.25	-600.44	-92.62	188.77	607.54	600.86	3.88
10821.00	85.10	176.30	10480.27	-632.23	-90.60	188.15	638.69	632.64	3.14
10853.00	86.20	175.70	10482.69	-664.06	-88.37	187.58	669.92	664.46	3.91
10884.00	88.00	175.00	10484.26	-694.92	-85.86	187.04	700.21	695.30	6.23
10916.00	88.90	175.70	10485.13	-726.80	-83.27	186.54	731.56	727.17	3.56

10979.00	90.10	176.30	10485.68	-789.65	-78.87	185.70	793.58	790.00	2.13
11074.00	90.50	176.30	10485.18	-884.45	-72.74	184.70	887.43	884.77	0.42
11169.00	88.10	176.20	10486.34	-979.23	-66.53	183.89	981.49	979.52	2.53
11264.00	89.50	176.50	10488.33	-1074.01	-60.48	183.22	1075.72	1074.28	1.51
11359.00	87.60	175.50	10490.73	-1168.75	-53.86	182.64	1169.99	1168.98	2.26
11454.00	89.00	177.10	10493.55	-1263.50	-47.73	182.16	1264.40	1263.71	2.24
11549.00	90.10	178.50	10494.30	-1358.42	-44.09	181.86	1359.14	1358.61	1.87
11644.00	91.60	178.40	10492.89	-1453.38	-41.52	181.64	1453.98	1453.56	1.58
11739.00	92.40	178.50	10489.57	-1548.28	-38.95	181.44	1548.78	1548.45	0.85
11834.00	90.50	179.40	10487.17	-1643.23	-37.21	181.30	1643.65	1643.38	2.21
11928.00	91.10	179.20	10485.86	-1737.21	-36.06	181.19	1737.59	1737.36	0.67
12024.00	89.70	179.80	10485.19	-1833.21	-35.22	181.10	1833.54	1833.35	1.59
12119.00	89.00	179.30	10486.26	-1928.20	-34.48	181.02	1928.50	1928.33	0.91
12214.00	88.40	177.90	10488.42	-2023.14	-32.16	180.91	2023.38	2023.25	1.60
12308.00	88.40	177.70	10491.04	-2117.03	-28.55	180.77	2117.21	2117.13	0.21
12403.00	89.50	178.60	10492.79	-2211.97	-25.48	180.66	2212.13	2212.08	1.50
12498.00	89.30	178.10	10493.78	-2306.92	-22.75	180.56	2307.04	2307.01	0.57
12593.00	90.10	177.50	10494.28	-2401.85	-19.10	180.46	2401.92	2401.90	1.05
12688.00	89.90	178.80	10494.28	-2496.80	-16.03	180.37	2496.84	2496.83	1.38
12783.00	89.50	178.20	10494.77	-2591.76	-13.55	180.30	2591.76	2591.76	0.76
12878.00	89.50	178.10	10495.60	-2686.71	-10.48	180.22	2686.79	2686.79	0.11
12973.00	89.80	178.50	10496.18	-2781.67	-7.66	180.16	2781.78	2781.77	0.53
13068.00	90.10	179.00	10496.27	-2876.64	-5.59	180.11	2876.74	2876.73	0.61
13163.00	90.80	179.00	10495.52	-2971.63	-3.93	180.08	2971.43	2971.41	0.74
13258.00	91.00	179.00	10494.03	-3066.60	-2.28	180.04	3066.90	3066.88	0.21
13353.00	90.50	180.10	10492.79	-3161.59	-1.53	180.03	3161.84	3161.82	1.27
13448.00	90.30	180.30	10492.12	-3256.58	-1.86	180.03	3256.71	3256.69	0.30
13543.00	90.20	180.50	10491.71	-3351.58	-2.52	180.04	3351.74	3351.71	0.24
13638.00	89.70	180.50	10491.79	-3446.58	-3.35	180.06	3446.55	3446.53	0.53
13733.00	91.30	180.50	10490.96	-3541.57	-4.18	180.07	3541.76	3541.74	1.68
13828.00	92.40	179.50	10487.89	-3636.51	-4.18	180.07	3636.71	3636.69	1.56
13923.00	90.80	180.70	10485.24	-3731.47	-4.35	180.07	3731.65	3731.63	2.10
14018.00	91.10	180.60	10483.67	-3826.45	-5.43	180.08	3826.51	3826.49	0.33
14113.00	90.90	180.10	10482.01	-3921.44	-6.01	180.09	3921.22	3921.20	0.57
14208.00	91.10	179.40	10480.35	-4016.42	-5.59	180.08	4016.38	4016.36	0.77
14303.00	91.20	179.30	10478.44	-4111.39	-4.51	180.06	4111.24	4111.22	0.15
14398.00	92.00	179.10	10475.79	-4206.35	-3.19	180.04	4206.13	4206.10	0.87
14493.00	92.00	179.10	10472.48	-4301.28	-1.70	180.02	4302.52	4302.48	0.00
14588.00	90.60	180.00	10470.32	-4396.25	-0.95	180.01	4397.67	4397.63	1.75
14683.00	91.20	180.00	10468.83	-4491.23	-0.95	180.01	4491.77	4491.72	0.63
14703.00	91.40	180.20	10468.38	-4511.23	-0.99	180.01	4509.32	4509.28	1.41

Archer

Overlay Well & Survey Report

Site: Sec.31-T24S-R32E
Well: Redhead 31 Federal #1H
Wellbore: Wellbore #1
Design: Design #3
Lat: 32° 10' 48.243 N
Long: 103° 43' 9.434 W
GL: 3514.0
ELL @ 3531.0usft (Original Well Elev)



SECTION DETAILS				
E/W	Dleg	TFace	VSeet	Annotation
22.7	0.00	0.00	2307.0	Tie on / Start DLS 2.00 TFO 112.74
21.0	2.00	112.74	2410.5	Start 121.0 hold at 12601.5 MD
21.0	0.00	0.00	2531.4	Start Build 2.00
21.1	2.00	0.00	2606.4	Start 1961.5 hold at 12797.5 MD
21.4	0.00	0.00	4568.0	TD at 14759.1

ad 31 Federal #1H		
3514.0		
Latitude	Longitude	Slot
10° 48.243 N	103° 43' 9.434 W	

TAILS (LAT/LONG)		
Latitude	Longitude	Shape
32° 10' 3.041 N	103° 43' 9.986 W	Point

T

G

M

Azimuths to Grid North

True North: -0.33°

Magnetic North: 7.16°

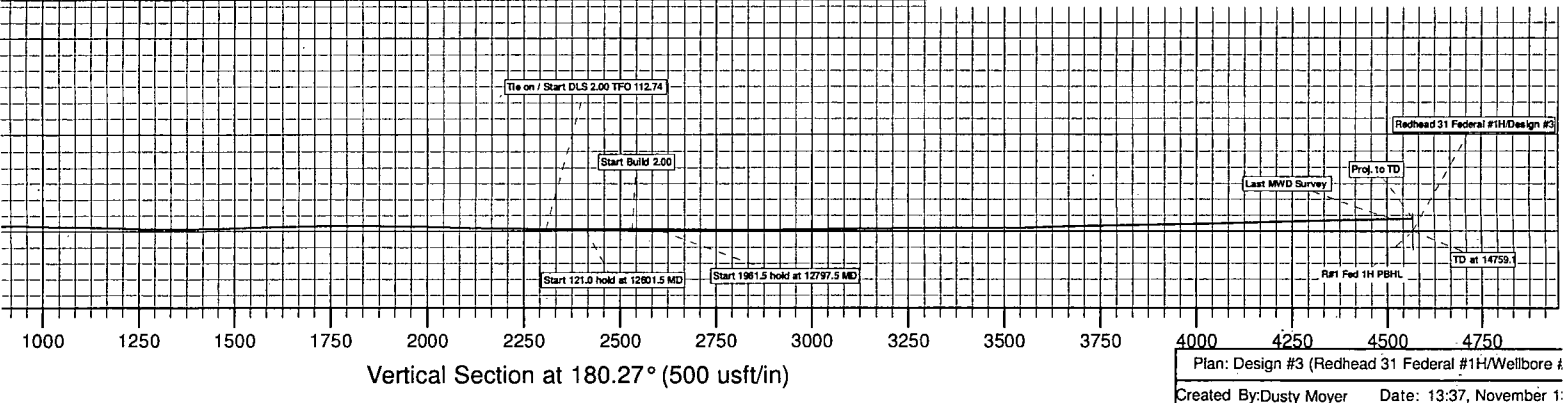
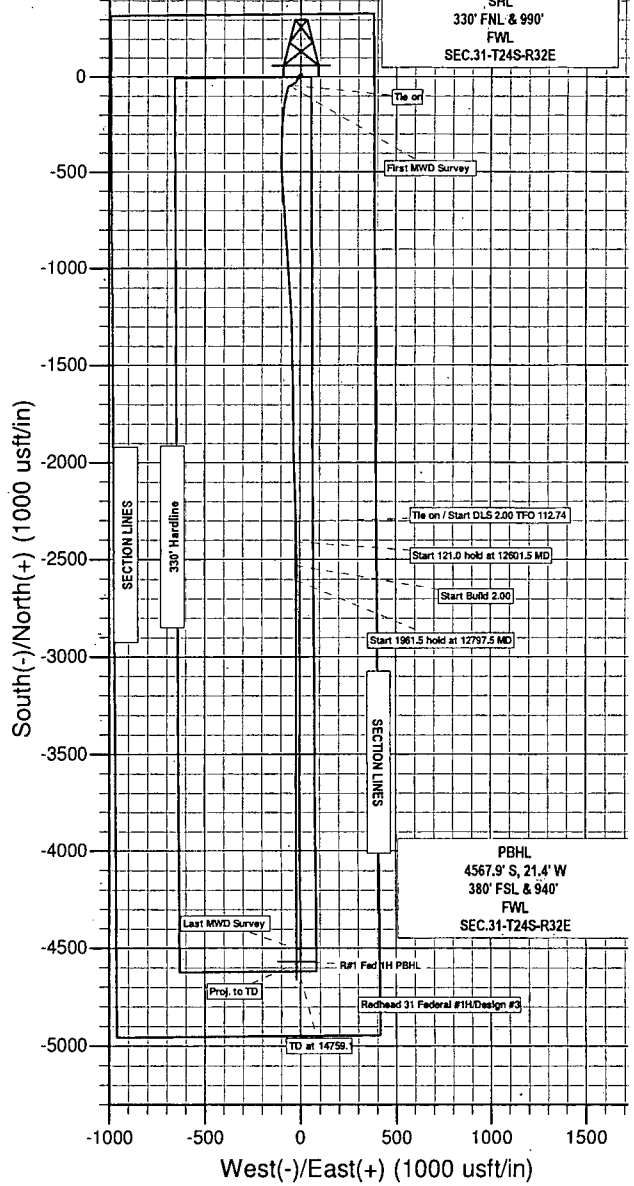
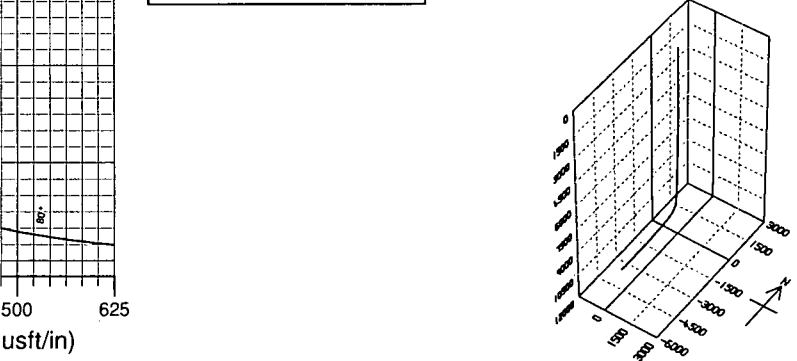
Magnetic Field

Strength: 48438.9snT

Dip Angle: 60.09°

Date: 2012/10/17

Model: IGRF2010



Plan: Design #3 (Redhead 31 Federal #1H/Wellbore #1)
Created By: Dusty Moyer Date: 13:37, November 1, 2012

Archer

COG Operating, LLC

Lea County(NM27E)

Sec.31-T24S-R32E

Redhead 31 Federal #1H

SUR: D-31-24s-32e, 330/N & 990/W

BHL: M-31-24s-32e, 4898/N & 989/W

API # 30-025-40390

Wellbore #1

Survey: Archer MWD Survey

Standard Survey Report

13 November, 2012



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Redhead 31 Federal #1H
Project:	Lea County(NM27E)	TVD Reference:	WELL @ 3531.0usft (Original Well Elev)
Site:	Sec.31-T24S-R32E	MD Reference:	WELL @ 3531.0usft (Original Well Elev)
Well:	Redhead 31 Federal #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Project	Lea County(NM27E)		
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.31-T24S-R32E		
Site Position:		Northing:	429,771.20 usft
From:	Map	Easting:	689,979.70 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16"
		Latitude:	32° 10' 48.243 N
		Longitude:	103° 43' 9.434 W
		Grid Convergence:	0.33 °

Well:	Redhead 31 Federal #1H		
Well Position	+N/-S	0.0 usft	Northing: 429,771.20 usft
	+E/-W	0.0 usft	Easting: 689,979.70 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	usft
		Latitude:	32° 10' 48.243 N
		Longitude:	103° 43' 9.434 W
		Ground Level:	3,514.0 usft

Wellbore	Wellbore #1		
Magnetics	Model Name	Sample Date	Declination (°)
	IGRF2010	2012/10/17	7.49
			Dip Angle (°)
			60.09
			Field Strength (nT)
			48,439

Design	Wellbore #1		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.0	0.0	0.0
			Direction (°)
			229.78

Survey Program	Date 2012/11/13		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name
100.0	9,500.0	VES Gyro (Wellbore #1)	MWD
9,674.0	14,760.0	Archer MWD Survey (Wellbore #1)	MWD
			Description
			MWD - Standard
			MWD - Standard

Survey										
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Vertical	Dogleg	Build	Turn	
Depth (usft)	(°)	(°)	Depth (usft)	(usft)	(usft)	Section (usft)	Rate (°/100usft)	Rate (°/100usft)	Rate (°/100usft)	
Tie on										
9,500.0	1.86	244.66	9,498.8	-44.8	-53.0	69.4	0.00	0.00	0.00	
First MWD Survey										
9,674.0	2.10	237.10	9,672.7	-47.7	-58.2	75.3	0.20	0.14	-4.34	
9,815.0	1.60	234.40	9,813.7	-50.3	-62.0	79.8	0.36	-0.35	-1.91	
9,909.0	2.10	235.10	9,907.6	-52.0	-64.5	82.8	0.53	0.53	0.74	
9,999.0	5.10	199.40	9,997.4	-56.8	-67.1	87.9	4.01	3.33	-39.67	
10,030.0	10.20	197.80	10,028.2	-60.7	-68.4	91.4	16.46	16.45	-5.16	
10,062.0	14.80	194.70	10,059.4	-67.3	-70.3	97.2	14.52	14.37	-9.69	
10,093.0	19.00	193.20	10,089.0	-76.1	-72.5	104.5	13.62	13.55	-4.84	
10,125.0	23.00	192.30	10,118.9	-87.3	-75.0	113.6	12.54	12.50	-2.81	
10,156.0	26.10	192.30	10,147.1	-99.8	-77.8	123.8	10.00	10.00	0.00	

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Redhead 31 Federal #1H
Project:	Lea County(NM27E)	TVD Reference:	WELL @ 3531.0usft (Original Well Elev)
Site:	Sec.31-T24S-R32E	MD Reference:	WELL @ 3531.0usft (Original Well Elev)
Well:	Redhead 31 Federal #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,188.0	29.00	192.10	10,175.5	-114.3	-80.9	135.6	9.07	9.06	-0.62
10,220.0	31.60	190.10	10,203.1	-130.1	-84.0	148.2	8.71	8.12	-6.25
10,251.0	34.70	188.00	10,229.0	-146.9	-86.6	161.0	10.66	10.00	-6.77
10,283.0	37.60	186.20	10,254.9	-165.6	-89.0	174.9	9.65	9.06	-5.62
10,315.0	40.60	184.30	10,279.7	-185.7	-90.8	189.2	10.09	9.37	-5.94
10,346.0	43.40	184.10	10,302.8	-206.4	-92.3	203.8	9.04	9.03	-0.65
10,377.0	46.30	184.70	10,324.7	-228.2	-94.0	219.1	9.45	9.35	1.94
10,409.0	49.40	183.60	10,346.2	-251.9	-95.7	235.7	10.02	9.69	-3.44
10,441.0	52.00	182.30	10,366.5	-276.6	-97.0	252.6	8.71	8.12	-4.06
10,472.0	54.60	181.20	10,385.0	-301.4	-97.7	269.3	8.86	8.39	-3.55
10,504.0	58.30	180.60	10,402.7	-328.1	-98.1	286.8	11.67	11.56	-1.87
10,535.0	62.60	180.70	10,418.0	-355.0	-98.4	304.4	13.87	13.87	0.32
10,567.0	68.10	181.40	10,431.3	-384.1	-99.0	323.6	17.30	17.19	2.19
10,599.0	72.70	181.20	10,442.0	-414.2	-99.7	343.6	14.39	14.37	-0.62
10,630.0	75.90	179.90	10,450.4	-444.1	-100.0	363.1	11.08	10.32	-4.19
10,662.0	77.70	178.30	10,457.7	-475.2	-99.5	382.8	7.44	5.62	-5.00
10,694.0	79.50	177.00	10,464.1	-506.6	-98.2	402.1	6.89	5.62	-4.06
10,726.0	81.30	176.60	10,469.4	-538.1	-96.4	421.1	5.76	5.62	-1.25
10,758.0	82.90	176.50	10,473.8	-569.7	-94.5	440.0	5.01	5.00	-0.31
10,789.0	84.10	176.40	10,477.3	-600.4	-92.6	458.4	3.88	3.87	-0.32
10,821.0	85.10	176.30	10,480.3	-632.2	-90.6	477.4	3.14	3.12	-0.31
10,853.0	86.20	175.70	10,482.7	-664.1	-88.3	496.3	3.91	3.44	-1.87
10,884.0	88.00	175.00	10,484.3	-694.9	-85.8	514.3	6.23	5.81	-2.26
10,916.0	88.90	175.70	10,485.2	-726.8	-83.2	532.9	3.56	2.81	2.19
10,979.0	90.10	176.30	10,485.7	-789.6	-78.8	570.1	2.13	1.90	0.95
11,074.0	90.50	176.30	10,485.2	-884.4	-72.7	626.7	0.42	0.42	0.00
11,169.0	88.10	176.20	10,486.4	-979.2	-66.5	683.1	2.53	-2.53	-0.11
11,264.0	89.50	176.50	10,488.4	-1,074.0	-60.5	739.7	1.51	1.47	0.32
11,359.0	87.60	175.50	10,490.8	-1,168.7	-53.8	795.8	2.26	-2.00	-1.05
11,454.0	89.00	177.10	10,493.6	-1,263.5	-47.7	852.3	2.24	1.47	1.68
11,549.0	90.10	178.50	10,494.3	-1,358.4	-44.1	910.8	1.87	1.16	1.47
11,644.0	91.60	178.40	10,492.9	-1,453.4	-41.5	970.2	1.58	1.58	-0.11
11,739.0	92.40	178.50	10,489.6	-1,548.3	-38.9	1,029.5	0.85	0.84	0.11
11,834.0	90.50	179.40	10,487.2	-1,643.2	-37.2	1,089.5	2.21	-2.00	0.95
11,928.0	91.10	179.20	10,485.9	-1,737.2	-36.0	1,149.3	0.67	0.64	-0.21
12,024.0	89.70	179.80	10,485.2	-1,833.2	-35.2	1,210.7	1.59	-1.46	0.62
12,119.0	89.00	179.30	10,486.3	-1,928.2	-34.5	1,271.4	0.91	-0.74	-0.53
12,214.0	88.40	177.90	10,488.5	-2,023.1	-32.1	1,331.0	1.60	-0.63	-1.47
12,308.0	88.40	177.70	10,491.1	-2,117.0	-28.5	1,388.8	0.21	0.00	-0.21
12,403.0	89.50	178.60	10,492.8	-2,212.0	-25.5	1,447.8	1.50	1.16	0.95
12,498.0	89.30	178.10	10,493.8	-2,306.9	-22.7	1,507.0	0.57	-0.21	-0.53
12,593.0	90.10	177.50	10,494.3	-2,401.9	-19.1	1,565.6	1.05	0.84	-0.63
12,688.0	89.90	178.80	10,494.3	-2,496.8	-16.0	1,624.5	1.38	-0.21	1.37
12,783.0	89.50	178.20	10,494.8	-2,591.8	-13.5	1,683.9	0.76	-0.42	-0.63
12,878.0	89.50	178.10	10,495.6	-2,686.7	-10.5	1,742.9	0.11	0.00	-0.11
12,973.0	89.80	178.50	10,496.2	-2,781.7	-7.6	1,802.1	0.53	0.32	0.42
13,068.0	90.10	179.00	10,496.3	-2,876.6	-5.6	1,861.8	0.61	0.32	0.53
13,163.0	90.80	179.00	10,495.6	-2,971.6	-3.9	1,921.9	0.74	0.74	0.00
13,258.0	91.00	179.00	10,494.1	-3,066.6	-2.2	1,982.0	0.21	0.21	0.00
13,353.0	90.50	180.10	10,492.8	-3,161.6	-1.5	2,042.7	1.27	-0.53	1.16
13,448.0	90.30	180.30	10,492.2	-3,256.6	-1.8	2,104.3	0.30	-0.21	0.21
13,543.0	90.20	180.50	10,491.8	-3,351.6	-2.5	2,166.2	0.24	-0.11	0.21
13,638.0	89.70	180.50	10,491.8	-3,446.6	-3.3	2,228.2	0.53	-0.53	0.00
13,733.0	91.30	180.50	10,491.0	-3,541.6	-4.2	2,290.1	1.68	1.68	0.00

Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well Redhead 31 Federal #1H
Project:	Lea County(NM27E)	TVD Reference:	WELL @ 3531.0usft (Original Well Elev)
Site:	Sec.31-T24S-R32E	MD Reference:	WELL @ 3531.0usft (Original Well Elev)
Well:	Redhead 31 Federal #1H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDMDBBW

Survey:										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
13,828.0	92.40	179.50	10,487.9	-3,636.5	-4.2	2,351.4	1.56	1.16	-1.05	
13,923.0	90.80	180.70	10,485.3	-3,731.5	-4.3	2,412.9	2.10	-1.68	1.26	
14,018.0	91.10	180.60	10,483.7	-3,826.5	-5.4	2,475.0	0.33	0.32	-0.11	
14,113.0	90.90	180.10	10,482.1	-3,921.4	-6.0	2,536.8	0.57	-0.21	-0.53	
14,208.0	91.10	179.40	10,480.4	-4,016.4	-5.6	2,597.8	0.77	0.21	-0.74	
14,303.0	91.20	179.30	10,478.5	-4,111.4	-4.5	2,658.3	0.15	0.11	-0.11	
14,398.0	92.00	179.10	10,475.8	-4,206.3	-3.2	2,718.6	0.87	0.84	-0.21	
14,493.0	92.00	179.10	10,472.5	-4,301.3	-1.7	2,778.8	0.00	0.00	0.00	
14,588.0	90.60	180.00	10,470.4	-4,396.2	-0.9	2,839.6	1.75	-1.47	0.95	
14,683.0	91.20	180.00	10,468.9	-4,491.2	-0.9	2,900.9	0.63	0.63	0.00	
Last MWD Survey										
14,703.0	91.40	180.20	10,468.4	-4,511.2	-1.0	2,913.8	1.41	1.00	1.00	
Proj. to TD										
14,760.0	91.40	180.20	10,467.0	-4,568.2	-1.2	2,950.8	0.00	0.00	0.00	

Survey Annotations:					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates			
		+N/-S (usft)	+E/-W (usft)	Comment	
9,500.0	9,498.8	-44.8	-53.0	Tie on	
9,674.0	9,672.7	-47.7	-58.2	First MWD Survey	
14,703.0	10,468.4	-4,511.2	-1.0	Last MWD Survey	
14,760.0	10,467.0	-4,568.2	-1.2	Proj. to TD	

Checked By: _____	Approved By: _____	Date: _____
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