

3001542782



February 9, 2015

NM OIL CONSERVATION
ARTESIA DISTRICT

APR 13 2015

RECEIVED

Concho Resources, Inc.
One Concho Center
600 W. Illinois Avenue
Midland, Texas 79701

Attn: Kanicia Castillo

RE: Halberd 27 State 3H

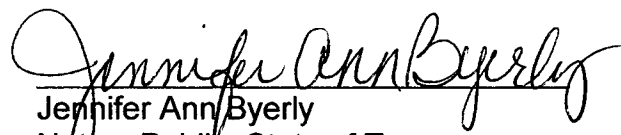
Please find enclosed a copy of the survey from 0' to 3104' ran on the above referenced well.

Sincerely,

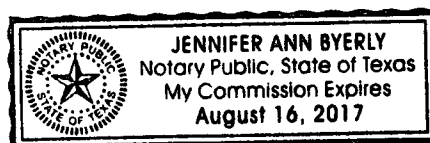
Keith Havelka
Operations

STATE OF TEXAS §
 §
COUNTY OF NUECES §

This instrument was acknowledged before me on the 9 day of Feb,
A.D., 2015, by Keith Havelka.


Jennifer Ann Byerly
Notary Public, State of Texas

VES Survey International
P.O. Box 261021 Corpus Christi, TX 78426
T (361) 767-0602 F (361) 767-0612
www.vesurvey.com





Company: Concho
Lease/Well: Halberd 27 State/3H

Location: Sec27 T17S R28E

Rig Name: Silver Oak 3

State/County: New Mexico/Eddy

Latitude: 32.81, Longitude: -104.16

GRID North is 0.10 Degrees East of True North

VS-Azi: 0.00 Degrees



Depth Reference : RKB = 18 Feet

DRILLOG HA GYRO SURVEY CALCULATIONS

Filename: gyro survey.ut

Minimum Curvature Method

Report Date/Time: 2/9/2015 / 15:08

VES Survey International

West Texas

(432) 563-5444

Surveyor: Noe Garza

Halberd 27 State 3H / API 30-015-42782

NM OIL CONSERVATION
ARTESIA DISTRICT

APR 13 2015

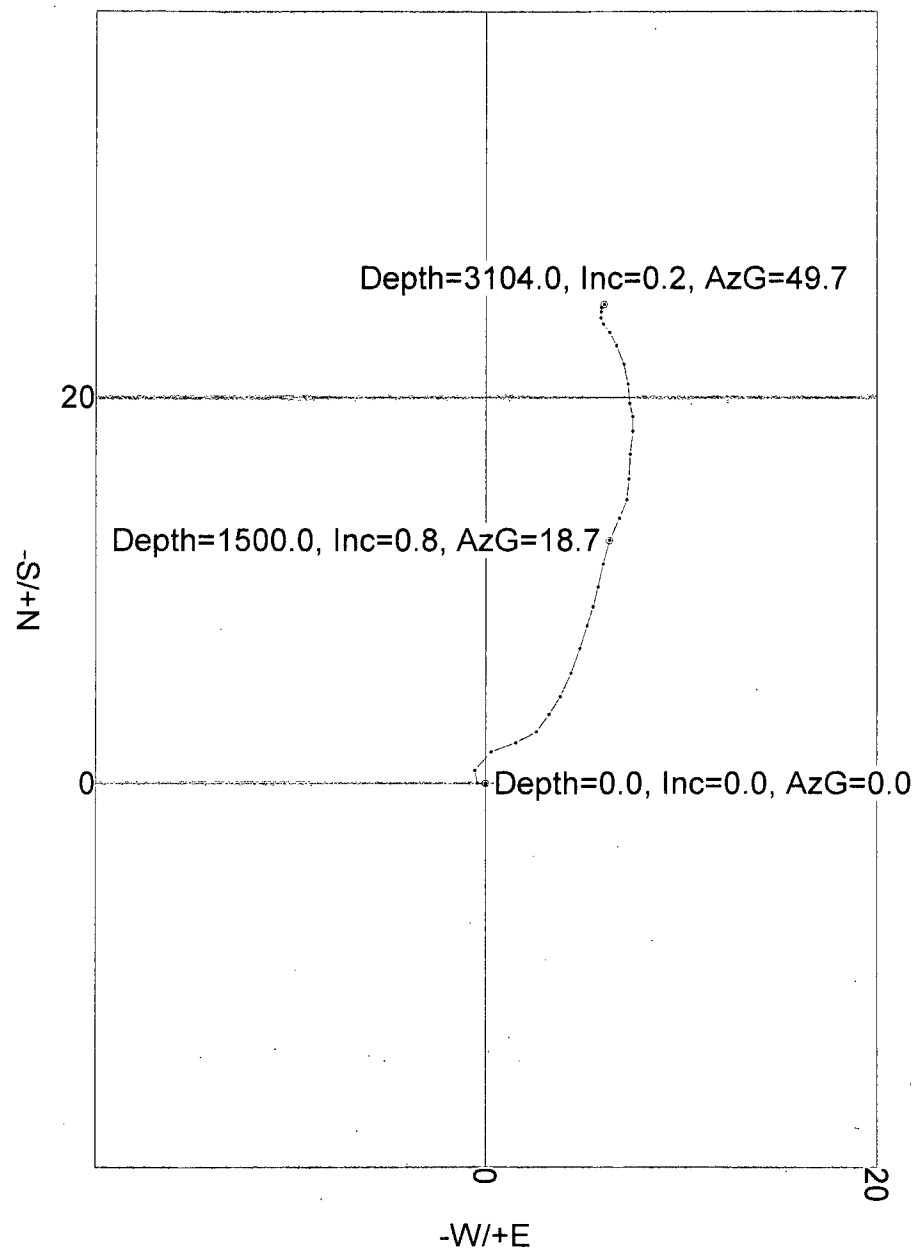
RECEIVED

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section 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	0.00	****
100.00	0.09	182.65	100.00	-0.08	0.00	-0.08	0.08	182.65	0.09
200.00	0.53	292.28	200.00	0.02	-0.43	0.02	0.43	272.22	0.56
300.00	0.66	30.99	300.00	0.68	-0.56	0.68	0.88	320.55	0.90
400.00	0.81	48.50	399.99	1.64	0.26	1.64	1.66	9.13	0.27
500.00	0.83	90.22	499.98	2.11	1.52	2.11	2.60	35.79	0.58
600.00	0.77	31.16	599.97	2.68	2.59	2.68	3.73	44.06	0.79
700.00	0.49	41.91	699.96	3.57	3.22	3.57	4.81	42.09	0.30
800.00	0.75	24.65	799.96	4.49	3.79	4.49	5.87	40.15	0.32
900.00	0.77	23.67	899.95	5.70	4.33	5.70	7.16	37.22	0.02
1000.00	0.80	15.23	999.94	6.99	4.78	6.99	8.47	34.39	0.12
1100.00	0.64	20.55	1099.93	8.18	5.16	8.18	9.67	32.25	0.17
1200.00	0.53	12.33	1199.93	9.15	5.46	9.15	10.65	30.80	0.14
1300.00	0.70	14.85	1299.92	10.19	5.71	10.19	11.68	29.26	0.17
1400.00	0.68	10.31	1399.91	11.36	5.97	11.36	12.83	27.73	0.06
1500.00	0.78	18.70	1499.91	12.59	6.30	12.59	14.08	26.57	0.15
1600.00	0.67	29.54	1599.90	13.75	6.81	13.75	15.35	26.33	0.18
1700.00	0.51	11.21	1699.89	14.70	7.18	14.70	16.36	26.04	0.25
1800.00	0.72	1.52	1799.89	15.77	7.29	15.77	17.37	24.80	0.23

Measured Depth FT	Incl Angle Deg	Drift Direction Deg	TVD FT	+N/-S FT	+E/-W FT	Vertical Section FT	Closure Distance FT	Closure Direction Deg	Dogleg Severity Deg/100
1900.00	0.75	4.47	1899.88	17.05	7.35	17.05	18.57	23.34	0.05
2000.00	0.63	8.54	1999.87	18.24	7.49	18.24	19.72	22.32	0.13
2100.00	0.27	337.29	2099.87	19.00	7.48	19.00	20.42	21.48	0.42
2200.00	0.54	352.88	2199.86	19.69	7.32	19.69	21.01	20.40	0.29
2300.00	0.62	356.84	2299.86	20.70	7.24	20.70	21.93	19.26	0.09
2400.00	0.60	339.70	2399.85	21.73	7.02	21.73	22.84	17.91	0.18
2500.00	0.56	336.91	2499.85	22.68	6.65	22.68	23.63	16.35	0.05
2600.00	0.34	328.43	2599.85	23.38	6.30	23.38	24.21	15.09	0.23
2700.00	0.27	313.92	2699.84	23.80	5.98	23.80	24.54	14.09	0.10
2800.00	0.19	15.08	2799.84	24.13	5.85	24.13	24.83	13.62	0.25
2900.00	0.17	348.52	2899.84	24.44	5.86	24.44	25.13	13.49	0.09
3000.00	0.09	29.66	2999.84	24.65	5.87	24.65	25.34	13.40	0.12
3104.00	0.17	49.72	3103.84	24.82	6.03	24.82	25.55	13.66	0.09



VES Survey International
West Texas
(432) 563-5444
Surveyor: Noe Garza
Halberd 27 State 3H / API 30-015-42782



VES Survey Date: 2/4/2015



PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288

NM OIL CONSERVATION
ARTESIA DISTRICT

APR 13 2015

RECEIVED

February 13, 2015

COG, LLC
One Concho Center
600 W. Illinois Ave.
Midland, TX 79701

RE: Helberd 27 State 3H
2090' FNL & 45' FEL
Sec. 27, T17S, R28E
Eddy County, New Mexico

Dear Sir,

The attached is the Deviation Survey for the above captioned well.

Very truly yours,

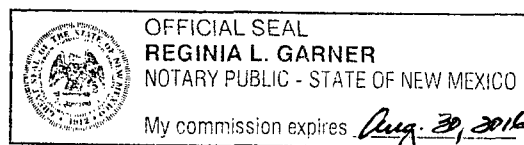
A handwritten signature in cursive script that reads "Chris Graham".

Chris Graham
Drilling Superintendent

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 13th day of February, 2015.

A handwritten signature in cursive script that reads "Regina L. Garner".

Notary Public

HALBERD 27 STATE #3H

Date	Depth	Deviation	Direction	TVD	Horiz
1/31/2015	147	0.50	0.00	0.00	0.00
2/2/2015	535	1.00	0.00	0.00	0.00
2/2/2015	845	0.50	0.00	0.00	0.00
2/4/2015	1277	0.80	0.00	0.00	0.00
2/4/2015	1717	0.80	0.00	0.00	0.00
2/4/2015	2160	1.10	0.00	0.00	0.00
2/4/2015	2602	0.70	0.00	0.00	0.00
2/5/2015	3100	0.50	0.00	0.00	0.00
2/5/2015	3136	0.20	102.40	0.00	0.00
2/5/2015	3168	1.00	141.50	0.00	0.00
2/5/2015	3200	0.10	142.90	0.00	0.00
2/5/2015	3231	0.30	102.40	0.00	0.00
2/5/2015	3262	0.80	244.90	0.00	0.00
2/5/2015	3294	2.00	256.40	0.00	0.00
2/6/2015	3357	5.40	262.60	3356.00	0.00
2/6/2015	3388	7.30	264.70	3387.00	0.00
2/6/2015	3482	15.00	266.00	3479.00	0.00
2/6/2015	3545	21.20	266.00	3539.00	0.00
2/6/2015	3577	24.80	265.40	3569.00	0.00
2/6/2015	3609	28.20	264.90	3597.00	0.00
2/6/2015	3672	35.30	263.70	0.00	0.00
2/6/2015	3704	39.00	263.80	0.00	0.00
2/6/2015	3735	42.70	263.50	0.00	0.00
2/6/2015	3767	46.50	263.20	0.00	0.00
2/6/2015	3798	50.10	262.70	0.00	0.00
2/6/2015	3830	53.80	262.50	0.00	0.00
2/6/2015	3956	68.60	264.50	0.00	0.00
2/6/2015	3987	71.10	264.40	0.00	0.00
2/6/2015	4014	74.40	263.60	0.00	0.00
2/6/2015	4051	78.10	262.90	0.00	0.00
2/6/2015	4051	78.10	262.90	0.00	0.00
2/7/2015	4101	84.30	263.10	3858.00	0.00
2/7/2015	4132	88.10	262.80	3860.00	0.00
2/7/2015	4195	90.70	259.00	0.00	0.00
2/7/2015	4227	91.30	257.00	0.00	0.00
2/7/2015	4258	92.40	256.10	0.00	0.00
2/7/2015	4290	92.50	255.90	0.00	0.00
2/7/2015	4321	92.90	254.60	0.00	0.00
2/7/2015	4353	92.80	254.40	0.00	0.00
2/7/2015	4574	92.00	260.50	0.00	0.00
2/7/2015	4668	92.00	265.20	0.00	0.00
2/7/2015	4762	92.10	267.30	0.00	0.00

Date	Depth	Deviation	Direction	TVD	Horiz
2/8/2015	4951	92.30	269.40	3832.00	0.00
2/8/2015	5046	92.30	269.80	3828.00	0.00
2/8/2015	5141	92.50	269.70	3824.00	0.00
2/8/2015	5235	92.60	269.30	3820.00	0.00
2/8/2015	5329	92.40	269.30	0.00	0.00
2/8/2015	5424	90.80	269.20	0.00	0.00
2/8/2015	5517	91.00	269.30	0.00	0.00
2/8/2015	5612	91.30	269.30	0.00	0.00
2/8/2015	5705	91.40	269.20	0.00	0.00
2/8/2015	5802	91.40	269.20	0.00	0.00
2/8/2015	5896	91.40	268.70	0.00	0.00
2/9/2015	5990	91.90	270.80	0.00	0.00
2/9/2015	6085	92.10	270.50	0.00	0.00
2/9/2015	6180	92.50	269.80	0.00	0.00
2/9/2015	6275	92.80	269.80	0.00	0.00
2/9/2015	6370	92.20	269.40	0.00	0.00
2/9/2015	6465	92.50	269.20	0.00	0.00
2/9/2015	6560	92.90	268.60	0.00	0.00
2/9/2015	6654	92.90	269.80	0.00	0.00
2/9/2015	6748	91.30	269.50	0.00	0.00
2/9/2015	6844	91.30	269.20	0.00	0.00
2/9/2015	6876	91.30	269.10	0.00	0.00
2/9/2015	6939	91.40	269.00	0.00	0.00
2/9/2015	7033	91.70	269.10	0.00	0.00
2/10/2015	7128	91.40	269.60	0.00	0.00
2/10/2015	7223	91.30	264.00	0.00	0.00
2/10/2015	7317	91.30	268.90	0.00	0.00
2/10/2015	7412	91.50	269.20	0.00	0.00
2/10/2015	7506	90.70	269.70	0.00	0.00
2/10/2015	7600	90.90	269.70	0.00	0.00
2/10/2015	7681	91.00	269.50	0.00	0.00
2/10/2015	7776	91.10	269.00	0.00	0.00
2/10/2015	7870	91.30	268.90	0.00	0.00
2/10/2015	7964	91.60	269.80	0.00	0.00
2/11/2015	8059	90.60	270.50	0.00	0.00
2/11/2015	8159	90.20	270.20	0.00	0.00
2/11/2015	8248	90.20	270.00	0.00	0.00
2/11/2015	8388	90.60	269.90	0.00	0.00

EOF



NM OIL CONSERVATION

ARTESIA DISTRICT

APR 13 2015

RECEIVED

COG Operating LLC

Eddy County, NM (NAD27 NME)

Halberd 27 State

#3H

WB1 / Job #1512865

Design: Surveys (Silver Oak 3)

Standard Survey Report

12 February, 2015





Survey Report



Company:	COG Operating, LLC	Local Co-ordinate Reference:	Well #3H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3628.00usft (Silver Oak 3)
Site:	Halberd 27 State	MD Reference:	KB @ 3628.00usft (Silver Oak 3)
Well:	#3H	North Reference:	Grid
Wellbore:	WB1 / Job #1512865	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Silver Oak 3)	Database:	Compass 5000 GCR

Project: Eddy 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: Halberd 27 State					
Site Position:		Northing:	657,322.00 usft	Latitude:	32° 48' 24.98418 N
From:	Map	Easting:	554,777.30 usft	Longitude:	104° 9' 18.18172 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.10 °

Well	#3H					
Well Position	+N/-S	0.00 usft	Northing:	657,322.00 usft	Latitude:	32° 48' 24.98418 N
	+E/-W	0.00 usft	Easting:	554,777.30 usft	Longitude:	104° 9' 18.18172 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	3,610.00 usft

Wellbore						WB1 / Job #1512865									
Magnetics						Model Name		Sample Date		Declination		Dip Angle		Field Strength	
										(°)		(°)		(nT)	
						IGRF2015		1/27/2015		7.52		60.53		48,466	

Design: Surveys (Silver Oak 3)				
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.00
Vertical Section:	Depth From (TVD)	+N-S	+E-W	Direction
	(usft)	(usft)	(usft)	(°)
	0.00	0.00	0.00	267.79

Survey Program		Date	2/12/2015		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	3,104.00	VES Gyro Survey (WB1 / Job #1512865)	NS-GYRO-MS	North sensing gyrocompassing m/s	
3,136.00	8,462.00	Phoenix MWD Survey (WB1 / Job #15128)	PHX+MWD+IGRF	PHX+MWD+IGRF v3:standard declination	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.09	182.65	100.00	-0.08	0.00	0.01	0.09	0.09	0.00
200.00	0.53	292.28	200.00	0.02	-0.44	0.43	0.57	0.44	109.63
300.00	0.66	30.99	300.00	0.69	-0.57	0.54	0.91	0.13	98.71
400.00	0.81	48.50	399.99	1.65	0.26	-0.32	0.27	0.15	17.51
500.00	0.83	90.22	499.98	2.12	1.51	-1.59	0.58	0.02	41.72
600.00	0.77	31.16	599.97	2.69	2.58	-2.69	0.79	-0.06	-59.06
700.00	0.49	41.91	699.96	3.58	3.22	-3.35	0.30	-0.28	10.75
800.00	0.75	24.65	799.96	4.49	3.78	-3.95	0.32	0.26	-17.26
900.00	0.77	23.67	899.95	5.70	4.32	-4.54	0.02	0.02	-0.98



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well: #3H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3628.00usft (Silver Oak 3)
Site:	Halberd 27 State	MD Reference:	KB @ 3628.00usft (Silver Oak 3)
Well:	#3H	North Reference:	Grid
Wellbore:	WB1 / Job #1512865	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Silver Oak 3)	Database:	Compass 5000 GCR

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,000.00	0.80	15.23	999.94	6.99	4.77	-5.04	0.12	0.03	-8.44
1,100.00	0.64	20.55	1,099.93	8.19	5.15	-5.46	0.17	-0.16	5.32
1,200.00	0.53	12.33	1,199.93	9.16	5.45	-5.80	0.14	-0.11	-8.22
1,300.00	0.70	14.85	1,299.92	10.21	5.70	-6.09	0.17	0.17	2.52
1,400.00	0.68	10.31	1,399.91	11.38	5.97	-6.40	0.06	-0.02	-4.54
1,500.00	0.78	18.70	1,499.91	12.61	6.29	-6.77	0.15	0.10	8.39
1,600.00	0.67	29.54	1,599.90	13.76	6.80	-7.32	0.18	-0.11	10.84
1,700.00	0.51	11.21	1,699.89	14.71	7.17	-7.73	0.25	-0.16	-18.33
1,800.00	0.72	1.52	1,799.89	15.77	7.27	-7.88	0.23	0.21	-9.69
1,900.00	0.75	4.47	1,899.88	17.05	7.34	-7.99	0.05	0.03	2.95
2,000.00	0.63	8.54	1,999.87	18.25	7.47	-8.17	0.13	-0.12	4.07
2,100.00	0.27	337.29	2,099.87	19.01	7.46	-8.19	0.42	-0.36	-31.25
2,200.00	0.54	352.88	2,199.87	19.70	7.32	-8.07	0.29	0.27	15.59
2,300.00	0.62	356.84	2,299.86	20.70	7.23	-8.02	0.09	0.08	3.96
2,400.00	0.60	339.70	2,399.85	21.73	7.02	-7.85	0.18	-0.02	-17.14
2,500.00	0.56	336.91	2,499.85	22.68	6.64	-7.51	0.05	-0.04	-2.79
2,600.00	0.34	328.43	2,599.85	23.38	6.30	-7.19	0.23	-0.22	-8.48
2,700.00	0.27	313.92	2,699.84	23.79	5.97	-6.88	0.10	-0.07	-14.51
2,800.00	0.19	15.08	2,799.84	24.12	5.84	-6.77	0.24	-0.08	61.16
2,900.00	0.17	348.52	2,899.84	24.42	5.86	-6.79	0.08	-0.02	-26.56
3,000.00	0.09	29.66	2,999.84	24.64	5.87	-6.81	0.12	-0.08	41.14
3,104.00	0.17	49.72	3,103.84	24.81	6.02	-6.98	0.09	0.08	19.29
Tie-on to VES Gyro Survey									
3,136.00	0.20	102.40	3,135.84	24.83	6.12	-7.07	0.52	0.09	164.63
First Phoenix MWD Survey									
3,168.00	0.10	141.50	3,167.84	24.79	6.19	-7.14	0.43	-0.31	122.19
3,200.00	0.10	142.90	3,199.84	24.75	6.22	-7.17	0.01	0.00	4.38
3,231.00	0.30	193.70	3,230.84	24.65	6.22	-7.16	0.80	0.65	163.87
3,262.00	0.80	244.90	3,261.84	24.48	6.00	-6.94	2.11	1.61	165.16
3,294.00	2.00	256.40	3,293.83	24.25	5.26	-6.19	3.83	3.75	35.94
3,325.00	3.60	258.90	3,324.79	23.94	3.78	-4.70	5.18	5.16	8.06
3,357.00	5.40	262.60	3,356.69	23.55	1.30	-2.21	5.69	5.63	11.56
3,388.00	7.30	264.70	3,387.50	23.18	-2.11	1.21	6.17	6.13	6.77
3,419.00	9.60	266.00	3,418.16	22.82	-6.65	5.76	7.44	7.42	4.19
3,451.00	12.20	265.90	3,449.58	22.39	-12.69	11.81	8.13	8.13	-0.31
3,482.00	15.00	266.00	3,479.71	21.87	-19.96	19.10	9.03	9.03	0.32
3,513.00	18.00	266.10	3,509.43	21.27	-28.74	27.90	9.68	9.68	0.32
3,545.00	21.20	266.00	3,539.57	20.53	-39.45	38.62	10.00	10.00	-0.31
3,577.00	24.80	265.40	3,569.02	19.59	-51.91	51.12	11.27	11.25	-1.88
3,609.00	28.20	264.90	3,597.66	18.38	-66.14	65.38	10.65	10.63	-1.56
3,640.00	31.80	264.20	3,624.50	16.90	-81.56	80.85	11.67	11.61	-2.26
3,672.00	35.30	263.70	3,651.17	15.03	-99.15	98.49	10.97	10.94	-1.56
3,704.00	39.00	263.80	3,676.67	12.93	-118.35	117.77	11.56	11.56	0.31



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #3H
Project:	Eddy County, NM (NAD27, NME)	TVD Reference:	KB @ 3628.00usft (Silver Oak 3)
Site:	Halberd 27 State	MD Reference:	KB @ 3628.00usft (Silver Oak 3)
Well:	#3H	North Reference:	Grid
Wellbore:	WB1 / Job #1512865	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Silver Oak 3)	Database:	Compass 5000 GCR

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)
3,735.00	42.70	263.50	3,700.11	10.68	-138.50	137.99	11.95	11.94	-0.97
3,767.00	46.50	263.20	3,722.89	8.08	-160.81	160.38	11.89	11.88	-0.94
3,798.00	50.10	262.70	3,743.51	5.24	-183.78	183.44	11.68	11.61	-1.61
3,830.00	53.80	262.50	3,763.23	1.99	-208.77	208.53	11.57	11.56	-0.63
3,862.00	57.70	262.80	3,781.24	-1.39	-234.99	234.87	12.21	12.19	0.94
3,893.00	61.30	263.30	3,796.97	-4.62	-261.50	261.49	11.70	11.61	1.61
3,924.00	65.10	264.00	3,810.94	-7.68	-289.00	289.08	12.42	12.26	2.26
3,956.00	68.60	264.50	3,823.52	-10.62	-318.27	318.44	11.03	10.94	1.56
3,987.00	71.10	264.60	3,834.20	-13.39	-347.24	347.50	8.07	8.06	0.32
4,019.00	74.40	263.60	3,843.69	-16.53	-377.63	377.99	10.74	10.31	-3.13
4,051.00	78.10	262.90	3,851.29	-20.18	-408.50	408.97	11.76	11.56	-2.19
4,082.00	82.10	262.80	3,856.62	-23.98	-438.79	439.39	12.91	12.90	-0.32
4,101.00	84.30	263.10	3,858.87	-26.30	-457.51	458.19	11.68	11.58	1.58
4,132.00	88.10	262.80	3,860.93	-30.09	-488.20	489.00	12.30	12.26	-0.97
4,163.00	89.80	260.90	3,861.49	-34.49	-518.88	519.83	8.22	5.48	-6.13
4,195.00	90.70	259.10	3,861.35	-40.04	-550.40	551.53	6.29	2.81	-5.63
4,227.00	91.30	257.00	3,860.79	-46.67	-581.70	583.06	6.82	1.88	-6.56
4,258.00	92.40	256.10	3,859.79	-53.88	-611.83	613.45	4.58	3.55	-2.90
4,290.00	92.50	255.90	3,858.43	-61.61	-642.85	644.75	0.70	0.31	-0.63
4,321.00	92.90	254.60	3,856.97	-69.49	-672.79	674.97	4.38	1.29	-4.19
4,353.00	92.80	254.40	3,855.37	-78.03	-703.59	706.08	0.70	-0.31	-0.63
4,384.00	92.50	254.30	3,853.94	-86.39	-733.41	736.20	1.02	-0.97	-0.32
4,415.00	92.10	255.40	3,852.70	-94.48	-763.31	766.39	3.77	-1.29	3.55
4,479.00	92.10	255.80	3,850.35	-110.39	-825.26	828.90	0.62	0.00	0.63
4,574.00	92.00	260.50	3,846.95	-129.88	-918.15	922.47	4.95	-0.11	4.95
4,668.00	92.00	265.20	3,843.67	-141.57	-1,011.33	1,016.04	5.00	0.00	5.00
4,762.00	92.10	267.30	3,840.31	-147.71	-1,105.07	1,109.94	2.24	0.11	2.23
4,857.00	92.40	267.60	3,836.58	-151.94	-1,199.90	1,204.87	0.45	0.32	0.32
4,951.00	92.30	269.40	3,832.72	-154.39	-1,293.78	1,298.78	1.92	-0.11	1.91
5,046.00	92.30	269.80	3,828.91	-155.06	-1,388.70	1,393.65	0.42	0.00	0.42
5,141.00	92.50	269.70	3,824.93	-155.47	-1,483.62	1,488.51	0.24	0.21	-0.11
5,235.00	92.60	269.30	3,820.75	-156.29	-1,577.52	1,582.38	0.44	0.11	-0.43
5,329.00	92.40	269.30	3,816.65	-157.44	-1,671.43	1,676.25	0.21	-0.21	0.00
5,424.00	90.80	269.20	3,814.00	-158.68	-1,766.38	1,771.18	1.69	-1.68	-0.11
5,517.00	91.00	269.30	3,812.54	-159.90	-1,859.36	1,864.14	0.24	0.22	0.11
5,612.00	91.30	269.30	3,810.63	-161.06	-1,954.33	1,959.09	0.32	0.32	0.00
5,707.00	91.40	269.20	3,808.39	-162.30	-2,049.30	2,054.03	0.15	0.11	-0.11
5,802.00	91.60	268.80	3,805.90	-163.96	-2,144.25	2,148.98	0.47	0.21	-0.42
5,896.00	91.40	268.70	3,803.44	-166.01	-2,238.20	2,242.93	0.24	-0.21	-0.11
5,990.00	91.90	270.80	3,800.74	-166.42	-2,332.15	2,336.83	2.30	0.53	2.23
6,085.00	92.10	270.50	3,797.42	-165.34	-2,427.09	2,431.66	0.38	0.21	-0.32
6,180.00	92.50	269.80	3,793.61	-165.09	-2,522.01	2,526.50	0.85	0.42	-0.74
6,275.00	92.80	269.70	3,789.22	-165.51	-2,616.91	2,621.34	0.33	0.32	-0.11
6,370.00	92.20	269.40	3,785.07	-166.25	-2,711.81	2,716.21	0.71	-0.63	-0.32



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well #3H
Project:	Eddy County, NM (NAD27 NME)	TVD Reference:	KB @ 3628.00usft (Silver Oak-3)
Site:	Halberd 27 State	MD Reference:	KB @ 3628.00usft (Silver Oak-3)
Well:	#3H	North Reference:	Grid
Wellbore:	WB1 / Job: #1512865	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Silver Oak-3)	Database:	Compass 5000 GCR

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)
6,465.00	92.50	269.20	3,781.18	-167.41	-2,806.73	2,811.09	0.38	0.32	-0.21
6,560.00	92.90	268.60	3,776.70	-169.23	-2,901.60	2,905.97	0.76	0.42	-0.63
6,654.00	92.90	269.80	3,771.95	-170.54	-2,995.47	2,999.82	1.27	0.00	1.28
6,748.00	91.30	269.50	3,768.50	-171.12	-3,089.40	3,093.70	1.73	-1.70	-0.32
6,780.00	91.20	269.30	3,767.80	-171.45	-3,121.39	3,125.68	0.70	-0.31	-0.63
6,812.00	91.20	269.20	3,767.13	-171.87	-3,153.38	3,157.67	0.31	0.00	-0.31
6,844.00	91.30	269.20	3,766.44	-172.32	-3,185.37	3,189.65	0.31	0.31	0.00
6,876.00	91.30	269.10	3,765.71	-172.79	-3,217.36	3,221.63	0.31	0.00	-0.31
6,907.00	91.30	269.00	3,765.01	-173.31	-3,248.35	3,252.62	0.32	0.00	-0.32
6,939.00	91.40	269.00	3,764.25	-173.87	-3,280.34	3,284.60	0.31	0.31	0.00
7,033.00	91.70	269.10	3,761.71	-175.42	-3,374.29	3,378.54	0.34	0.32	0.11
7,128.00	91.40	269.60	3,759.14	-176.50	-3,469.25	3,473.47	0.61	-0.32	0.53
7,223.00	91.30	269.40	3,756.90	-177.33	-3,564.22	3,568.40	0.24	-0.11	-0.21
7,317.00	91.30	268.90	3,754.77	-178.72	-3,658.18	3,662.35	0.53	0.00	-0.53
7,412.00	91.50	269.20	3,752.45	-180.30	-3,753.14	3,757.30	0.38	0.21	0.32
7,506.00	90.70	269.70	3,750.64	-181.20	-3,847.12	3,851.24	1.00	-0.85	0.53
7,600.00	90.90	269.70	3,749.33	-181.69	-3,941.11	3,945.18	0.21	0.21	0.00
7,681.00	91.00	269.50	3,747.99	-182.26	-4,022.09	4,026.13	0.28	0.12	-0.25
7,776.00	91.10	269.00	3,746.25	-183.50	-4,117.07	4,121.08	0.54	0.11	-0.53
7,870.00	91.30	268.90	3,744.28	-185.22	-4,211.03	4,215.04	0.24	0.21	-0.11
7,964.00	91.60	269.80	3,741.90	-186.29	-4,305.00	4,308.98	1.01	0.32	0.96
8,059.00	90.60	270.50	3,740.08	-186.04	-4,399.98	4,403.88	1.28	-1.05	0.74
8,154.00	90.20	270.20	3,739.41	-185.46	-4,494.97	4,498.78	0.53	-0.42	-0.32
8,248.00	90.20	270.00	3,739.08	-185.30	-4,588.97	4,592.70	0.21	0.00	-0.21
8,342.00	89.80	269.50	3,739.08	-185.71	-4,682.97	4,686.65	0.68	-0.43	-0.53
8,388.00	90.60	269.90	3,738.92	-185.95	-4,728.97	4,732.62	1.94	1.74	0.87
Last Phoenix MWD Survey									
8,462.00	90.60	269.90	3,738.15	-186.08	-4,802.96	4,806.57	0.00	0.00	0.00
Projection to TD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
3,104.00	3,103.84	24.81	6.02	Tie-on to VES Gyro Survey
3,136.00	3,135.84	24.83	6.12	First Phoenix MWD Survey
8,388.00	3,738.92	-185.95	-4,728.97	Last Phoenix MWD Survey
8,462.00	3,738.15	-186.08	-4,802.96	Projection to TD

Checked By: _____ Approved By: _____ Date: _____