



HOBBS OCD
MAY 05 2017
RECEIVED

COG Operating LLC

Lea County, NM (NAD-27 2015)

Flat Head Federal Com #27H

API #: 30-025-43147

SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A

PP: 985' FNL, 975' FEL, Sec 14, T17S, R32E, Unit A

BHL: 378' FNL, 973' FEL, Sec 11, T17S, R32E, Unit A

Design: BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A

Standard Survey Report

27 December, 2016



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

Project	Lea County, NM (NAD-27 2015)		
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	Flat Head Federal Com #27H				
Site Position:		Northing:	669,275.20 usft	Latitude:	32° 50' 18.509 N
From:	Map	Easting:	684,935.80 usft	Longitude:	103° 43' 52.381 W
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.33 °

Well	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A					
Well Position	+N/-S	0.00 usft	Northing:	669,275.20 usft	Latitude:	32° 50' 18.509 N
	+E/-W	0.00 usft	Easting:	684,935.80 usft	Longitude:	103° 43' 52.381 W
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	4,100.00 usft

Wellbore	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	11/23/2016	7.13	60.61	48,339

Design	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	359.83	

Survey Program		Date	12/27/2016		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,760.30	Scientific Gyro #1 (BHL: 350' FNL, 970' FE	Scientific Gyro	Scientific Drilling Intl	
2,856.00	12,434.00	TDS MWD #2 (BHL: 350' FNL, 970' FEL, S	MWD	MWD - Standard	

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	0.29	280.16	100.00	0.04	-0.25	0.05	0.29	0.29	0.00
125.00	0.32	277.84	125.00	0.07	-0.38	0.07	0.13	0.12	-9.28
150.00	0.30	288.65	150.00	0.10	-0.51	0.10	0.25	-0.08	43.24
175.00	0.36	257.29	175.00	0.10	-0.65	0.10	0.75	0.24	-125.44
200.00	0.23	255.12	200.00	0.07	-0.78	0.07	0.52	-0.52	-8.68
225.00	0.18	201.16	225.00	0.02	-0.84	0.02	0.77	-0.20	-215.84

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

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)
250.00	0.30	178.81	250.00	-0.08	-0.85	-0.08	0.60	0.48	-89.40
275.00	0.42	177.03	275.00	-0.24	-0.84	-0.24	0.48	0.48	-7.12
300.00	0.53	168.85	300.00	-0.44	-0.82	-0.44	0.52	0.44	-32.72
325.00	0.55	174.07	325.00	-0.68	-0.78	-0.67	0.21	0.08	20.88
350.00	0.53	173.59	349.99	-0.91	-0.76	-0.91	0.08	-0.08	-1.92
375.00	0.45	164.99	374.99	-1.12	-0.72	-1.12	0.43	-0.32	-34.40
400.00	0.45	174.75	399.99	-1.31	-0.68	-1.31	0.31	0.00	39.04
425.00	0.45	179.44	424.99	-1.51	-0.67	-1.51	0.15	0.00	18.76
450.00	0.48	178.68	449.99	-1.71	-0.67	-1.71	0.12	0.12	-3.04
475.00	0.48	179.37	474.99	-1.92	-0.67	-1.92	0.02	0.00	2.76
500.00	0.49	168.33	499.99	-2.13	-0.65	-2.13	0.38	0.04	-44.16
525.00	0.55	172.31	524.99	-2.35	-0.61	-2.35	0.28	0.24	15.92
550.00	0.33	172.32	549.99	-2.55	-0.58	-2.54	0.88	-0.88	0.04
575.00	0.30	191.12	574.99	-2.68	-0.58	-2.68	0.43	-0.12	75.20
600.00	0.29	218.62	599.99	-2.79	-0.64	-2.79	0.56	-0.04	110.00
625.00	0.19	215.21	624.99	-2.88	-0.70	-2.88	0.40	-0.40	-13.64
650.00	0.26	232.51	649.99	-2.95	-0.77	-2.94	0.39	0.28	69.20
675.00	0.29	251.35	674.99	-3.00	-0.87	-3.00	0.38	0.12	75.36
700.00	0.25	226.90	699.99	-3.06	-0.97	-3.06	0.48	-0.16	-97.80
725.00	0.17	261.81	724.99	-3.10	-1.05	-3.10	0.59	-0.32	139.64
750.00	0.22	245.53	749.99	-3.13	-1.13	-3.12	0.30	0.20	-65.12
775.00	0.22	253.79	774.99	-3.16	-1.22	-3.16	0.13	0.00	33.04
800.00	0.20	279.48	799.99	-3.17	-1.31	-3.16	0.38	-0.08	102.76
825.00	0.11	234.66	824.98	-3.17	-1.37	-3.17	0.58	-0.36	-179.28
850.00	0.02	280.07	849.98	-3.19	-1.40	-3.18	0.39	-0.36	181.64
875.00	0.04	41.83	874.98	-3.18	-1.39	-3.17	0.21	0.08	487.04
900.00	0.14	18.11	899.98	-3.14	-1.38	-3.14	0.42	0.40	-94.88
925.00	0.13	47.45	924.98	-3.09	-1.35	-3.09	0.28	-0.04	117.36
950.00	0.24	79.58	949.98	-3.07	-1.28	-3.06	0.59	0.44	128.52
975.00	0.20	76.46	974.98	-3.05	-1.18	-3.04	0.17	-0.16	-12.48
1,000.00	0.16	78.66	999.98	-3.03	-1.11	-3.03	0.16	-0.16	8.80
1,025.00	0.22	78.50	1,024.98	-3.01	-1.02	-3.01	0.24	0.24	-0.64
1,050.00	0.21	92.24	1,049.98	-3.00	-0.93	-3.00	0.21	-0.04	54.96
1,075.00	0.25	102.06	1,074.98	-3.02	-0.83	-3.02	0.22	0.16	39.28
1,100.00	0.31	80.37	1,099.98	-3.02	-0.71	-3.02	0.48	0.24	-86.76
1,125.00	0.25	85.30	1,124.98	-3.00	-0.59	-3.00	0.26	-0.24	19.72
1,150.00	0.22	68.39	1,149.98	-2.98	-0.49	-2.98	0.30	-0.12	-67.64
1,175.00	0.19	92.73	1,174.98	-2.96	-0.41	-2.96	0.37	-0.12	97.36
1,200.00	0.20	118.93	1,199.98	-2.99	-0.33	-2.99	0.36	0.04	104.80
1,225.00	0.24	121.45	1,224.98	-3.04	-0.24	-3.03	0.16	0.16	10.08
1,250.00	0.21	131.58	1,249.98	-3.09	-0.17	-3.09	0.20	-0.12	40.52

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Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

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)
1,275.00	0.19	124.32	1,274.98	-3.15	-0.10	-3.15	0.13	-0.08	-29.04
1,300.00	0.17	151.74	1,299.98	-3.20	-0.05	-3.20	0.35	-0.08	109.68
1,325.00	0.11	146.36	1,324.98	-3.26	-0.01	-3.26	0.25	-0.24	-21.52
1,350.00	0.18	189.62	1,349.98	-3.31	-0.01	-3.31	0.50	0.28	173.04
1,375.00	0.16	156.35	1,374.98	-3.39	0.00	-3.39	0.40	-0.08	-133.08
1,400.00	0.19	154.77	1,399.98	-3.45	0.03	-3.45	0.12	0.12	-6.32
1,425.00	0.21	159.16	1,424.98	-3.54	0.07	-3.54	0.10	0.08	17.56
1,450.00	0.24	158.87	1,449.98	-3.63	0.10	-3.63	0.12	0.12	-1.16
1,475.00	0.24	161.99	1,474.98	-3.73	0.14	-3.73	0.05	0.00	12.48
1,500.00	0.25	146.54	1,499.98	-3.82	0.18	-3.82	0.27	0.04	-61.80
1,525.00	0.22	134.02	1,524.98	-3.90	0.25	-3.90	0.24	-0.12	-50.08
1,550.00	0.19	86.20	1,549.98	-3.93	0.32	-3.93	0.67	-0.12	-191.28
1,575.00	0.18	100.93	1,574.98	-3.93	0.40	-3.94	0.19	-0.04	58.92
1,600.00	0.14	124.26	1,599.98	-3.96	0.47	-3.96	0.30	-0.16	93.32
1,625.00	0.15	143.11	1,624.98	-4.00	0.51	-4.00	0.19	0.04	75.40
1,650.00	0.22	126.32	1,649.98	-4.06	0.57	-4.06	0.35	0.28	-67.16
1,675.00	0.17	125.51	1,674.98	-4.11	0.64	-4.11	0.20	-0.20	-3.24
1,700.00	0.22	84.72	1,699.98	-4.12	0.72	-4.13	0.58	0.20	-163.16
1,725.00	0.26	91.45	1,724.98	-4.12	0.82	-4.12	0.20	0.16	26.92
1,750.00	0.27	78.74	1,749.98	-4.11	0.94	-4.11	0.24	0.04	-50.84
1,775.00	0.40	70.42	1,774.98	-4.07	1.08	-4.07	0.55	0.52	-33.28
1,800.00	0.58	73.34	1,799.98	-4.01	1.28	-4.01	0.73	0.72	11.68
1,825.00	0.87	70.12	1,824.98	-3.90	1.58	-3.91	1.17	1.16	-12.88
1,850.00	0.91	72.46	1,849.97	-3.78	1.95	-3.79	0.22	0.16	9.36
1,875.00	0.99	74.15	1,874.97	-3.66	2.34	-3.67	0.34	0.32	6.76
1,900.00	1.12	76.88	1,899.97	-3.55	2.79	-3.56	0.56	0.52	10.92
1,925.00	1.31	80.00	1,924.96	-3.44	3.31	-3.45	0.80	0.76	12.48
1,950.00	1.41	78.21	1,949.95	-3.33	3.89	-3.34	0.43	0.40	-7.16
1,975.00	1.43	79.37	1,974.95	-3.21	4.50	-3.22	0.14	0.08	4.64
2,000.00	1.57	74.69	1,999.94	-3.06	5.14	-3.08	0.74	0.56	-18.72
2,025.00	1.57	77.13	2,024.93	-2.89	5.80	-2.91	0.27	0.00	9.76
2,050.00	1.66	78.54	2,049.92	-2.75	6.49	-2.77	0.39	0.36	5.64
2,075.00	1.59	78.60	2,074.91	-2.61	7.18	-2.63	0.28	-0.28	0.24
2,100.00	1.70	79.96	2,099.90	-2.47	7.89	-2.50	0.47	0.44	5.44
2,125.00	1.73	75.47	2,124.89	-2.31	8.62	-2.34	0.55	0.12	-17.96
2,150.00	1.68	75.63	2,149.87	-2.13	9.34	-2.15	0.20	-0.20	0.64
2,175.00	1.56	70.93	2,174.86	-1.93	10.02	-1.95	0.72	-0.48	-18.80
2,200.00	1.67	73.15	2,199.85	-1.71	10.69	-1.74	0.51	0.44	8.88
2,225.00	1.73	73.45	2,224.84	-1.50	11.40	-1.53	0.24	0.24	1.20
2,250.00	1.75	70.37	2,249.83	-1.26	12.12	-1.30	0.38	0.08	-12.32
2,275.00	1.65	74.85	2,274.82	-1.04	12.82	-1.08	0.67	-0.40	17.92

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2,300.00	1.63	77.88	2,299.81	-0.87	13.52	-0.91	0.36	-0.08	12.12
2,325.00	1.60	74.60	2,324.80	-0.70	14.20	-0.74	0.39	-0.12	-13.12
2,350.00	1.62	72.28	2,349.79	-0.50	14.88	-0.55	0.27	0.08	-9.28
2,375.00	1.51	76.35	2,374.78	-0.32	15.53	-0.36	0.63	-0.44	16.28
2,400.00	1.47	75.37	2,399.77	-0.16	16.16	-0.20	0.19	-0.16	-3.92
2,425.00	1.50	75.65	2,424.76	0.01	16.79	-0.04	0.12	0.12	1.12
2,450.00	1.39	76.05	2,449.76	0.16	17.40	0.11	0.44	-0.44	1.60
2,475.00	1.38	78.21	2,474.75	0.29	17.99	0.24	0.21	-0.04	8.64
2,500.00	1.44	74.89	2,499.74	0.44	18.59	0.38	0.41	0.24	-13.28
2,525.00	1.33	74.81	2,524.73	0.60	19.17	0.54	0.44	-0.44	-0.32
2,550.00	1.40	74.69	2,549.73	0.75	19.75	0.69	0.28	0.28	-0.48
2,575.00	1.41	71.55	2,574.72	0.93	20.33	0.87	0.31	0.04	-12.56
2,600.00	1.30	71.67	2,599.71	1.12	20.89	1.05	0.44	-0.44	0.48
2,625.00	1.33	76.09	2,624.71	1.28	21.45	1.21	0.42	0.12	17.68
2,650.00	1.36	75.07	2,649.70	1.42	22.01	1.36	0.15	0.12	-4.08
2,675.00	1.18	75.42	2,674.69	1.56	22.55	1.50	0.72	-0.72	1.40
2,700.00	0.99	72.02	2,699.69	1.69	23.00	1.63	0.80	-0.76	-13.60
2,725.00	0.96	80.35	2,724.69	1.80	23.42	1.73	0.58	-0.12	33.32
2,750.00	0.95	71.09	2,749.68	1.90	23.82	1.83	0.62	-0.04	-37.04
2,760.30	0.88	78.86	2,759.98	1.94	23.98	1.87	1.38	-0.68	75.44
Tie-In to Scientific Gyro									
2,856.00	1.10	86.70	2,855.67	2.14	25.61	2.06	0.27	0.23	8.19
First TDS MWD Survey									
2,918.00	1.50	151.90	2,917.65	1.45	26.59	1.38	2.32	0.65	105.16
2,979.00	1.80	159.20	2,978.63	-0.15	27.31	-0.23	0.60	0.49	11.97
3,074.00	1.50	156.00	3,073.59	-2.68	28.34	-2.76	0.33	-0.32	-3.37
3,168.00	2.20	184.10	3,167.54	-5.60	28.71	-5.68	1.20	0.74	29.89
3,262.00	1.90	183.60	3,261.48	-8.95	28.49	-9.04	0.32	-0.32	-0.53
3,356.00	1.70	187.40	3,355.43	-11.89	28.21	-11.98	0.25	-0.21	4.04
3,449.00	3.30	172.50	3,448.34	-15.91	28.38	-16.00	1.84	1.72	-16.02
3,542.00	3.10	172.60	3,541.20	-21.06	29.06	-21.15	0.22	-0.22	0.11
3,635.00	2.60	171.10	3,634.08	-25.64	29.71	-25.73	0.54	-0.54	-1.61
3,729.00	3.60	183.00	3,727.95	-30.69	29.88	-30.78	1.26	1.06	12.66
3,824.00	3.30	184.40	3,822.77	-36.40	29.52	-36.49	0.33	-0.32	1.47
3,917.00	3.00	180.70	3,915.63	-41.50	29.28	-41.59	0.39	-0.32	-3.98
4,010.00	2.90	180.20	4,008.51	-46.29	29.24	-46.37	0.11	-0.11	-0.54
4,105.00	4.10	192.30	4,103.33	-52.01	28.51	-52.09	1.48	1.26	12.74
4,199.00	4.10	191.50	4,197.09	-58.58	27.12	-58.66	0.06	0.00	-0.85
4,293.00	4.20	188.20	4,290.84	-65.28	25.96	-65.36	0.28	0.11	-3.51
4,387.00	3.30	209.00	4,384.65	-71.06	24.16	-71.13	1.72	-0.96	22.13
4,482.00	3.50	210.50	4,479.48	-75.95	21.36	-76.01	0.23	0.21	1.58

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

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)	
4,576.00	2.50	204.90	4,573.35	-80.28	19.04	-80.34	1.11	-1.06	-5.96	
4,671.00	2.80	202.50	4,668.25	-84.30	17.28	-84.35	0.34	0.32	-2.53	
4,765.00	2.10	171.30	4,762.17	-88.13	16.67	-88.18	1.57	-0.74	-33.19	
4,860.00	2.00	172.00	4,857.10	-91.49	17.16	-91.54	0.11	-0.11	0.74	
4,953.00	1.90	170.70	4,950.05	-94.62	17.63	-94.67	0.12	-0.11	-1.40	
5,048.00	2.70	182.00	5,044.97	-98.41	17.81	-98.46	0.96	0.84	11.89	
5,142.00	2.90	182.80	5,138.86	-103.00	17.62	-103.05	0.22	0.21	0.85	
5,236.00	2.90	180.90	5,232.74	-107.75	17.46	-107.80	0.10	0.00	-2.02	
5,331.00	2.90	181.70	5,327.62	-112.55	17.35	-112.60	0.04	0.00	0.84	
5,425.00	2.70	181.20	5,421.51	-117.14	17.24	-117.19	0.21	-0.21	-0.53	
5,518.00	2.60	181.10	5,514.41	-121.44	17.15	-121.49	0.11	-0.11	-0.11	
5,613.00	2.50	181.40	5,609.31	-125.67	17.06	-125.72	0.11	-0.11	0.32	
5,707.00	1.30	199.50	5,703.26	-128.72	16.65	-128.77	1.41	-1.28	19.26	
5,801.00	0.60	231.20	5,797.25	-130.04	15.91	-130.08	0.90	-0.74	33.72	
5,833.00	0.50	256.40	5,829.25	-130.17	15.65	-130.22	0.81	-0.31	78.75	
5,864.00	0.70	279.20	5,860.25	-130.18	15.33	-130.22	0.99	0.65	73.55	
5,895.00	2.00	346.80	5,891.24	-129.62	15.02	-129.66	5.97	4.19	218.06	
5,926.00	5.30	351.60	5,922.17	-127.68	14.69	-127.72	10.68	10.65	15.48	
5,957.00	9.20	354.90	5,952.92	-123.79	14.26	-123.83	12.65	12.58	10.65	
5,989.00	12.90	354.60	5,984.32	-117.68	13.69	-117.72	11.56	11.56	-0.94	
6,020.00	16.60	353.50	6,014.29	-109.84	12.87	-109.87	11.97	11.94	-3.55	
6,052.00	20.10	354.20	6,044.66	-99.82	11.79	-99.85	10.96	10.94	2.19	
6,083.00	23.60	356.50	6,073.43	-88.32	10.87	-88.35	11.62	11.29	7.42	
6,114.00	27.00	357.70	6,101.45	-75.09	10.21	-75.12	11.09	10.97	3.87	
6,146.00	30.50	357.80	6,129.50	-59.72	9.61	-59.74	10.94	10.94	0.31	
6,178.00	33.40	359.60	6,156.65	-42.79	9.24	-42.82	9.54	9.06	5.63	
6,209.00	36.50	0.80	6,182.06	-25.03	9.31	-25.06	10.24	10.00	3.87	
6,240.00	39.30	1.10	6,206.52	-6.00	9.62	-6.03	9.05	9.03	0.97	
6,272.00	42.50	1.40	6,230.70	14.95	10.08	14.92	10.02	10.00	0.94	
6,304.00	44.80	1.30	6,253.85	37.03	10.60	37.00	7.19	7.19	-0.31	
6,335.00	45.60	1.10	6,275.70	59.02	11.06	58.99	2.62	2.58	-0.65	
6,366.00	45.90	1.00	6,297.33	81.22	11.47	81.19	0.99	0.97	-0.32	
6,398.00	46.10	1.20	6,319.56	104.24	11.91	104.20	0.77	0.63	0.63	
6,430.00	46.30	0.90	6,341.71	127.33	12.33	127.29	0.92	0.63	-0.94	
6,461.00	46.50	1.40	6,363.09	149.77	12.78	149.73	1.33	0.65	1.61	
6,492.00	46.60	1.50	6,384.40	172.27	13.35	172.23	0.40	0.32	0.32	
6,508.83	47.70	1.07	6,395.85	184.61	13.63	184.57	6.82	6.56	-2.54	
As-Drilled PP										
6,524.00	48.70	0.70	6,405.96	195.91	13.81	195.87	6.82	6.57	-2.46	
6,555.00	51.80	358.80	6,425.78	219.74	13.69	219.70	11.05	10.00	-6.13	
6,586.00	54.50	357.40	6,444.37	244.53	12.86	244.49	9.43	8.71	-4.52	

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

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)
6,618.00	57.70	357.00	6,462.22	271.06	11.57	271.02	10.05	10.00	-1.25
6,648.00	61.80	357.60	6,477.33	296.94	10.35	296.91	13.78	13.67	2.00
6,680.00	66.30	358.90	6,491.33	325.69	9.48	325.66	14.53	14.06	4.06
6,711.00	70.30	359.50	6,502.79	354.48	9.08	354.46	13.03	12.90	1.94
6,743.00	72.80	0.00	6,512.91	384.84	8.94	384.81	7.95	7.81	1.56
6,774.00	75.10	0.20	6,521.48	414.63	9.00	414.60	7.45	7.42	0.65
6,809.00	77.90	0.40	6,529.65	448.66	9.18	448.63	8.02	8.00	0.57
6,840.00	81.00	0.70	6,535.33	479.13	9.47	479.10	10.05	10.00	0.97
6,871.00	85.10	0.80	6,539.08	509.89	9.87	509.86	13.23	13.23	0.32
6,903.00	89.20	0.80	6,540.67	541.84	10.32	541.81	12.81	12.81	0.00
6,996.00	91.30	0.30	6,540.26	634.83	11.21	634.79	2.32	2.26	-0.54
7,090.00	89.30	0.10	6,539.77	728.82	11.54	728.79	2.14	-2.13	-0.21
7,184.00	89.60	0.40	6,540.67	822.82	11.95	822.78	0.45	0.32	0.32
7,277.00	90.20	0.40	6,540.84	915.81	12.60	915.77	0.65	0.65	0.00
7,372.00	88.70	0.00	6,541.75	1,010.81	12.93	1,010.76	1.63	-1.58	-0.42
7,465.00	89.20	0.00	6,543.45	1,103.79	12.93	1,103.75	0.54	0.54	0.00
7,559.00	89.50	0.30	6,544.52	1,197.78	13.17	1,197.74	0.45	0.32	0.32
7,653.00	89.50	0.00	6,545.34	1,291.78	13.42	1,291.73	0.32	0.00	-0.32
7,747.00	89.50	0.00	6,546.16	1,385.78	13.42	1,385.73	0.00	0.00	0.00
7,841.00	89.50	359.90	6,546.98	1,479.77	13.34	1,479.73	0.11	0.00	-0.11
7,935.00	89.40	359.60	6,547.88	1,573.77	12.93	1,573.72	0.34	-0.11	-0.32
8,028.00	89.80	359.50	6,548.53	1,666.76	12.20	1,666.72	0.44	0.43	-0.11
8,121.00	90.20	359.70	6,548.53	1,759.76	11.55	1,759.72	0.48	0.43	0.22
8,214.00	90.80	359.90	6,547.72	1,852.76	11.22	1,852.71	0.68	0.65	0.22
8,308.00	89.80	359.40	6,547.23	1,946.75	10.65	1,946.71	1.19	-1.06	-0.53
8,402.00	90.50	359.60	6,546.98	2,040.75	9.83	2,040.71	0.77	0.74	0.21
8,496.00	89.30	359.60	6,547.15	2,134.74	9.17	2,134.71	1.28	-1.28	0.00
8,590.00	90.10	0.00	6,547.64	2,228.74	8.85	2,228.70	0.95	0.85	0.43
8,684.00	89.50	0.00	6,547.97	2,322.74	8.85	2,322.70	0.64	-0.64	0.00
8,777.00	90.10	0.30	6,548.29	2,415.74	9.09	2,415.70	0.72	0.65	0.32
8,873.00	89.40	0.00	6,548.71	2,511.73	9.34	2,511.70	0.79	-0.73	-0.31
8,968.00	89.80	359.90	6,549.37	2,606.73	9.26	2,606.69	0.43	0.42	-0.11
9,062.00	89.50	359.50	6,549.95	2,700.73	8.77	2,700.69	0.53	-0.32	-0.43
9,155.00	89.70	359.70	6,550.60	2,793.72	8.12	2,793.69	0.30	0.22	0.22
9,249.00	88.80	358.70	6,551.83	2,887.70	6.80	2,887.67	1.43	-0.96	-1.06
9,343.00	89.20	359.10	6,553.47	2,981.67	5.00	2,981.64	0.60	0.43	0.43
9,438.00	89.50	359.30	6,554.55	3,076.66	3.67	3,076.63	0.38	0.32	0.21
9,532.00	89.60	359.50	6,555.28	3,170.65	2.69	3,170.63	0.24	0.11	0.21
9,625.00	89.80	359.30	6,555.77	3,263.64	1.72	3,263.62	0.30	0.22	-0.22
9,720.00	90.60	359.70	6,555.44	3,358.64	0.89	3,358.62	0.94	0.84	0.42
9,813.00	91.20	0.10	6,553.98	3,451.63	0.72	3,451.61	0.78	0.65	0.43

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,907.00	89.50	0.00	6,553.40	3,545.62	0.81	3,545.60	1.81	-1.81	-0.11
10,002.00	90.40	1.80	6,553.49	3,640.60	2.30	3,640.58	2.12	0.95	1.89
10,097.00	90.00	0.40	6,553.16	3,735.58	4.12	3,735.55	1.53	-0.42	-1.47
10,191.00	90.40	359.20	6,552.83	3,829.58	3.79	3,829.55	1.35	0.43	-1.28
10,285.00	91.10	359.70	6,551.60	3,923.57	2.89	3,923.54	0.92	0.74	0.53
10,379.00	89.80	357.60	6,550.86	4,017.53	0.68	4,017.51	2.63	-1.38	-2.23
10,472.00	90.30	357.90	6,550.78	4,110.46	-2.97	4,110.45	0.63	0.54	0.32
10,566.00	90.50	358.10	6,550.12	4,204.40	-6.25	4,204.40	0.30	0.21	0.21
10,660.00	90.60	358.00	6,549.22	4,298.34	-9.45	4,298.35	0.15	0.11	-0.11
10,753.00	89.00	357.90	6,549.54	4,391.28	-12.78	4,391.30	1.72	-1.72	-0.11
10,848.00	89.50	359.40	6,550.79	4,486.24	-15.02	4,486.26	1.66	0.53	1.58
10,942.00	90.00	359.80	6,551.20	4,580.24	-15.67	4,580.26	0.68	0.53	0.43
11,037.00	90.20	359.70	6,551.03	4,675.23	-16.09	4,675.26	0.24	0.21	-0.11
11,131.00	90.70	0.00	6,550.29	4,769.23	-16.33	4,769.26	0.62	0.53	0.32
11,225.00	91.10	0.60	6,548.82	4,863.22	-15.84	4,863.24	0.77	0.43	0.64
11,319.00	90.10	359.70	6,547.83	4,957.21	-15.60	4,957.23	1.43	-1.06	-0.96
11,412.00	90.50	0.00	6,547.35	5,050.21	-15.84	5,050.23	0.54	0.43	0.32
11,506.00	90.90	0.80	6,546.20	5,144.20	-15.18	5,144.22	0.95	0.43	0.85
11,601.00	89.20	0.30	6,546.11	5,239.19	-14.27	5,239.21	1.87	-1.79	-0.53
11,695.00	89.40	359.40	6,547.26	5,333.18	-14.52	5,333.20	0.98	0.21	-0.96
11,789.00	89.80	359.90	6,547.92	5,427.18	-15.09	5,427.20	0.68	0.43	0.53
11,883.00	90.70	0.10	6,547.51	5,521.17	-15.09	5,521.19	0.98	0.96	0.21
11,977.00	90.50	359.70	6,546.52	5,615.17	-15.26	5,615.19	0.48	-0.21	-0.43
12,072.00	91.50	0.00	6,544.87	5,710.15	-15.50	5,710.17	1.10	1.05	0.32
12,167.00	90.20	359.20	6,543.46	5,805.14	-16.17	5,805.16	1.61	-1.37	-0.84
12,260.00	90.90	358.70	6,542.56	5,898.12	-17.87	5,898.14	0.92	0.75	-0.54
12,353.00	90.70	358.90	6,541.27	5,991.09	-19.82	5,991.12	0.30	-0.22	0.22
12,378.00	90.20	359.10	6,541.07	6,016.08	-20.26	6,016.12	2.15	-2.00	0.80
Last TDS MWD Survey									
12,434.00	90.20	359.10	6,540.87	6,072.07	-21.14	6,072.11	0.00	0.00	0.00
Projection to Bit/TD									



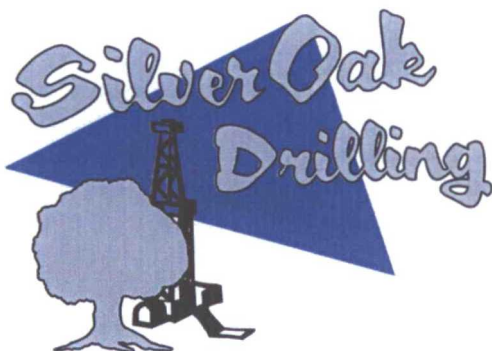
TDS
Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A
Project:	Lea County, NM (NAD-27 2015)	TVD Reference:	KB @ 4118.00usft (Silver Oak #3)
Site:	Flat Head Federal Com #27H	MD Reference:	KB @ 4118.00usft (Silver Oak #3)
Well:	SHL: 1170' FNL, 990' FEL, Sec 14, T17S, R32E, Unit A	North Reference:	Grid
Wellbore:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Survey Calculation Method:	Minimum Curvature
Design:	BHL: 350' FNL, 970' FEL, Sec 11, T17S, R32E, Unit A	Database:	EDM 5000.1 Single User Db

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,760.30	2,759.98	1.94	23.98	Tie-In to Scientific Gyro
2,856.00	2,855.67	2.14	25.61	First TDS MWD Survey
6,508.83	6,395.85	184.61	13.63	As-Drilled PP
12,378.00	6,541.07	6,016.08	-20.26	Last TDS MWD Survey
12,434.00	6,540.87	6,072.07	-21.14	Projection to Bit/TD

Checked By: _____	Approved By: _____	Date: _____
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PO Box 1370
Artesia, NM 88211-1370
(575) 748-1288

December 27, 2016

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

RE: Flat Head Fed Com 27H
1170' FNL & 990' FEL
Sec. 14, T17S, R32E
Lea County, New Mexico

Dear Sir,

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

Very truly yours,

A handwritten signature in black ink, appearing to read "Chris Graham".

Chris Graham
Asst. Operations Manager

State of New Mexico }
County of Eddy }

The foregoing was acknowledged before me this 27th day of December, 2016.

A handwritten signature in black ink, appearing to read "Regina L. Garner".

Notary Public



FLAT HEAD FED COM #27 H

Date	Depth	Deviation	Direction
12/6/2016	204	0.60	0.00
12/6/2016	527	0.50	0.00
12/6/2016	950	0.30	0.00
12/6/2016	1098	0.20	0.00
12/8/2016	1575	0.20	0.00
12/8/2016	2010	1.40	0.00
12/8/2016	2236	0.70	0.00
12/9/2016	2725	0.90	0.00
12/10/2016	2856	1.10	86.70
12/10/2016	2918	1.50	151.90
12/10/2016	2979	1.80	159.20
12/10/2016	3074	1.50	156.00
12/10/2016	3168	2.20	184.10
12/10/2016	3262	1.90	183.60
12/10/2016	3356	1.70	187.40
12/10/2016	3449	3.30	172.50
12/11/2016	3635	2.60	171.10
12/11/2016	3729	3.60	183.00
12/11/2016	3824	3.30	184.40
12/11/2016	3917	3.00	180.70
12/11/2016	4010	2.90	180.20
12/11/2016	4105	4.10	192.30
12/11/2016	4199	4.10	191.50
12/11/2016	4293	4.20	191.50
12/11/2016	4387	3.30	209.00
12/11/2016	4482	3.50	210.50
12/11/2016	4576	2.50	204.90
12/11/2016	4671	2.80	202.50
12/11/2016	4765	2.10	171.30
12/12/2016	4860	2.00	172.00
12/12/2016	4953	1.90	170.70
12/12/2016	5048	2.70	182.00
12/12/2016	5142	2.90	182.80
12/12/2016	5246	2.90	180.90
12/12/2016	5331	2.90	181.70
12/12/2016	5425	2.70	181.20
12/12/2016	5518	2.60	181.20
12/12/2016	5613	2.50	181.40
12/12/2016	5707	1.30	199.50
12/12/2016	5801	0.60	231.20
12/12/2016	5864	0.70	279.20
12/12/2016	5926	5.30	351.60
12/12/2016	5989	12.90	354.60

Date	Depth	Deviation	Direction
12/12/2016	6020	16.60	353.50
12/13/2016	6052	20.10	354.20
12/13/2016	6083	23.60	356.60
12/13/2016	6114	30.50	357.80
12/13/2016	6148	30.50	357.80
12/13/2016	6178	33.40	359.60
12/13/2016	6272	42.50	1.40
12/13/2016	6304	44.50	1.30
12/13/2016	6366	45.90	10.00
12/13/2016	6398	46.10	12.00
12/13/2016	6430	46.30	0.90
12/13/2016	6492	46.50	1.40
12/13/2016	6524	48.70	0.70
12/13/2016	6586	54.50	357.40
12/13/2016	6618	57.70	357.00
12/13/2016	6648	61.80	357.60
12/13/2016	6680	66.30	358.90
12/13/2016	6711	70.30	359.50
12/13/2016	6743	72.80	0.00
12/13/2016	6774	75.10	0.20
12/14/2016	6809	77.90	0.40
12/14/2016	6840	81.00	0.70
12/14/2016	6871	85.10	0.80
12/14/2016	6903	89.20	0.80
12/14/2016	6996	91.30	0.30
12/14/2016	7090	89.30	0.10
12/14/2016	7184	89.60	0.40
12/14/2016	7277	90.20	0.40
12/14/2016	7372	88.70	360.00
12/15/2016	7465	89.20	360.00
12/15/2016	7559	89.50	0.30
12/15/2016	7653	89.50	360.00
12/15/2016	7747	89.50	360.00
12/15/2016	7841	89.50	359.90
12/15/2016	7935	89.40	359.60
12/15/2016	8028	89.80	359.50
12/15/2016	8121	90.20	359.70
12/15/2016	8214	90.80	359.90
12/15/2016	8308	89.80	359.40
12/15/2016	8402	90.50	359.60
12/15/2016	8496	89.30	359.60
12/15/2016	8590	90.10	0.00
12/16/2016	8777	90.10	0.30
12/16/2016	8873	89.40	360.00
12/16/2016	8968	89.80	359.90

Date	Depth	Deviation	Direction
12/16/2016	9062	89.50	359.50
12/16/2016	9155	89.70	359.70
12/16/2016	9244	88.80	358.70
12/16/2016	9343	89.20	359.10
12/16/2016	9438	89.50	359.30
12/16/2016	9532	89.60	359.50
12/16/2016	9625	89.80	359.30
12/16/2016	9720	90.60	359.70
12/16/2016	9813	91.20	0.10
12/16/2016	9907	89.50	360.00
12/17/2016	10002	90.40	1.80
12/17/2016	10097	90.00	0.40
12/17/2016	10191	90.40	359.20
12/17/2016	10285	91.10	359.70
12/18/2016	10472	90.30	357.90
12/18/2016	10566	90.50	358.10
12/18/2016	10660	90.60	358.00
12/18/2016	10753	89.00	0.00
12/18/2016	10848	89.50	359.40
12/18/2016	10942	90.00	359.80
12/18/2016	11037	90.20	359.70
12/18/2016	11131	90.70	0.00
12/18/2016	11225	91.10	0.60
12/18/2016	11319	90.10	359.70
12/18/2016	11412	90.50	0.00
12/19/2016	11506	90.90	0.80
12/19/2016	11601	89.30	0.30
12/19/2016	11695	89.40	359.40
12/21/2016	11789	89.80	359.90
12/22/2016	12072	91.50	0.00
12/22/2016	12167	90.20	359.20
12/22/2016	12260	90.90	358.70
12/22/2016	12353	90.70	358.90
12/22/2016	12378	90.20	359.10