



OCD – HOBBS  
04/16/2020  
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## **COG Operating LLC**

Lea County, NM (NAD27 NME)

Brot Helm Federal Com

603H

OH / 65032

Design: Surveys (McVay 8)

## **Standard Survey Report**

05 November, 2019



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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

Site		Brot Helm Federal Com			
Site Position:		Northing:	430,515.90 usft	Latitude:	32° 10' 49.593475 N
From:	Map	Easting:	776,731.20 usft	Longitude:	103° 26' 20.027429 W
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.48 °

Well	603H					
Well Position	+N/-S	0.00 usft	Northing:	430,515.90 usft	Latitude:	32° 10' 49.593475 N
	+E/-W	0.00 usft	Easting:	776,731.20 usft	Longitude:	103° 26' 20.027429 W
Position Uncertainty		1.00 usft	Wellhead Elevation:	usft	Ground Level:	3,416.90 usft

<b>Wellbore</b>	OH / 65032				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	MVHD	9/12/2019	6.58	59.80	47,775.67905765

<b>Design</b>	Surveys (McVay 8)				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	179.06	

<b>Survey Program</b>	<b>Date</b>	11/5/2019			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
100.00	11,865.00	SDI Gyro Surveys (OH / 65032)	Scientific Keeper	Scientific Drilling Intl. Standard Wireline Keeper	
11,973.00	22,707.00	Phoenix MWD Surveys (OH / 65032)	MWD+HRGM	OWSG MWD + HRGM	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.15	240.16	100.00	-0.07	-0.11	0.06	0.15	0.15	0.00	
125.00	0.18	236.83	125.00	-0.10	-0.17	0.10	0.13	0.12	-13.32	
150.00	0.22	253.82	150.00	-0.14	-0.25	0.13	0.28	0.16	67.96	
175.00	0.23	235.03	175.00	-0.18	-0.34	0.17	0.30	0.04	-75.16	
200.00	0.23	228.79	200.00	-0.24	-0.42	0.23	0.10	0.00	-24.96	
225.00	0.17	230.72	225.00	-0.30	-0.49	0.29	0.24	-0.24	7.72	
250.00	0.15	220.46	250.00	-0.35	-0.54	0.34	0.14	-0.08	-41.04	
275.00	0.14	200.25	275.00	-0.40	-0.57	0.39	0.21	-0.04	-80.84	
300.00	0.12	191.23	300.00	-0.45	-0.58	0.44	0.11	-0.08	-36.08	

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
325.00	0.23	130.60	325.00	-0.51	-0.55	0.50	0.80	0.44	-242.52
350.00	0.29	121.35	350.00	-0.58	-0.46	0.57	0.29	0.24	-37.00
375.00	0.32	115.81	375.00	-0.64	-0.34	0.64	0.17	0.12	-22.16
400.00	0.32	114.81	400.00	-0.70	-0.22	0.70	0.02	0.00	-4.00
425.00	0.29	106.09	425.00	-0.75	-0.09	0.75	0.22	-0.12	-34.88
450.00	0.32	112.86	450.00	-0.79	0.03	0.79	0.19	0.12	27.08
475.00	0.29	109.57	475.00	-0.84	0.16	0.84	0.14	-0.12	-13.16
500.00	0.31	115.73	500.00	-0.89	0.28	0.90	0.15	0.08	24.64
525.00	0.29	117.35	525.00	-0.95	0.40	0.96	0.09	-0.08	6.48
550.00	0.25	90.70	550.00	-0.98	0.51	0.99	0.52	-0.16	-106.60
575.00	0.28	88.35	575.00	-0.98	0.62	0.99	0.13	0.12	-9.40
600.00	0.26	80.14	600.00	-0.97	0.74	0.98	0.17	-0.08	-32.84
625.00	0.27	78.59	624.99	-0.95	0.85	0.96	0.05	0.04	-6.20
650.00	0.28	78.54	649.99	-0.92	0.97	0.94	0.04	0.04	-0.20
675.00	0.32	70.36	674.99	-0.89	1.10	0.90	0.23	0.16	-32.72
700.00	0.36	63.34	699.99	-0.83	1.23	0.85	0.23	0.16	-28.08
725.00	0.34	79.79	724.99	-0.78	1.37	0.80	0.41	-0.08	65.80
750.00	0.47	84.51	749.99	-0.76	1.55	0.78	0.54	0.52	18.88
775.00	0.38	80.07	774.99	-0.73	1.73	0.76	0.38	-0.36	-17.76
800.00	0.36	85.84	799.99	-0.71	1.89	0.74	0.17	-0.08	23.08
825.00	0.40	63.46	824.99	-0.67	2.05	0.70	0.61	0.16	-89.52
850.00	0.43	57.77	849.99	-0.58	2.21	0.61	0.20	0.12	-22.76
875.00	0.48	45.99	874.99	-0.46	2.36	0.49	0.42	0.20	-47.12
900.00	0.48	43.69	899.99	-0.31	2.51	0.35	0.08	0.00	-9.20
925.00	0.48	44.83	924.99	-0.16	2.66	0.20	0.04	0.00	4.56
950.00	0.53	44.10	949.99	0.00	2.81	0.05	0.20	0.20	-2.92
975.00	0.56	40.35	974.99	0.18	2.97	-0.13	0.19	0.12	-15.00
1,000.00	0.71	38.57	999.98	0.39	3.15	-0.34	0.61	0.60	-7.12
1,025.00	0.77	37.96	1,024.98	0.64	3.35	-0.59	0.24	0.24	-2.44
1,050.00	0.76	41.84	1,049.98	0.90	3.56	-0.84	0.21	-0.04	15.52
1,075.00	0.73	46.12	1,074.98	1.13	3.78	-1.07	0.25	-0.12	17.12
1,100.00	0.64	41.75	1,099.98	1.35	3.99	-1.28	0.42	-0.36	-17.48
1,125.00	0.57	36.24	1,124.97	1.55	4.16	-1.48	0.36	-0.28	-22.04
1,150.00	0.45	18.79	1,149.97	1.75	4.26	-1.68	0.78	-0.48	-69.80
1,175.00	0.34	359.16	1,174.97	1.91	4.29	-1.84	0.69	-0.44	-78.52
1,200.00	0.33	340.75	1,199.97	2.06	4.27	-1.98	0.43	-0.04	-73.64
1,225.00	0.39	343.08	1,224.97	2.20	4.22	-2.13	0.25	0.24	9.32
1,250.00	0.32	355.79	1,249.97	2.36	4.19	-2.29	0.42	-0.28	50.84
1,275.00	0.31	1.51	1,274.97	2.49	4.19	-2.42	0.13	-0.04	22.88
1,300.00	0.21	342.37	1,299.97	2.60	4.18	-2.54	0.52	-0.40	-76.56
1,325.00	0.14	333.18	1,324.97	2.67	4.15	-2.61	0.30	-0.28	-36.76
1,350.00	0.22	318.25	1,349.97	2.74	4.10	-2.67	0.37	0.32	-59.72
1,375.00	0.24	326.10	1,374.97	2.82	4.04	-2.75	0.15	0.08	31.40

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<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
1,400.00	0.21	321.50	1,399.97	2.90	3.98	-2.83	0.14	-0.12	-18.40
1,425.00	0.12	315.86	1,424.97	2.95	3.94	-2.89	0.37	-0.36	-22.56
1,450.00	0.16	196.27	1,449.97	2.94	3.91	-2.87	0.97	0.16	-478.36
1,475.00	0.40	185.76	1,474.97	2.82	3.89	-2.75	0.98	0.96	-42.04
1,500.00	0.39	184.29	1,499.97	2.64	3.88	-2.58	0.06	-0.04	-5.88
1,525.00	0.47	177.60	1,524.97	2.46	3.87	-2.39	0.38	0.32	-26.76
1,550.00	0.55	181.26	1,549.97	2.23	3.87	-2.17	0.35	0.32	14.64
1,575.00	0.61	183.29	1,574.97	1.98	3.86	-1.92	0.25	0.24	8.12
1,600.00	0.59	190.11	1,599.96	1.72	3.83	-1.66	0.30	-0.08	27.28
1,625.00	0.55	193.98	1,624.96	1.48	3.78	-1.42	0.22	-0.16	15.48
1,650.00	0.55	196.26	1,649.96	1.25	3.72	-1.19	0.09	0.00	9.12
1,675.00	0.61	196.51	1,674.96	1.00	3.65	-0.94	0.24	0.24	1.00
1,700.00	0.56	193.13	1,699.96	0.76	3.58	-0.70	0.24	-0.20	-13.52
1,725.00	0.51	198.23	1,724.96	0.53	3.52	-0.48	0.28	-0.20	20.40
1,750.00	0.48	183.79	1,749.96	0.32	3.48	-0.27	0.51	-0.12	-57.76
1,775.00	0.54	183.51	1,774.96	0.10	3.46	-0.04	0.24	0.24	-1.12
1,800.00	0.51	180.86	1,799.96	-0.13	3.46	0.18	0.15	-0.12	-10.60
1,825.00	0.52	179.33	1,824.95	-0.35	3.46	0.41	0.07	0.04	-6.12
1,850.00	0.54	179.92	1,849.95	-0.58	3.46	0.64	0.08	0.08	2.36
1,875.00	0.55	174.44	1,874.95	-0.82	3.47	0.88	0.21	0.04	-21.92
1,900.00	0.57	179.03	1,899.95	-1.06	3.48	1.12	0.20	0.08	18.36
1,925.00	0.55	181.40	1,924.95	-1.31	3.48	1.37	0.12	-0.08	9.48
1,950.00	0.53	182.85	1,949.95	-1.54	3.47	1.60	0.10	-0.08	5.80
1,975.00	0.45	184.56	1,974.95	-1.76	3.46	1.81	0.33	-0.32	6.84
2,000.00	0.47	184.98	1,999.95	-1.96	3.44	2.01	0.08	0.08	1.68
2,025.00	0.47	179.32	2,024.95	-2.16	3.43	2.22	0.19	0.00	-22.64
2,050.00	0.43	178.99	2,049.95	-2.36	3.44	2.41	0.16	-0.16	-1.32
2,075.00	0.38	176.35	2,074.95	-2.54	3.44	2.59	0.21	-0.20	-10.56
2,100.00	0.42	170.18	2,099.94	-2.71	3.47	2.76	0.23	0.16	-24.68
2,125.00	0.42	163.52	2,124.94	-2.89	3.51	2.94	0.20	0.00	-26.64
2,150.00	0.41	164.84	2,149.94	-3.06	3.56	3.12	0.06	-0.04	5.28
2,175.00	0.48	163.09	2,174.94	-3.25	3.61	3.31	0.29	0.28	-7.00
2,200.00	0.49	159.92	2,199.94	-3.45	3.68	3.51	0.11	0.04	-12.68
2,225.00	0.44	161.54	2,224.94	-3.64	3.74	3.70	0.21	-0.20	6.48
2,250.00	0.45	165.34	2,249.94	-3.83	3.80	3.89	0.12	0.04	15.20
2,275.00	0.42	167.02	2,274.94	-4.01	3.85	4.07	0.13	-0.12	6.72
2,300.00	0.40	168.75	2,299.94	-4.18	3.88	4.25	0.09	-0.08	6.92
2,325.00	0.38	167.99	2,324.94	-4.35	3.92	4.41	0.08	-0.08	-3.04
2,350.00	0.43	168.29	2,349.94	-4.52	3.95	4.59	0.20	0.20	1.20
2,375.00	0.26	159.28	2,374.94	-4.67	3.99	4.73	0.71	-0.68	-36.04
2,400.00	0.26	154.47	2,399.94	-4.77	4.04	4.84	0.09	0.00	-19.24
2,425.00	0.27	154.06	2,424.94	-4.88	4.09	4.94	0.04	0.04	-1.64
2,450.00	0.19	149.92	2,449.94	-4.97	4.13	5.03	0.33	-0.32	-16.56

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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)
2,475.00	0.19	136.58	2,474.94	-5.03	4.18	5.10	0.18	0.00	-53.36
2,500.00	0.15	110.97	2,499.94	-5.07	4.24	5.14	0.34	-0.16	-102.44
2,525.00	0.20	92.30	2,524.94	-5.09	4.32	5.16	0.30	0.20	-74.68
2,550.00	0.43	38.36	2,549.94	-5.02	4.42	5.09	1.41	0.92	-215.76
2,575.00	1.08	26.26	2,574.93	-4.73	4.58	4.81	2.66	2.60	-48.40
2,600.00	1.39	25.05	2,599.93	-4.24	4.81	4.32	1.24	1.24	-4.84
2,625.00	1.39	27.29	2,624.92	-3.70	5.08	3.78	0.22	0.00	8.96
2,650.00	1.48	26.11	2,649.91	-3.14	5.36	3.23	0.38	0.36	-4.72
2,675.00	1.48	26.30	2,674.90	-2.56	5.65	2.65	0.02	0.00	0.76
2,700.00	1.50	27.55	2,699.90	-1.98	5.94	2.08	0.15	0.08	5.00
2,725.00	1.51	31.15	2,724.89	-1.41	6.26	1.51	0.38	0.04	14.40
2,750.00	1.60	29.98	2,749.88	-0.83	6.61	0.93	0.38	0.36	-4.68
2,775.00	1.59	32.68	2,774.87	-0.23	6.97	0.35	0.30	-0.04	10.80
2,800.00	1.60	34.85	2,799.86	0.35	7.36	-0.23	0.24	0.04	8.68
2,825.00	1.56	37.33	2,824.85	0.90	7.76	-0.78	0.32	-0.16	9.92
2,850.00	1.55	39.48	2,849.84	1.44	8.18	-1.30	0.24	-0.04	8.60
2,875.00	1.51	42.20	2,874.83	1.94	8.62	-1.80	0.33	-0.16	10.88
2,900.00	1.51	45.05	2,899.82	2.42	9.07	-2.27	0.30	0.00	11.40
2,925.00	1.52	48.45	2,924.81	2.87	9.56	-2.71	0.36	0.04	13.60
2,950.00	1.54	50.09	2,949.80	3.31	10.06	-3.14	0.19	0.08	6.56
2,975.00	1.57	50.84	2,974.80	3.74	10.58	-3.56	0.15	0.12	3.00
3,000.00	1.58	51.30	2,999.79	4.17	11.12	-3.99	0.06	0.04	1.84
3,025.00	1.63	51.76	3,024.78	4.60	11.67	-4.41	0.21	0.20	1.84
3,050.00	1.65	51.25	3,049.77	5.05	12.23	-4.85	0.10	0.08	-2.04
3,075.00	1.66	49.54	3,074.76	5.51	12.78	-5.30	0.20	0.04	-6.84
3,100.00	1.64	46.68	3,099.74	5.99	13.32	-5.77	0.34	-0.08	-11.44
3,125.00	1.61	46.39	3,124.73	6.48	13.83	-6.25	0.12	-0.12	-1.16
3,150.00	1.63	43.69	3,149.72	6.98	14.33	-6.74	0.32	0.08	-10.80
3,175.00	1.60	43.35	3,174.71	7.49	14.82	-7.24	0.13	-0.12	-1.36
3,200.00	1.58	44.86	3,199.71	7.99	15.30	-7.73	0.19	-0.08	6.04
3,225.00	1.56	44.20	3,224.70	8.47	15.78	-8.21	0.11	-0.08	-2.64
3,250.00	1.52	45.60	3,249.69	8.95	16.26	-8.68	0.22	-0.16	5.60
3,275.00	1.52	47.71	3,274.68	9.41	16.74	-9.13	0.22	0.00	8.44
3,300.00	1.42	49.87	3,299.67	9.83	17.22	-9.54	0.46	-0.40	8.64
3,325.00	1.28	47.62	3,324.66	10.22	17.66	-9.93	0.60	-0.56	-9.00
3,350.00	1.20	44.16	3,349.66	10.59	18.05	-10.29	0.44	-0.32	-13.84
3,375.00	1.15	42.43	3,374.65	10.97	18.40	-10.66	0.25	-0.20	-6.92
3,400.00	1.21	40.77	3,399.65	11.35	18.75	-11.04	0.28	0.24	-6.64
3,425.00	1.26	37.72	3,424.64	11.77	19.09	-11.45	0.33	0.20	-12.20
3,450.00	1.24	34.03	3,449.63	12.21	19.41	-11.89	0.33	-0.08	-14.76
3,475.00	1.16	34.15	3,474.63	12.64	19.70	-12.32	0.32	-0.32	0.48
3,500.00	1.23	32.97	3,499.62	13.08	19.99	-12.75	0.30	0.28	-4.72
3,525.00	1.79	20.48	3,524.62	13.67	20.27	-13.33	2.59	2.24	-49.96
3,550.00	1.88	22.09	3,549.60	14.41	20.56	-14.07	0.41	0.36	6.44

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
3,575.00	1.95	19.95	3,574.59	15.19	20.86	-14.85	0.40	0.28	-8.56
3,600.00	1.95	20.55	3,599.57	15.99	21.15	-15.64	0.08	0.00	2.40
3,625.00	1.94	21.76	3,624.56	16.78	21.46	-16.43	0.17	-0.04	4.84
3,650.00	1.93	25.25	3,649.55	17.56	21.80	-17.20	0.47	-0.04	13.96
3,675.00	1.94	28.20	3,674.53	18.31	22.18	-17.94	0.40	0.04	11.80
3,700.00	1.92	30.54	3,699.52	19.04	22.59	-18.67	0.33	-0.08	9.36
3,725.00	1.88	36.53	3,724.50	19.73	23.05	-19.35	0.81	-0.16	23.96
3,750.00	1.95	35.79	3,749.49	20.41	23.54	-20.02	0.30	0.28	-2.96
3,775.00	1.98	35.26	3,774.47	21.11	24.04	-20.71	0.14	0.12	-2.12
3,800.00	1.79	6.92	3,799.46	21.85	24.33	-21.44	3.76	-0.76	-113.36
3,825.00	1.75	353.69	3,824.45	22.61	24.34	-22.21	1.64	-0.16	-52.92
3,850.00	1.68	352.35	3,849.44	23.36	24.25	-22.96	0.32	-0.28	-5.36
3,875.00	1.62	351.45	3,874.43	24.07	24.15	-23.67	0.26	-0.24	-3.60
3,900.00	1.57	351.80	3,899.42	24.76	24.04	-24.36	0.20	-0.20	1.40
3,925.00	1.54	350.84	3,924.41	25.43	23.94	-25.03	0.16	-0.12	-3.84
3,950.00	1.49	350.46	3,949.40	26.08	23.84	-25.69	0.20	-0.20	-1.52
3,975.00	1.44	347.66	3,974.39	26.71	23.71	-26.32	0.35	-0.20	-11.20
4,000.00	1.36	338.59	3,999.38	27.29	23.54	-26.90	0.94	-0.32	-36.28
4,025.00	1.38	324.25	4,024.38	27.81	23.25	-27.43	1.37	0.08	-57.36
4,050.00	1.41	315.54	4,049.37	28.28	22.86	-27.90	0.86	0.12	-34.84
4,075.00	1.43	312.15	4,074.36	28.70	22.42	-28.33	0.35	0.08	-13.56
4,100.00	1.47	312.92	4,099.35	29.13	21.95	-28.77	0.18	0.16	3.08
4,125.00	1.45	312.54	4,124.35	29.56	21.48	-29.21	0.09	-0.08	-1.52
4,150.00	1.43	313.20	4,149.34	29.99	21.02	-29.64	0.10	-0.08	2.64
4,175.00	1.47	333.85	4,174.33	30.49	20.65	-30.15	2.08	0.16	82.60
4,200.00	1.78	348.82	4,199.32	31.16	20.44	-30.82	2.09	1.24	59.88
4,225.00	1.80	349.71	4,224.31	31.93	20.29	-31.59	0.14	0.08	3.56
4,250.00	1.82	347.55	4,249.30	32.70	20.14	-32.37	0.28	0.08	-8.64
4,275.00	1.76	346.81	4,274.28	33.46	19.96	-33.13	0.26	-0.24	-2.96
4,300.00	1.72	347.74	4,299.27	34.20	19.80	-33.88	0.20	-0.16	3.72
4,325.00	1.76	349.38	4,324.26	34.95	19.64	-34.62	0.26	0.16	6.56
4,350.00	1.74	351.91	4,349.25	35.70	19.52	-35.38	0.32	-0.08	10.12
4,375.00	1.78	35.90	4,374.24	36.39	19.69	-36.06	5.27	0.16	175.96
4,400.00	2.10	55.24	4,399.22	36.97	20.30	-36.63	2.90	1.28	77.36
4,425.00	2.13	55.98	4,424.21	37.49	21.06	-37.14	0.16	0.12	2.96
4,450.00	2.35	59.03	4,449.19	38.01	21.88	-37.65	1.00	0.88	12.20
4,475.00	2.37	60.25	4,474.17	38.53	22.77	-38.15	0.22	0.08	4.88
4,500.00	2.52	62.51	4,499.14	39.04	23.71	-38.65	0.71	0.60	9.04
4,525.00	2.68	65.49	4,524.12	39.54	24.73	-39.13	0.84	0.64	11.92
4,550.00	2.93	67.76	4,549.09	40.02	25.85	-39.59	1.09	1.00	9.08
4,575.00	3.01	70.63	4,574.06	40.48	27.06	-40.03	0.68	0.32	11.48
4,600.00	3.17	76.34	4,599.02	40.86	28.35	-40.39	1.39	0.64	22.84
4,625.00	3.31	79.81	4,623.98	41.15	29.74	-40.66	0.96	0.56	13.88

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)	
4,650.00	3.31	80.83	4,648.94	41.40	31.16	-40.88	0.24	0.00	4.08	
4,675.00	3.31	83.52	4,673.90	41.59	32.59	-41.05	0.62	0.00	10.76	
4,700.00	3.49	85.69	4,698.85	41.73	34.06	-41.17	0.88	0.72	8.68	
4,725.00	3.65	89.59	4,723.80	41.80	35.62	-41.21	1.16	0.64	15.60	
4,750.00	3.58	89.43	4,748.75	41.81	37.19	-41.19	0.28	-0.28	-0.64	
4,775.00	3.67	89.91	4,773.70	41.82	38.78	-41.18	0.38	0.36	1.92	
4,800.00	3.57	90.40	4,798.65	41.81	40.35	-41.15	0.42	-0.40	1.96	
4,825.00	3.04	84.65	4,823.61	41.87	41.79	-41.18	2.50	-2.12	-23.00	
4,850.00	2.13	65.35	4,848.59	42.13	42.87	-41.42	4.99	-3.64	-77.20	
4,875.00	1.88	57.97	4,873.57	42.54	43.64	-41.82	1.44	-1.00	-29.52	
4,900.00	1.93	59.13	4,898.56	42.97	44.35	-42.24	0.25	0.20	4.64	
4,925.00	1.96	59.33	4,923.54	43.40	45.08	-42.66	0.12	0.12	0.80	
4,950.00	2.28	67.51	4,948.53	43.81	45.91	-43.05	1.76	1.28	32.72	
4,975.00	2.61	73.96	4,973.50	44.16	46.92	-43.38	1.72	1.32	25.80	
5,000.00	2.73	76.78	4,998.48	44.45	48.04	-43.66	0.71	0.48	11.28	
5,025.00	2.83	76.23	5,023.45	44.74	49.22	-43.92	0.41	0.40	-2.20	
5,050.00	2.75	75.85	5,048.42	45.03	50.40	-44.20	0.33	-0.32	-1.52	
5,075.00	2.73	76.58	5,073.39	45.32	51.56	-44.46	0.16	-0.08	2.92	
5,100.00	2.80	78.41	5,098.36	45.58	52.74	-44.70	0.45	0.28	7.32	
5,125.00	2.89	82.94	5,123.33	45.78	53.96	-44.88	0.97	0.36	18.12	
5,150.00	3.13	89.29	5,148.29	45.86	55.27	-44.95	1.64	0.96	25.40	
5,175.00	3.35	94.71	5,173.25	45.81	56.68	-44.87	1.51	0.88	21.68	
5,200.00	3.29	95.02	5,198.21	45.69	58.13	-44.73	0.25	-0.24	1.24	
5,225.00	3.35	95.27	5,223.17	45.56	59.57	-44.57	0.25	0.24	1.00	
5,250.00	3.44	95.07	5,248.13	45.42	61.04	-44.42	0.36	0.36	-0.80	
5,275.00	3.33	95.18	5,273.08	45.29	62.51	-44.26	0.44	-0.44	0.44	
5,300.00	3.28	95.63	5,298.04	45.16	63.95	-44.10	0.23	-0.20	1.80	
5,325.00	3.23	96.56	5,323.00	45.01	65.36	-43.93	0.29	-0.20	3.72	
5,350.00	3.10	96.28	5,347.96	44.85	66.73	-43.75	0.52	-0.52	-1.12	
5,375.00	3.02	94.98	5,372.93	44.72	68.06	-43.60	0.42	-0.32	-5.20	
5,400.00	2.92	94.88	5,397.89	44.61	69.35	-43.47	0.40	-0.40	-0.40	
5,425.00	2.85	93.73	5,422.86	44.52	70.60	-43.35	0.36	-0.28	-4.60	
5,450.00	2.73	92.79	5,447.83	44.45	71.82	-43.26	0.51	-0.48	-3.76	
5,475.00	2.73	89.49	5,472.80	44.42	73.01	-43.22	0.63	0.00	-13.20	
5,500.00	2.66	64.90	5,497.78	44.67	74.13	-43.45	4.60	-0.28	-98.36	
5,525.00	3.18	45.63	5,522.75	45.40	75.15	-44.17	4.41	2.08	-77.08	
5,550.00	3.14	39.76	5,547.71	46.42	76.08	-45.16	1.30	-0.16	-23.48	
5,575.00	3.12	38.13	5,572.67	47.48	76.94	-46.21	0.36	-0.08	-6.52	
5,600.00	3.19	39.05	5,597.63	48.55	77.80	-47.27	0.35	0.28	3.68	
5,625.00	3.17	38.69	5,622.59	49.63	78.67	-48.34	0.11	-0.08	-1.44	
5,650.00	3.10	36.83	5,647.56	50.71	79.51	-49.40	0.49	-0.28	-7.44	
5,675.00	2.85	30.91	5,672.52	51.79	80.23	-50.46	1.58	-1.00	-23.68	
5,700.00	2.60	22.90	5,697.49	52.84	80.77	-51.51	1.82	-1.00	-32.04	

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
5,725.00	2.44	17.21	5,722.47	53.87	81.15	-52.53	1.19	-0.64	-22.76	
5,750.00	2.44	14.64	5,747.45	54.90	81.44	-53.55	0.44	0.00	-10.28	
5,775.00	2.32	14.33	5,772.43	55.90	81.70	-54.55	0.48	-0.48	-1.24	
5,800.00	2.33	13.34	5,797.41	56.89	81.94	-55.53	0.17	0.04	-3.96	
5,825.00	2.31	15.41	5,822.38	57.87	82.19	-56.51	0.34	-0.08	8.28	
5,850.00	2.29	13.98	5,847.36	58.84	82.45	-57.48	0.24	-0.08	-5.72	
5,875.00	2.29	12.19	5,872.34	59.81	82.68	-58.45	0.29	0.00	-7.16	
5,900.00	2.32	13.70	5,897.32	60.79	82.90	-59.42	0.27	0.12	6.04	
5,925.00	2.25	14.12	5,922.30	61.76	83.14	-60.39	0.29	-0.28	1.68	
5,950.00	2.29	12.42	5,947.28	62.72	83.37	-61.35	0.31	0.16	-6.80	
5,975.00	2.19	13.57	5,972.27	63.67	83.59	-62.29	0.44	-0.40	4.60	
6,000.00	2.14	10.19	5,997.25	64.60	83.78	-63.21	0.55	-0.20	-13.52	
6,025.00	2.03	11.77	6,022.23	65.49	83.95	-64.10	0.50	-0.44	6.32	
6,050.00	2.03	13.58	6,047.22	66.35	84.15	-64.96	0.26	0.00	7.24	
6,075.00	1.94	10.05	6,072.20	67.20	84.33	-65.81	0.61	-0.36	-14.12	
6,100.00	1.98	11.14	6,097.19	68.04	84.48	-66.65	0.22	0.16	4.36	
6,125.00	1.99	10.90	6,122.17	68.89	84.65	-67.49	0.05	0.04	-0.96	
6,150.00	2.01	10.10	6,147.16	69.75	84.81	-68.35	0.14	0.08	-3.20	
6,175.00	2.02	7.69	6,172.14	70.62	84.94	-69.21	0.34	0.04	-9.64	
6,200.00	2.00	7.26	6,197.13	71.49	85.06	-70.08	0.10	-0.08	-1.72	
6,225.00	1.91	9.62	6,222.11	72.33	85.18	-70.92	0.48	-0.36	9.44	
6,250.00	1.98	10.08	6,247.10	73.17	85.33	-71.76	0.29	0.28	1.84	
6,275.00	2.05	7.76	6,272.08	74.03	85.46	-72.62	0.43	0.28	-9.28	
6,300.00	1.94	3.53	6,297.07	74.90	85.55	-73.49	0.73	-0.44	-16.92	
6,325.00	1.96	5.21	6,322.05	75.75	85.62	-74.33	0.24	0.08	6.72	
6,350.00	2.05	358.95	6,347.04	76.62	85.65	-75.21	0.95	0.36	-25.04	
6,375.00	2.12	356.00	6,372.02	77.53	85.61	-76.11	0.51	0.28	-11.80	
6,400.00	2.01	353.97	6,397.00	78.43	85.53	-77.01	0.53	-0.44	-8.12	
6,425.00	2.13	355.97	6,421.99	79.33	85.45	-77.91	0.56	0.48	8.00	
6,450.00	2.05	353.46	6,446.97	80.23	85.37	-78.82	0.49	-0.32	-10.04	
6,475.00	2.05	355.41	6,471.95	81.12	85.28	-79.71	0.28	0.00	7.80	
6,500.00	2.05	354.67	6,496.94	82.01	85.20	-80.61	0.11	0.00	-2.96	
6,525.00	2.09	354.76	6,521.92	82.91	85.12	-81.51	0.16	0.16	0.36	
6,550.00	2.13	351.67	6,546.90	83.83	85.01	-82.42	0.48	0.16	-12.36	
6,575.00	1.99	347.21	6,571.89	84.71	84.85	-83.31	0.85	-0.56	-17.84	
6,600.00	1.92	347.23	6,596.87	85.54	84.66	-84.14	0.28	-0.28	0.08	
6,625.00	1.98	349.04	6,621.86	86.37	84.48	-84.98	0.34	0.24	7.24	
6,650.00	2.00	347.78	6,646.84	87.22	84.31	-85.83	0.19	0.08	-5.04	
6,675.00	2.04	344.66	6,671.83	88.08	84.10	-86.69	0.47	0.16	-12.48	
6,700.00	1.89	345.34	6,696.81	88.91	83.88	-87.52	0.61	-0.60	2.72	
6,725.00	1.97	346.89	6,721.80	89.73	83.67	-88.34	0.38	0.32	6.20	
6,750.00	1.99	341.67	6,746.79	90.56	83.44	-89.18	0.73	0.08	-20.88	
6,775.00	1.96	345.99	6,771.77	91.38	83.20	-90.01	0.61	-0.12	17.28	
6,800.00	1.93	342.87	6,796.76	92.20	82.97	-90.83	0.44	-0.12	-12.48	



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
6,825.00	1.89	344.25	6,821.74	93.00	82.74	-91.63	0.24	-0.16	5.52
6,850.00	2.00	345.39	6,846.73	93.82	82.51	-92.45	0.47	0.44	4.56
6,875.00	2.03	338.54	6,871.71	94.65	82.24	-93.29	0.97	0.12	-27.40
6,900.00	2.00	344.60	6,896.70	95.48	81.96	-94.13	0.86	-0.12	24.24
6,925.00	1.98	341.28	6,921.68	96.31	81.71	-94.96	0.47	-0.08	-13.28
6,950.00	1.99	344.56	6,946.67	97.14	81.46	-95.79	0.46	0.04	13.12
6,975.00	2.01	342.73	6,971.65	97.98	81.21	-96.63	0.27	0.08	-7.32
7,000.00	1.91	342.52	6,996.64	98.80	80.96	-97.45	0.40	-0.40	-0.84
7,025.00	1.91	343.64	7,021.62	99.59	80.71	-98.25	0.15	0.00	4.48
7,050.00	1.92	343.55	7,046.61	100.39	80.48	-99.06	0.04	0.04	-0.36
7,075.00	1.88	342.85	7,071.60	101.19	80.24	-99.86	0.18	-0.16	-2.80
7,100.00	1.91	341.49	7,096.58	101.97	79.98	-100.65	0.22	0.12	-5.44
7,125.00	1.92	338.06	7,121.57	102.76	79.70	-101.44	0.46	0.04	-13.72
7,150.00	1.80	338.75	7,146.55	103.51	79.40	-102.20	0.49	-0.48	2.76
7,175.00	1.81	341.29	7,171.54	104.25	79.13	-102.94	0.32	0.04	10.16
7,200.00	1.88	338.59	7,196.53	105.01	78.85	-103.70	0.45	0.28	-10.80
7,225.00	1.76	338.15	7,221.52	105.75	78.56	-104.44	0.48	-0.48	-1.76
7,250.00	1.74	340.00	7,246.50	106.46	78.29	-105.16	0.24	-0.08	7.40
7,275.00	1.82	341.68	7,271.49	107.19	78.03	-105.90	0.38	0.32	6.72
7,300.00	1.81	337.13	7,296.48	107.93	77.75	-106.64	0.58	-0.04	-18.20
7,325.00	1.75	341.66	7,321.47	108.66	77.48	-107.37	0.61	-0.24	18.12
7,350.00	1.80	342.27	7,346.46	109.40	77.24	-108.11	0.21	0.20	2.44
7,375.00	1.82	338.32	7,371.44	110.14	76.97	-108.86	0.51	0.08	-15.80
7,400.00	1.74	341.85	7,396.43	110.87	76.71	-109.59	0.54	-0.32	14.12
7,425.00	1.82	342.60	7,421.42	111.61	76.47	-110.34	0.33	0.32	3.00
7,450.00	1.82	339.41	7,446.41	112.36	76.21	-111.09	0.41	0.00	-12.76
7,475.00	1.83	341.84	7,471.39	113.11	75.95	-111.85	0.31	0.04	9.72
7,500.00	1.78	338.31	7,496.38	113.85	75.68	-112.59	0.49	-0.20	-14.12
7,525.00	1.75	341.93	7,521.37	114.57	75.42	-113.32	0.46	-0.12	14.48
7,550.00	1.71	340.80	7,546.36	115.29	75.18	-114.04	0.21	-0.16	-4.52
7,575.00	1.73	338.80	7,571.35	115.99	74.92	-114.75	0.25	0.08	-8.00
7,600.00	1.59	336.69	7,596.34	116.66	74.65	-115.42	0.61	-0.56	-8.44
7,625.00	1.64	338.49	7,621.33	117.31	74.38	-116.08	0.28	0.20	7.20
7,650.00	1.53	335.37	7,646.32	117.95	74.11	-116.72	0.56	-0.44	-12.48
7,675.00	1.59	339.22	7,671.31	118.58	73.84	-117.35	0.48	0.24	15.40
7,700.00	1.52	337.54	7,696.30	119.21	73.60	-117.98	0.33	-0.28	-6.72
7,725.00	1.60	339.32	7,721.29	119.84	73.35	-118.62	0.37	0.32	7.12
7,750.00	1.59	335.57	7,746.28	120.48	73.08	-119.27	0.42	-0.04	-15.00
7,775.00	1.64	340.98	7,771.27	121.14	72.82	-119.93	0.64	0.20	21.64
7,800.00	2.43	353.19	7,796.25	122.00	72.64	-120.79	3.59	3.16	48.84
7,825.00	2.68	358.67	7,821.23	123.11	72.56	-121.91	1.40	1.00	21.92
7,850.00	2.85	359.08	7,846.20	124.32	72.54	-123.11	0.68	0.68	1.64
7,875.00	2.89	358.08	7,871.17	125.57	72.51	-124.36	0.26	0.16	-4.00

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)	
7,900.00	2.81	359.36	7,896.14	126.81	72.48	-125.61	0.41	-0.32	5.12	
7,925.00	2.92	358.96	7,921.11	128.06	72.46	-126.86	0.45	0.44	-1.60	
7,950.00	2.81	357.47	7,946.08	129.31	72.42	-128.10	0.53	-0.44	-5.96	
7,975.00	2.85	359.25	7,971.05	130.54	72.39	-129.34	0.39	0.16	7.12	
8,000.00	2.82	359.82	7,996.01	131.78	72.38	-130.58	0.16	-0.12	2.28	
8,025.00	2.86	0.13	8,020.98	133.02	72.38	-131.81	0.17	0.16	1.24	
8,050.00	2.87	0.11	8,045.95	134.27	72.38	-133.06	0.04	0.04	-0.08	
8,075.00	2.87	358.71	8,070.92	135.52	72.37	-134.31	0.28	0.00	-5.60	
8,100.00	2.85	358.78	8,095.89	136.77	72.34	-135.56	0.08	-0.08	0.28	
8,125.00	2.77	357.64	8,120.86	137.99	72.30	-136.79	0.39	-0.32	-4.56	
8,150.00	2.55	357.44	8,145.83	139.15	72.25	-137.95	0.88	-0.88	-0.80	
8,175.00	2.37	356.27	8,170.81	140.22	72.19	-139.02	0.75	-0.72	-4.68	
8,200.00	2.34	358.54	8,195.79	141.25	72.15	-140.05	0.39	-0.12	9.08	
8,225.00	2.25	359.83	8,220.77	142.25	72.13	-141.05	0.42	-0.36	5.16	
8,250.00	2.16	0.43	8,245.75	143.21	72.13	-142.01	0.37	-0.36	2.40	
8,275.00	2.14	0.70	8,270.73	144.15	72.14	-142.95	0.09	-0.08	1.08	
8,300.00	2.07	4.34	8,295.72	145.07	72.18	-143.86	0.60	-0.28	14.56	
8,325.00	2.03	6.65	8,320.70	145.96	72.27	-144.75	0.37	-0.16	9.24	
8,350.00	1.80	7.59	8,345.69	146.79	72.37	-145.58	0.93	-0.92	3.76	
8,375.00	1.90	11.41	8,370.67	147.58	72.51	-146.37	0.63	0.40	15.28	
8,400.00	1.83	6.95	8,395.66	148.38	72.64	-147.17	0.64	-0.28	-17.84	
8,425.00	1.78	11.75	8,420.65	149.16	72.76	-147.95	0.64	-0.20	19.20	
8,450.00	1.75	14.40	8,445.64	149.91	72.94	-148.69	0.35	-0.12	10.60	
8,475.00	1.69	15.34	8,470.62	150.63	73.13	-149.41	0.27	-0.24	3.76	
8,500.00	1.64	10.73	8,495.61	151.34	73.29	-150.12	0.57	-0.20	-18.44	
8,525.00	1.69	10.10	8,520.60	152.06	73.43	-150.83	0.21	0.20	-2.52	
8,550.00	1.63	10.87	8,545.59	152.77	73.56	-151.54	0.26	-0.24	3.08	
8,575.00	1.59	12.97	8,570.58	153.46	73.70	-152.23	0.29	-0.16	8.40	
8,600.00	1.55	14.14	8,595.57	154.12	73.86	-152.89	0.21	-0.16	4.68	
8,625.00	1.53	15.91	8,620.56	154.77	74.04	-153.53	0.21	-0.08	7.08	
8,650.00	1.56	18.29	8,645.56	155.41	74.23	-154.18	0.28	0.12	9.52	
8,675.00	1.66	19.20	8,670.55	156.08	74.46	-154.84	0.41	0.40	3.64	
8,700.00	1.60	17.02	8,695.54	156.76	74.68	-155.51	0.35	-0.24	-8.72	
8,725.00	1.59	16.15	8,720.53	157.42	74.88	-156.17	0.10	-0.04	-3.48	
8,750.00	1.60	19.14	8,745.52	158.09	75.09	-156.83	0.34	0.04	11.96	
8,775.00	1.59	18.31	8,770.51	158.74	75.31	-157.49	0.10	-0.04	-3.32	
8,800.00	1.58	16.87	8,795.50	159.40	75.52	-158.14	0.16	-0.04	-5.76	
8,825.00	1.66	16.32	8,820.49	160.08	75.73	-158.82	0.33	0.32	-2.20	
8,850.00	1.70	18.52	8,845.48	160.78	75.95	-159.51	0.30	0.16	8.80	
8,875.00	1.63	19.22	8,870.47	161.47	76.18	-160.20	0.29	-0.28	2.80	
8,900.00	1.72	18.57	8,895.45	162.16	76.42	-160.88	0.37	0.36	-2.60	
8,925.00	1.70	17.19	8,920.44	162.87	76.65	-161.59	0.18	-0.08	-5.52	
8,950.00	1.66	19.32	8,945.43	163.56	76.88	-162.28	0.30	-0.16	8.52	

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)	
8,975.00	1.75	16.67	8,970.42	164.27	77.10	-162.98	0.48	0.36	-10.60	
9,000.00	1.67	16.96	8,995.41	164.99	77.32	-163.70	0.32	-0.32	1.16	
9,025.00	1.77	17.63	9,020.40	165.70	77.54	-164.41	0.41	0.40	2.68	
9,050.00	1.68	15.97	9,045.39	166.42	77.76	-165.12	0.41	-0.36	-6.64	
9,075.00	1.69	18.73	9,070.38	167.12	77.98	-165.82	0.33	0.04	11.04	
9,100.00	1.70	20.20	9,095.37	167.82	78.23	-166.52	0.18	0.04	5.88	
9,125.00	1.73	21.64	9,120.36	168.52	78.49	-167.21	0.21	0.12	5.76	
9,150.00	1.74	23.12	9,145.34	169.22	78.78	-167.90	0.18	0.04	5.92	
9,175.00	1.79	21.93	9,170.33	169.93	79.08	-168.61	0.25	0.20	-4.76	
9,200.00	1.85	21.58	9,195.32	170.67	79.37	-169.34	0.24	0.24	-1.40	
9,225.00	1.86	21.13	9,220.31	171.42	79.67	-170.09	0.07	0.04	-1.80	
9,250.00	1.78	23.06	9,245.29	172.16	79.96	-170.82	0.40	-0.32	7.72	
9,275.00	1.73	27.01	9,270.28	172.85	80.29	-171.51	0.52	-0.20	15.80	
9,300.00	1.60	33.26	9,295.27	173.48	80.65	-172.13	0.89	-0.52	25.00	
9,325.00	1.39	52.91	9,320.26	173.95	81.08	-172.60	2.20	-0.84	78.60	
9,350.00	1.39	61.44	9,345.26	174.28	81.59	-172.92	0.83	0.00	34.12	
9,375.00	1.45	64.74	9,370.25	174.56	82.14	-173.19	0.41	0.24	13.20	
9,400.00	1.49	66.82	9,395.24	174.82	82.73	-173.44	0.27	0.16	8.32	
9,425.00	1.60	65.38	9,420.23	175.10	83.35	-173.71	0.47	0.44	-5.76	
9,450.00	1.57	63.99	9,445.22	175.39	83.97	-173.99	0.20	-0.12	-5.56	
9,475.00	1.52	64.67	9,470.21	175.69	84.58	-174.27	0.21	-0.20	2.72	
9,500.00	1.57	67.16	9,495.20	175.96	85.19	-174.54	0.33	0.20	9.96	
9,525.00	1.58	66.80	9,520.19	176.23	85.83	-174.80	0.06	0.04	-1.44	
9,550.00	1.33	67.39	9,545.19	176.48	86.41	-175.04	1.00	-1.00	2.36	
9,575.00	1.33	71.22	9,570.18	176.68	86.95	-175.23	0.36	0.00	15.32	
9,600.00	1.33	72.81	9,595.17	176.86	87.50	-175.40	0.15	0.00	6.36	
9,625.00	1.20	68.49	9,620.17	177.04	88.03	-175.57	0.64	-0.52	-17.28	
9,650.00	1.22	76.19	9,645.16	177.20	88.53	-175.73	0.65	0.08	30.80	
9,675.00	1.14	72.25	9,670.15	177.34	89.02	-175.86	0.46	-0.32	-15.76	
9,700.00	1.16	79.34	9,695.15	177.46	89.51	-175.97	0.57	0.08	28.36	
9,725.00	1.03	75.53	9,720.15	177.57	89.97	-176.07	0.60	-0.52	-15.24	
9,750.00	1.07	79.71	9,745.14	177.66	90.42	-176.16	0.35	0.16	16.72	
9,775.00	1.02	84.17	9,770.14	177.73	90.87	-176.21	0.38	-0.20	17.84	
9,800.00	0.96	86.08	9,795.13	177.77	91.30	-176.24	0.27	-0.24	7.64	
9,825.00	0.99	99.01	9,820.13	177.75	91.73	-176.22	0.89	0.12	51.72	
9,850.00	1.04	103.68	9,845.13	177.66	92.16	-176.12	0.39	0.20	18.68	
9,875.00	0.96	105.74	9,870.12	177.55	92.58	-176.01	0.35	-0.32	8.24	
9,900.00	1.08	115.90	9,895.12	177.39	92.99	-175.84	0.87	0.48	40.64	
9,925.00	1.16	115.58	9,920.11	177.18	93.43	-175.62	0.32	0.32	-1.28	
9,950.00	1.20	122.84	9,945.11	176.93	93.88	-175.36	0.62	0.16	29.04	
9,975.00	1.33	122.09	9,970.10	176.63	94.35	-175.06	0.52	0.52	-3.00	
10,000.00	1.18	122.74	9,995.10	176.34	94.81	-174.76	0.60	-0.60	2.60	
10,025.00	1.32	123.97	10,020.09	176.04	95.27	-174.45	0.57	0.56	4.92	
10,050.00	1.18	124.82	10,045.08	175.73	95.72	-174.13	0.56	-0.56	3.40	

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
10,075.00	1.23	127.26	10,070.08	175.42	96.14	-173.82	0.29	0.20	9.76
10,100.00	1.18	125.84	10,095.07	175.11	96.56	-173.50	0.23	-0.20	-5.68
10,125.00	1.15	127.67	10,120.07	174.80	96.97	-173.19	0.19	-0.12	7.32
10,150.00	1.22	130.63	10,145.06	174.47	97.37	-172.85	0.37	0.28	11.84
10,175.00	1.27	129.70	10,170.06	174.12	97.79	-172.50	0.22	0.20	-3.72
10,200.00	1.21	126.98	10,195.05	173.79	98.21	-172.15	0.34	-0.24	-10.88
10,225.00	1.29	126.05	10,220.04	173.46	98.65	-171.82	0.33	0.32	-3.72
10,250.00	1.11	124.54	10,245.04	173.16	99.08	-171.51	0.73	-0.72	-6.04
10,275.00	1.10	128.15	10,270.03	172.88	99.46	-171.22	0.28	-0.04	14.44
10,300.00	1.01	124.06	10,295.03	172.60	99.84	-170.94	0.47	-0.36	-16.36
10,325.00	0.88	119.14	10,320.03	172.39	100.19	-170.72	0.61	-0.52	-19.68
10,350.00	0.74	118.63	10,345.02	172.22	100.50	-170.54	0.56	-0.56	-2.04
10,375.00	0.59	122.34	10,370.02	172.07	100.75	-170.39	0.62	-0.60	14.84
10,400.00	0.53	129.80	10,395.02	171.93	100.94	-170.25	0.38	-0.24	29.84
10,425.00	0.43	127.70	10,420.02	171.80	101.11	-170.11	0.41	-0.40	-8.40
10,450.00	0.31	106.55	10,445.02	171.72	101.25	-170.04	0.72	-0.48	-84.60
10,475.00	0.24	127.78	10,470.02	171.67	101.35	-169.98	0.49	-0.28	84.92
10,500.00	0.15	122.65	10,495.02	171.62	101.42	-169.93	0.37	-0.36	-20.52
10,525.00	0.08	40.21	10,520.02	171.61	101.46	-169.93	0.64	-0.28	-329.76
10,550.00	0.17	318.40	10,545.02	171.65	101.45	-169.97	0.71	0.36	-327.24
10,575.00	0.26	307.40	10,570.02	171.72	101.38	-170.03	0.39	0.36	-44.00
10,600.00	0.20	301.00	10,595.02	171.77	101.29	-170.09	0.26	-0.24	-25.60
10,625.00	0.16	311.68	10,620.02	171.82	101.23	-170.14	0.21	-0.16	42.72
10,650.00	0.25	310.60	10,645.02	171.88	101.16	-170.20	0.36	0.36	-4.32
10,675.00	0.18	307.38	10,670.02	171.94	101.09	-170.26	0.28	-0.28	-12.88
10,700.00	0.29	327.14	10,695.02	172.01	101.02	-170.33	0.54	0.44	79.04
10,725.00	0.26	314.91	10,720.02	172.11	100.95	-170.43	0.26	-0.12	-48.92
10,750.00	0.35	330.45	10,745.02	172.21	100.87	-170.54	0.49	0.36	62.16
10,775.00	0.43	329.73	10,770.02	172.36	100.79	-170.69	0.32	0.32	-2.88
10,800.00	0.62	333.75	10,795.02	172.56	100.68	-170.89	0.77	0.76	16.08
10,825.00	0.58	332.22	10,820.01	172.80	100.56	-171.12	0.17	-0.16	-6.12
10,850.00	0.67	338.76	10,845.01	173.05	100.45	-171.37	0.46	0.36	26.16
10,875.00	0.63	332.35	10,870.01	173.30	100.33	-171.63	0.33	-0.16	-25.64
10,900.00	0.71	333.16	10,895.01	173.56	100.20	-171.90	0.32	0.32	3.24
10,925.00	0.72	334.96	10,920.01	173.84	100.06	-172.18	0.10	0.04	7.20
10,950.00	0.82	335.01	10,945.01	174.15	99.92	-172.49	0.40	0.40	0.20
10,975.00	0.66	335.76	10,970.00	174.44	99.79	-172.78	0.64	-0.64	3.00
11,000.00	0.87	332.00	10,995.00	174.74	99.64	-173.08	0.86	0.84	-15.04
11,025.00	0.86	334.51	11,020.00	175.08	99.47	-173.42	0.16	-0.04	10.04
11,050.00	0.86	333.50	11,045.00	175.42	99.30	-173.76	0.06	0.00	-4.04
11,075.00	0.82	337.69	11,069.99	175.75	99.15	-174.10	0.29	-0.16	16.76
11,100.00	0.77	325.45	11,094.99	176.05	98.99	-174.40	0.71	-0.20	-48.96
11,125.00	0.72	322.33	11,119.99	176.32	98.80	-174.67	0.26	-0.20	-12.48

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
11,150.00	0.70	306.50	11,144.99	176.53	98.58	-174.89	0.79	-0.08	-63.32
11,175.00	0.72	310.80	11,169.98	176.72	98.34	-175.09	0.23	0.08	17.20
11,200.00	0.77	304.85	11,194.98	176.92	98.08	-175.29	0.37	0.20	-23.80
11,225.00	0.73	311.25	11,219.98	177.12	97.82	-175.49	0.37	-0.16	25.60
11,250.00	0.89	305.54	11,244.98	177.34	97.54	-175.72	0.72	0.64	-22.84
11,275.00	1.03	301.76	11,269.97	177.57	97.20	-175.95	0.61	0.56	-15.12
11,300.00	1.26	303.60	11,294.97	177.84	96.78	-176.23	0.93	0.92	7.36
11,325.00	1.50	299.53	11,319.96	178.16	96.26	-176.55	1.04	0.96	-16.28
11,350.00	1.72	293.81	11,344.95	178.47	95.63	-176.88	1.09	0.88	-22.88
11,375.00	1.91	294.83	11,369.94	178.80	94.91	-177.21	0.77	0.76	4.08
11,400.00	2.13	294.66	11,394.92	179.16	94.11	-177.60	0.88	0.88	-0.68
11,425.00	2.19	293.46	11,419.91	179.55	93.25	-177.99	0.30	0.24	-4.80
11,450.00	2.33	293.05	11,444.89	179.94	92.35	-178.40	0.56	0.56	-1.64
11,475.00	2.67	291.62	11,469.86	180.35	91.34	-178.83	1.38	1.36	-5.72
11,500.00	2.77	290.66	11,494.84	180.78	90.23	-179.27	0.44	0.40	-3.84
11,525.00	2.86	289.88	11,519.80	181.20	89.08	-179.72	0.39	0.36	-3.12
11,550.00	2.84	290.38	11,544.77	181.63	87.91	-180.16	0.13	-0.08	2.00
11,575.00	2.79	289.21	11,569.74	182.05	86.76	-180.60	0.30	-0.20	-4.68
11,600.00	2.77	287.94	11,594.71	182.43	85.61	-181.00	0.26	-0.08	-5.08
11,625.00	2.79	285.70	11,619.68	182.78	84.45	-181.37	0.44	0.08	-8.96
11,650.00	2.91	286.61	11,644.65	183.13	83.25	-181.74	0.51	0.48	3.64
11,675.00	2.88	285.27	11,669.62	183.48	82.04	-182.11	0.30	-0.12	-5.36
11,700.00	2.89	280.89	11,694.59	183.76	80.81	-182.41	0.88	0.04	-17.52
11,725.00	2.80	275.97	11,719.56	183.94	79.59	-182.61	1.04	-0.36	-19.68
11,750.00	2.75	273.09	11,744.53	184.04	78.38	-182.73	0.59	-0.20	-11.52
11,775.00	2.80	270.78	11,769.50	184.08	77.17	-182.79	0.49	0.20	-9.24
11,800.00	2.72	270.71	11,794.47	184.10	75.97	-182.83	0.32	-0.32	-0.28
11,825.00	2.70	268.17	11,819.44	184.08	74.79	-182.83	0.49	-0.08	-10.16
11,850.00	2.66	267.48	11,844.42	184.04	73.62	-182.81	0.21	-0.16	-2.76
11,865.00	2.73	265.95	11,859.40	184.00	72.92	-182.78	0.67	0.47	-10.20
Tie In									
11,973.00	3.55	266.75	11,967.24	183.63	67.01	-182.50	0.76	0.76	0.74
First Phoenix MWD Survey									
11,995.00	3.11	270.76	11,989.20	183.60	65.73	-182.49	2.26	-2.00	18.23
12,058.00	2.97	212.46	12,052.13	182.24	63.15	-181.18	4.70	-0.22	-92.54
12,090.00	6.96	188.13	12,084.00	179.62	62.43	-178.57	13.83	12.47	-76.03
12,121.00	11.83	182.66	12,114.58	174.59	62.02	-173.55	15.95	15.71	-17.65
12,152.00	17.10	179.90	12,144.58	166.85	61.88	-165.81	17.14	17.00	-8.90
12,184.00	22.40	179.10	12,174.69	156.04	61.98	-155.00	16.58	16.56	-2.50
12,201.00	25.06	179.10	12,190.25	149.20	62.09	-148.16	15.67	15.67	0.02
FTP: 12201' MD									
12,232.00	29.92	179.11	12,217.74	134.90	62.31	-133.86	15.67	15.67	0.02
12,279.00	35.66	177.29	12,257.24	109.47	63.14	-108.42	12.39	12.21	-3.87
12,327.00	39.92	176.89	12,295.16	80.10	64.64	-79.03	8.89	8.88	-0.83

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)	
12,374.00	45.18	176.67	12,329.78	48.38	66.43	-47.28	11.20	11.19	-0.47	
12,422.00	49.77	177.53	12,362.21	13.06	68.21	-11.94	9.65	9.56	1.79	
12,468.00	53.62	178.77	12,390.72	-23.01	69.36	24.15	8.63	8.37	2.70	
12,516.00	55.71	177.82	12,418.48	-62.15	70.53	63.30	4.64	4.35	-1.98	
12,563.00	59.58	176.51	12,443.63	-101.79	72.50	102.97	8.56	8.23	-2.79	
12,611.00	65.04	176.20	12,465.92	-144.19	75.21	145.41	11.39	11.38	-0.65	
12,657.00	68.41	175.59	12,484.10	-186.34	78.23	187.59	7.43	7.33	-1.33	
12,705.00	71.90	176.23	12,500.39	-231.36	81.45	232.67	7.38	7.27	1.33	
12,751.00	75.95	177.33	12,513.13	-275.48	83.93	276.82	9.10	8.80	2.39	
12,799.00	83.46	178.18	12,521.70	-322.64	85.77	324.01	15.74	15.65	1.77	
12,846.00	90.34	180.22	12,524.24	-369.54	86.43	370.91	15.27	14.64	4.34	
12,940.00	90.01	178.65	12,523.95	-463.53	87.35	464.90	1.71	-0.35	-1.67	
13,035.00	89.58	177.52	12,524.29	-558.47	90.53	559.88	1.27	-0.45	-1.19	
13,130.00	91.10	175.94	12,523.73	-653.31	95.95	654.80	2.31	1.60	-1.66	
13,226.00	87.46	177.75	12,524.93	-749.14	101.23	750.70	4.23	-3.79	1.89	
13,321.00	86.50	180.58	12,529.94	-843.99	102.61	845.56	3.14	-1.01	2.98	
13,416.00	86.20	179.28	12,535.99	-938.79	102.73	940.35	1.40	-0.32	-1.37	
13,512.00	85.54	181.85	12,542.90	-1,034.53	101.78	1,036.06	2.76	-0.69	2.68	
13,606.00	87.52	182.13	12,548.59	-1,128.29	98.53	1,129.76	2.13	2.11	0.30	
13,701.00	90.15	182.21	12,550.52	-1,223.20	94.93	1,224.59	2.77	2.77	0.08	
13,796.00	88.97	180.11	12,551.25	-1,318.17	93.01	1,319.52	2.54	-1.24	-2.21	
13,889.00	88.64	178.06	12,553.19	-1,411.13	94.49	1,412.49	2.23	-0.35	-2.20	
13,984.00	89.28	179.86	12,554.92	-1,506.10	96.21	1,507.47	2.01	0.67	1.89	
14,078.00	89.61	180.90	12,555.83	-1,600.09	95.59	1,601.44	1.16	0.35	1.11	
14,173.00	90.08	181.53	12,556.08	-1,695.07	93.58	1,696.37	0.83	0.49	0.66	
14,268.00	89.27	181.11	12,556.62	-1,790.04	91.39	1,791.30	0.96	-0.85	-0.44	
14,363.00	90.42	181.40	12,556.88	-1,885.01	89.31	1,886.23	1.25	1.21	0.31	
14,457.00	89.61	178.84	12,556.86	-1,979.00	89.11	1,980.20	2.86	-0.86	-2.72	
14,552.00	89.35	177.70	12,557.72	-2,073.96	91.98	2,075.19	1.23	-0.27	-1.20	
14,646.00	89.98	178.06	12,558.27	-2,167.89	95.46	2,169.16	0.77	0.67	0.38	
14,740.00	89.35	177.66	12,558.82	-2,261.82	98.97	2,263.14	0.79	-0.67	-0.43	
14,835.00	89.76	176.80	12,559.56	-2,356.71	103.56	2,358.09	1.00	0.43	-0.91	
14,929.00	90.19	175.85	12,559.60	-2,450.51	109.58	2,451.98	1.11	0.46	-1.01	
15,024.00	89.68	178.63	12,559.70	-2,545.39	114.16	2,546.92	2.98	-0.54	2.93	
15,118.00	89.46	179.41	12,560.41	-2,639.38	115.76	2,640.92	0.86	-0.23	0.83	
15,213.00	88.52	178.71	12,562.08	-2,734.35	117.32	2,735.90	1.23	-0.99	-0.74	
15,308.00	88.35	178.20	12,564.68	-2,829.28	119.88	2,830.86	0.57	-0.18	-0.54	
15,402.00	89.71	179.26	12,566.27	-2,923.24	121.97	2,924.84	1.83	1.45	1.13	
15,497.00	91.03	179.14	12,565.66	-3,018.22	123.29	3,019.84	1.40	1.39	-0.13	
15,592.00	89.20	182.14	12,565.47	-3,113.20	122.23	3,114.79	3.70	-1.93	3.16	
15,686.00	88.46	182.56	12,567.39	-3,207.10	118.38	3,208.61	0.91	-0.79	0.45	
15,781.00	92.14	183.28	12,566.89	-3,301.96	113.54	3,303.38	3.95	3.87	0.76	
15,876.00	90.26	182.17	12,564.90	-3,396.83	109.02	3,398.16	2.30	-1.98	-1.17	

<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
15,971.00	89.72	179.48	12,564.91	-3,491.81	107.66	3,493.10	2.89	-0.57	-2.83
16,065.00	90.69	179.78	12,564.58	-3,585.80	108.26	3,587.10	1.08	1.03	0.32
16,161.00	92.01	179.89	12,562.32	-3,681.77	108.54	3,683.06	1.38	1.38	0.11
16,256.00	92.34	179.51	12,558.71	-3,776.70	109.04	3,777.98	0.53	0.35	-0.40
16,349.00	90.49	178.96	12,556.42	-3,869.66	110.28	3,870.95	2.08	-1.99	-0.59
16,444.00	90.05	178.37	12,555.97	-3,964.64	112.49	3,965.95	0.77	-0.46	-0.62
16,538.00	89.35	179.47	12,556.46	-4,058.62	114.26	4,059.94	1.39	-0.74	1.17
16,633.00	87.46	179.91	12,559.10	-4,153.57	114.78	4,154.90	2.04	-1.99	0.46
16,729.00	86.85	179.49	12,563.87	-4,249.45	115.28	4,250.77	0.77	-0.64	-0.44
16,824.00	87.01	178.53	12,568.96	-4,344.30	116.92	4,345.63	1.02	0.17	-1.01
16,919.00	87.84	178.82	12,573.22	-4,439.18	119.11	4,440.54	0.93	0.87	0.31
17,014.00	89.46	178.74	12,575.46	-4,534.13	121.13	4,535.50	1.71	1.71	-0.08
17,108.00	88.86	178.00	12,576.84	-4,628.08	123.81	4,629.49	1.01	-0.64	-0.79
17,202.00	91.14	178.31	12,576.84	-4,722.02	126.83	4,723.47	2.45	2.43	0.33
17,296.00	88.84	176.69	12,576.86	-4,815.92	130.93	4,817.42	2.99	-2.45	-1.72
17,391.00	90.30	177.43	12,577.57	-4,910.79	135.81	4,912.36	1.72	1.54	0.78
17,486.00	89.97	176.86	12,577.35	-5,005.67	140.54	5,007.31	0.69	-0.35	-0.60
17,508.00	90.74	177.05	12,577.21	-5,027.64	141.71	5,029.29	3.58	3.48	0.84
17508' MD: Sect. Line									
17,581.00	93.28	177.66	12,574.65	-5,100.51	145.08	5,102.21	3.58	3.48	0.84
17,676.00	93.95	178.72	12,568.66	-5,195.28	148.07	5,197.01	1.32	0.71	1.12
17,770.00	93.46	179.62	12,562.59	-5,289.07	149.43	5,290.81	1.09	-0.52	0.96
17,864.00	91.91	180.45	12,558.18	-5,382.96	149.37	5,384.69	1.87	-1.65	0.88
17,959.00	88.22	179.58	12,558.08	-5,477.94	149.35	5,479.66	3.99	-3.88	-0.92
18,053.00	86.98	178.34	12,562.01	-5,571.84	151.05	5,573.57	1.86	-1.32	-1.32
18,148.00	89.06	181.83	12,565.30	-5,666.77	150.91	5,668.48	4.27	2.19	3.67
18,242.00	90.05	181.61	12,566.03	-5,760.72	148.09	5,762.37	1.08	1.05	-0.23
18,337.00	90.89	179.49	12,565.25	-5,855.71	147.18	5,857.33	2.40	0.88	-2.23
18,432.00	90.62	178.83	12,564.00	-5,950.69	148.57	5,952.32	0.75	-0.28	-0.69
18,526.00	89.04	177.69	12,564.27	-6,044.64	151.42	6,046.31	2.07	-1.68	-1.21
18,621.00	91.29	178.56	12,564.00	-6,139.58	154.53	6,141.29	2.54	2.37	0.92
18,715.00	89.37	180.98	12,563.46	-6,233.57	154.91	6,235.27	3.29	-2.04	2.57
18,809.00	89.26	180.66	12,564.58	-6,327.55	153.56	6,329.22	0.36	-0.12	-0.34
18,905.00	90.38	180.06	12,564.88	-6,423.55	152.96	6,425.19	1.32	1.17	-0.63
18,999.00	90.52	179.00	12,564.15	-6,517.54	153.73	6,519.18	1.14	0.15	-1.13
19,093.00	90.74	177.98	12,563.11	-6,611.50	156.21	6,613.17	1.11	0.23	-1.09
19,188.00	91.53	178.73	12,561.23	-6,706.44	158.93	6,708.14	1.15	0.83	0.79
19,282.00	91.15	180.72	12,559.03	-6,800.41	159.39	6,802.11	2.15	-0.40	2.12
19,377.00	91.12	179.75	12,557.15	-6,895.39	159.00	6,897.07	1.02	-0.03	-1.02
19,471.00	90.64	180.00	12,555.71	-6,989.38	159.20	6,991.05	0.58	-0.51	0.27
19,565.00	90.50	178.40	12,554.77	-7,083.36	160.51	7,085.04	1.71	-0.15	-1.70
19,659.00	91.64	181.28	12,553.02	-7,177.33	160.78	7,179.00	3.29	1.21	3.06
19,754.00	92.64	181.60	12,549.47	-7,272.23	158.39	7,273.85	1.11	1.05	0.34
19,848.00	90.19	181.10	12,547.15	-7,366.17	156.18	7,367.74	2.66	-2.61	-0.53



<b>Company:</b>	COG Operating LLC	<b>Local Co-ordinate Reference:</b>	Well 603H
<b>Project:</b>	Lea County, NM (NAD27 NME)	<b>TVD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

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)
19,942.00	90.84	180.36	12,546.30	-7,460.16	154.98	7,461.70	1.05	0.69	-0.79
20,037.00	87.95	180.45	12,547.31	-7,555.14	154.31	7,556.65	3.04	-3.04	0.09
20,132.00	87.70	179.55	12,550.91	-7,650.07	154.31	7,651.57	0.98	-0.26	-0.95
20,227.00	89.17	180.02	12,553.51	-7,745.03	154.66	7,746.53	1.62	1.55	0.49
20,322.00	88.81	179.76	12,555.18	-7,840.02	154.85	7,841.50	0.47	-0.38	-0.27
20,416.00	91.39	181.34	12,555.02	-7,934.00	153.94	7,935.46	3.22	2.74	1.68
20,511.00	92.47	180.31	12,551.82	-8,028.93	152.58	8,030.36	1.57	1.14	-1.08
20,605.00	90.46	181.52	12,549.41	-8,122.89	151.08	8,124.27	2.50	-2.14	1.29
20,699.00	91.62	180.90	12,547.71	-8,216.85	149.09	8,218.19	1.40	1.23	-0.66
20,794.00	89.56	180.11	12,546.73	-8,311.83	148.25	8,313.15	2.32	-2.17	-0.83
20,889.00	89.38	179.09	12,547.61	-8,406.82	148.92	8,408.14	1.09	-0.19	-1.07
20,983.00	90.04	178.33	12,548.08	-8,500.80	151.03	8,502.13	1.07	0.70	-0.81
21,078.00	89.76	178.66	12,548.25	-8,595.77	153.53	8,597.13	0.46	-0.29	0.35
21,172.00	90.17	177.33	12,548.31	-8,689.71	156.82	8,691.11	1.48	0.44	-1.41
21,266.00	89.75	178.07	12,548.37	-8,783.63	160.59	8,785.08	0.91	-0.45	0.79
21,361.00	88.57	180.25	12,549.77	-8,878.60	161.98	8,880.06	2.61	-1.24	2.29
21,456.00	89.03	179.81	12,551.76	-8,973.58	161.93	8,975.03	0.67	0.48	-0.46
21,550.00	89.26	179.54	12,553.16	-9,067.57	162.47	9,069.01	0.38	0.24	-0.29
21,644.00	88.83	178.59	12,554.72	-9,161.54	164.00	9,163.00	1.11	-0.46	-1.01
21,739.00	88.88	180.26	12,556.62	-9,256.51	164.95	9,257.97	1.76	0.05	1.76
21,834.00	89.11	180.56	12,558.29	-9,351.50	164.27	9,352.93	0.40	0.24	0.32
21,929.00	90.42	180.52	12,558.68	-9,446.49	163.38	9,447.90	1.38	1.38	-0.04
22,023.00	89.11	180.30	12,559.06	-9,540.48	162.70	9,541.87	1.41	-1.39	-0.23
22,118.00	92.33	179.77	12,557.87	-9,635.46	162.65	9,636.83	3.44	3.39	-0.56
22,213.00	92.47	179.34	12,553.89	-9,730.38	163.38	9,731.75	0.48	0.15	-0.45
22,308.00	92.00	179.09	12,550.19	-9,825.30	164.68	9,826.67	0.56	-0.49	-0.26
22,366.00	92.73	179.15	12,547.79	-9,883.24	165.57	9,884.63	1.26	1.26	0.10
22,457.00	93.02	178.88	12,543.23	-9,974.11	167.14	9,975.51	0.44	0.32	-0.30
22,549.00	92.89	178.25	12,538.49	-10,065.96	169.44	10,067.38	0.70	-0.14	-0.68
22,641.00	93.18	178.33	12,533.62	-10,157.79	172.18	10,159.25	0.33	0.32	0.09
22,651.00	93.18	178.33	12,533.06	-10,167.79	172.46	10,169.25	0.00	0.00	0.00
<b>Final Phoenix MWD Survey</b>									
22,686.00	93.18	178.33	12,531.12	-10,202.70	173.49	10,204.17	0.00	0.00	0.00
<b>LTP: 22686' MD</b>									
22,707.00	93.18	178.33	12,529.96	-10,223.68	174.08	10,225.16	0.00	0.00	0.00
<b>Projection to TD</b>									



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<b>Site:</b>	Brot Helm Federal Com	<b>MD Reference:</b>	RKB @ 3442.90usft (McVay 8)
<b>Well:</b>	603H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	OH / 65032	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys (McVay 8)	<b>Database:</b>	USA Compass

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
11,865.00	11,859.40	184.00	72.92	Tie In
11,973.00	11,967.24	183.63	67.01	First Phoenix MWD Survey
12,201.00	12,190.25	149.20	62.09	FTP: 12201' MD
17,508.00	12,577.21	-5,027.64	141.71	17508' MD: Sect. Line
22,651.00	12,533.06	-10,167.79	172.46	Final Phoenix MWD Survey
22,686.00	12,531.12	-10,202.70	173.49	LTP: 22686' MD
22,707.00	12,529.96	-10,223.68	174.08	Projection to TD