

COG Operating LLC

Lea County, NM (NAD27 NME)

Eider Federal

102H

OH / 62730

Design: Surveys (Ensign 155)

Standard Survey Report

01 August, 2018

HOBBS OCD

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Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass

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

Site	Eider Federal		
Site Position:		Northing:	425,274.00 usft
From:	Map	Easting:	711,380.40 usft
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "
		Latitude:	32° 10' 2.46309 N
		Longitude:	103° 39' 0.76609 W
		Grid Convergence:	0.36 °

Well	102H		
Well Position	+N/-S	0.00 usft	Northing: 425,274.50 usft
	+E/-W	0.00 usft	Easting: 711,440.30 usft
Position Uncertainty	0.00 usft	Wellhead Elevation:	0.00 usft
		Latitude:	32° 10' 2.46428 N
		Longitude:	103° 39' 0.06921 W
		Ground Level:	3,522.30 usft

Wellbore	OH / 62730		
Magnetics	Model Name	Sample Date	Declination
			(°)
	MVHD	7/10/2018	6.73
			Dip Angle (°)
			59.86
			Field Strength (nT)
			47,931.67411062

Design	Surveys (Ensign 155)		
Audit Notes:			
Version:	1.0	Phase:	ACTUAL
		Tie On Depth:	0.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W
	(usft)	(usft)	(usft)
	0.00	0.00	0.00
			Direction (°)
			358.95

Survey Program	Date 8/1/2018		
From	To	Survey (Wellbore)	Tool Name
(usft)	(usft)		
100.00	8,125.00	Scientific Gyro Surveys (OH / 62730)	Scientific Keeper
8,125.00	16,466.00	Phoenix MWD Surveys (OH / 62730)	MWD+HDGM
			Description
			Scientific Drilling Intl. Standard Wireline Keeper
			OWSG Rev.2 MWD + HDGM

Survey									
Measured Depth	Inclination	Azimuth	Vertical Depth	+N/-S	+E/-W	Vertical Section	Dogleg Rate	Build Rate	Turn Rate
(usft)	(°)	(°)	(usft)	(usft)	(usft)	(usft)	(°/100usft)	(°/100usft)	(°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.77	270.28	100.00	0.00	-0.67	0.02	0.77	0.77	0.00
125.00	0.72	281.97	124.99	0.04	-0.99	0.05	0.64	-0.20	46.76
150.00	0.87	285.44	149.99	0.12	-1.33	0.14	0.63	0.60	13.88
175.00	0.95	277.96	174.99	0.20	-1.72	0.23	0.57	0.32	-29.92
200.00	1.00	279.13	199.99	0.26	-2.14	0.30	0.22	0.20	4.68
225.00	0.99	273.21	224.98	0.31	-2.57	0.36	0.41	-0.04	-23.68
250.00	0.91	272.30	249.98	0.33	-2.98	0.38	0.33	-0.32	-3.64
275.00	0.91	273.01	274.98	0.35	-3.38	0.41	0.05	0.00	2.84
300.00	0.80	261.41	299.97	0.33	-3.75	0.40	0.82	-0.44	-46.40

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Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.67	254.82	324.97	0.27	-4.07	0.34	0.62	-0.52	-26.36
350.00	0.47	222.14	349.97	0.15	-4.27	0.23	1.50	-0.80	-130.72
375.00	0.39	217.81	374.97	0.01	-4.40	0.09	0.35	-0.32	-17.32
400.00	0.42	191.28	399.97	-0.15	-4.47	-0.07	0.75	0.12	-106.12
425.00	0.45	188.34	424.97	-0.33	-4.50	-0.25	0.15	0.12	-11.76
450.00	0.49	170.47	449.97	-0.54	-4.49	-0.45	0.60	0.16	-71.48
475.00	0.51	172.70	474.97	-0.75	-4.46	-0.67	0.11	0.08	8.92
500.00	0.56	176.11	499.96	-0.98	-4.44	-0.90	0.24	0.20	13.64
525.00	0.67	172.44	524.96	-1.25	-4.41	-1.17	0.47	0.44	-14.68
550.00	0.64	173.06	549.96	-1.54	-4.38	-1.45	0.12	-0.12	2.48
575.00	0.68	169.59	574.96	-1.82	-4.33	-1.74	0.23	0.16	-13.88
600.00	0.70	167.48	599.96	-2.11	-4.27	-2.04	0.13	0.08	-8.44
625.00	0.94	173.56	624.96	-2.47	-4.22	-2.39	1.02	0.96	24.32
650.00	1.18	175.29	649.95	-2.93	-4.17	-2.85	0.97	0.96	6.92
675.00	1.34	170.34	674.94	-3.47	-4.10	-3.40	0.77	0.64	-19.80
700.00	1.54	167.84	699.94	-4.09	-3.98	-4.02	0.84	0.80	-10.00
725.00	1.81	165.62	724.93	-4.80	-3.81	-4.73	1.11	1.08	-8.88
750.00	1.94	159.98	749.91	-5.58	-3.57	-5.51	0.90	0.52	-22.56
775.00	2.09	154.90	774.90	-6.39	-3.23	-6.33	0.93	0.60	-20.32
800.00	2.27	150.28	799.88	-7.23	-2.79	-7.18	1.01	0.72	-18.48
825.00	2.38	137.84	824.86	-8.05	-2.20	-8.01	2.06	0.44	-49.76
850.00	2.72	128.95	849.83	-8.81	-1.39	-8.78	2.08	1.36	-35.56
875.00	2.89	117.81	874.80	-9.47	-0.37	-9.46	2.28	0.68	-44.56
900.00	3.31	108.39	899.77	-9.99	0.87	-10.01	2.64	1.68	-37.68
925.00	3.41	104.24	924.73	-10.40	2.28	-10.44	1.05	0.40	-16.60
950.00	3.69	96.30	949.68	-10.68	3.80	-10.74	2.26	1.12	-31.76
975.00	3.66	94.12	974.63	-10.82	5.39	-10.92	0.57	-0.12	-8.72
1,000.00	3.61	94.36	999.58	-10.94	6.97	-11.06	0.21	-0.20	0.96
1,025.00	3.56	92.95	1,024.53	-11.04	8.53	-11.19	0.41	-0.20	-5.64
1,050.00	3.54	93.08	1,049.48	-11.12	10.08	-11.30	0.09	-0.08	0.52
1,075.00	3.58	91.59	1,074.43	-11.18	11.63	-11.39	0.40	0.16	-5.96
1,100.00	3.04	90.35	1,099.39	-11.21	13.07	-11.45	2.18	-2.16	-4.96
1,125.00	1.96	86.07	1,124.36	-11.18	14.16	-11.44	4.38	-4.32	-17.12
1,150.00	1.57	77.82	1,149.35	-11.08	14.92	-11.35	1.86	-1.56	-33.00
1,175.00	1.23	73.99	1,174.35	-10.94	15.52	-11.22	1.41	-1.36	-15.32
1,200.00	0.79	27.96	1,199.34	-10.71	15.85	-11.00	3.55	-1.76	-184.12
1,225.00	1.97	318.84	1,224.34	-10.23	15.65	-10.52	7.37	4.72	-276.48
1,250.00	2.64	311.38	1,249.31	-9.53	14.94	-9.80	2.93	2.68	-29.84
1,275.00	2.97	310.70	1,274.28	-8.73	14.01	-8.98	1.33	1.32	-2.72
1,300.00	3.04	309.14	1,299.25	-7.89	13.01	-8.12	0.43	0.28	-6.24
1,325.00	3.07	306.24	1,324.22	-7.07	11.96	-7.29	0.63	0.12	-11.60
1,350.00	3.05	309.57	1,349.18	-6.25	10.90	-6.45	0.72	-0.08	13.32
1,375.00	3.02	309.40	1,374.14	-5.41	9.88	-5.59	0.13	-0.12	-0.68

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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)	
1,400.00	2.54	304.70	1,399.11	-4.68	8.92	-4.84	2.12	-1.92	-18.80	
1,425.00	1.84	293.26	1,424.10	-4.20	8.09	-4.35	3.29	-2.80	-45.76	
1,450.00	1.59	285.20	1,449.09	-3.95	7.39	-4.09	1.39	-1.00	-32.24	
1,475.00	1.53	285.61	1,474.08	-3.77	6.73	-3.90	0.24	-0.24	1.64	
1,500.00	1.66	286.44	1,499.07	-3.58	6.06	-3.69	0.53	0.52	3.32	
1,525.00	1.50	282.73	1,524.06	-3.41	5.40	-3.50	0.76	-0.64	-14.84	
1,550.00	1.44	286.26	1,549.05	-3.25	4.78	-3.33	0.43	-0.24	14.12	
1,575.00	1.48	285.31	1,574.04	-3.07	4.16	-3.15	0.19	0.16	-3.80	
1,600.00	1.57	283.29	1,599.03	-2.91	3.52	-2.97	0.42	0.36	-8.08	
1,625.00	1.42	285.97	1,624.02	-2.75	2.89	-2.80	0.66	-0.60	10.72	
1,650.00	1.07	294.02	1,649.02	-2.56	2.38	-2.61	1.56	-1.40	32.20	
1,675.00	0.43	331.91	1,674.02	-2.39	2.12	-2.43	3.11	-2.56	151.56	
1,700.00	0.90	55.95	1,699.01	-2.19	2.24	-2.23	3.83	1.88	336.16	
1,725.00	0.89	64.11	1,724.01	-2.00	2.58	-2.05	0.51	-0.04	32.64	
1,750.00	1.02	64.91	1,749.01	-1.82	2.95	-1.87	0.52	0.52	3.20	
1,775.00	1.06	64.13	1,774.00	-1.63	3.36	-1.69	0.17	0.16	-3.12	
1,800.00	1.16	66.83	1,799.00	-1.42	3.80	-1.49	0.45	0.40	10.80	
1,825.00	1.22	62.94	1,823.99	-1.20	4.27	-1.28	0.40	0.24	-15.56	
1,850.00	1.17	64.07	1,848.99	-0.97	4.74	-1.06	0.22	-0.20	4.52	
1,875.00	1.19	64.57	1,873.98	-0.75	5.20	-0.84	0.09	0.08	2.00	
1,900.00	1.22	63.95	1,898.98	-0.52	5.68	-0.62	0.13	0.12	-2.48	
1,925.00	1.24	65.97	1,923.97	-0.29	6.16	-0.41	0.19	0.08	8.08	
1,950.00	1.33	63.10	1,948.96	-0.05	6.67	-0.17	0.44	0.36	-11.48	
1,975.00	1.26	64.60	1,973.96	0.20	7.18	0.07	0.31	-0.28	6.00	
2,000.00	1.25	61.78	1,998.95	0.44	7.66	0.30	0.25	-0.04	-11.28	
2,025.00	1.21	59.76	2,023.95	0.71	8.13	0.56	0.24	-0.16	-8.08	
2,050.00	0.91	62.00	2,048.94	0.93	8.54	0.78	1.21	-1.20	8.96	
2,075.00	0.27	99.76	2,073.94	1.02	8.77	0.85	2.86	-2.56	151.04	
2,100.00	0.35	148.52	2,098.94	0.94	8.87	0.78	1.06	0.32	195.04	
2,125.00	0.42	148.98	2,123.94	0.80	8.95	0.63	0.28	0.28	1.84	
2,150.00	0.67	143.83	2,148.94	0.60	9.09	0.43	1.02	1.00	-20.60	
2,175.00	0.87	136.17	2,173.94	0.35	9.30	0.17	0.90	0.80	-30.64	
2,200.00	0.96	134.59	2,198.93	0.06	9.59	-0.11	0.37	0.36	-6.32	
2,225.00	1.11	129.40	2,223.93	-0.24	9.92	-0.42	0.71	0.60	-20.76	
2,250.00	1.14	127.41	2,248.92	-0.54	10.31	-0.73	0.20	0.12	-7.96	
2,275.00	1.15	117.25	2,273.92	-0.81	10.73	-1.01	0.81	0.04	-40.64	
2,300.00	1.14	121.97	2,298.91	-1.06	11.16	-1.26	0.38	-0.04	18.88	
2,325.00	1.09	121.80	2,323.91	-1.31	11.57	-1.53	0.20	-0.20	-0.68	
2,350.00	1.02	120.70	2,348.91	-1.55	11.97	-1.77	0.29	-0.28	-4.40	
2,375.00	1.13	116.47	2,373.90	-1.78	12.38	-2.00	0.54	0.44	-16.92	
2,400.00	1.09	123.65	2,398.90	-2.02	12.80	-2.25	0.58	-0.16	28.72	
2,425.00	1.14	120.61	2,423.89	-2.28	13.21	-2.52	0.31	0.20	-12.16	
2,450.00	1.14	120.18	2,448.89	-2.53	13.64	-2.78	0.03	0.00	-1.72	

Survey Report

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Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
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Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
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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	1.14	117.34	2,473.88	-2.77	14.07	-3.02	0.23	0.00	-11.36	
2,500.00	1.10	122.81	2,498.88	-3.01	14.50	-3.28	0.46	-0.16	21.88	
2,525.00	1.13	123.91	2,523.87	-3.28	14.90	-3.55	0.15	0.12	4.40	
2,550.00	1.16	126.26	2,548.87	-3.57	15.31	-3.85	0.22	0.12	9.40	
2,575.00	1.15	114.58	2,573.86	-3.82	15.74	-4.11	0.94	-0.04	-46.72	
2,600.00	1.21	114.82	2,598.86	-4.03	16.21	-4.33	0.24	0.24	0.96	
2,625.00	1.39	99.48	2,623.85	-4.20	16.75	-4.50	1.56	0.72	-61.36	
2,650.00	1.68	93.83	2,648.84	-4.27	17.42	-4.59	1.31	1.16	-22.60	
2,675.00	1.79	90.62	2,673.83	-4.30	18.17	-4.63	0.59	0.44	-12.84	
2,700.00	1.96	88.97	2,698.82	-4.30	18.99	-4.64	0.71	0.68	-6.60	
2,725.00	1.90	88.65	2,723.80	-4.28	19.83	-4.64	0.24	-0.24	-1.28	
2,750.00	2.05	87.09	2,748.79	-4.25	20.69	-4.62	0.64	0.60	-6.24	
2,775.00	2.19	83.90	2,773.77	-4.17	21.61	-4.57	0.73	0.56	-12.76	
2,800.00	1.99	87.00	2,798.75	-4.10	22.52	-4.51	0.92	-0.80	12.40	
2,825.00	2.00	88.38	2,823.74	-4.06	23.39	-4.49	0.20	0.04	5.52	
2,850.00	2.03	89.37	2,848.72	-4.05	24.27	-4.49	0.18	0.12	3.96	
2,875.00	1.93	86.44	2,873.71	-4.02	25.13	-4.48	0.57	-0.40	-11.72	
2,900.00	1.60	96.02	2,898.70	-4.03	25.90	-4.50	1.77	-1.32	38.32	
2,925.00	1.02	103.14	2,923.69	-4.11	26.46	-4.60	2.41	-2.32	28.48	
2,950.00	0.79	111.35	2,948.69	-4.23	26.84	-4.72	1.05	-0.92	32.84	
2,975.00	0.77	126.36	2,973.68	-4.39	27.14	-4.89	0.82	-0.08	60.04	
3,000.00	0.85	134.56	2,998.68	-4.62	27.41	-5.12	0.56	0.32	32.80	
3,025.00	0.88	148.11	3,023.68	-4.91	27.64	-5.42	0.82	0.12	54.20	
3,050.00	1.04	140.68	3,048.68	-5.25	27.88	-5.76	0.81	0.64	-29.72	
3,075.00	1.03	136.68	3,073.67	-5.59	28.18	-6.10	0.29	-0.04	-16.00	
3,100.00	1.00	138.16	3,098.67	-5.91	28.48	-6.44	0.16	-0.12	5.92	
3,125.00	1.01	128.50	3,123.66	-6.21	28.80	-6.74	0.68	0.04	-38.64	
3,150.00	1.04	126.05	3,148.66	-6.49	29.16	-7.02	0.21	0.12	-9.80	
3,175.00	0.92	124.58	3,173.66	-6.73	29.50	-7.27	0.49	-0.48	-5.88	
3,200.00	0.86	131.98	3,198.65	-6.97	29.81	-7.52	0.52	-0.24	29.60	
3,225.00	0.92	122.66	3,223.65	-7.21	30.12	-7.76	0.63	0.24	-37.28	
3,250.00	0.90	128.74	3,248.65	-7.44	30.44	-7.99	0.39	-0.08	24.32	
3,275.00	0.69	111.22	3,273.64	-7.61	30.73	-8.18	1.28	-0.84	-70.08	
3,300.00	0.73	58.94	3,298.64	-7.59	31.01	-8.15	2.51	0.16	-209.12	
3,325.00	0.70	52.10	3,323.64	-7.41	31.27	-7.98	0.36	-0.12	-27.36	
3,350.00	0.80	47.45	3,348.64	-7.20	31.52	-7.78	0.47	0.40	-18.60	
3,375.00	0.55	52.16	3,373.64	-7.01	31.74	-7.59	1.02	-1.00	18.84	
3,400.00	0.51	60.14	3,398.64	-6.88	31.93	-7.46	0.34	-0.16	31.92	
3,425.00	0.61	63.35	3,423.64	-6.76	32.15	-7.35	0.42	0.40	12.84	
3,450.00	0.53	58.76	3,448.63	-6.64	32.36	-7.24	0.37	-0.32	-18.36	
3,475.00	0.62	65.10	3,473.63	-6.53	32.58	-7.12	0.44	0.36	25.36	
3,500.00	0.65	66.49	3,498.63	-6.41	32.84	-7.01	0.13	0.12	5.56	
3,525.00	0.64	66.44	3,523.63	-6.30	33.10	-6.91	0.04	-0.04	-0.20	
3,550.00	0.78	70.49	3,548.63	-6.19	33.38	-6.80	0.59	0.56	16.20	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.90	74.91	3,573.62	-6.08	33.73	-6.70	0.55	0.48	17.68
3,600.00	0.99	73.22	3,598.62	-5.97	34.13	-6.59	0.38	0.36	-6.76
3,625.00	0.99	77.85	3,623.62	-5.86	34.55	-6.49	0.32	0.00	18.52
3,650.00	1.16	70.59	3,648.61	-5.73	35.00	-6.37	0.87	0.68	-29.04
3,675.00	1.34	65.55	3,673.61	-5.52	35.50	-6.17	0.84	0.72	-20.16
3,700.00	1.34	69.87	3,698.60	-5.30	36.04	-5.96	0.40	0.00	17.28
3,725.00	1.25	66.12	3,723.59	-5.09	36.57	-5.76	0.49	-0.36	-15.00
3,750.00	1.32	69.22	3,748.59	-4.88	37.09	-5.56	0.39	0.28	12.40
3,775.00	1.31	68.36	3,773.58	-4.67	37.62	-5.36	0.09	-0.04	-3.44
3,800.00	1.30	74.83	3,798.57	-4.49	38.16	-5.19	0.59	-0.04	25.88
3,825.00	1.46	75.18	3,823.57	-4.34	38.74	-5.05	0.64	0.64	1.40
3,850.00	1.47	75.69	3,848.56	-4.18	39.36	-4.90	0.07	0.04	2.04
3,875.00	1.69	69.81	3,873.55	-3.97	40.02	-4.70	1.09	0.88	-23.52
3,900.00	1.63	65.42	3,898.54	-3.69	40.69	-4.44	0.56	-0.24	-17.56
3,925.00	1.54	68.14	3,923.53	-3.42	41.32	-4.18	0.47	-0.36	10.88
3,950.00	1.52	71.14	3,948.52	-3.19	41.95	-3.96	0.33	-0.08	12.00
3,975.00	1.60	71.72	3,973.51	-2.97	42.59	-3.75	0.33	0.32	2.32
4,000.00	1.59	74.57	3,998.50	-2.77	43.26	-3.56	0.32	-0.04	11.40
4,025.00	1.60	76.05	4,023.49	-2.59	43.93	-3.40	0.17	0.04	5.92
4,050.00	1.72	73.51	4,048.48	-2.40	44.63	-3.22	0.56	0.48	-10.16
4,075.00	1.80	75.68	4,073.47	-2.20	45.37	-3.03	0.42	0.32	8.68
4,100.00	1.93	79.58	4,098.46	-2.03	46.16	-2.87	0.73	0.52	15.60
4,125.00	2.10	81.33	4,123.44	-1.88	47.03	-2.74	0.72	0.68	7.00
4,150.00	2.16	82.16	4,148.42	-1.75	47.95	-2.63	0.27	0.24	3.32
4,175.00	2.16	84.03	4,173.41	-1.63	48.89	-2.53	0.28	0.00	7.48
4,200.00	1.97	85.89	4,198.39	-1.55	49.78	-2.47	0.81	-0.76	7.44
4,225.00	1.60	91.26	4,223.38	-1.53	50.56	-2.46	1.62	-1.48	21.48
4,250.00	0.89	104.62	4,248.37	-1.59	51.10	-2.52	3.05	-2.84	53.44
4,275.00	0.73	110.96	4,273.37	-1.69	51.43	-2.64	0.73	-0.64	25.36
4,300.00	0.69	119.21	4,298.37	-1.82	51.71	-2.77	0.44	-0.16	33.00
4,325.00	0.72	117.00	4,323.37	-1.97	51.99	-2.92	0.16	0.12	-8.84
4,350.00	0.74	119.76	4,348.36	-2.12	52.27	-3.08	0.16	0.08	11.04
4,375.00	0.81	119.09	4,373.36	-2.29	52.56	-3.25	0.28	0.28	-2.68
4,400.00	1.04	125.91	4,398.36	-2.51	52.90	-3.47	1.02	0.92	27.28
4,425.00	1.16	126.31	4,423.35	-2.79	53.29	-3.76	0.48	0.48	1.60
4,450.00	1.18	127.65	4,448.35	-3.10	53.69	-4.08	0.14	0.08	5.36
4,475.00	1.25	131.23	4,473.34	-3.43	54.10	-4.42	0.41	0.28	14.32
4,500.00	1.22	134.45	4,498.34	-3.80	54.50	-4.80	0.30	-0.12	12.88
4,525.00	1.04	140.37	4,523.33	-4.16	54.83	-5.16	0.86	-0.72	23.68
4,550.00	0.93	140.01	4,548.33	-4.49	55.11	-5.50	0.44	-0.44	-1.44
4,575.00	0.92	133.56	4,573.32	-4.78	55.38	-5.80	0.42	-0.04	-25.80
4,600.00	0.91	132.93	4,598.32	-5.06	55.67	-6.08	0.06	-0.04	-2.52
4,625.00	0.94	139.76	4,623.32	-5.35	55.95	-6.37	0.46	0.12	27.32

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.94	140.01	4,648.32	-5.66	56.22	-6.69	0.02	0.00	1.00	
4,675.00	0.81	140.25	4,673.31	-5.96	56.46	-6.99	0.52	-0.52	0.96	
4,700.00	0.68	140.17	4,698.31	-6.21	56.67	-7.24	0.52	-0.52	-0.32	
4,725.00	0.57	143.60	4,723.31	-6.42	56.84	-7.46	0.46	-0.44	13.72	
4,750.00	0.55	154.88	4,748.31	-6.63	56.96	-7.67	0.45	-0.08	45.12	
4,775.00	0.54	157.79	4,773.31	-6.85	57.06	-7.89	0.12	-0.04	11.64	
4,800.00	0.50	148.38	4,798.31	-7.05	57.16	-8.09	0.38	-0.16	-37.64	
4,825.00	0.51	160.39	4,823.30	-7.25	57.25	-8.29	0.42	0.04	48.04	
4,850.00	0.35	176.40	4,848.30	-7.43	57.30	-8.48	0.79	-0.64	64.04	
4,875.00	0.39	176.48	4,873.30	-7.59	57.31	-8.64	0.16	0.16	0.32	
4,900.00	0.39	182.44	4,898.30	-7.76	57.31	-8.81	0.16	0.00	23.84	
4,925.00	0.41	174.12	4,923.30	-7.93	57.31	-8.98	0.25	0.08	-33.28	
4,950.00	0.38	172.29	4,948.30	-8.10	57.33	-9.15	0.13	-0.12	-7.32	
4,975.00	0.43	170.39	4,973.30	-8.28	57.36	-9.33	0.21	0.20	-7.60	
5,000.00	0.35	170.84	4,998.30	-8.45	57.39	-9.50	0.32	-0.32	1.80	
5,025.00	0.46	171.62	5,023.30	-8.62	57.41	-9.67	0.44	0.44	3.12	
5,050.00	0.43	173.84	5,048.30	-8.81	57.44	-9.86	0.14	-0.12	8.88	
5,075.00	0.48	178.18	5,073.30	-9.01	57.45	-10.06	0.24	0.20	17.36	
5,100.00	0.68	178.26	5,098.30	-9.26	57.46	-10.32	0.80	0.80	0.32	
5,125.00	0.71	178.78	5,123.29	-9.57	57.47	-10.62	0.12	0.12	2.08	
5,150.00	0.70	175.19	5,148.29	-9.87	57.48	-10.93	0.18	-0.04	-14.36	
5,175.00	0.64	173.13	5,173.29	-10.16	57.51	-11.22	0.26	-0.24	-8.24	
5,200.00	0.59	164.36	5,198.29	-10.43	57.57	-11.48	0.43	-0.20	-35.08	
5,225.00	0.61	167.11	5,223.29	-10.68	57.63	-11.74	0.14	0.08	11.00	
5,250.00	0.55	173.77	5,248.29	-10.93	57.67	-11.98	0.36	-0.24	26.64	
5,275.00	0.56	172.00	5,273.29	-11.17	57.70	-12.23	0.08	0.04	-7.08	
5,300.00	0.53	163.00	5,298.28	-11.40	57.75	-12.46	0.36	-0.12	-36.00	
5,325.00	0.55	167.35	5,323.28	-11.63	57.81	-12.69	0.18	0.08	17.40	
5,350.00	0.51	150.47	5,348.28	-11.84	57.89	-12.90	0.64	-0.16	-67.52	
5,375.00	0.66	110.32	5,373.28	-11.99	58.08	-13.05	1.70	0.60	-160.60	
5,400.00	0.69	107.77	5,398.28	-12.09	58.36	-13.15	0.17	0.12	-10.20	
5,425.00	0.74	101.56	5,423.28	-12.16	58.66	-13.24	0.37	0.20	-24.84	
5,450.00	0.76	98.66	5,448.28	-12.22	58.99	-13.30	0.17	0.08	-11.60	
5,475.00	0.79	117.71	5,473.27	-12.33	59.30	-13.41	1.03	0.12	76.20	
5,500.00	0.83	108.56	5,498.27	-12.46	59.63	-13.56	0.54	0.16	-36.60	
5,525.00	0.79	108.91	5,523.27	-12.58	59.96	-13.67	0.16	-0.16	1.40	
5,550.00	0.78	110.11	5,548.27	-12.69	60.28	-13.79	0.08	-0.04	4.80	
5,575.00	0.67	97.57	5,573.26	-12.77	60.59	-13.88	0.77	-0.44	-50.16	
5,600.00	0.76	97.64	5,598.26	-12.81	60.90	-13.93	0.36	0.36	0.28	
5,625.00	0.71	111.59	5,623.26	-12.89	61.21	-14.01	0.74	-0.20	55.80	
5,650.00	0.68	106.85	5,648.26	-12.99	61.49	-14.12	0.26	-0.12	-18.96	
5,675.00	0.63	110.09	5,673.26	-13.08	61.76	-14.21	0.25	-0.20	12.96	
5,700.00	0.27	121.34	5,698.26	-13.16	61.94	-14.29	1.48	-1.44	45.00	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.46	278.25	5,723.26	-13.17	61.89	-14.31	2.86	0.76	627.64	
5,750.00	0.72	282.64	5,748.25	-13.13	61.64	-14.25	1.05	1.04	17.56	
5,775.00	0.74	290.03	5,773.25	-13.04	61.34	-14.16	0.38	0.08	29.56	
5,800.00	0.75	291.32	5,798.25	-12.92	61.03	-14.04	0.08	0.04	5.16	
5,825.00	0.80	284.81	5,823.25	-12.82	60.71	-13.93	0.40	0.20	-26.04	
5,850.00	0.81	292.16	5,848.25	-12.71	60.38	-13.81	0.41	0.04	29.40	
5,875.00	0.82	288.32	5,873.24	-12.58	60.05	-13.68	0.22	0.04	-15.36	
5,900.00	0.85	288.71	5,898.24	-12.47	59.70	-13.56	0.12	0.12	1.56	
5,925.00	0.98	283.19	5,923.24	-12.36	59.32	-13.44	0.63	0.52	-22.08	
5,950.00	0.96	283.13	5,948.23	-12.26	58.90	-13.34	0.08	-0.08	-0.24	
5,975.00	0.95	280.72	5,973.23	-12.18	58.50	-13.25	0.17	-0.04	-9.64	
6,000.00	1.01	288.43	5,998.23	-12.07	58.08	-13.13	0.58	0.24	30.84	
6,025.00	1.01	285.04	6,023.22	-11.94	57.66	-13.00	0.24	0.00	-13.56	
6,050.00	0.95	288.56	6,048.22	-11.82	57.25	-12.87	0.34	-0.24	14.08	
6,075.00	1.09	293.29	6,073.21	-11.66	56.84	-12.70	0.65	0.56	18.92	
6,100.00	1.14	292.16	6,098.21	-11.47	56.39	-12.50	0.22	0.20	-4.52	
6,125.00	1.12	290.45	6,123.21	-11.29	55.93	-12.31	0.16	-0.08	-6.84	
6,150.00	1.05	287.25	6,148.20	-11.14	55.48	-12.15	0.37	-0.28	-12.80	
6,175.00	1.11	279.61	6,173.20	-11.03	55.03	-12.04	0.62	0.24	-30.56	
6,200.00	1.12	279.47	6,198.19	-10.95	54.55	-11.95	0.04	0.04	-0.56	
6,225.00	1.23	279.36	6,223.19	-10.87	54.04	-11.85	0.44	0.44	-0.44	
6,250.00	1.12	297.73	6,248.18	-10.71	53.56	-11.69	1.56	-0.44	73.48	
6,275.00	1.11	307.19	6,273.18	-10.45	53.15	-11.42	0.74	-0.04	37.84	
6,300.00	0.89	312.55	6,298.17	-10.17	52.81	-11.14	0.96	-0.88	21.44	
6,325.00	0.99	314.83	6,323.17	-9.89	52.52	-10.85	0.43	0.40	9.12	
6,350.00	1.10	320.84	6,348.17	-9.55	52.21	-10.50	0.62	0.44	24.04	
6,375.00	1.08	317.84	6,373.16	-9.19	51.90	-10.14	0.24	-0.08	-12.00	
6,400.00	1.02	311.73	6,398.16	-8.87	51.58	-9.81	0.51	-0.24	-24.44	
6,425.00	0.99	314.10	6,423.15	-8.57	51.26	-9.50	0.21	-0.12	9.48	
6,450.00	0.86	315.47	6,448.15	-8.28	50.97	-9.22	0.53	-0.52	5.48	
6,475.00	0.89	315.49	6,473.15	-8.01	50.70	-8.94	0.12	0.12	0.08	
6,500.00	0.84	324.23	6,498.14	-7.72	50.46	-8.65	0.56	-0.20	34.96	
6,525.00	0.71	336.84	6,523.14	-7.43	50.29	-8.35	0.85	-0.52	50.44	
6,550.00	0.53	353.09	6,548.14	-7.18	50.22	-8.09	1.00	-0.72	65.00	
6,575.00	0.57	13.33	6,573.14	-6.94	50.23	-7.86	0.79	0.16	80.96	
6,600.00	0.37	45.91	6,598.14	-6.76	50.32	-7.68	1.30	-0.80	130.32	
6,625.00	0.48	53.82	6,623.14	-6.64	50.46	-7.57	0.50	0.44	31.64	
6,650.00	0.47	57.26	6,648.14	-6.53	50.63	-7.45	0.12	-0.04	13.76	
6,675.00	0.53	64.49	6,673.14	-6.42	50.82	-7.35	0.35	0.24	28.92	
6,700.00	0.50	71.95	6,698.13	-6.34	51.03	-7.27	0.29	-0.12	29.84	
6,725.00	0.48	72.38	6,723.13	-6.27	51.23	-7.21	0.08	-0.08	1.72	
6,750.00	0.52	79.98	6,748.13	-6.22	51.45	-7.16	0.31	0.16	30.40	
6,775.00	0.47	97.81	6,773.13	-6.22	51.66	-7.16	0.64	-0.20	71.32	
6,800.00	0.53	115.17	6,798.13	-6.28	51.87	-7.23	0.65	0.24	69.44	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.64	126.54	6,823.13	-6.41	52.08	-7.36	0.64	0.44	45.48
6,850.00	0.68	134.26	6,848.13	-6.60	52.30	-7.55	0.39	0.16	30.88
6,875.00	0.66	142.31	6,873.13	-6.81	52.49	-7.78	0.38	-0.08	32.20
6,900.00	0.75	139.89	6,898.12	-7.05	52.69	-8.02	0.38	0.36	-9.68
6,925.00	0.82	144.89	6,923.12	-7.33	52.90	-8.29	0.39	0.28	20.00
6,950.00	0.83	139.89	6,948.12	-7.61	53.12	-8.58	0.29	0.04	-20.00
6,975.00	0.84	144.53	6,973.12	-7.90	53.34	-8.87	0.27	0.04	18.56
7,000.00	0.93	143.49	6,998.11	-8.21	53.57	-9.19	0.37	0.36	-4.16
7,025.00	1.00	151.56	7,023.11	-8.57	53.79	-9.55	0.61	0.28	32.28
7,050.00	1.14	150.39	7,048.11	-8.97	54.02	-9.96	0.57	0.56	-4.68
7,075.00	1.25	150.61	7,073.10	-9.43	54.27	-10.42	0.44	0.44	0.88
7,100.00	1.35	151.39	7,098.09	-9.92	54.55	-10.92	0.41	0.40	3.12
7,125.00	1.46	153.21	7,123.09	-10.47	54.83	-11.47	0.47	0.44	7.28
7,150.00	1.55	154.88	7,148.08	-11.06	55.12	-12.06	0.40	0.36	6.68
7,175.00	1.62	155.18	7,173.07	-11.68	55.41	-12.70	0.28	0.28	1.20
7,200.00	1.47	153.96	7,198.06	-12.29	55.70	-13.31	0.61	-0.60	-4.88
7,225.00	0.72	172.03	7,223.05	-12.74	55.86	-13.76	3.27	-3.00	72.28
7,250.00	0.45	226.29	7,248.05	-12.96	55.81	-13.98	2.34	-1.08	217.04
7,275.00	0.54	247.80	7,273.05	-13.07	55.63	-14.09	0.82	0.36	86.04
7,300.00	0.77	263.50	7,298.05	-13.14	55.36	-14.15	1.16	0.92	62.80
7,325.00	1.33	291.38	7,323.05	-13.05	54.92	-14.05	2.97	2.24	111.52
7,350.00	1.58	295.23	7,348.04	-12.80	54.34	-13.79	1.07	1.00	15.40
7,375.00	1.71	293.13	7,373.03	-12.50	53.68	-13.48	0.57	0.52	-8.40
7,400.00	1.33	307.13	7,398.02	-12.18	53.11	-13.15	2.11	-1.52	56.00
7,425.00	1.31	333.81	7,423.01	-11.75	52.75	-12.71	2.44	-0.08	106.72
7,450.00	1.40	348.53	7,448.01	-11.19	52.57	-12.15	1.43	0.36	58.88
7,475.00	1.51	345.23	7,473.00	-10.58	52.42	-11.53	0.55	0.44	-13.20
7,500.00	1.32	344.60	7,497.99	-9.98	52.26	-10.94	0.76	-0.76	-2.52
7,525.00	1.12	348.07	7,522.98	-9.46	52.13	-10.42	0.85	-0.80	13.88
7,550.00	1.28	357.84	7,547.98	-8.94	52.07	-9.90	1.04	0.64	39.08
7,575.00	1.12	349.44	7,572.97	-8.43	52.02	-9.38	0.95	-0.64	-33.60
7,600.00	0.95	355.48	7,597.97	-7.98	51.96	-8.93	0.81	-0.68	24.16
7,625.00	0.84	355.72	7,622.97	-7.59	51.93	-8.54	0.44	-0.44	0.96
7,650.00	0.74	339.19	7,647.96	-7.26	51.86	-8.20	0.99	-0.40	-66.12
7,675.00	0.50	343.83	7,672.96	-7.00	51.77	-7.95	0.98	-0.96	18.56
7,700.00	0.70	343.11	7,697.96	-6.75	51.69	-7.70	0.80	0.80	-2.88
7,725.00	0.46	316.93	7,722.96	-6.53	51.58	-7.47	1.41	-0.96	-104.72
7,750.00	0.34	333.04	7,747.96	-6.39	51.48	-7.33	0.65	-0.48	64.44
7,775.00	0.44	299.95	7,772.96	-6.28	51.36	-7.22	0.97	0.40	-132.36
7,800.00	0.25	294.05	7,797.96	-6.21	51.23	-7.14	0.77	-0.76	-23.60
7,825.00	0.33	279.51	7,822.96	-6.17	51.11	-7.11	0.43	0.32	-58.16
7,850.00	0.22	252.83	7,847.96	-6.17	50.99	-7.11	0.66	-0.44	-106.72
7,875.00	0.31	268.53	7,872.96	-6.19	50.88	-7.12	0.46	0.36	62.80

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Elder Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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	0.13	277.89	7,897.96	-6.19	50.78	-7.12	0.73	-0.72	37.44
7,925.00	0.24	223.33	7,922.96	-6.22	50.72	-7.15	0.78	0.44	-218.24
7,950.00	0.32	267.68	7,947.96	-6.26	50.61	-7.19	0.90	0.32	177.40
7,975.00	0.27	205.80	7,972.96	-6.32	50.52	-7.24	1.23	-0.20	-247.52
8,000.00	0.29	217.49	7,997.96	-6.42	50.45	-7.35	0.24	0.08	46.76
8,025.00	0.16	287.75	8,022.96	-6.46	50.38	-7.38	1.12	-0.52	281.04
8,050.00	0.39	191.02	8,047.96	-6.53	50.33	-7.46	1.75	0.92	-386.92
8,075.00	0.70	195.26	8,072.95	-6.77	50.27	-7.69	1.25	1.24	16.96
8,100.00	0.65	204.08	8,097.95	-7.04	50.18	-7.96	0.46	-0.20	35.28
8,125.00	0.40	183.80	8,122.95	-7.26	50.11	-8.18	1.23	-1.00	-81.12
Tie In									
8,177.00	0.42	192.13	8,174.95	-7.63	50.06	-8.54	0.12	0.04	16.02
First Phoenix MWD Survey									
8,272.00	0.70	225.93	8,269.95	-8.37	49.57	-9.28	0.44	0.29	35.58
8,366.00	1.15	349.97	8,363.94	-7.84	48.99	-8.74	1.75	0.48	131.96
8,460.00	0.80	317.24	8,457.93	-6.43	48.38	-7.32	0.69	-0.37	-34.82
8,554.00	0.69	299.54	8,551.92	-5.67	47.45	-6.54	0.27	-0.12	-18.83
8,634.00	0.55	301.89	8,631.91	-5.23	46.70	-6.08	0.18	-0.18	2.94
8,709.00	2.63	316.60	8,706.88	-3.79	45.21	-4.62	2.80	2.77	19.61
8,756.00	8.49	336.94	8,753.64	0.19	43.11	-0.60	12.96	12.47	43.28
8,803.00	14.83	341.48	8,799.65	9.10	39.84	8.36	13.62	13.49	9.66
8,850.00	19.97	341.75	8,844.49	22.43	35.41	21.78	10.94	10.94	0.57
8,897.00	23.62	342.63	8,888.12	39.04	30.08	38.49	7.80	7.77	1.87
8,944.00	26.97	343.36	8,930.61	58.25	24.22	57.79	7.16	7.13	1.55
8,991.00	30.31	345.74	8,971.85	79.96	18.25	79.61	7.51	7.11	5.06
9,038.00	36.08	345.98	9,011.16	104.90	11.97	104.67	12.28	12.28	0.51
9,085.00	42.65	345.77	9,047.48	133.80	4.69	133.69	13.98	13.98	-0.45
9,132.00	48.63	346.54	9,080.33	166.41	-3.34	166.44	12.78	12.72	1.64
9,179.00	55.58	347.87	9,109.18	202.56	-11.52	202.74	14.95	14.79	2.83
9,226.00	62.39	347.89	9,133.38	241.92	-19.98	242.24	14.49	14.49	0.04
9,273.00	65.12	348.46	9,154.16	283.18	-28.61	283.65	5.91	5.81	1.21
9,320.00	70.39	348.72	9,171.95	325.80	-37.21	326.43	11.22	11.21	0.55
9,367.00	74.56	347.44	9,186.10	369.64	-46.47	370.43	9.24	8.87	-2.72
9,414.00	78.75	348.29	9,196.95	414.34	-56.08	415.30	9.09	8.91	1.81
9,454.00	83.10	346.22	9,203.26	452.86	-64.80	453.97	12.01	10.87	-5.18
FTP: 9454' MD									
9,460.00	83.75	345.91	9,203.94	458.64	-66.23	459.78	12.01	10.88	-5.12
9,488.00	86.47	346.41	9,206.33	485.73	-72.91	486.98	9.88	9.71	1.79
9,535.00	89.05	348.97	9,208.17	531.60	-82.92	533.03	7.73	5.49	5.45
9,582.00	90.61	350.97	9,208.31	577.88	-91.10	579.45	5.40	3.32	4.26
9,629.00	90.42	353.46	9,207.88	624.44	-97.47	626.12	5.31	-0.40	5.30
9,676.00	90.61	356.07	9,207.46	671.24	-101.75	672.99	5.57	0.40	5.55
9,723.00	90.67	358.62	9,206.94	718.18	-103.93	719.97	5.43	0.13	5.43
9,817.00	90.06	358.82	9,206.34	812.16	-106.03	813.96	0.68	-0.65	0.21

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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)	
9,911.00	89.89	358.17	9,206.38	906.12	-108.50	907.96	0.71	-0.18	-0.69	
10,005.00	88.32	357.88	9,207.85	1,000.05	-111.74	1,001.93	1.70	-1.67	-0.31	
10,099.00	89.21	358.22	9,209.87	1,093.98	-114.94	1,095.90	1.01	0.95	0.36	
10,193.00	91.21	357.24	9,209.53	1,187.90	-118.66	1,189.87	2.37	2.13	-1.04	
10,287.00	91.31	357.80	9,207.46	1,281.79	-122.73	1,283.82	0.61	0.11	0.60	
10,382.00	88.23	359.38	9,207.84	1,376.74	-125.06	1,378.80	3.64	-3.24	1.66	
10,476.00	88.45	359.81	9,210.57	1,470.70	-125.73	1,472.76	0.51	0.23	0.46	
10,569.00	89.39	0.50	9,212.32	1,563.68	-125.48	1,565.72	1.25	1.01	0.74	
10,663.00	88.51	1.47	9,214.04	1,657.65	-123.86	1,659.64	1.39	-0.94	1.03	
10,757.00	89.02	2.07	9,216.07	1,751.58	-120.96	1,753.50	0.84	0.54	0.64	
10,851.00	88.66	359.43	9,217.97	1,845.55	-119.73	1,847.43	2.83	-0.38	-2.81	
10,945.00	90.09	359.10	9,219.00	1,939.53	-120.93	1,941.42	1.56	1.52	-0.35	
11,039.00	92.58	359.14	9,216.81	2,033.49	-122.38	2,035.39	2.65	2.65	0.04	
11,134.00	92.24	359.12	9,212.81	2,128.39	-123.82	2,130.30	0.36	-0.36	-0.02	
11,227.00	90.64	0.25	9,210.47	2,221.36	-124.33	2,223.26	2.11	-1.72	1.22	
11,321.00	87.68	0.39	9,211.85	2,315.33	-123.80	2,317.21	3.15	-3.15	0.15	
11,415.00	88.41	1.10	9,215.06	2,409.27	-122.58	2,411.11	1.08	0.78	0.76	
11,509.00	90.34	1.60	9,216.08	2,503.23	-120.37	2,505.02	2.12	2.05	0.53	
11,602.00	90.98	0.35	9,215.01	2,596.21	-118.78	2,597.95	1.51	0.69	-1.34	
11,697.00	90.79	0.55	9,213.55	2,691.20	-118.04	2,692.91	0.29	-0.20	0.21	
11,790.00	90.61	358.43	9,212.41	2,784.18	-118.87	2,785.89	2.29	-0.19	-2.28	
11,884.00	92.02	358.06	9,210.25	2,878.11	-121.74	2,879.86	1.55	1.50	-0.39	
11,978.00	91.20	357.23	9,207.61	2,971.99	-125.61	2,973.79	1.24	-0.87	-0.88	
12,072.00	90.61	358.48	9,206.13	3,065.91	-129.12	3,067.76	1.47	-0.63	1.33	
12,167.00	88.23	0.15	9,207.09	3,160.89	-130.26	3,162.75	3.06	-2.51	1.76	
12,261.00	89.83	1.99	9,208.68	3,254.85	-128.50	3,256.66	2.59	1.70	1.96	
12,355.00	91.37	1.00	9,207.69	3,348.81	-126.05	3,350.56	1.95	1.64	-1.05	
12,449.00	91.09	358.94	9,205.68	3,442.78	-126.10	3,444.52	2.21	-0.30	-2.19	
12,542.00	90.70	358.91	9,204.22	3,535.76	-127.85	3,537.51	0.42	-0.42	-0.03	
12,636.00	90.11	0.01	9,203.56	3,629.75	-128.73	3,631.50	1.33	-0.63	1.17	
12,731.00	88.88	1.13	9,204.40	3,724.74	-127.79	3,726.45	1.75	-1.29	1.18	
12,825.00	89.61	1.91	9,205.64	3,818.69	-125.29	3,820.35	1.14	0.78	0.83	
12,919.00	89.64	0.50	9,206.25	3,912.67	-123.32	3,914.27	1.50	0.03	-1.50	
13,012.00	88.07	359.14	9,208.11	4,005.64	-123.61	4,007.24	2.23	-1.69	-1.46	
13,106.00	88.23	358.49	9,211.14	4,099.58	-125.55	4,101.19	0.71	0.17	-0.69	
13,201.00	89.97	359.71	9,212.64	4,194.55	-127.04	4,196.17	2.24	1.83	1.28	
13,295.00	90.59	0.58	9,212.18	4,288.54	-126.80	4,290.15	1.14	0.66	0.93	
13,389.00	89.24	359.35	9,212.32	4,382.54	-126.86	4,384.13	1.94	-1.44	-1.31	
13,484.00	89.50	358.92	9,213.36	4,477.52	-128.30	4,479.12	0.53	0.27	-0.45	
13,578.00	88.82	357.42	9,214.74	4,571.46	-131.30	4,573.10	1.75	-0.72	-1.60	
13,672.00	88.46	356.60	9,216.97	4,665.31	-136.20	4,667.02	0.95	-0.38	-0.87	
13,766.00	88.77	357.42	9,219.24	4,759.15	-141.10	4,760.94	0.93	0.33	0.87	
13,860.00	88.51	357.24	9,221.47	4,853.02	-145.48	4,854.87	0.34	-0.28	-0.19	

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	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)
13,955.00	89.83	359.39	9,222.85	4,947.96	-148.27	4,949.85	2.66	1.39	2.26
14,049.00	90.25	359.13	9,222.78	5,041.95	-149.49	5,043.85	0.53	0.45	-0.28
14,142.00	88.99	355.53	9,223.40	5,134.83	-153.82	5,136.79	4.10	-1.35	-3.87
14,236.00	89.39	358.50	9,224.73	5,228.69	-158.71	5,230.72	3.19	0.43	3.16
14,330.00	89.21	357.99	9,225.88	5,322.64	-161.59	5,324.70	0.58	-0.19	-0.54
14,424.00	91.57	0.23	9,225.24	5,416.61	-163.05	5,418.69	3.46	2.51	2.38
14,518.00	92.75	1.65	9,221.70	5,510.53	-161.51	5,512.56	1.96	1.26	1.51
14,612.00	90.92	1.81	9,218.69	5,604.43	-158.67	5,606.40	1.95	-1.95	0.17
14,707.00	90.79	359.86	9,217.27	5,699.41	-157.29	5,701.33	2.06	-0.14	-2.05
14,802.00	88.66	0.63	9,217.72	5,794.40	-156.88	5,796.30	2.38	-2.24	0.81
14,896.00	88.04	0.38	9,220.43	5,888.35	-156.05	5,890.22	0.71	-0.66	-0.27
14,990.00	87.53	0.39	9,224.06	5,982.28	-155.42	5,984.12	0.54	-0.54	0.01
15,084.00	89.72	359.64	9,226.32	6,076.25	-155.40	6,078.08	2.46	2.33	-0.80
15,179.00	91.18	359.69	9,225.57	6,171.24	-155.95	6,173.06	1.54	1.54	0.05
15,273.00	91.85	359.61	9,223.09	6,265.21	-156.53	6,267.02	0.72	0.71	-0.09
15,368.00	92.38	359.69	9,219.58	6,360.14	-157.11	6,361.95	0.56	0.56	0.08
15,462.00	90.09	0.28	9,217.56	6,454.11	-157.13	6,455.91	2.52	-2.44	0.63
15,556.00	89.50	0.32	9,217.89	6,548.11	-156.64	6,549.88	0.63	-0.63	0.04
15,650.00	91.26	1.26	9,217.27	6,642.09	-155.34	6,643.82	2.12	1.87	1.00
15,745.00	89.41	0.94	9,216.71	6,737.07	-153.52	6,738.75	1.98	-1.95	-0.34
15,839.00	89.33	0.32	9,217.75	6,831.06	-152.49	6,832.70	0.67	-0.09	-0.66
15,933.00	89.97	0.47	9,218.32	6,925.05	-151.84	6,926.67	0.70	0.68	0.16
16,028.00	86.97	0.84	9,220.86	7,020.00	-150.75	7,021.59	3.18	-3.16	0.39
16,122.00	86.61	0.37	9,226.12	7,113.85	-149.76	7,115.40	0.63	-0.38	-0.50
16,216.00	86.98	1.17	9,231.38	7,207.69	-148.50	7,209.20	0.94	0.39	0.85
16,310.00	86.89	1.74	9,236.40	7,301.53	-146.12	7,302.98	0.61	-0.10	0.61
16,366.00	88.78	2.01	9,238.52	7,357.45	-144.29	7,358.86	3.41	3.38	0.48
LTP: 16366' MD									
16,402.00	90.00	2.18	9,238.90	7,393.43	-142.97	7,394.81	3.41	3.38	0.48
Final Phoenix MWD Survey									
16,466.00	90.00	2.18	9,238.90	7,457.38	-140.54	7,458.70	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)	
8,125.00	8,122.95	-7.26	50.11	Tie In
8,177.00	8,174.95	-7.63	50.06	First Phoenix MWD Survey
9,454.00	9,203.26	452.86	-64.80	FTP: 9454' MD
16,366.00	9,238.52	7,357.45	-144.29	LTP: 16366' MD
16,402.00	9,238.90	7,393.43	-142.97	Final Phoenix MWD Survey
16,466.00	9,238.90	7,457.38	-140.54	Projection to TD

Survey Report

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 102H
Project:	Lea County, NM (NAD27 NME)	TVD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Site:	Eider Federal	MD Reference:	GL+KB @ 3546.30usft (Ensign 155)
Well:	102H	North Reference:	Grid
Wellbore:	OH / 62730	Survey Calculation Method:	Minimum Curvature
Design:	Surveys (Ensign 155)	Database:	USA Compass