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## COG Operating, LLC

Lea County, NM  
Sec 17, T26S, R33E  
Vast State #20H

Curve & Lateral

Design: Curve & Lateral

## Survey Report - Geographic

08 May, 2017



<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

<b>Project</b>	Lea County, NM		
<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		

<b>Site</b>	Sec 17, T26S, R33E				
<b>Site Position:</b>		<b>Northing:</b>	378,083.90 usft	<b>Latitude:</b>	32° 2' 14.178 N
<b>From:</b>	Map	<b>Easting:</b>	731,217.50 usft	<b>Longitude:</b>	103° 35' 13.794 W
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.40 °

<b>Well</b>	Vast State #20H					
<b>Well Position</b>	<b>+N-S</b>	0.0 usft	<b>Northing:</b>	378,083.90 usft	<b>Latitude:</b>	32° 2' 14.178 N
	<b>+E-W</b>	0.0 usft	<b>Easting:</b>	731,217.50 usft	<b>Longitude:</b>	103° 35' 13.794 W
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	0.0 usft	<b>Ground Level:</b>	3,254.0 usft

<b>Wellbore</b>	Curve & Lateral				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	3/31/2017	6.97	59.89	47,849

<b>Design</b>	Curve & Lateral				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	11,704.4
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N-S (usft)</b>	<b>+E-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	359.66	

<b>Survey Program</b>	<b>Date</b>	5/8/2017			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
71.0	11,704.4	Gyro Surveys (Pilot Hole)	GYRO-NS	Gyrocompass Gyro	
11,840.0	17,059.0	MWD Survey (Curve & Lateral)	MWD default	MWD - Standard	

<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>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
0.0	0.00	0.00	0.0	0.0	0.0	378,083.90	731,217.50	32° 2' 14.178 N	103° 35' 13.794 W	
71.0	0.17	171.79	71.0	-0.1	0.0	378,083.79	731,217.51	32° 2' 14.177 N	103° 35' 13.794 W	
96.5	0.28	177.44	96.5	-0.2	0.0	378,083.69	731,217.52	32° 2' 14.176 N	103° 35' 13.794 W	
100.0	0.28	176.56	100.0	-0.2	0.0	378,083.68	731,217.52	32° 2' 14.176 N	103° 35' 13.793 W	
125.0	0.30	170.62	125.0	-0.3	0.0	378,083.55	731,217.53	32° 2' 14.174 N	103° 35' 13.793 W	
150.0	0.40	164.30	150.0	-0.5	0.1	378,083.40	731,217.57	32° 2' 14.173 N	103° 35' 13.793 W	
175.0	0.59	146.63	175.0	-0.7	0.2	378,083.21	731,217.66	32° 2' 14.171 N	103° 35' 13.792 W	
200.0	0.56	146.71	200.0	-0.9	0.3	378,083.00	731,217.80	32° 2' 14.169 N	103° 35' 13.790 W	
225.0	0.65	150.60	225.0	-1.1	0.4	378,082.78	731,217.94	32° 2' 14.167 N	103° 35' 13.789 W	
250.0	0.56	146.07	250.0	-1.3	0.6	378,082.55	731,218.08	32° 2' 14.165 N	103° 35' 13.787 W	
275.0	0.59	139.89	275.0	-1.5	0.7	378,082.35	731,218.23	32° 2' 14.163 N	103° 35' 13.785 W	

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
300.0	0.52	135.82	300.0	-1.7	0.9	378,082.17	731,218.39	32° 2' 14.161 N	103° 35' 13.784 W	
325.0	0.52	135.62	325.0	-1.9	1.1	378,082.01	731,218.55	32° 2' 14.159 N	103° 35' 13.782 W	
350.0	0.53	143.53	350.0	-2.1	1.2	378,081.84	731,218.70	32° 2' 14.157 N	103° 35' 13.780 W	
375.0	0.52	150.50	375.0	-2.3	1.3	378,081.64	731,218.82	32° 2' 14.155 N	103° 35' 13.779 W	
400.0	0.51	150.49	400.0	-2.5	1.4	378,081.45	731,218.93	32° 2' 14.154 N	103° 35' 13.777 W	
425.0	0.47	149.12	425.0	-2.6	1.5	378,081.26	731,219.04	32° 2' 14.152 N	103° 35' 13.776 W	
450.0	0.48	144.74	450.0	-2.8	1.7	378,081.09	731,219.15	32° 2' 14.150 N	103° 35' 13.775 W	
475.0	0.49	148.33	475.0	-3.0	1.8	378,080.91	731,219.27	32° 2' 14.148 N	103° 35' 13.773 W	
500.0	0.53	152.07	500.0	-3.2	1.9	378,080.72	731,219.38	32° 2' 14.146 N	103° 35' 13.772 W	
525.0	0.58	149.22	525.0	-3.4	2.0	378,080.51	731,219.50	32° 2' 14.144 N	103° 35' 13.771 W	
550.0	0.57	146.52	550.0	-3.6	2.1	378,080.30	731,219.63	32° 2' 14.142 N	103° 35' 13.769 W	
575.0	0.61	148.15	575.0	-3.8	2.3	378,080.08	731,219.77	32° 2' 14.140 N	103° 35' 13.768 W	
600.0	0.59	141.30	600.0	-4.0	2.4	378,079.87	731,219.92	32° 2' 14.138 N	103° 35' 13.766 W	
625.0	0.58	143.84	625.0	-4.2	2.6	378,079.66	731,220.07	32° 2' 14.136 N	103° 35' 13.764 W	
650.0	0.52	135.58	650.0	-4.4	2.7	378,079.48	731,220.23	32° 2' 14.134 N	103° 35' 13.762 W	
675.0	0.55	141.23	675.0	-4.6	2.9	378,079.31	731,220.38	32° 2' 14.132 N	103° 35' 13.761 W	
700.0	0.54	139.16	700.0	-4.8	3.0	378,079.12	731,220.54	32° 2' 14.130 N	103° 35' 13.759 W	
725.0	0.54	135.83	725.0	-4.9	3.2	378,078.95	731,220.69	32° 2' 14.129 N	103° 35' 13.757 W	
750.0	0.55	134.54	750.0	-5.1	3.4	378,078.78	731,220.86	32° 2' 14.127 N	103° 35' 13.755 W	
775.0	0.52	136.99	775.0	-5.3	3.5	378,078.61	731,221.03	32° 2' 14.125 N	103° 35' 13.753 W	
800.0	0.51	136.04	800.0	-5.4	3.7	378,078.45	731,221.18	32° 2' 14.124 N	103° 35' 13.751 W	
825.0	0.50	141.18	825.0	-5.6	3.8	378,078.29	731,221.33	32° 2' 14.122 N	103° 35' 13.750 W	
850.0	0.51	145.36	850.0	-5.8	4.0	378,078.11	731,221.46	32° 2' 14.120 N	103° 35' 13.748 W	
875.0	0.48	147.37	875.0	-6.0	4.1	378,077.93	731,221.58	32° 2' 14.119 N	103° 35' 13.747 W	
900.0	0.50	150.89	900.0	-6.2	4.2	378,077.75	731,221.69	32° 2' 14.117 N	103° 35' 13.746 W	
925.0	0.53	150.38	925.0	-6.3	4.3	378,077.55	731,221.80	32° 2' 14.115 N	103° 35' 13.744 W	
950.0	0.59	149.63	950.0	-6.6	4.4	378,077.34	731,221.92	32° 2' 14.113 N	103° 35' 13.743 W	
975.0	0.54	140.32	975.0	-6.8	4.6	378,077.14	731,222.06	32° 2' 14.111 N	103° 35' 13.741 W	
1,000.0	0.60	131.67	1,000.0	-6.9	4.7	378,076.96	731,222.23	32° 2' 14.109 N	103° 35' 13.739 W	
1,025.0	0.61	129.12	1,025.0	-7.1	4.9	378,076.79	731,222.43	32° 2' 14.107 N	103° 35' 13.737 W	
1,050.0	0.62	129.18	1,050.0	-7.3	5.1	378,076.62	731,222.64	32° 2' 14.106 N	103° 35' 13.735 W	
1,075.0	0.63	122.30	1,075.0	-7.4	5.4	378,076.46	731,222.86	32° 2' 14.104 N	103° 35' 13.732 W	
1,100.0	0.63	120.62	1,100.0	-7.6	5.6	378,076.32	731,223.10	32° 2' 14.102 N	103° 35' 13.729 W	
1,125.0	0.57	112.40	1,125.0	-7.7	5.8	378,076.20	731,223.33	32° 2' 14.101 N	103° 35' 13.727 W	
1,150.0	0.57	114.24	1,150.0	-7.8	6.1	378,076.10	731,223.56	32° 2' 14.100 N	103° 35' 13.724 W	
1,175.0	0.49	114.44	1,175.0	-7.9	6.3	378,076.01	731,223.77	32° 2' 14.099 N	103° 35' 13.722 W	
1,200.0	0.49	116.81	1,200.0	-8.0	6.5	378,075.91	731,223.96	32° 2' 14.098 N	103° 35' 13.719 W	
1,225.0	0.60	121.89	1,224.9	-8.1	6.7	378,075.80	731,224.17	32° 2' 14.097 N	103° 35' 13.717 W	
1,250.0	0.67	121.65	1,249.9	-8.2	6.9	378,075.65	731,224.40	32° 2' 14.096 N	103° 35' 13.714 W	
1,275.0	0.79	128.20	1,274.9	-8.4	7.2	378,075.47	731,224.66	32° 2' 14.094 N	103° 35' 13.711 W	
1,300.0	0.89	130.71	1,299.9	-8.7	7.5	378,075.23	731,224.95	32° 2' 14.092 N	103° 35' 13.708 W	
1,325.0	0.92	132.58	1,324.9	-8.9	7.7	378,074.97	731,225.24	32° 2' 14.089 N	103° 35' 13.704 W	
1,350.0	0.99	136.89	1,349.9	-9.2	8.0	378,074.68	731,225.54	32° 2' 14.086 N	103° 35' 13.701 W	
1,375.0	1.02	139.43	1,374.9	-9.5	8.3	378,074.35	731,225.83	32° 2' 14.083 N	103° 35' 13.698 W	
1,400.0	0.94	136.94	1,399.9	-9.9	8.6	378,074.03	731,226.11	32° 2' 14.080 N	103° 35' 13.694 W	
1,425.0	0.95	140.19	1,424.9	-10.2	8.9	378,073.72	731,226.39	32° 2' 14.077 N	103° 35' 13.691 W	
1,450.0	0.88	139.72	1,449.9	-10.5	9.1	378,073.42	731,226.64	32° 2' 14.074 N	103° 35' 13.688 W	
1,475.0	0.80	150.17	1,474.9	-10.8	9.4	378,073.12	731,226.85	32° 2' 14.071 N	103° 35' 13.686 W	
1,500.0	0.78	154.69	1,499.9	-11.1	9.5	378,072.81	731,227.01	32° 2' 14.068 N	103° 35' 13.684 W	
1,525.0	0.77	163.63	1,524.9	-11.4	9.6	378,072.50	731,227.13	32° 2' 14.064 N	103° 35' 13.683 W	
1,550.0	0.72	168.21	1,549.9	-11.7	9.7	378,072.18	731,227.21	32° 2' 14.061 N	103° 35' 13.682 W	
1,575.0	0.67	173.22	1,574.9	-12.0	9.8	378,071.89	731,227.26	32° 2' 14.058 N	103° 35' 13.681 W	
1,600.0	0.69	180.14	1,599.9	-12.3	9.8	378,071.59	731,227.28	32° 2' 14.055 N	103° 35' 13.681 W	
1,625.0	0.67	187.48	1,624.9	-12.6	9.8	378,071.29	731,227.26	32° 2' 14.052 N	103° 35' 13.681 W	
1,650.0	0.71	190.89	1,649.9	-12.9	9.7	378,071.00	731,227.21	32° 2' 14.050 N	103° 35' 13.682 W	

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<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,675.0	0.72	191.36	1,674.9	-13.2	9.7	378,070.69	731,227.15	32° 2' 14.047 N	103° 35' 13.683 W
1,700.0	0.75	195.74	1,699.9	-13.5	9.6	378,070.38	731,227.08	32° 2' 14.043 N	103° 35' 13.684 W
1,725.0	0.79	193.82	1,724.9	-13.8	9.5	378,070.05	731,226.99	32° 2' 14.040 N	103° 35' 13.685 W
1,750.0	0.71	199.51	1,749.9	-14.2	9.4	378,069.74	731,226.90	32° 2' 14.037 N	103° 35' 13.686 W
1,775.0	0.63	201.55	1,774.9	-14.4	9.3	378,069.47	731,226.80	32° 2' 14.034 N	103° 35' 13.687 W
1,800.0	0.63	208.38	1,799.9	-14.7	9.2	378,069.22	731,226.68	32° 2' 14.032 N	103° 35' 13.688 W
1,825.0	0.61	211.34	1,824.9	-14.9	9.0	378,068.98	731,226.55	32° 2' 14.030 N	103° 35' 13.690 W
1,850.0	0.66	218.58	1,849.9	-15.1	8.9	378,068.76	731,226.39	32° 2' 14.027 N	103° 35' 13.692 W
1,875.0	0.77	218.57	1,874.9	-15.4	8.7	378,068.51	731,226.19	32° 2' 14.025 N	103° 35' 13.694 W
1,900.0	0.75	225.51	1,899.9	-15.6	8.5	378,068.27	731,225.97	32° 2' 14.023 N	103° 35' 13.697 W
1,925.0	0.75	231.94	1,924.9	-15.8	8.2	378,068.05	731,225.72	32° 2' 14.021 N	103° 35' 13.699 W
1,950.0	0.81	235.24	1,949.9	-16.0	8.0	378,067.85	731,225.45	32° 2' 14.019 N	103° 35' 13.703 W
1,975.0	0.84	234.31	1,974.9	-16.3	7.7	378,067.64	731,225.16	32° 2' 14.017 N	103° 35' 13.706 W
2,000.0	0.91	231.43	1,999.9	-16.5	7.4	378,067.41	731,224.85	32° 2' 14.014 N	103° 35' 13.710 W
2,025.0	0.91	232.54	2,024.9	-16.7	7.0	378,067.17	731,224.54	32° 2' 14.012 N	103° 35' 13.713 W
2,050.0	0.98	232.78	2,049.9	-17.0	6.7	378,066.92	731,224.21	32° 2' 14.009 N	103° 35' 13.717 W
2,075.0	0.97	233.30	2,074.9	-17.2	6.4	378,066.66	731,223.87	32° 2' 14.007 N	103° 35' 13.721 W
2,100.0	0.82	241.33	2,099.9	-17.4	6.0	378,066.45	731,223.55	32° 2' 14.005 N	103° 35' 13.725 W
2,125.0	0.92	236.70	2,124.9	-17.6	5.7	378,066.25	731,223.22	32° 2' 14.003 N	103° 35' 13.729 W
2,150.0	0.97	237.21	2,149.9	-17.9	5.4	378,066.03	731,222.88	32° 2' 14.001 N	103° 35' 13.733 W
2,175.0	0.93	245.87	2,174.9	-18.1	5.0	378,065.83	731,222.51	32° 2' 13.999 N	103° 35' 13.737 W
2,200.0	1.03	243.62	2,199.9	-18.2	4.6	378,065.65	731,222.13	32° 2' 13.997 N	103° 35' 13.741 W
2,225.0	1.13	244.38	2,224.8	-18.5	4.2	378,065.44	731,221.70	32° 2' 13.995 N	103° 35' 13.746 W
2,250.0	1.09	245.56	2,249.8	-18.7	3.8	378,065.24	731,221.26	32° 2' 13.993 N	103° 35' 13.751 W
2,275.0	1.10	247.71	2,274.8	-18.9	3.3	378,065.05	731,220.82	32° 2' 13.991 N	103° 35' 13.757 W
2,300.0	1.13	250.41	2,299.8	-19.0	2.9	378,064.87	731,220.37	32° 2' 13.989 N	103° 35' 13.762 W
2,325.0	1.16	250.19	2,324.8	-19.2	2.4	378,064.71	731,219.90	32° 2' 13.988 N	103° 35' 13.767 W
2,350.0	1.14	250.65	2,349.8	-19.4	1.9	378,064.54	731,219.43	32° 2' 13.986 N	103° 35' 13.773 W
2,375.0	1.12	250.42	2,374.8	-19.5	1.5	378,064.37	731,218.96	32° 2' 13.985 N	103° 35' 13.778 W
2,400.0	1.20	251.50	2,399.8	-19.7	1.0	378,064.21	731,218.48	32° 2' 13.983 N	103° 35' 13.784 W
2,425.0	1.16	258.38	2,424.8	-19.8	0.5	378,064.07	731,217.99	32° 2' 13.982 N	103° 35' 13.790 W
2,450.0	1.23	278.88	2,449.8	-19.8	0.0	378,064.07	731,217.48	32° 2' 13.982 N	103° 35' 13.796 W
2,475.0	1.49	297.67	2,474.8	-19.6	-0.6	378,064.26	731,216.92	32° 2' 13.984 N	103° 35' 13.802 W
2,500.0	1.58	303.02	2,499.8	-19.3	-1.2	378,064.60	731,216.35	32° 2' 13.987 N	103° 35' 13.809 W
2,525.0	1.63	304.32	2,524.8	-18.9	-1.7	378,064.98	731,215.76	32° 2' 13.991 N	103° 35' 13.815 W
2,550.0	1.60	304.90	2,549.8	-18.5	-2.3	378,065.38	731,215.18	32° 2' 13.995 N	103° 35' 13.822 W
2,575.0	1.56	302.55	2,574.8	-18.1	-2.9	378,065.77	731,214.61	32° 2' 13.999 N	103° 35' 13.829 W
2,600.0	1.58	301.97	2,599.7	-17.8	-3.5	378,066.13	731,214.03	32° 2' 14.002 N	103° 35' 13.835 W
2,625.0	1.43	303.69	2,624.7	-17.4	-4.0	378,066.49	731,213.48	32° 2' 14.006 N	103° 35' 13.842 W
2,650.0	0.70	309.21	2,649.7	-17.1	-4.4	378,066.76	731,213.10	32° 2' 14.009 N	103° 35' 13.846 W
2,675.0	0.15	26.34	2,674.7	-17.0	-4.5	378,066.88	731,213.00	32° 2' 14.010 N	103° 35' 13.847 W
2,700.0	0.25	85.06	2,699.7	-17.0	-4.4	378,066.92	731,213.07	32° 2' 14.010 N	103° 35' 13.847 W
2,725.0	0.28	85.04	2,724.7	-17.0	-4.3	378,066.93	731,213.18	32° 2' 14.010 N	103° 35' 13.845 W
2,750.0	0.39	100.11	2,749.7	-17.0	-4.2	378,066.92	731,213.33	32° 2' 14.010 N	103° 35' 13.844 W
2,775.0	0.43	106.75	2,774.7	-17.0	-4.0	378,066.88	731,213.50	32° 2' 14.010 N	103° 35' 13.842 W
2,800.0	0.44	102.91	2,799.7	-17.1	-3.8	378,066.83	731,213.68	32° 2' 14.009 N	103° 35' 13.839 W
2,825.0	0.46	105.39	2,824.7	-17.1	-3.6	378,066.78	731,213.87	32° 2' 14.009 N	103° 35' 13.837 W
2,850.0	0.45	105.62	2,849.7	-17.2	-3.4	378,066.73	731,214.06	32° 2' 14.008 N	103° 35' 13.835 W
2,875.0	0.43	106.48	2,874.7	-17.2	-3.2	378,066.67	731,214.25	32° 2' 14.008 N	103° 35' 13.833 W
2,900.0	0.46	106.85	2,899.7	-17.3	-3.1	378,066.62	731,214.43	32° 2' 14.007 N	103° 35' 13.831 W
2,925.0	0.46	118.58	2,924.7	-17.4	-2.9	378,066.54	731,214.62	32° 2' 14.006 N	103° 35' 13.829 W
2,950.0	0.47	118.30	2,949.7	-17.5	-2.7	378,066.44	731,214.80	32° 2' 14.005 N	103° 35' 13.827 W
2,975.0	0.46	117.91	2,974.7	-17.5	-2.5	378,066.35	731,214.98	32° 2' 14.004 N	103° 35' 13.824 W
3,000.0	0.47	117.56	2,999.7	-17.6	-2.3	378,066.25	731,215.16	32° 2' 14.003 N	103° 35' 13.822 W
3,025.0	0.46	113.21	3,024.7	-17.7	-2.2	378,066.17	731,215.34	32° 2' 14.003 N	103° 35' 13.820 W

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
3,050.0	0.47	119.93	3,049.7	-17.8	-2.0	378,066.08	731,215.52	32° 2' 14.002 N	103° 35' 13.818 W	
3,075.0	0.52	136.84	3,074.7	-18.0	-1.8	378,065.94	731,215.69	32° 2' 14.000 N	103° 35' 13.816 W	
3,100.0	0.29	87.99	3,099.7	-18.0	-1.7	378,065.86	731,215.83	32° 2' 14.000 N	103° 35' 13.815 W	
3,125.0	0.69	1.20	3,124.7	-17.9	-1.6	378,066.01	731,215.89	32° 2' 14.001 N	103° 35' 13.814 W	
3,150.0	0.83	358.67	3,149.7	-17.6	-1.6	378,066.35	731,215.89	32° 2' 14.004 N	103° 35' 13.814 W	
3,175.0	0.88	356.16	3,174.7	-17.2	-1.6	378,066.72	731,215.88	32° 2' 14.008 N	103° 35' 13.814 W	
3,200.0	0.89	352.79	3,199.7	-16.8	-1.7	378,067.10	731,215.84	32° 2' 14.012 N	103° 35' 13.814 W	
3,225.0	0.94	355.88	3,224.7	-16.4	-1.7	378,067.50	731,215.80	32° 2' 14.016 N	103° 35' 13.815 W	
3,250.0	0.95	352.92	3,249.7	-16.0	-1.7	378,067.91	731,215.76	32° 2' 14.020 N	103° 35' 13.815 W	
3,275.0	0.89	351.61	3,274.7	-15.6	-1.8	378,068.31	731,215.71	32° 2' 14.024 N	103° 35' 13.816 W	
3,300.0	0.94	352.59	3,299.7	-15.2	-1.8	378,068.70	731,215.65	32° 2' 14.028 N	103° 35' 13.816 W	
3,325.0	0.95	350.54	3,324.7	-14.8	-1.9	378,069.11	731,215.59	32° 2' 14.032 N	103° 35' 13.817 W	
3,350.0	0.93	350.18	3,349.7	-14.4	-2.0	378,069.52	731,215.52	32° 2' 14.036 N	103° 35' 13.818 W	
3,375.0	0.94	357.54	3,374.7	-14.0	-2.0	378,069.92	731,215.48	32° 2' 14.040 N	103° 35' 13.818 W	
3,400.0	0.94	4.46	3,399.7	-13.6	-2.0	378,070.33	731,215.48	32° 2' 14.044 N	103° 35' 13.818 W	
3,425.0	1.03	16.01	3,424.7	-13.1	-1.9	378,070.75	731,215.56	32° 2' 14.048 N	103° 35' 13.817 W	
3,450.0	1.25	38.39	3,449.7	-12.7	-1.7	378,071.18	731,215.79	32° 2' 14.052 N	103° 35' 13.815 W	
3,475.0	1.50	54.61	3,474.7	-12.3	-1.3	378,071.58	731,216.23	32° 2' 14.056 N	103° 35' 13.809 W	
3,500.0	1.81	62.35	3,499.7	-11.9	-0.6	378,071.96	731,216.85	32° 2' 14.060 N	103° 35' 13.802 W	
3,525.0	2.00	68.27	3,524.6	-11.6	0.1	378,072.30	731,217.60	32° 2' 14.063 N	103° 35' 13.793 W	
3,550.0	2.08	70.15	3,549.6	-11.3	0.9	378,072.62	731,218.43	32° 2' 14.066 N	103° 35' 13.784 W	
3,575.0	2.06	70.72	3,574.6	-11.0	1.8	378,072.92	731,219.28	32° 2' 14.069 N	103° 35' 13.774 W	
3,600.0	2.05	70.49	3,599.6	-10.7	2.6	378,073.22	731,220.13	32° 2' 14.072 N	103° 35' 13.764 W	
3,625.0	1.82	66.20	3,624.6	-10.4	3.4	378,073.53	731,220.91	32° 2' 14.075 N	103° 35' 13.755 W	
3,650.0	1.57	62.01	3,649.6	-10.1	4.1	378,073.85	731,221.58	32° 2' 14.078 N	103° 35' 13.747 W	
3,675.0	1.35	56.10	3,674.6	-9.7	4.6	378,074.17	731,222.13	32° 2' 14.081 N	103° 35' 13.741 W	
3,700.0	1.05	40.27	3,699.6	-9.4	5.0	378,074.51	731,222.52	32° 2' 14.085 N	103° 35' 13.736 W	
3,725.0	0.94	12.34	3,724.6	-9.0	5.2	378,074.89	731,222.71	32° 2' 14.088 N	103° 35' 13.734 W	
3,750.0	0.87	9.07	3,749.6	-8.6	5.3	378,075.27	731,222.79	32° 2' 14.092 N	103° 35' 13.733 W	
3,775.0	0.89	9.33	3,774.5	-8.2	5.4	378,075.65	731,222.85	32° 2' 14.096 N	103° 35' 13.732 W	
3,800.0	0.97	11.60	3,799.5	-7.8	5.4	378,076.05	731,222.92	32° 2' 14.100 N	103° 35' 13.731 W	
3,825.0	0.94	11.40	3,824.5	-7.4	5.5	378,076.46	731,223.00	32° 2' 14.104 N	103° 35' 13.730 W	
3,850.0	0.95	10.32	3,849.5	-7.0	5.6	378,076.86	731,223.08	32° 2' 14.108 N	103° 35' 13.729 W	
3,875.0	0.98	12.92	3,874.5	-6.6	5.7	378,077.28	731,223.17	32° 2' 14.112 N	103° 35' 13.728 W	
3,900.0	0.94	10.51	3,899.5	-6.2	5.8	378,077.69	731,223.25	32° 2' 14.116 N	103° 35' 13.727 W	
3,925.0	0.96	10.61	3,924.5	-5.8	5.8	378,078.09	731,223.33	32° 2' 14.120 N	103° 35' 13.726 W	
3,950.0	0.94	11.16	3,949.5	-5.4	5.9	378,078.50	731,223.41	32° 2' 14.124 N	103° 35' 13.726 W	
3,975.0	0.91	12.65	3,974.5	-5.0	6.0	378,078.90	731,223.49	32° 2' 14.128 N	103° 35' 13.725 W	
4,000.0	0.89	8.85	3,999.5	-4.6	6.1	378,079.28	731,223.56	32° 2' 14.132 N	103° 35' 13.724 W	
4,025.0	0.85	17.31	4,024.5	-4.2	6.2	378,079.65	731,223.65	32° 2' 14.135 N	103° 35' 13.723 W	
4,050.0	0.83	15.88	4,049.5	-3.9	6.3	378,080.00	731,223.75	32° 2' 14.139 N	103° 35' 13.721 W	
4,075.0	0.85	17.21	4,074.5	-3.5	6.4	378,080.35	731,223.86	32° 2' 14.142 N	103° 35' 13.720 W	
4,100.0	0.79	16.69	4,099.5	-3.2	6.5	378,080.70	731,223.96	32° 2' 14.146 N	103° 35' 13.719 W	
4,125.0	0.80	16.28	4,124.5	-2.9	6.6	378,081.03	731,224.06	32° 2' 14.149 N	103° 35' 13.718 W	
4,150.0	0.79	28.63	4,149.5	-2.6	6.7	378,081.35	731,224.19	32° 2' 14.152 N	103° 35' 13.716 W	
4,175.0	0.77	47.99	4,174.5	-2.3	6.9	378,081.61	731,224.40	32° 2' 14.155 N	103° 35' 13.714 W	
4,200.0	0.97	67.92	4,199.5	-2.1	7.2	378,081.80	731,224.72	32° 2' 14.157 N	103° 35' 13.710 W	
4,225.0	1.17	80.95	4,224.5	-2.0	7.7	378,081.92	731,225.17	32° 2' 14.158 N	103° 35' 13.705 W	
4,250.0	1.52	94.43	4,249.5	-2.0	8.3	378,081.94	731,225.75	32° 2' 14.158 N	103° 35' 13.698 W	
4,275.0	1.85	103.02	4,274.5	-2.1	9.0	378,081.82	731,226.47	32° 2' 14.157 N	103° 35' 13.690 W	
4,300.0	1.88	103.15	4,299.5	-2.3	9.8	378,081.64	731,227.27	32° 2' 14.155 N	103° 35' 13.680 W	
4,325.0	1.88	104.09	4,324.5	-2.5	10.6	378,081.44	731,228.06	32° 2' 14.153 N	103° 35' 13.671 W	
4,350.0	1.79	108.63	4,349.4	-2.7	11.3	378,081.22	731,228.83	32° 2' 14.151 N	103° 35' 13.662 W	
4,375.0	1.69	133.60	4,374.4	-3.1	12.0	378,080.84	731,229.47	32° 2' 14.147 N	103° 35' 13.655 W	
4,400.0	1.83	152.42	4,399.4	-3.7	12.4	378,080.23	731,229.92	32° 2' 14.141 N	103° 35' 13.650 W	

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,425.0	1.85	151.48	4,424.4	-4.4	12.8	378,079.52	731,230.30	32° 2' 14.134 N	103° 35' 13.645 W	
4,450.0	2.04	152.17	4,449.4	-5.1	13.2	378,078.78	731,230.70	32° 2' 14.126 N	103° 35' 13.641 W	
4,475.0	2.40	151.55	4,474.4	-6.0	13.7	378,077.92	731,231.15	32° 2' 14.118 N	103° 35' 13.636 W	
4,500.0	2.47	152.11	4,499.3	-6.9	14.2	378,076.98	731,231.66	32° 2' 14.109 N	103° 35' 13.630 W	
4,525.0	2.46	152.56	4,524.3	-7.9	14.7	378,076.03	731,232.16	32° 2' 14.099 N	103° 35' 13.624 W	
4,550.0	2.10	153.21	4,549.3	-8.8	15.1	378,075.15	731,232.61	32° 2' 14.090 N	103° 35' 13.619 W	
4,575.0	1.57	155.35	4,574.3	-9.5	15.5	378,074.43	731,232.96	32° 2' 14.083 N	103° 35' 13.615 W	
4,600.0	1.63	155.82	4,599.3	-10.1	15.8	378,073.79	731,233.25	32° 2' 14.077 N	103° 35' 13.612 W	
4,625.0	1.60	155.96	4,624.3	-10.7	16.0	378,073.15	731,233.53	32° 2' 14.070 N	103° 35' 13.608 W	
4,650.0	1.61	155.93	4,649.3	-11.4	16.3	378,072.51	731,233.82	32° 2' 14.064 N	103° 35' 13.605 W	
4,675.0	1.64	157.99	4,674.3	-12.0	16.6	378,071.86	731,234.10	32° 2' 14.058 N	103° 35' 13.602 W	
4,700.0	1.62	159.32	4,699.2	-12.7	16.9	378,071.19	731,234.36	32° 2' 14.051 N	103° 35' 13.599 W	
4,725.0	1.54	158.75	4,724.2	-13.3	17.1	378,070.55	731,234.60	32° 2' 14.045 N	103° 35' 13.596 W	
4,750.0	1.51	160.59	4,749.2	-14.0	17.3	378,069.93	731,234.83	32° 2' 14.038 N	103° 35' 13.593 W	
4,775.0	1.45	160.13	4,774.2	-14.6	17.6	378,069.32	731,235.05	32° 2' 14.032 N	103° 35' 13.591 W	
4,800.0	1.36	161.17	4,799.2	-15.2	17.8	378,068.74	731,235.25	32° 2' 14.027 N	103° 35' 13.589 W	
4,825.0	1.28	163.10	4,824.2	-15.7	17.9	378,068.19	731,235.43	32° 2' 14.021 N	103° 35' 13.587 W	
4,850.0	1.04	162.45	4,849.2	-16.2	18.1	378,067.71	731,235.58	32° 2' 14.016 N	103° 35' 13.585 W	
4,875.0	0.95	162.31	4,874.2	-16.6	18.2	378,067.30	731,235.71	32° 2' 14.012 N	103° 35' 13.583 W	
4,900.0	0.86	164.99	4,899.2	-17.0	18.3	378,066.92	731,235.82	32° 2' 14.009 N	103° 35' 13.582 W	
4,925.0	0.88	161.49	4,924.2	-17.3	18.4	378,066.55	731,235.93	32° 2' 14.005 N	103° 35' 13.581 W	
4,950.0	0.86	169.85	4,949.2	-17.7	18.5	378,066.19	731,236.03	32° 2' 14.001 N	103° 35' 13.580 W	
4,975.0	0.80	167.73	4,974.2	-18.1	18.6	378,065.83	731,236.10	32° 2' 13.998 N	103° 35' 13.579 W	
5,000.0	0.77	166.12	4,999.2	-18.4	18.7	378,065.50	731,236.17	32° 2' 13.995 N	103° 35' 13.578 W	
5,025.0	0.75	169.73	5,024.2	-18.7	18.7	378,065.17	731,236.24	32° 2' 13.991 N	103° 35' 13.577 W	
5,050.0	0.73	168.71	5,049.2	-19.0	18.8	378,064.86	731,236.30	32° 2' 13.988 N	103° 35' 13.577 W	
5,075.0	0.69	165.98	5,074.2	-19.3	18.9	378,064.55	731,236.37	32° 2' 13.985 N	103° 35' 13.576 W	
5,100.0	0.66	169.97	5,099.2	-19.6	18.9	378,064.27	731,236.43	32° 2' 13.982 N	103° 35' 13.575 W	
5,125.0	0.68	170.29	5,124.2	-19.9	19.0	378,063.98	731,236.48	32° 2' 13.979 N	103° 35' 13.575 W	
5,150.0	0.66	165.35	5,149.2	-20.2	19.0	378,063.69	731,236.55	32° 2' 13.977 N	103° 35' 13.574 W	
5,175.0	0.59	164.32	5,174.2	-20.5	19.1	378,063.43	731,236.62	32° 2' 13.974 N	103° 35' 13.573 W	
5,200.0	0.57	155.41	5,199.2	-20.7	19.2	378,063.19	731,236.70	32° 2' 13.972 N	103° 35' 13.572 W	
5,225.0	0.56	153.01	5,224.2	-20.9	19.3	378,062.97	731,236.81	32° 2' 13.969 N	103° 35' 13.571 W	
5,250.0	0.56	155.63	5,249.2	-21.1	19.4	378,062.75	731,236.92	32° 2' 13.967 N	103° 35' 13.570 W	
5,275.0	0.51	160.05	5,274.2	-21.4	19.5	378,062.54	731,237.00	32° 2' 13.965 N	103° 35' 13.569 W	
5,300.0	0.52	143.90	5,299.2	-21.6	19.6	378,062.34	731,237.11	32° 2' 13.963 N	103° 35' 13.568 W	
5,325.0	0.49	146.06	5,324.2	-21.7	19.7	378,062.16	731,237.24	32° 2' 13.961 N	103° 35' 13.566 W	
5,350.0	0.49	141.29	5,349.2	-21.9	19.9	378,061.99	731,237.36	32° 2' 13.960 N	103° 35' 13.565 W	
5,375.0	0.45	142.06	5,374.2	-22.1	20.0	378,061.83	731,237.49	32° 2' 13.958 N	103° 35' 13.563 W	
5,400.0	0.46	146.94	5,399.2	-22.2	20.1	378,061.66	731,237.60	32° 2' 13.956 N	103° 35' 13.562 W	
5,425.0	0.49	145.89	5,424.2	-22.4	20.2	378,061.49	731,237.72	32° 2' 13.955 N	103° 35' 13.561 W	
5,450.0	0.41	150.45	5,449.2	-22.6	20.3	378,061.33	731,237.82	32° 2' 13.953 N	103° 35' 13.559 W	
5,475.0	0.42	163.01	5,474.2	-22.7	20.4	378,061.16	731,237.89	32° 2' 13.951 N	103° 35' 13.559 W	
5,500.0	0.44	144.36	5,499.2	-22.9	20.5	378,060.99	731,237.98	32° 2' 13.950 N	103° 35' 13.558 W	
5,525.0	0.34	154.48	5,524.2	-23.0	20.6	378,060.85	731,238.07	32° 2' 13.948 N	103° 35' 13.557 W	
5,550.0	0.36	161.94	5,549.2	-23.2	20.6	378,060.71	731,238.12	32° 2' 13.947 N	103° 35' 13.556 W	
5,575.0	0.35	163.78	5,574.2	-23.3	20.7	378,060.56	731,238.17	32° 2' 13.946 N	103° 35' 13.556 W	
5,600.0	0.37	156.21	5,599.1	-23.5	20.7	378,060.41	731,238.22	32° 2' 13.944 N	103° 35' 13.555 W	
5,625.0	0.33	166.34	5,624.1	-23.6	20.8	378,060.27	731,238.27	32° 2' 13.943 N	103° 35' 13.554 W	
5,650.0	0.31	160.39	5,649.1	-23.8	20.8	378,060.13	731,238.31	32° 2' 13.941 N	103° 35' 13.554 W	
5,675.0	0.34	158.30	5,674.1	-23.9	20.9	378,060.00	731,238.36	32° 2' 13.940 N	103° 35' 13.553 W	
5,700.0	0.30	174.60	5,699.1	-24.0	20.9	378,059.87	731,238.39	32° 2' 13.939 N	103° 35' 13.553 W	
5,725.0	0.23	175.51	5,724.1	-24.1	20.9	378,059.75	731,238.40	32° 2' 13.938 N	103° 35' 13.553 W	
5,750.0	0.24	167.41	5,749.1	-24.2	20.9	378,059.65	731,238.42	32° 2' 13.937 N	103° 35' 13.553 W	
5,775.0	0.24	182.94	5,774.1	-24.4	20.9	378,059.55	731,238.43	32° 2' 13.935 N	103° 35' 13.553 W	

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,800.0	0.15	171.00	5,799.1	-24.4	20.9	378,059.46	731,238.43	32° 2' 13.935 N	103° 35' 13.553 W
5,825.0	0.18	178.50	5,824.1	-24.5	20.9	378,059.39	731,238.44	32° 2' 13.934 N	103° 35' 13.552 W
5,850.0	0.23	160.57	5,849.1	-24.6	21.0	378,059.31	731,238.45	32° 2' 13.933 N	103° 35' 13.552 W
5,875.0	0.14	154.12	5,874.1	-24.7	21.0	378,059.23	731,238.48	32° 2' 13.932 N	103° 35' 13.552 W
5,900.0	0.31	342.99	5,899.1	-24.6	21.0	378,059.27	731,238.48	32° 2' 13.933 N	103° 35' 13.552 W
5,925.0	0.54	354.09	5,924.1	-24.4	20.9	378,059.45	731,238.45	32° 2' 13.935 N	103° 35' 13.552 W
5,950.0	0.64	350.43	5,949.1	-24.2	20.9	378,059.70	731,238.41	32° 2' 13.937 N	103° 35' 13.553 W
5,975.0	0.66	350.67	5,974.1	-23.9	20.9	378,059.98	731,238.36	32° 2' 13.940 N	103° 35' 13.553 W
6,000.0	0.65	355.29	5,999.1	-23.6	20.8	378,060.27	731,238.33	32° 2' 13.943 N	103° 35' 13.554 W
6,025.0	0.65	355.30	6,024.1	-23.3	20.8	378,060.55	731,238.31	32° 2' 13.945 N	103° 35' 13.554 W
6,050.0	0.64	355.44	6,049.1	-23.1	20.8	378,060.83	731,238.28	32° 2' 13.948 N	103° 35' 13.554 W
6,075.0	0.66	352.58	6,074.1	-22.8	20.8	378,061.11	731,238.25	32° 2' 13.951 N	103° 35' 13.554 W
6,100.0	0.66	356.61	6,099.1	-22.5	20.7	378,061.40	731,238.23	32° 2' 13.954 N	103° 35' 13.555 W
6,125.0	0.65	356.62	6,124.1	-22.2	20.7	378,061.68	731,238.21	32° 2' 13.957 N	103° 35' 13.555 W
6,150.0	0.69	355.59	6,149.1	-21.9	20.7	378,061.98	731,238.19	32° 2' 13.960 N	103° 35' 13.555 W
6,175.0	0.66	359.09	6,174.1	-21.6	20.7	378,062.27	731,238.18	32° 2' 13.962 N	103° 35' 13.555 W
6,200.0	0.67	354.95	6,199.1	-21.3	20.7	378,062.56	731,238.16	32° 2' 13.965 N	103° 35' 13.555 W
6,225.0	0.66	359.23	6,224.1	-21.0	20.6	378,062.85	731,238.15	32° 2' 13.968 N	103° 35' 13.556 W
6,250.0	0.70	2.31	6,249.1	-20.8	20.7	378,063.15	731,238.15	32° 2' 13.971 N	103° 35' 13.555 W
6,275.0	0.70	359.94	6,274.1	-20.4	20.7	378,063.45	731,238.16	32° 2' 13.974 N	103° 35' 13.555 W
6,300.0	0.70	1.61	6,299.1	-20.1	20.7	378,063.76	731,238.16	32° 2' 13.977 N	103° 35' 13.555 W
6,325.0	0.72	353.24	6,324.1	-19.8	20.6	378,064.07	731,238.15	32° 2' 13.980 N	103° 35' 13.555 W
6,350.0	0.69	1.85	6,349.1	-19.5	20.6	378,064.37	731,238.13	32° 2' 13.983 N	103° 35' 13.556 W
6,375.0	0.71	351.22	6,374.1	-19.2	20.6	378,064.68	731,238.11	32° 2' 13.986 N	103° 35' 13.556 W
6,400.0	0.82	347.04	6,399.1	-18.9	20.6	378,065.00	731,238.05	32° 2' 13.990 N	103° 35' 13.557 W
6,425.0	0.81	354.29	6,424.1	-18.5	20.5	378,065.35	731,237.99	32° 2' 13.993 N	103° 35' 13.557 W
6,450.0	0.85	352.10	6,449.1	-18.2	20.5	378,065.71	731,237.95	32° 2' 13.997 N	103° 35' 13.558 W
6,475.0	0.85	357.12	6,474.1	-17.8	20.4	378,066.08	731,237.91	32° 2' 14.000 N	103° 35' 13.558 W
6,500.0	0.90	352.46	6,499.1	-17.4	20.4	378,066.46	731,237.88	32° 2' 14.004 N	103° 35' 13.558 W
6,525.0	0.91	351.95	6,524.1	-17.0	20.3	378,066.85	731,237.83	32° 2' 14.008 N	103° 35' 13.559 W
6,550.0	0.99	354.65	6,549.1	-16.6	20.3	378,067.26	731,237.78	32° 2' 14.012 N	103° 35' 13.559 W
6,575.0	0.96	355.21	6,574.1	-16.2	20.2	378,067.69	731,237.74	32° 2' 14.016 N	103° 35' 13.560 W
6,600.0	0.95	355.69	6,599.1	-15.8	20.2	378,068.10	731,237.71	32° 2' 14.020 N	103° 35' 13.560 W
6,625.0	0.97	356.28	6,624.1	-15.4	20.2	378,068.52	731,237.68	32° 2' 14.024 N	103° 35' 13.561 W
6,650.0	0.96	354.87	6,649.1	-15.0	20.1	378,068.94	731,237.65	32° 2' 14.028 N	103° 35' 13.561 W
6,675.0	0.99	359.45	6,674.1	-14.5	20.1	378,069.37	731,237.62	32° 2' 14.033 N	103° 35' 13.561 W
6,700.0	1.00	359.54	6,699.1	-14.1	20.1	378,069.80	731,237.62	32° 2' 14.037 N	103° 35' 13.561 W
6,725.0	0.97	0.36	6,724.1	-13.7	20.1	378,070.23	731,237.62	32° 2' 14.041 N	103° 35' 13.561 W
6,750.0	0.99	357.39	6,749.1	-13.2	20.1	378,070.66	731,237.61	32° 2' 14.045 N	103° 35' 13.561 W
6,775.0	0.99	357.97	6,774.1	-12.8	20.1	378,071.09	731,237.59	32° 2' 14.050 N	103° 35' 13.561 W
6,800.0	0.95	2.09	6,799.1	-12.4	20.1	378,071.51	731,237.59	32° 2' 14.054 N	103° 35' 13.561 W
6,825.0	0.93	357.59	6,824.1	-12.0	20.1	378,071.92	731,237.59	32° 2' 14.058 N	103° 35' 13.561 W
6,850.0	0.89	356.01	6,849.1	-11.6	20.1	378,072.32	731,237.57	32° 2' 14.062 N	103° 35' 13.561 W
6,875.0	0.89	353.86	6,874.0	-11.2	20.0	378,072.70	731,237.54	32° 2' 14.066 N	103° 35' 13.562 W
6,900.0	0.83	354.97	6,899.0	-10.8	20.0	378,073.08	731,237.50	32° 2' 14.069 N	103° 35' 13.562 W
6,925.0	0.87	353.15	6,924.0	-10.5	20.0	378,073.45	731,237.46	32° 2' 14.073 N	103° 35' 13.563 W
6,950.0	0.82	353.15	6,949.0	-10.1	19.9	378,073.81	731,237.42	32° 2' 14.077 N	103° 35' 13.563 W
6,975.0	0.80	346.52	6,974.0	-9.7	19.9	378,074.16	731,237.36	32° 2' 14.080 N	103° 35' 13.564 W
7,000.0	0.81	344.53	6,999.0	-9.4	19.8	378,074.50	731,237.27	32° 2' 14.084 N	103° 35' 13.565 W
7,025.0	0.77	343.43	7,024.0	-9.1	19.7	378,074.83	731,237.17	32° 2' 14.087 N	103° 35' 13.566 W
7,050.0	0.80	341.40	7,049.0	-8.7	19.6	378,075.16	731,237.07	32° 2' 14.090 N	103° 35' 13.567 W
7,075.0	0.81	341.35	7,074.0	-8.4	19.5	378,075.49	731,236.96	32° 2' 14.093 N	103° 35' 13.568 W
7,100.0	0.80	340.69	7,099.0	-8.1	19.3	378,075.82	731,236.84	32° 2' 14.097 N	103° 35' 13.570 W
7,125.0	0.87	336.38	7,124.0	-7.7	19.2	378,076.16	731,236.71	32° 2' 14.100 N	103° 35' 13.571 W
7,150.0	0.90	337.88	7,149.0	-7.4	19.1	378,076.52	731,236.56	32° 2' 14.104 N	103° 35' 13.573 W

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
7,175.0	0.85	337.83	7,174.0	-7.0	18.9	378,076.87	731,236.42	32° 2' 14.107 N	103° 35' 13.575 W	
7,200.0	0.90	335.03	7,199.0	-6.7	18.8	378,077.22	731,236.26	32° 2' 14.111 N	103° 35' 13.576 W	
7,225.0	0.92	334.32	7,224.0	-6.3	18.6	378,077.58	731,236.09	32° 2' 14.114 N	103° 35' 13.578 W	
7,250.0	0.87	329.26	7,249.0	-6.0	18.4	378,077.92	731,235.91	32° 2' 14.118 N	103° 35' 13.580 W	
7,275.0	0.90	325.52	7,274.0	-5.7	18.2	378,078.25	731,235.70	32° 2' 14.121 N	103° 35' 13.583 W	
7,300.0	0.90	324.67	7,299.0	-5.3	18.0	378,078.57	731,235.48	32° 2' 14.124 N	103° 35' 13.585 W	
7,325.0	0.94	322.64	7,324.0	-5.0	17.7	378,078.89	731,235.24	32° 2' 14.127 N	103° 35' 13.588 W	
7,350.0	0.99	322.20	7,349.0	-4.7	17.5	378,079.23	731,234.98	32° 2' 14.130 N	103° 35' 13.591 W	
7,375.0	0.98	321.84	7,374.0	-4.3	17.2	378,079.57	731,234.72	32° 2' 14.134 N	103° 35' 13.594 W	
7,400.0	0.99	323.13	7,399.0	-4.0	17.0	378,079.91	731,234.45	32° 2' 14.137 N	103° 35' 13.597 W	
7,425.0	0.96	318.21	7,424.0	-3.7	16.7	378,080.24	731,234.19	32° 2' 14.141 N	103° 35' 13.600 W	
7,450.0	0.95	317.10	7,449.0	-3.4	16.4	378,080.54	731,233.90	32° 2' 14.144 N	103° 35' 13.603 W	
7,475.0	0.91	319.17	7,474.0	-3.1	16.1	378,080.85	731,233.63	32° 2' 14.147 N	103° 35' 13.607 W	
7,500.0	0.96	318.71	7,499.0	-2.7	15.9	378,081.15	731,233.37	32° 2' 14.150 N	103° 35' 13.610 W	
7,525.0	0.91	319.48	7,524.0	-2.4	15.6	378,081.46	731,233.10	32° 2' 14.153 N	103° 35' 13.613 W	
7,550.0	0.93	315.82	7,549.0	-2.1	15.3	378,081.76	731,232.83	32° 2' 14.156 N	103° 35' 13.616 W	
7,575.0	0.93	314.56	7,574.0	-1.9	15.0	378,082.05	731,232.54	32° 2' 14.159 N	103° 35' 13.619 W	
7,600.0	0.92	309.63	7,599.0	-1.6	14.7	378,082.32	731,232.24	32° 2' 14.161 N	103° 35' 13.623 W	
7,625.0	0.94	305.15	7,624.0	-1.3	14.4	378,082.56	731,231.92	32° 2' 14.164 N	103° 35' 13.626 W	
7,650.0	0.93	303.93	7,649.0	-1.1	14.1	378,082.79	731,231.58	32° 2' 14.166 N	103° 35' 13.630 W	
7,675.0	0.91	303.94	7,674.0	-0.9	13.8	378,083.02	731,231.25	32° 2' 14.168 N	103° 35' 13.634 W	
7,700.0	0.84	303.28	7,698.9	-0.7	13.4	378,083.23	731,230.93	32° 2' 14.170 N	103° 35' 13.638 W	
7,725.0	0.73	301.34	7,723.9	-0.5	13.1	378,083.41	731,230.64	32° 2' 14.172 N	103° 35' 13.641 W	
7,750.0	0.61	294.17	7,748.9	-0.3	12.9	378,083.55	731,230.39	32° 2' 14.174 N	103° 35' 13.644 W	
7,775.0	0.56	294.04	7,773.9	-0.2	12.7	378,083.65	731,230.15	32° 2' 14.175 N	103° 35' 13.647 W	
7,800.0	0.50	287.38	7,798.9	-0.2	12.4	378,083.74	731,229.94	32° 2' 14.175 N	103° 35' 13.649 W	
7,825.0	0.51	287.99	7,823.9	-0.1	12.2	378,083.80	731,229.73	32° 2' 14.176 N	103° 35' 13.652 W	
7,850.0	0.51	285.70	7,848.9	0.0	12.0	378,083.87	731,229.52	32° 2' 14.177 N	103° 35' 13.654 W	
7,875.0	0.50	280.19	7,873.9	0.0	11.8	378,083.92	731,229.30	32° 2' 14.177 N	103° 35' 13.657 W	
7,900.0	0.48	279.46	7,898.9	0.1	11.6	378,083.95	731,229.09	32° 2' 14.178 N	103° 35' 13.659 W	
7,925.0	0.51	280.18	7,923.9	0.1	11.4	378,083.99	731,228.88	32° 2' 14.178 N	103° 35' 13.662 W	
7,950.0	0.47	281.41	7,948.9	0.1	11.2	378,084.03	731,228.67	32° 2' 14.178 N	103° 35' 13.664 W	
7,975.0	0.50	281.75	7,973.9	0.2	11.0	378,084.07	731,228.46	32° 2' 14.179 N	103° 35' 13.666 W	
8,000.0	0.49	272.94	7,998.9	0.2	10.8	378,084.10	731,228.25	32° 2' 14.179 N	103° 35' 13.669 W	
8,025.0	0.45	270.62	8,023.9	0.2	10.5	378,084.11	731,228.04	32° 2' 14.179 N	103° 35' 13.671 W	
8,050.0	0.41	265.82	8,048.9	0.2	10.4	378,084.10	731,227.85	32° 2' 14.179 N	103° 35' 13.673 W	
8,075.0	0.43	269.44	8,073.9	0.2	10.2	378,084.09	731,227.67	32° 2' 14.179 N	103° 35' 13.676 W	
8,100.0	0.32	261.29	8,098.9	0.2	10.0	378,084.08	731,227.51	32° 2' 14.179 N	103° 35' 13.677 W	
8,125.0	0.40	257.86	8,123.9	0.2	9.9	378,084.05	731,227.35	32° 2' 14.179 N	103° 35' 13.679 W	
8,150.0	0.42	254.59	8,148.9	0.1	9.7	378,084.01	731,227.18	32° 2' 14.178 N	103° 35' 13.681 W	
8,175.0	0.40	240.73	8,173.9	0.0	9.5	378,083.94	731,227.02	32° 2' 14.178 N	103° 35' 13.683 W	
8,200.0	0.41	234.50	8,198.9	0.0	9.4	378,083.85	731,226.87	32° 2' 14.177 N	103° 35' 13.685 W	
8,225.0	0.51	217.63	8,223.9	-0.2	9.2	378,083.71	731,226.73	32° 2' 14.175 N	103° 35' 13.687 W	
8,250.0	0.57	199.25	8,248.9	-0.4	9.1	378,083.50	731,226.62	32° 2' 14.173 N	103° 35' 13.688 W	
8,275.0	0.60	194.53	8,273.9	-0.6	9.0	378,083.26	731,226.54	32° 2' 14.171 N	103° 35' 13.689 W	
8,300.0	0.59	196.47	8,298.9	-0.9	9.0	378,083.01	731,226.47	32° 2' 14.168 N	103° 35' 13.690 W	
8,325.0	0.61	191.68	8,323.9	-1.1	8.9	378,082.76	731,226.41	32° 2' 14.166 N	103° 35' 13.690 W	
8,350.0	0.60	190.27	8,348.9	-1.4	8.9	378,082.50	731,226.36	32° 2' 14.163 N	103° 35' 13.691 W	
8,375.0	0.59	183.49	8,373.9	-1.7	8.8	378,082.24	731,226.33	32° 2' 14.161 N	103° 35' 13.691 W	
8,400.0	0.56	175.20	8,398.9	-1.9	8.8	378,081.99	731,226.33	32° 2' 14.158 N	103° 35' 13.691 W	
8,425.0	0.56	177.01	8,423.9	-2.2	8.9	378,081.75	731,226.35	32° 2' 14.156 N	103° 35' 13.691 W	
8,450.0	0.56	173.11	8,448.9	-2.4	8.9	378,081.50	731,226.37	32° 2' 14.154 N	103° 35' 13.691 W	
8,475.0	0.53	175.50	8,473.9	-2.6	8.9	378,081.27	731,226.39	32° 2' 14.151 N	103° 35' 13.691 W	
8,500.0	0.57	172.84	8,498.9	-2.9	8.9	378,081.03	731,226.42	32° 2' 14.149 N	103° 35' 13.690 W	
8,525.0	0.56	173.36	8,523.9	-3.1	9.0	378,080.78	731,226.45	32° 2' 14.146 N	103° 35' 13.690 W	



<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
8,550.0	0.54	170.77	8,548.9	-3.4	9.0	378,080.54	731,226.48	32° 2' 14.144 N	103° 35' 13.690 W	
8,575.0	0.58	171.17	8,573.9	-3.6	9.0	378,080.30	731,226.52	32° 2' 14.142 N	103° 35' 13.689 W	
8,600.0	0.59	166.33	8,598.9	-3.8	9.1	378,080.05	731,226.57	32° 2' 14.139 N	103° 35' 13.689 W	
8,625.0	0.58	166.73	8,623.9	-4.1	9.1	378,079.80	731,226.63	32° 2' 14.137 N	103° 35' 13.688 W	
8,650.0	0.59	164.83	8,648.9	-4.3	9.2	378,079.56	731,226.69	32° 2' 14.134 N	103° 35' 13.687 W	
8,675.0	0.61	160.52	8,673.9	-4.6	9.3	378,079.31	731,226.77	32° 2' 14.132 N	103° 35' 13.686 W	
8,700.0	0.62	158.58	8,698.9	-4.8	9.4	378,079.06	731,226.86	32° 2' 14.129 N	103° 35' 13.685 W	
8,725.0	0.63	157.19	8,723.9	-5.1	9.5	378,078.80	731,226.97	32° 2' 14.127 N	103° 35' 13.684 W	
8,750.0	0.59	157.91	8,748.9	-5.3	9.6	378,078.56	731,227.07	32° 2' 14.124 N	103° 35' 13.683 W	
8,775.0	0.61	160.12	8,773.9	-5.6	9.7	378,078.31	731,227.16	32° 2' 14.122 N	103° 35' 13.682 W	
8,800.0	0.66	153.30	8,798.9	-5.8	9.8	378,078.06	731,227.27	32° 2' 14.119 N	103° 35' 13.681 W	
8,825.0	0.63	153.81	8,823.9	-6.1	9.9	378,077.81	731,227.40	32° 2' 14.117 N	103° 35' 13.679 W	
8,850.0	0.65	152.60	8,848.9	-6.3	10.0	378,077.56	731,227.52	32° 2' 14.114 N	103° 35' 13.678 W	
8,875.0	0.65	149.53	8,873.9	-6.6	10.2	378,077.31	731,227.66	32° 2' 14.112 N	103° 35' 13.676 W	
8,900.0	0.68	143.91	8,898.9	-6.8	10.3	378,077.07	731,227.82	32° 2' 14.110 N	103° 35' 13.674 W	
8,925.0	0.67	144.39	8,923.9	-7.1	10.5	378,076.83	731,227.99	32° 2' 14.107 N	103° 35' 13.672 W	
8,950.0	0.67	144.07	8,948.9	-7.3	10.7	378,076.59	731,228.16	32° 2' 14.105 N	103° 35' 13.670 W	
8,975.0	0.56	145.88	8,973.9	-7.5	10.8	378,076.37	731,228.32	32° 2' 14.103 N	103° 35' 13.669 W	
9,000.0	0.56	140.77	8,998.9	-7.7	11.0	378,076.18	731,228.46	32° 2' 14.101 N	103° 35' 13.667 W	
9,025.0	0.50	131.73	9,023.9	-7.9	11.1	378,076.01	731,228.62	32° 2' 14.099 N	103° 35' 13.665 W	
9,050.0	0.44	127.94	9,048.9	-8.0	11.3	378,075.88	731,228.78	32° 2' 14.098 N	103° 35' 13.663 W	
9,075.0	0.47	120.46	9,073.9	-8.1	11.4	378,075.77	731,228.94	32° 2' 14.097 N	103° 35' 13.661 W	
9,100.0	0.59	111.72	9,098.9	-8.2	11.7	378,075.67	731,229.15	32° 2' 14.096 N	103° 35' 13.659 W	
9,125.0	0.81	105.78	9,123.9	-8.3	11.9	378,075.57	731,229.44	32° 2' 14.095 N	103° 35' 13.656 W	
9,150.0	0.95	101.94	9,148.9	-8.4	12.3	378,075.48	731,229.81	32° 2' 14.094 N	103° 35' 13.651 W	
9,175.0	1.44	101.50	9,173.9	-8.5	12.8	378,075.38	731,230.32	32° 2' 14.093 N	103° 35' 13.645 W	
9,200.0	1.58	99.10	9,198.9	-8.6	13.5	378,075.26	731,230.97	32° 2' 14.091 N	103° 35' 13.638 W	
9,225.0	1.76	99.49	9,223.9	-8.8	14.2	378,075.14	731,231.69	32° 2' 14.090 N	103° 35' 13.630 W	
9,250.0	2.25	102.28	9,248.8	-8.9	15.1	378,074.97	731,232.55	32° 2' 14.089 N	103° 35' 13.620 W	
9,275.0	2.75	106.88	9,273.8	-9.2	16.1	378,074.69	731,233.60	32° 2' 14.086 N	103° 35' 13.607 W	
9,300.0	2.98	110.89	9,298.8	-9.6	17.3	378,074.29	731,234.78	32° 2' 14.082 N	103° 35' 13.594 W	
9,325.0	3.29	115.48	9,323.7	-10.2	18.5	378,073.75	731,236.04	32° 2' 14.076 N	103° 35' 13.579 W	
9,350.0	3.73	120.16	9,348.7	-10.9	19.9	378,073.03	731,237.39	32° 2' 14.069 N	103° 35' 13.564 W	
9,375.0	4.32	119.46	9,373.6	-11.7	21.4	378,072.16	731,238.91	32° 2' 14.060 N	103° 35' 13.546 W	
9,400.0	4.59	118.46	9,398.6	-12.7	23.1	378,071.22	731,240.61	32° 2' 14.051 N	103° 35' 13.526 W	
9,425.0	4.71	117.16	9,423.5	-13.6	24.9	378,070.27	731,242.40	32° 2' 14.041 N	103° 35' 13.506 W	
9,450.0	4.76	117.69	9,448.4	-14.6	26.7	378,069.32	731,244.23	32° 2' 14.032 N	103° 35' 13.484 W	
9,475.0	4.79	117.25	9,473.3	-15.5	28.6	378,068.36	731,246.08	32° 2' 14.022 N	103° 35' 13.463 W	
9,500.0	4.83	116.68	9,498.2	-16.5	30.5	378,067.41	731,247.95	32° 2' 14.013 N	103° 35' 13.441 W	
9,525.0	4.87	114.03	9,523.1	-17.4	32.4	378,066.51	731,249.86	32° 2' 14.004 N	103° 35' 13.419 W	
9,550.0	5.38	107.95	9,548.0	-18.2	34.4	378,065.72	731,251.94	32° 2' 13.996 N	103° 35' 13.395 W	
9,575.0	5.72	105.59	9,572.9	-18.9	36.8	378,065.02	731,254.26	32° 2' 13.989 N	103° 35' 13.368 W	
9,600.0	5.81	105.40	9,597.8	-19.6	39.2	378,064.35	731,256.68	32° 2' 13.982 N	103° 35' 13.340 W	
9,625.0	5.86	105.42	9,622.7	-20.2	41.6	378,063.67	731,259.13	32° 2' 13.975 N	103° 35' 13.312 W	
9,650.0	5.88	105.38	9,647.5	-20.9	44.1	378,062.99	731,261.59	32° 2' 13.968 N	103° 35' 13.283 W	
9,675.0	6.01	105.23	9,672.4	-21.6	46.6	378,062.31	731,264.09	32° 2' 13.961 N	103° 35' 13.254 W	
9,700.0	6.01	105.92	9,697.3	-22.3	49.1	378,061.61	731,266.61	32° 2' 13.954 N	103° 35' 13.225 W	
9,725.0	6.05	108.42	9,722.1	-23.1	51.6	378,060.83	731,269.12	32° 2' 13.946 N	103° 35' 13.196 W	
9,750.0	6.01	112.30	9,747.0	-24.0	54.1	378,059.92	731,271.58	32° 2' 13.937 N	103° 35' 13.167 W	
9,775.0	5.94	113.31	9,771.8	-25.0	56.5	378,058.91	731,273.98	32° 2' 13.927 N	103° 35' 13.140 W	
9,800.0	5.94	113.90	9,796.7	-26.0	58.9	378,057.88	731,276.35	32° 2' 13.916 N	103° 35' 13.112 W	
9,825.0	5.99	113.80	9,821.6	-27.1	61.2	378,056.82	731,278.73	32° 2' 13.906 N	103° 35' 13.085 W	
9,850.0	6.00	114.29	9,846.4	-28.1	63.6	378,055.76	731,281.11	32° 2' 13.895 N	103° 35' 13.057 W	
9,875.0	5.89	116.08	9,871.3	-29.2	66.0	378,054.66	731,283.46	32° 2' 13.884 N	103° 35' 13.030 W	
9,900.0	5.97	117.97	9,896.2	-30.4	68.3	378,053.49	731,285.76	32° 2' 13.872 N	103° 35' 13.003 W	

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
9,925.0	6.16	122.65	9,921.0	-31.7	70.5	378,052.15	731,288.03	32° 2' 13.859 N	103° 35' 12.977 W	
9,950.0	6.31	126.13	9,945.9	-33.3	72.8	378,050.62	731,290.27	32° 2' 13.844 N	103° 35' 12.951 W	
9,975.0	6.33	127.11	9,970.7	-34.9	75.0	378,048.98	731,292.48	32° 2' 13.827 N	103° 35' 12.925 W	
10,000.0	6.47	127.97	9,995.6	-36.6	77.2	378,047.28	731,294.69	32° 2' 13.810 N	103° 35' 12.900 W	
10,025.0	6.69	132.19	10,020.4	-38.5	79.4	378,045.43	731,296.88	32° 2' 13.792 N	103° 35' 12.875 W	
10,050.0	6.78	133.60	10,045.2	-40.5	81.5	378,043.44	731,299.03	32° 2' 13.772 N	103° 35' 12.850 W	
10,075.0	6.82	133.14	10,070.1	-42.5	83.7	378,041.41	731,301.18	32° 2' 13.752 N	103° 35' 12.825 W	
10,100.0	6.89	133.38	10,094.9	-44.5	85.9	378,039.36	731,303.35	32° 2' 13.731 N	103° 35' 12.800 W	
10,125.0	6.87	133.40	10,119.7	-46.6	88.0	378,037.30	731,305.53	32° 2' 13.711 N	103° 35' 12.775 W	
10,150.0	6.82	132.96	10,144.5	-48.6	90.2	378,035.26	731,307.70	32° 2' 13.690 N	103° 35' 12.750 W	
10,175.0	6.63	132.83	10,169.3	-50.6	92.3	378,033.27	731,309.85	32° 2' 13.671 N	103° 35' 12.725 W	
10,200.0	6.24	132.93	10,194.2	-52.5	94.4	378,031.37	731,311.90	32° 2' 13.652 N	103° 35' 12.701 W	
10,225.0	5.79	131.80	10,219.1	-54.3	96.3	378,029.60	731,313.83	32° 2' 13.634 N	103° 35' 12.679 W	
10,250.0	5.54	131.18	10,243.9	-55.9	98.2	378,027.96	731,315.68	32° 2' 13.618 N	103° 35' 12.658 W	
10,275.0	5.52	130.73	10,268.8	-57.5	100.0	378,026.39	731,317.50	32° 2' 13.602 N	103° 35' 12.637 W	
10,300.0	5.53	130.68	10,293.7	-59.1	101.8	378,024.82	731,319.33	32° 2' 13.586 N	103° 35' 12.616 W	
10,325.0	5.55	131.02	10,318.6	-60.7	103.7	378,023.24	731,321.15	32° 2' 13.571 N	103° 35' 12.594 W	
10,350.0	5.64	130.31	10,343.5	-62.2	105.5	378,021.65	731,323.00	32° 2' 13.555 N	103° 35' 12.573 W	
10,375.0	5.76	129.63	10,368.3	-63.8	107.4	378,020.05	731,324.90	32° 2' 13.539 N	103° 35' 12.551 W	
10,400.0	6.08	129.01	10,393.2	-65.5	109.4	378,018.42	731,326.90	32° 2' 13.522 N	103° 35' 12.528 W	
10,425.0	6.31	128.95	10,418.1	-67.2	111.5	378,016.72	731,329.00	32° 2' 13.506 N	103° 35' 12.504 W	
10,450.0	6.45	128.15	10,442.9	-68.9	113.7	378,014.99	731,331.17	32° 2' 13.488 N	103° 35' 12.479 W	
10,475.0	6.78	127.30	10,467.7	-70.7	116.0	378,013.23	731,333.45	32° 2' 13.471 N	103° 35' 12.452 W	
10,500.0	7.14	127.14	10,492.6	-72.5	118.4	378,011.40	731,335.86	32° 2' 13.452 N	103° 35' 12.425 W	
10,525.0	7.23	126.79	10,517.4	-74.4	120.9	378,009.52	731,338.36	32° 2' 13.434 N	103° 35' 12.396 W	
10,550.0	7.30	126.36	10,542.2	-76.3	123.4	378,007.63	731,340.90	32° 2' 13.415 N	103° 35' 12.366 W	
10,575.0	7.28	126.01	10,567.0	-78.1	126.0	378,005.76	731,343.46	32° 2' 13.396 N	103° 35' 12.337 W	
10,600.0	7.30	126.39	10,591.8	-80.0	128.5	378,003.89	731,346.02	32° 2' 13.377 N	103° 35' 12.307 W	
10,625.0	7.26	126.20	10,616.6	-81.9	131.1	378,002.01	731,348.57	32° 2' 13.359 N	103° 35' 12.278 W	
10,650.0	7.32	127.17	10,641.4	-83.8	133.6	378,000.12	731,351.11	32° 2' 13.340 N	103° 35' 12.248 W	
10,675.0	7.19	128.09	10,666.2	-85.7	136.1	377,998.19	731,353.61	32° 2' 13.320 N	103° 35' 12.219 W	
10,700.0	7.00	128.67	10,691.0	-87.6	138.5	377,996.27	731,356.04	32° 2' 13.301 N	103° 35' 12.191 W	
10,725.0	6.86	129.34	10,715.8	-89.5	140.9	377,994.37	731,358.38	32° 2' 13.282 N	103° 35' 12.164 W	
10,750.0	6.84	130.66	10,740.6	-91.4	143.2	377,992.46	731,360.66	32° 2' 13.263 N	103° 35' 12.138 W	
10,775.0	6.75	132.21	10,765.4	-93.4	145.4	377,990.50	731,362.88	32° 2' 13.244 N	103° 35' 12.112 W	
10,800.0	6.56	135.58	10,790.3	-95.4	147.5	377,988.49	731,364.97	32° 2' 13.224 N	103° 35' 12.088 W	
10,825.0	6.59	135.19	10,815.1	-97.4	149.5	377,986.46	731,366.98	32° 2' 13.203 N	103° 35' 12.065 W	
10,850.0	6.69	135.88	10,839.9	-99.5	151.5	377,984.39	731,369.00	32° 2' 13.183 N	103° 35' 12.042 W	
10,875.0	6.70	135.85	10,864.8	-101.6	153.5	377,982.30	731,371.03	32° 2' 13.162 N	103° 35' 12.018 W	
10,900.0	6.65	134.39	10,889.6	-103.7	155.6	377,980.24	731,373.08	32° 2' 13.141 N	103° 35' 11.995 W	
10,925.0	6.57	133.68	10,914.4	-105.7	157.7	377,978.24	731,375.15	32° 2' 13.122 N	103° 35' 11.971 W	
10,950.0	6.54	128.41	10,939.3	-107.5	159.8	377,976.37	731,377.30	32° 2' 13.103 N	103° 35' 11.946 W	
10,975.0	6.48	126.12	10,964.1	-109.2	162.1	377,974.65	731,379.56	32° 2' 13.086 N	103° 35' 11.920 W	
11,000.0	6.50	126.10	10,988.9	-110.9	164.3	377,972.99	731,381.84	32° 2' 13.069 N	103° 35' 11.894 W	
11,025.0	6.28	124.13	11,013.8	-112.5	166.6	377,971.39	731,384.12	32° 2' 13.053 N	103° 35' 11.867 W	
11,050.0	5.85	124.60	11,038.6	-114.0	168.8	377,969.90	731,386.30	32° 2' 13.038 N	103° 35' 11.842 W	
11,075.0	5.39	124.07	11,063.5	-115.4	170.8	377,968.52	731,388.32	32° 2' 13.024 N	103° 35' 11.819 W	
11,100.0	4.74	124.45	11,088.4	-116.6	172.6	377,967.27	731,390.14	32° 2' 13.012 N	103° 35' 11.798 W	
11,125.0	4.49	122.59	11,113.3	-117.7	174.3	377,966.16	731,391.82	32° 2' 13.001 N	103° 35' 11.778 W	
11,150.0	4.62	122.93	11,138.3	-118.8	176.0	377,965.09	731,393.49	32° 2' 12.990 N	103° 35' 11.759 W	
11,175.0	4.39	124.94	11,163.2	-119.9	177.6	377,963.99	731,395.12	32° 2' 12.979 N	103° 35' 11.740 W	
11,200.0	4.15	124.67	11,188.1	-121.0	179.1	377,962.93	731,396.65	32° 2' 12.969 N	103° 35' 11.722 W	
11,225.0	3.96	126.74	11,213.0	-122.0	180.6	377,961.90	731,398.08	32° 2' 12.958 N	103° 35' 11.706 W	
11,250.0	3.71	126.50	11,238.0	-123.0	181.9	377,960.90	731,399.42	32° 2' 12.948 N	103° 35' 11.690 W	
11,275.0	3.46	131.47	11,262.9	-124.0	183.1	377,959.92	731,400.64	32° 2' 12.939 N	103° 35' 11.676 W	

<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,300.0	2.98	137.23	11,287.9	-125.0	184.1	377,958.94	731,401.65	32° 2' 12.929 N	103° 35' 11.665 W
11,325.0	2.96	139.66	11,312.9	-125.9	185.0	377,957.97	731,402.50	32° 2' 12.919 N	103° 35' 11.655 W
11,350.0	2.81	142.59	11,337.8	-126.9	185.8	377,957.00	731,403.29	32° 2' 12.909 N	103° 35' 11.646 W
11,375.0	2.69	140.57	11,362.8	-127.8	186.5	377,956.06	731,404.04	32° 2' 12.900 N	103° 35' 11.637 W
11,400.0	2.56	144.70	11,387.8	-128.8	187.2	377,955.15	731,404.73	32° 2' 12.891 N	103° 35' 11.629 W
11,425.0	2.24	144.78	11,412.8	-129.6	187.8	377,954.29	731,405.34	32° 2' 12.882 N	103° 35' 11.622 W
11,450.0	2.23	143.51	11,437.7	-130.4	188.4	377,953.50	731,405.91	32° 2' 12.875 N	103° 35' 11.615 W
11,475.0	2.16	146.00	11,462.7	-131.2	189.0	377,952.72	731,406.46	32° 2' 12.867 N	103° 35' 11.609 W
11,500.0	2.03	145.61	11,487.7	-131.9	189.5	377,951.96	731,406.98	32° 2' 12.859 N	103° 35' 11.603 W
11,525.0	1.84	140.38	11,512.7	-132.6	190.0	377,951.29	731,407.48	32° 2' 12.853 N	103° 35' 11.597 W
11,550.0	1.69	139.55	11,537.7	-133.2	190.5	377,950.70	731,407.98	32° 2' 12.847 N	103° 35' 11.592 W
11,575.0	1.51	135.23	11,562.7	-133.7	191.0	377,950.19	731,408.45	32° 2' 12.842 N	103° 35' 11.586 W
11,600.0	1.29	125.77	11,587.7	-134.1	191.4	377,949.79	731,408.91	32° 2' 12.838 N	103° 35' 11.581 W
11,625.0	1.29	116.61	11,612.7	-134.4	191.9	377,949.50	731,409.39	32° 2' 12.835 N	103° 35' 11.575 W
11,650.0	1.04	110.27	11,637.7	-134.6	192.4	377,949.29	731,409.85	32° 2' 12.833 N	103° 35' 11.570 W
11,675.0	1.08	110.14	11,662.6	-134.8	192.8	377,949.13	731,410.29	32° 2' 12.831 N	103° 35' 11.565 W
11,700.0	1.15	102.02	11,687.6	-134.9	193.3	377,949.00	731,410.75	32° 2' 12.830 N	103° 35' 11.560 W
11,704.5	1.20	102.76	11,692.1	-134.9	193.3	377,948.98	731,410.84	32° 2' 12.830 N	103° 35' 11.559 W
<b>Gyro Tie-in @ 11704.5' MD / 11692.1' TVD</b>									
11,840.0	1.50	106.10	11,827.6	-135.7	196.4	377,948.17	731,413.93	32° 2' 12.821 N	103° 35' 11.523 W
11,936.0	1.80	115.20	11,923.6	-136.7	199.0	377,947.18	731,416.50	32° 2' 12.811 N	103° 35' 11.493 W
11,980.0	1.80	56.00	11,967.5	-136.6	200.2	377,947.28	731,417.70	32° 2' 12.812 N	103° 35' 11.479 W
12,027.0	7.00	20.80	12,014.4	-133.5	201.8	377,950.37	731,419.33	32° 2' 12.843 N	103° 35' 11.460 W
12,075.0	15.20	22.20	12,061.5	-125.0	205.3	377,958.94	731,422.75	32° 2' 12.927 N	103° 35' 11.419 W
12,123.0	22.50	22.40	12,106.9	-110.6	211.1	377,973.28	731,428.64	32° 2' 13.069 N	103° 35' 11.350 W
12,171.0	26.80	20.30	12,150.5	-92.0	218.4	377,991.93	731,435.90	32° 2' 13.253 N	103° 35' 11.264 W
12,218.0	30.10	10.30	12,191.8	-70.4	224.2	378,013.48	731,441.69	32° 2' 13.466 N	103° 35' 11.195 W
12,251.0	31.50	4.30	12,220.2	-53.7	226.3	378,030.22	731,443.81	32° 2' 13.631 N	103° 35' 11.169 W
12,299.0	36.90	359.70	12,259.9	-26.7	227.2	378,057.16	731,444.68	32° 2' 13.898 N	103° 35' 11.157 W
12,347.0	44.20	356.70	12,296.3	4.4	226.1	378,088.32	731,443.64	32° 2' 14.206 N	103° 35' 11.166 W
12,395.0	52.30	356.90	12,328.2	40.2	224.1	378,124.05	731,441.64	32° 2' 14.560 N	103° 35' 11.187 W
12,443.0	57.50	358.30	12,355.8	79.4	222.5	378,163.27	731,440.02	32° 2' 14.948 N	103° 35' 11.202 W
12,491.0	62.30	359.70	12,379.9	120.9	221.8	378,204.78	731,439.30	32° 2' 15.359 N	103° 35' 11.207 W
12,539.0	66.20	359.50	12,400.8	164.1	221.5	378,248.00	731,439.00	32° 2' 15.787 N	103° 35' 11.207 W
12,587.0	71.10	0.10	12,418.2	208.8	221.4	378,292.69	731,438.85	32° 2' 16.229 N	103° 35' 11.206 W
12,635.0	80.40	358.10	12,430.0	255.3	220.6	378,339.16	731,438.10	32° 2' 16.689 N	103° 35' 11.211 W
12,683.0	83.10	358.30	12,436.9	302.7	219.1	378,386.63	731,436.61	32° 2' 17.159 N	103° 35' 11.224 W
12,730.0	85.50	359.50	12,441.6	349.5	218.2	378,433.39	731,435.71	32° 2' 17.621 N	103° 35' 11.231 W
12,778.0	87.10	0.40	12,444.7	397.4	218.2	378,481.29	731,435.67	32° 2' 18.095 N	103° 35' 11.227 W
12,826.0	87.40	1.00	12,447.0	445.3	218.8	378,529.23	731,436.26	32° 2' 18.570 N	103° 35' 11.217 W
12,922.0	91.40	1.10	12,448.0	541.3	220.5	378,625.19	731,438.02	32° 2' 19.519 N	103° 35' 11.189 W
13,018.0	93.60	3.10	12,443.8	637.1	224.0	378,721.02	731,441.53	32° 2' 20.467 N	103° 35' 11.140 W
13,113.0	92.20	3.40	12,439.0	731.8	229.4	378,815.74	731,446.91	32° 2' 21.404 N	103° 35' 11.070 W
13,208.0	89.70	2.00	12,437.4	826.7	233.9	378,910.61	731,451.38	32° 2' 22.343 N	103° 35' 11.010 W
13,304.0	92.60	2.70	12,435.5	922.6	237.8	379,006.50	731,455.32	32° 2' 23.292 N	103° 35' 10.957 W
13,399.0	92.20	2.50	12,431.5	1,017.4	242.1	379,101.32	731,459.62	32° 2' 24.230 N	103° 35' 10.899 W
13,495.0	92.90	0.60	12,427.2	1,113.3	244.7	379,197.19	731,462.22	32° 2' 25.178 N	103° 35' 10.861 W
13,591.0	93.80	0.40	12,421.6	1,209.1	245.6	379,293.02	731,463.05	32° 2' 26.126 N	103° 35' 10.844 W
13,686.0	92.40	359.50	12,416.5	1,304.0	245.5	379,387.88	731,462.97	32° 2' 27.065 N	103° 35' 10.837 W
13,781.0	90.10	358.90	12,414.4	1,398.9	244.1	379,482.84	731,461.64	32° 2' 28.005 N	103° 35' 10.845 W
13,876.0	91.80	359.50	12,412.8	1,493.9	242.8	379,577.81	731,460.32	32° 2' 28.945 N	103° 35' 10.853 W
13,972.0	91.40	358.50	12,410.2	1,589.9	241.1	379,673.76	731,458.64	32° 2' 29.894 N	103° 35' 10.865 W
14,067.0	90.00	358.30	12,409.0	1,684.8	238.5	379,768.71	731,455.99	32° 2' 30.834 N	103° 35' 10.888 W
14,163.0	92.70	359.40	12,406.7	1,780.8	236.6	379,864.65	731,454.06	32° 2' 31.784 N	103° 35' 10.903 W
14,258.0	92.00	359.70	12,402.8	1,875.7	235.8	379,959.57	731,453.32	32° 2' 32.723 N	103° 35' 10.904 W



<b>Company:</b>	COG Operating, LLC	<b>Local Co-ordinate Reference:</b>	Well Vast State #20H
<b>Project:</b>	Lea County, NM	<b>TVD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Site:</b>	Sec 17, T26S, R33E	<b>MD Reference:</b>	KB @ 3283.0usft (Noram #21)
<b>Well:</b>	Vast State #20H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Curve & Lateral	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Curve & Lateral	<b>Database:</b>	EDM5002

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
14,354.0	88.80	359.90	12,402.2	1,971.7	235.5	380,055.56	731,452.98	32° 2' 33.673 N	103° 35' 10.900 W	
14,449.0	94.20	3.10	12,399.7	2,066.5	238.0	380,150.44	731,455.46	32° 2' 34.612 N	103° 35' 10.863 W	
14,545.0	91.60	1.80	12,394.8	2,162.3	242.1	380,246.22	731,459.56	32° 2' 35.559 N	103° 35' 10.808 W	
14,641.0	91.40	1.70	12,392.3	2,258.2	245.0	380,342.14	731,462.49	32° 2' 36.508 N	103° 35' 10.766 W	
14,736.0	89.90	0.60	12,391.2	2,353.2	246.9	380,437.11	731,464.40	32° 2' 37.448 N	103° 35' 10.736 W	
14,832.0	91.80	1.50	12,389.8	2,449.2	248.7	380,533.08	731,466.16	32° 2' 38.398 N	103° 35' 10.708 W	
14,927.0	93.70	0.10	12,385.3	2,544.1	250.0	380,627.96	731,467.48	32° 2' 39.336 N	103° 35' 10.685 W	
15,023.0	89.70	359.40	12,382.4	2,640.0	249.6	380,723.89	731,467.06	32° 2' 40.286 N	103° 35' 10.682 W	
15,119.0	91.60	0.10	12,381.3	2,736.0	249.1	380,819.88	731,466.64	32° 2' 41.236 N	103° 35' 10.680 W	
15,214.0	88.50	357.10	12,381.2	2,830.9	246.8	380,914.83	731,464.32	32° 2' 42.175 N	103° 35' 10.699 W	
15,309.0	92.50	358.90	12,380.4	2,925.8	243.5	381,009.75	731,461.01	32° 2' 43.115 N	103° 35' 10.730 W	
15,405.0	92.20	357.80	12,376.5	3,021.7	240.8	381,105.62	731,458.25	32° 2' 44.064 N	103° 35' 10.754 W	
15,500.0	93.60	359.00	12,371.7	3,116.6	238.1	381,200.46	731,455.60	32° 2' 45.003 N	103° 35' 10.777 W	
15,595.0	94.00	358.10	12,365.4	3,211.3	235.7	381,295.22	731,453.20	32° 2' 45.940 N	103° 35' 10.798 W	
15,689.0	95.70	359.00	12,357.4	3,305.0	233.3	381,388.85	731,450.83	32° 2' 46.867 N	103° 35' 10.818 W	
15,785.0	88.70	357.10	12,353.7	3,400.8	230.1	381,484.66	731,447.56	32° 2' 47.816 N	103° 35' 10.848 W	
15,880.0	90.50	358.30	12,354.4	3,495.7	226.3	381,579.58	731,443.75	32° 2' 48.755 N	103° 35' 10.885 W	
15,975.0	92.20	359.20	12,352.2	3,590.6	224.2	381,674.52	731,441.68	32° 2' 49.695 N	103° 35' 10.901 W	
16,071.0	93.20	359.50	12,347.6	3,686.5	223.1	381,770.41	731,440.59	32° 2' 50.644 N	103° 35' 10.906 W	
16,165.0	88.80	359.20	12,346.0	3,780.5	222.0	381,864.36	731,439.52	32° 2' 51.574 N	103° 35' 10.911 W	
16,260.0	89.90	359.00	12,347.1	3,875.4	220.5	381,959.35	731,438.03	32° 2' 52.514 N	103° 35' 10.920 W	
16,356.0	94.30	358.90	12,343.6	3,971.3	218.8	382,055.24	731,436.27	32° 2' 53.463 N	103° 35' 10.933 W	
16,451.0	94.30	357.80	12,336.4	4,066.0	216.1	382,149.93	731,433.55	32° 2' 54.400 N	103° 35' 10.957 W	
16,546.0	94.30	358.00	12,329.3	4,160.7	212.6	382,244.60	731,430.08	32° 2' 55.337 N	103° 35' 10.990 W	
16,641.0	93.70	356.90	12,322.7	4,255.4	208.4	382,339.27	731,425.86	32° 2' 56.274 N	103° 35' 11.031 W	
16,736.0	94.70	357.40	12,315.7	4,350.0	203.7	382,433.90	731,421.15	32° 2' 57.211 N	103° 35' 11.078 W	
16,830.0	95.20	357.80	12,307.6	4,443.6	199.7	382,527.47	731,417.23	32° 2' 58.137 N	103° 35' 11.116 W	
16,924.0	94.40	356.90	12,299.8	4,537.1	195.4	382,621.04	731,412.89	32° 2' 59.063 N	103° 35' 11.159 W	
17,005.0	93.90	356.90	12,293.9	4,617.8	191.0	382,701.70	731,408.53	32° 2' 59.862 N	103° 35' 11.204 W	
17,059.0	93.90	356.90	12,290.2	4,671.6	188.1	382,755.50	731,405.61	32° 3' 0.394 N	103° 35' 11.233 W	

TD @ 17059.0' MD / 12290.2' TVD

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
11,704.5	11,692.1	-134.9	193.3	Gyro Tie-in @ 11704.5' MD / 11692.1' TVD	
17,059.0	12,290.2	4,671.6	188.1	TD @ 17059.0' MD / 12290.2' TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_