

COG

SURVEY REPORT

VAST STATE #023H

ENSIGN 156

5/10/2017



Scientific Drilling

The ~~Ultimate Partner~~ In Wellbore Placement

CUSTOMER
PROJECT
FIELD

COG
Lea County, New Mexico
N/A

SDI JOB NO.
SDI DISTRICT
SDI KIT/UNIT

OP.001274
Midland

SITE INFORMATION

Site Name
Lat/Long
Northing
Easting

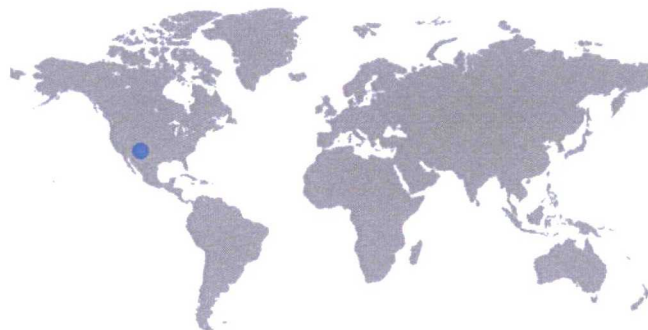
Lea County, Texas
32.036722° N, 103.5892053° W
377,879.6 ft
730,586.6 ft

Section
Township
Range

MAP INFORMATION

North Reference
Grid Correction
System
Datum
Map Zone

Grid North
0.40 deg
US State Plane 1927
North American Datum 1927 (Clarke 1866)
New Mexico East: 3001



WELL INFORMATION

Lat/Long
Northing
Easting
UWI

32.036722° N, 103.5892053° W
377,879.6 ft
730,586.6 ft
30-025-43552

DEPTH AND ELEVATION REFERENCE

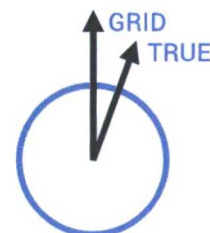
Ground Level
Reference Datum
Reference Height
Reference Elevation

3261 ft above Mean Sea Level
RKB
25 ft above G.L.
3286 ft

VERTICAL SECTION REFERENCE

+N/-S
+E/-W
Proposal Direction
Calculation Method

0 ft
0 ft
359.66°
Minimum Curvature



LOCAL GRAVITY REFERENCE INFORMATION

Local Gravity
True to Grid

998.499 mG [computed]
add 0.4°

WELL NOTES

Wireline Survey

OPERATORS

Jeffrey Loyd

SDI Operator Name (Printed)

SIGNATURE

DATE

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
0.00	0.00	0.00	0.00	0.00	0.00	0.00	Invalid	0.00	0.00
100.00	0.39	263.03	100.00	-0.04	-0.04	-0.34	0.39	0.34	263.03
125.00	0.44	235.90	125.00	-0.10	-0.10	-0.50	0.80	0.51	258.13
150.00	0.65	245.42	150.00	-0.21	-0.22	-0.71	0.91	0.74	252.91
175.00	0.83	244.43	175.00	-0.35	-0.35	-1.00	0.74	1.06	250.47
200.00	0.81	241.11	199.99	-0.51	-0.52	-1.32	0.20	1.41	248.53
225.00	0.89	241.07	224.99	-0.69	-0.70	-1.64	0.32	1.78	246.98
250.00	0.94	233.98	249.99	-0.90	-0.91	-1.98	0.48	2.18	245.24
275.00	0.96	239.92	274.98	-1.12	-1.14	-2.32	0.40	2.59	243.93
300.00	0.99	241.10	299.98	-1.33	-1.35	-2.69	0.14	3.01	243.45
325.00	0.98	236.16	324.98	-1.55	-1.57	-3.06	0.34	3.44	242.85
350.00	1.01	233.62	349.97	-1.80	-1.82	-3.41	0.21	3.87	241.96
375.00	0.99	235.01	374.97	-2.05	-2.07	-3.77	0.12	4.30	241.19
400.00	1.00	233.21	399.96	-2.30	-2.33	-4.12	0.13	4.73	240.54
425.00	1.01	235.53	424.96	-2.55	-2.58	-4.47	0.17	5.16	240.02
450.00	1.02	232.47	449.96	-2.81	-2.84	-4.83	0.22	5.60	239.55
475.00	0.97	238.85	474.95	-3.05	-3.08	-5.19	0.48	6.04	239.26
500.00	1.01	236.68	499.95	-3.28	-3.31	-5.55	0.22	6.47	239.16
525.00	0.97	236.62	524.95	-3.52	-3.55	-5.91	0.16	6.90	239.01
550.00	0.95	237.65	549.94	-3.74	-3.78	-6.26	0.09	7.32	238.90
575.00	0.97	238.92	574.94	-3.96	-4.00	-6.62	0.12	7.74	238.87
600.00	0.97	238.53	599.94	-4.18	-4.22	-6.98	0.04	8.16	238.86
625.00	0.97	238.44	624.93	-4.40	-4.44	-7.34	0.04	8.58	238.84
650.00	0.91	242.33	649.93	-4.60	-4.64	-7.70	0.36	8.99	238.91
675.00	0.91	242.17	674.93	-4.78	-4.83	-8.05	0.03	9.39	239.05
700.00	0.90	244.14	699.92	-4.96	-5.01	-8.40	0.13	9.78	239.21
725.00	0.85	243.11	724.92	-5.12	-5.18	-8.74	0.21	10.16	239.38
750.00	0.86	240.02	749.92	-5.30	-5.35	-9.07	0.19	10.53	239.46
775.00	0.89	240.45	774.91	-5.49	-5.54	-9.40	0.13	10.91	239.48
800.00	0.87	243.92	799.91	-5.66	-5.72	-9.74	0.23	11.30	239.57
825.00	0.95	241.53	824.91	-5.84	-5.90	-10.09	0.37	11.69	239.68
850.00	0.96	242.07	849.90	-6.04	-6.10	-10.46	0.05	12.11	239.75

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
875.00	1.01	238.92	874.90	-6.25	-6.31	-10.83	0.31	12.54	239.78
900.00	1.03	239.04	899.90	-6.48	-6.54	-11.22	0.08	12.99	239.75
925.00	0.97	237.40	924.89	-6.70	-6.77	-11.59	0.27	13.42	239.70
950.00	1.00	236.58	949.89	-6.94	-7.01	-11.95	0.13	13.85	239.62
975.00	0.94	241.75	974.89	-7.15	-7.23	-12.32	0.42	14.28	239.60
1000.00	0.97	236.02	999.88	-7.37	-7.44	-12.67	0.39	14.70	239.58
1025.00	0.92	231.10	1024.88	-7.61	-7.68	-13.00	0.37	15.10	239.42
1050.00	0.94	226.65	1049.88	-7.87	-7.95	-13.31	0.30	15.50	239.14
1075.00	0.92	231.22	1074.87	-8.14	-8.22	-13.61	0.31	15.90	238.88
1100.00	0.98	228.35	1099.87	-8.40	-8.48	-13.93	0.30	16.31	238.65
1125.00	0.96	227.24	1124.86	-8.68	-8.77	-14.24	0.10	16.72	238.38
1150.00	1.04	225.42	1149.86	-8.98	-9.07	-14.56	0.36	17.15	238.08
1175.00	1.07	229.09	1174.86	-9.29	-9.38	-14.89	0.30	17.60	237.79
1200.00	1.09	232.63	1199.85	-9.59	-9.68	-15.26	0.28	18.07	237.61
1225.00	1.15	236.48	1224.85	-9.87	-9.96	-15.66	0.39	18.56	237.54
1250.00	1.00	234.00	1249.84	-10.13	-10.23	-16.05	0.62	19.03	237.48
1275.00	1.03	236.47	1274.84	-10.39	-10.48	-16.41	0.20	19.47	237.43
1300.00	1.05	241.85	1299.83	-10.62	-10.72	-16.80	0.40	19.93	237.47
1325.00	1.09	244.26	1324.83	-10.82	-10.93	-17.22	0.23	20.39	237.60
1350.00	1.05	242.94	1349.83	-11.03	-11.13	-17.63	0.19	20.85	237.73
1375.00	1.09	241.85	1374.82	-11.24	-11.35	-18.05	0.18	21.32	237.83
1400.00	1.09	241.22	1399.82	-11.47	-11.58	-18.46	0.05	21.79	237.91
1425.00	1.03	239.24	1424.81	-11.69	-11.81	-18.87	0.26	22.26	237.96
1450.00	1.06	242.13	1449.81	-11.91	-12.03	-19.26	0.24	22.71	238.02
1475.00	1.02	240.00	1474.80	-12.13	-12.25	-19.66	0.22	23.17	238.08
1500.00	1.05	245.92	1499.80	-12.33	-12.45	-20.06	0.45	23.61	238.17
1525.00	1.04	239.71	1524.80	-12.54	-12.66	-20.47	0.46	24.07	238.26
1550.00	1.05	243.66	1549.79	-12.75	-12.88	-20.87	0.29	24.52	238.32
1575.00	1.10	242.06	1574.79	-12.97	-13.09	-21.29	0.22	24.99	238.41
1600.00	1.10	243.57	1599.78	-13.18	-13.31	-21.71	0.12	25.47	238.49
1625.00	1.14	238.59	1624.78	-13.41	-13.55	-22.14	0.42	25.95	238.54
1650.00	1.22	244.85	1649.77	-13.65	-13.79	-22.59	0.61	26.47	238.60

MD ft	INC deg	AZIM deg	TVD ft	VS ft	+N/-S ft	+E/-W ft	DLS °/100ft	CLOSURE DIST ft	CLOSURE DIR deg
1675.00	1.21	245.18	1674.77	-13.88	-14.01	-23.07	0.04	26.99	238.73
1700.00	1.28	249.02	1699.76	-14.08	-14.22	-23.57	0.43	27.53	238.89
1725.00	1.21	243.69	1724.76	-14.30	-14.44	-24.07	0.54	28.07	239.04
1750.00	1.33	248.46	1749.75	-14.52	-14.66	-24.58	0.63	28.62	239.18
1775.00	1.43	244.29	1774.74	-14.76	-14.91	-25.13	0.56	29.22	239.32
1800.00	1.46	247.45	1799.73	-15.01	-15.16	-25.70	0.34	29.84	239.46
1825.00	1.54	246.99	1824.73	-15.26	-15.42	-26.31	0.30	30.49	239.63
1850.00	1.55	247.37	1849.72	-15.52	-15.68	-26.93	0.07	31.16	239.79
1875.00	1.59	246.48	1874.71	-15.78	-15.95	-27.56	0.19	31.84	239.94
1900.00	1.65	246.61	1899.70	-16.06	-16.23	-28.20	0.23	32.54	240.09
1925.00	1.62	246.45	1924.69	-16.34	-16.51	-28.86	0.09	33.25	240.22
1950.00	1.62	244.23	1949.68	-16.63	-16.81	-29.50	0.25	33.95	240.33
1975.00	1.61	244.65	1974.67	-16.93	-17.11	-30.14	0.05	34.65	240.41
2000.00	1.72	247.97	1999.66	-17.22	-17.40	-30.80	0.58	35.38	240.54
2025.00	1.72	246.25	2024.65	-17.51	-17.69	-31.49	0.21	36.12	240.67
2050.00	1.75	246.33	2049.63	-17.81	-18.00	-32.19	0.10	36.88	240.79
2075.00	1.73	245.53	2074.62	-18.11	-18.31	-32.88	0.12	37.63	240.89
2100.00	1.77	247.80	2099.61	-18.41	-18.61	-33.58	0.31	38.39	241.01
2125.00	1.79	245.07	2124.60	-18.72	-18.92	-34.29	0.35	39.16	241.11
2150.00	1.83	247.82	2149.59	-19.03	-19.23	-35.01	0.39	39.95	241.22
2175.00	1.87	250.43	2174.57	-19.31	-19.52	-35.77	0.38	40.75	241.38
2200.00	1.90	250.87	2199.56	-19.58	-19.79	-36.55	0.10	41.56	241.56
2225.00	1.95	255.30	2224.55	-19.82	-20.04	-37.35	0.63	42.38	241.79
2250.00	1.99	255.50	2249.53	-20.03	-20.26	-38.18	0.16	43.22	242.05
2275.00	2.01	256.58	2274.52	-20.23	-20.47	-39.03	0.16	44.07	242.33
2300.00	1.98	257.64	2299.50	-20.42	-20.66	-39.87	0.18	44.91	242.61
2325.00	2.08	257.90	2324.49	-20.60	-20.85	-40.74	0.39	45.76	242.90
2350.00	2.02	257.94	2349.47	-20.79	-21.03	-41.61	0.21	46.63	243.18
2375.00	2.03	257.50	2374.45	-20.97	-21.22	-42.48	0.06	47.48	243.45
2400.00	2.08	259.76	2399.44	-21.14	-21.40	-43.35	0.40	48.35	243.73
2425.00	2.06	259.62	2424.42	-21.30	-21.56	-44.24	0.10	49.22	244.02
2450.00	2.08	260.46	2449.40	-21.45	-21.72	-45.13	0.14	50.09	244.31

MD ft	INC deg	AZIM deg	TVD ft	VS ft	+N/-S ft	+E/-W ft	DLS °/100ft	CLOSURE DIST ft	CLOSURE DIR deg
2475.00	2.05	260.22	2474.39	-21.59	-21.87	-46.02	0.13	50.95	244.59
2500.00	2.04	260.41	2499.37	-21.74	-22.02	-46.90	0.04	51.81	244.85
2525.00	2.02	258.97	2524.36	-21.89	-22.18	-47.77	0.22	52.67	245.10
2550.00	2.05	265.85	2549.34	-22.00	-22.29	-48.65	0.98	53.52	245.38
2575.00	2.02	268.40	2574.33	-22.04	-22.34	-49.54	0.37	54.34	245.73
2600.00	2.04	270.06	2599.31	-22.05	-22.35	-50.42	0.24	55.15	246.10
2625.00	1.93	267.95	2624.29	-22.06	-22.36	-51.29	0.51	55.95	246.44
2650.00	1.99	268.98	2649.28	-22.08	-22.39	-52.14	0.27	56.75	246.76
2675.00	1.95	267.22	2674.27	-22.10	-22.41	-53.00	0.30	57.55	247.08
2700.00	1.94	265.70	2699.25	-22.15	-22.47	-53.85	0.21	58.35	247.35
2725.00	1.95	264.73	2724.24	-22.21	-22.54	-54.69	0.14	59.15	247.60
2750.00	1.96	265.04	2749.22	-22.28	-22.61	-55.54	0.07	59.97	247.85
2775.00	1.97	267.56	2774.21	-22.33	-22.67	-56.40	0.34	60.78	248.10
2800.00	1.92	265.76	2799.19	-22.38	-22.72	-57.25	0.30	61.59	248.35
2825.00	1.81	262.03	2824.18	-22.46	-22.80	-58.05	0.66	62.37	248.55
2850.00	1.75	257.18	2849.17	-22.59	-22.94	-58.82	0.65	63.13	248.69
2875.00	1.69	256.55	2874.16	-22.76	-23.11	-59.55	0.24	63.88	248.79
2900.00	1.68	255.17	2899.15	-22.94	-23.29	-60.26	0.17	64.61	248.87
2925.00	1.54	258.77	2924.14	-23.09	-23.45	-60.94	0.71	65.30	248.95
2950.00	1.31	260.10	2949.13	-23.20	-23.57	-61.55	0.92	65.91	249.05
2975.00	1.15	264.78	2974.12	-23.27	-23.64	-62.08	0.76	66.43	249.16
3000.00	1.10	270.55	2999.12	-23.29	-23.66	-62.57	0.49	66.90	249.29
3025.00	0.99	276.67	3024.11	-23.26	-23.63	-63.03	0.61	67.31	249.45
3050.00	0.76	294.07	3049.11	-23.16	-23.54	-63.39	1.39	67.62	249.63
3075.00	0.72	323.77	3074.11	-22.97	-23.34	-63.64	1.53	67.78	249.86
3100.00	0.80	330.24	3099.11	-22.69	-23.07	-63.82	0.47	67.86	250.13
3125.00	0.71	327.31	3124.10	-22.40	-22.78	-63.99	0.38	67.92	250.40
3150.00	0.77	325.98	3149.10	-22.13	-22.51	-64.17	0.24	68.00	250.67
3175.00	0.84	323.77	3174.10	-21.84	-22.22	-64.37	0.28	68.10	250.95
3200.00	0.63	312.81	3199.10	-21.60	-21.98	-64.58	0.99	68.22	251.20
3225.00	0.53	234.31	3224.10	-21.57	-21.96	-64.77	2.96	68.39	251.27
3250.00	0.95	211.85	3249.09	-21.82	-22.20	-64.98	2.01	68.66	251.14

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
3275.00	1.08	209.70	3274.09	-22.19	-22.58	-65.20	0.53	69.00	250.90
3300.00	1.04	209.36	3299.09	-22.59	-22.98	-65.43	0.14	69.35	250.65
3325.00	1.09	206.42	3324.08	-23.00	-23.39	-65.65	0.29	69.69	250.39
3350.00	1.12	205.76	3349.08	-23.43	-23.83	-65.86	0.11	70.04	250.11
3375.00	1.12	206.47	3374.07	-23.87	-24.26	-66.07	0.06	70.39	249.84
3400.00	0.93	207.04	3399.07	-24.27	-24.66	-66.27	0.73	70.71	249.59
3425.00	0.76	203.83	3424.07	-24.60	-25.00	-66.43	0.71	70.98	249.38
3450.00	0.65	204.45	3449.06	-24.88	-25.28	-66.56	0.45	71.20	249.20
3475.00	0.42	185.94	3474.06	-25.10	-25.50	-66.63	1.15	71.34	249.06
3500.00	0.45	138.06	3499.06	-25.26	-25.66	-66.57	1.40	71.35	248.92
3525.00	0.74	118.64	3524.06	-25.41	-25.81	-66.37	1.40	71.21	248.75
3550.00	0.75	100.39	3549.06	-25.52	-25.92	-66.06	0.94	70.96	248.58
3575.00	1.00	103.25	3574.06	-25.60	-25.99	-65.69	1.01	70.65	248.41
3600.00	1.08	96.61	3599.05	-25.68	-26.07	-65.25	0.59	70.26	248.22
3625.00	1.27	91.67	3624.05	-25.72	-26.11	-64.74	0.85	69.80	248.04
3650.00	1.33	92.80	3649.04	-25.75	-26.13	-64.17	0.27	69.29	247.84
3675.00	1.19	85.95	3674.03	-25.75	-26.12	-63.62	0.83	68.78	247.68
3700.00	1.13	62.72	3699.03	-25.62	-25.99	-63.14	1.88	68.28	247.63
3725.00	1.18	51.23	3724.02	-25.35	-25.72	-62.72	0.94	67.79	247.70
3750.00	1.24	49.88	3749.02	-25.01	-25.38	-62.32	0.28	67.29	247.84
3775.00	1.28	47.05	3774.01	-24.65	-25.02	-61.91	0.29	66.77	247.99
3800.00	1.26	46.06	3799.01	-24.27	-24.64	-61.50	0.12	66.26	248.17
3825.00	1.26	47.41	3824.00	-23.90	-24.26	-61.10	0.12	65.74	248.34
3850.00	1.28	46.72	3848.99	-23.52	-23.89	-60.70	0.08	65.23	248.52
3875.00	1.25	45.94	3873.99	-23.15	-23.51	-60.30	0.14	64.72	248.70
3900.00	1.28	42.61	3898.98	-22.76	-23.11	-59.92	0.32	64.22	248.91
3925.00	1.18	45.27	3923.98	-22.37	-22.73	-59.55	0.44	63.73	249.11
3950.00	1.21	40.67	3948.97	-21.99	-22.34	-59.19	0.40	63.27	249.32
3975.00	1.19	39.87	3973.97	-21.59	-21.94	-58.85	0.13	62.81	249.55
4000.00	1.09	46.15	3998.96	-21.23	-21.58	-58.51	0.64	62.37	249.76
4025.00	1.02	48.69	4023.96	-20.92	-21.27	-58.18	0.32	61.94	249.92
4050.00	1.00	47.58	4048.95	-20.63	-20.98	-57.85	0.12	61.53	250.07

MD ft	INC deg	AZIM deg	TVD ft	VS ft	+N/-S ft	+E/-W ft	DLS °/100ft	CLOSURE DIST ft	CLOSURE DIR deg
4075.00	0.95	46.78	4073.95	-20.35	-20.69	-57.54	0.18	61.14	250.22
4100.00	0.96	47.47	4098.95	-20.06	-20.40	-57.23	0.05	60.76	250.38
4125.00	0.96	48.15	4123.94	-19.78	-20.12	-56.92	0.05	60.37	250.53
4150.00	0.91	46.62	4148.94	-19.51	-19.85	-56.62	0.24	60.00	250.68
4175.00	0.90	50.84	4173.94	-19.25	-19.59	-56.32	0.27	59.63	250.83
4200.00	1.08	61.18	4198.93	-19.01	-19.35	-55.96	1.00	59.21	250.93
4225.00	1.20	64.47	4223.93	-18.79	-19.12	-55.52	0.56	58.72	251.00
4250.00	1.34	69.73	4248.92	-18.58	-18.91	-55.01	0.71	58.17	251.03
4275.00	1.49	72.94	4273.91	-18.39	-18.71	-54.42	0.67	57.55	251.03
4300.00	1.62	76.39	4298.90	-18.21	-18.53	-53.77	0.64	56.88	250.98
4325.00	1.61	77.75	4323.89	-18.06	-18.37	-53.08	0.15	56.17	250.91
4350.00	1.75	79.54	4348.88	-17.92	-18.23	-52.37	0.59	55.45	250.81
4375.00	1.79	79.56	4373.87	-17.78	-18.09	-51.61	0.16	54.68	250.68
4400.00	1.74	77.81	4398.86	-17.64	-17.94	-50.85	0.29	53.92	250.57
4425.00	1.77	78.19	4423.85	-17.48	-17.78	-50.10	0.13	53.16	250.46
4450.00	1.84	80.18	4448.83	-17.34	-17.63	-49.33	0.37	52.38	250.33
4475.00	1.92	86.21	4473.82	-17.25	-17.54	-48.51	0.86	51.58	250.13
4500.00	2.01	93.85	4498.81	-17.25	-17.54	-47.65	1.11	50.78	249.80
4525.00	2.12	98.26	4523.79	-17.36	-17.63	-46.76	0.77	49.97	249.34
4550.00	2.26	106.32	4548.77	-17.57	-17.84	-45.83	1.34	49.18	248.73
4575.00	2.49	115.04	4573.75	-17.94	-18.21	-44.86	1.72	48.42	247.91
4600.00	2.59	120.76	4598.73	-18.46	-18.72	-43.89	1.09	47.71	246.89
4625.00	2.87	127.51	4623.70	-19.14	-19.39	-42.90	1.69	47.08	245.68
4650.00	2.91	132.17	4648.67	-19.95	-20.20	-41.94	0.95	46.55	244.28
4675.00	3.01	135.76	4673.63	-20.85	-21.10	-41.01	0.85	46.12	242.78
4700.00	2.96	139.74	4698.60	-21.82	-22.06	-40.14	0.85	45.80	241.21
4725.00	2.33	168.12	4723.57	-22.81	-23.05	-39.61	5.74	45.83	239.81
4750.00	2.50	214.27	4748.55	-23.76	-24.00	-39.82	7.59	46.49	238.92
4775.00	3.24	238.66	4773.52	-24.57	-24.82	-40.73	5.64	47.69	238.65
4800.00	3.60	243.38	4798.48	-25.28	-25.53	-42.03	1.83	49.18	238.72
4825.00	3.54	244.65	4823.43	-25.96	-26.22	-43.43	0.39	50.73	238.88
4850.00	3.45	245.41	4848.38	-26.59	-26.86	-44.81	0.43	52.24	239.06

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
4875.00	3.32	247.13	4873.34	-27.18	-27.45	-46.16	0.65	53.71	239.26
4900.00	3.07	251.99	4898.30	-27.66	-27.94	-47.47	1.47	55.08	239.52
4925.00	2.74	262.62	4923.27	-27.94	-28.23	-48.70	2.52	56.28	239.90
4950.00	2.60	272.65	4948.24	-27.98	-28.28	-49.86	1.95	57.32	240.44
4975.00	2.61	273.39	4973.22	-27.91	-28.22	-50.99	0.14	58.28	241.04
5000.00	2.54	272.87	4998.19	-27.84	-28.15	-52.11	0.31	59.23	241.62
5025.00	2.59	274.82	5023.17	-27.76	-28.08	-53.23	0.40	60.18	242.19
5050.00	2.60	275.02	5048.14	-27.66	-27.98	-54.36	0.08	61.14	242.76
5075.00	2.55	276.89	5073.11	-27.54	-27.87	-55.48	0.39	62.08	243.33
5100.00	2.53	276.96	5098.09	-27.40	-27.73	-56.58	0.10	63.01	243.89
5125.00	2.48	276.03	5123.07	-27.27	-27.61	-57.66	0.27	63.93	244.41
5150.00	2.50	277.93	5148.04	-27.13	-27.48	-58.74	0.34	64.85	244.93
5175.00	2.45	277.01	5173.02	-26.98	-27.34	-59.81	0.25	65.76	245.44
5200.00	2.35	277.35	5198.00	-26.84	-27.20	-60.85	0.43	66.65	245.91
5225.00	2.36	276.76	5222.98	-26.71	-27.08	-61.87	0.12	67.53	246.36
5250.00	2.31	274.84	5247.96	-26.60	-26.98	-62.88	0.37	68.42	246.78
5275.00	2.23	275.88	5272.94	-26.50	-26.88	-63.87	0.38	69.30	247.17
5300.00	2.16	276.47	5297.92	-26.40	-26.78	-64.82	0.28	70.13	247.55
5325.00	2.13	277.85	5322.90	-26.27	-26.66	-65.75	0.24	70.95	247.93
5350.00	2.09	278.68	5347.88	-26.14	-26.53	-66.66	0.20	71.75	248.30
5375.00	2.05	279.98	5372.87	-25.98	-26.38	-67.55	0.26	72.52	248.67
5400.00	1.91	277.77	5397.85	-25.84	-26.25	-68.41	0.62	73.27	249.01
5425.00	1.96	276.76	5422.84	-25.73	-26.14	-69.25	0.24	74.02	249.32
5450.00	1.84	276.75	5447.82	-25.63	-26.05	-70.07	0.47	74.75	249.61
5475.00	1.84	277.70	5472.81	-25.52	-25.95	-70.87	0.12	75.47	249.89
5500.00	1.90	276.85	5497.80	-25.42	-25.84	-71.68	0.27	76.19	250.17
5525.00	1.81	277.07	5522.78	-25.31	-25.74	-72.48	0.37	76.91	250.44
5550.00	1.80	278.82	5547.77	-25.20	-25.64	-73.26	0.22	77.61	250.71
5575.00	1.86	278.05	5572.76	-25.08	-25.52	-74.05	0.27	78.32	250.99
5600.00	1.84	279.84	5597.75	-24.95	-25.39	-74.85	0.26	79.04	251.26
5625.00	1.79	277.19	5622.73	-24.83	-25.28	-75.63	0.38	79.74	251.52
5650.00	1.77	278.88	5647.72	-24.71	-25.17	-76.40	0.22	80.44	251.77

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
5675.00	1.75	280.26	5672.71	-24.58	-25.04	-77.16	0.18	81.12	252.02
5700.00	1.77	281.30	5697.70	-24.43	-24.90	-77.91	0.14	81.79	252.28
5725.00	1.80	282.09	5722.69	-24.27	-24.74	-78.67	0.15	82.47	252.54
5750.00	1.76	282.21	5747.67	-24.10	-24.57	-79.43	0.13	83.15	252.81
5775.00	1.79	281.71	5772.66	-23.94	-24.41	-80.19	0.11	83.82	253.07
5800.00	1.80	279.24	5797.65	-23.79	-24.27	-80.96	0.31	84.52	253.31
5825.00	1.81	281.38	5822.64	-23.65	-24.13	-81.73	0.27	85.22	253.55
5850.00	1.39	295.28	5847.63	-23.43	-23.92	-82.39	2.26	85.80	253.81
5875.00	0.95	317.62	5872.62	-23.15	-23.64	-82.81	2.51	86.12	254.07
5900.00	0.64	333.47	5897.62	-22.87	-23.36	-83.01	1.53	86.24	254.28
5925.00	0.57	343.26	5922.62	-22.63	-23.12	-83.11	0.50	86.27	254.45
5950.00	0.59	346.40	5947.62	-22.38	-22.88	-83.18	0.15	86.26	254.62
5975.00	0.50	350.81	5972.62	-22.15	-22.65	-83.22	0.39	86.25	254.78
6000.00	0.53	344.52	5997.61	-21.93	-22.43	-83.27	0.27	86.24	254.93
6025.00	0.52	346.09	6022.61	-21.71	-22.20	-83.33	0.08	86.24	255.08
6050.00	0.46	339.28	6047.61	-21.50	-22.00	-83.39	0.34	86.25	255.22
6075.00	0.46	341.85	6072.61	-21.32	-21.81	-83.46	0.08	86.26	255.35
6100.00	0.47	344.88	6097.61	-21.12	-21.62	-83.52	0.11	86.27	255.49
6125.00	0.50	346.98	6122.61	-20.92	-21.41	-83.57	0.16	86.27	255.63
6150.00	0.46	350.23	6147.61	-20.71	-21.21	-83.61	0.21	86.26	255.77
6175.00	0.49	350.92	6172.61	-20.51	-21.01	-83.64	0.11	86.24	255.90
6200.00	0.49	3.23	6197.61	-20.30	-20.79	-83.65	0.42	86.20	256.04
6225.00	0.50	356.99	6222.61	-20.08	-20.58	-83.65	0.22	86.15	256.18
6250.00	0.49	1.49	6247.61	-19.87	-20.36	-83.66	0.17	86.10	256.32
6275.00	0.46	1.32	6272.61	-19.66	-20.16	-83.65	0.13	86.05	256.45
6300.00	0.51	359.60	6297.60	-19.45	-19.95	-83.65	0.23	85.99	256.59
6325.00	0.54	358.67	6322.60	-19.22	-19.72	-83.65	0.11	85.95	256.74
6350.00	0.55	0.04	6347.60	-18.98	-19.48	-83.66	0.08	85.89	256.89
6375.00	0.54	4.14	6372.60	-18.75	-19.24	-83.65	0.17	85.83	257.04
6400.00	0.36	23.74	6397.60	-18.56	-19.05	-83.61	0.92	85.75	257.16
6425.00	0.88	127.91	6422.60	-18.60	-19.10	-83.42	4.11	85.58	257.10
6450.00	1.41	135.94	6447.59	-18.94	-19.44	-83.06	2.20	85.30	256.83

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
6475.00	1.51	135.99	6472.59	-19.40	-19.89	-82.62	0.41	84.98	256.46
6500.00	1.57	140.87	6497.58	-19.91	-20.40	-82.17	0.57	84.67	256.06
6525.00	1.49	141.89	6522.57	-20.43	-20.92	-81.76	0.32	84.39	255.65
6550.00	1.49	141.63	6547.56	-20.94	-21.43	-81.36	0.03	84.13	255.24
6575.00	1.39	143.00	6572.55	-21.44	-21.92	-80.97	0.44	83.89	254.85
6600.00	1.29	143.15	6597.55	-21.91	-22.39	-80.62	0.40	83.67	254.48
6625.00	1.36	143.04	6622.54	-22.37	-22.85	-80.27	0.29	83.46	254.11
6650.00	1.34	144.51	6647.53	-22.85	-23.33	-79.93	0.17	83.26	253.73
6675.00	1.27	143.57	6672.53	-23.31	-23.79	-79.59	0.26	83.07	253.36
6700.00	1.22	141.64	6697.52	-23.75	-24.22	-79.26	0.27	82.88	253.01
6725.00	1.31	141.86	6722.51	-24.18	-24.65	-78.92	0.37	82.68	252.65
6750.00	1.36	142.97	6747.51	-24.65	-25.11	-78.57	0.21	82.48	252.27
6775.00	1.39	143.32	6772.50	-25.13	-25.59	-78.21	0.14	82.29	251.88
6800.00	1.38	142.48	6797.49	-25.61	-26.07	-77.84	0.10	82.09	251.48
6825.00	1.34	142.21	6822.48	-26.08	-26.54	-77.48	0.15	81.90	251.09
6850.00	1.32	141.40	6847.48	-26.54	-27.00	-77.12	0.09	81.71	250.70
6875.00	1.01	141.76	6872.47	-26.94	-27.40	-76.80	1.25	81.55	250.37
6900.00	0.26	99.51	6897.47	-27.13	-27.58	-76.61	3.36	81.43	250.20
6925.00	0.48	4.30	6922.47	-27.03	-27.49	-76.55	2.27	81.34	250.25
6950.00	0.61	357.48	6947.47	-26.79	-27.25	-76.55	0.58	81.25	250.41
6975.00	0.51	354.94	6972.47	-26.55	-27.00	-76.56	0.42	81.19	250.57
7000.00	0.51	6.34	6997.47	-26.33	-26.78	-76.56	0.41	81.11	250.72
7025.00	0.49	10.60	7022.47	-26.11	-26.57	-76.53	0.17	81.01	250.86
7050.00	0.46	18.05	7047.47	-25.91	-26.37	-76.48	0.27	80.90	250.98
7075.00	0.53	16.64	7072.46	-25.71	-26.16	-76.41	0.28	80.77	251.10
7100.00	0.53	18.55	7097.46	-25.48	-25.94	-76.34	0.07	80.63	251.23
7125.00	0.54	23.62	7122.46	-25.27	-25.72	-76.26	0.19	80.48	251.36
7150.00	0.58	19.80	7147.46	-25.04	-25.49	-76.17	0.23	80.32	251.50
7175.00	0.51	25.45	7172.46	-24.82	-25.27	-76.08	0.35	80.17	251.62
7200.00	0.50	18.25	7197.46	-24.62	-25.07	-76.00	0.26	80.02	251.74
7225.00	0.48	19.25	7222.46	-24.41	-24.87	-75.93	0.08	79.90	251.87
7250.00	0.42	18.62	7247.46	-24.23	-24.68	-75.86	0.26	79.78	251.98

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
7275.00	0.39	15.12	7272.46	-24.06	-24.51	-75.81	0.15	79.68	252.08
7300.00	0.31	17.76	7297.46	-23.92	-24.37	-75.77	0.33	79.59	252.17
7325.00	0.35	23.73	7322.46	-23.78	-24.23	-75.72	0.24	79.50	252.25
7350.00	0.30	36.06	7347.46	-23.66	-24.11	-75.65	0.36	79.40	252.32
7375.00	0.30	44.76	7372.46	-23.56	-24.01	-75.57	0.18	79.29	252.37
7400.00	0.36	48.29	7397.45	-23.46	-23.91	-75.46	0.27	79.16	252.42
7425.00	0.41	51.82	7422.45	-23.36	-23.80	-75.33	0.22	79.00	252.46
7450.00	0.44	43.65	7447.45	-23.23	-23.68	-75.19	0.27	78.83	252.52
7475.00	0.43	45.68	7472.45	-23.10	-23.54	-75.06	0.07	78.66	252.59
7500.00	0.48	47.95	7497.45	-22.96	-23.41	-74.91	0.19	78.49	252.65
7525.00	0.48	57.60	7522.45	-22.84	-23.28	-74.75	0.32	78.29	252.70
7550.00	0.43	55.48	7547.45	-22.73	-23.17	-74.58	0.21	78.10	252.74
7575.00	0.42	68.09	7572.45	-22.64	-23.08	-74.42	0.37	77.92	252.77
7600.00	0.47	76.62	7597.45	-22.58	-23.03	-74.24	0.32	77.72	252.77
7625.00	0.47	74.98	7622.45	-22.54	-22.98	-74.04	0.05	77.52	252.76
7650.00	0.57	68.73	7647.45	-22.47	-22.90	-73.82	0.46	77.29	252.76
7675.00	0.62	68.33	7672.45	-22.37	-22.81	-73.58	0.19	77.03	252.78
7700.00	0.57	61.98	7697.44	-22.26	-22.70	-73.35	0.33	76.78	252.80
7725.00	0.57	67.71	7722.44	-22.16	-22.60	-73.12	0.23	76.53	252.83
7750.00	0.55	56.37	7747.44	-22.05	-22.48	-72.91	0.45	76.29	252.86
7775.00	0.55	61.99	7772.44	-21.93	-22.36	-72.70	0.22	76.06	252.90
7800.00	0.48	57.28	7797.44	-21.82	-22.25	-72.51	0.34	75.84	252.94
7825.00	0.50	57.99	7822.44	-21.70	-22.13	-72.33	0.10	75.64	252.99
7850.00	0.52	57.95	7847.44	-21.59	-22.02	-72.14	0.07	75.43	253.03
7875.00	0.52	60.40	7872.44	-21.47	-21.90	-71.95	0.09	75.20	253.07
7900.00	0.59	69.83	7897.44	-21.37	-21.80	-71.72	0.47	74.96	253.09
7925.00	0.60	76.67	7922.43	-21.30	-21.72	-71.48	0.28	74.70	253.09
7950.00	0.55	86.12	7947.43	-21.26	-21.69	-71.23	0.41	74.46	253.07
7975.00	0.46	79.49	7972.43	-21.24	-21.66	-71.01	0.45	74.24	253.04
8000.00	0.62	76.30	7997.43	-21.19	-21.61	-70.78	0.67	74.01	253.02
8025.00	0.53	94.29	8022.43	-21.17	-21.59	-70.53	0.81	73.76	252.98
8050.00	0.49	59.27	8047.43	-21.12	-21.54	-70.33	1.24	73.55	252.97

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
8075.00	0.43	81.58	8072.43	-21.05	-21.47	-70.14	0.75	73.35	252.98
8100.00	0.60	81.51	8097.43	-21.02	-21.44	-69.92	0.66	73.13	252.95
8125.00	0.52	96.51	8122.43	-21.02	-21.43	-69.68	0.66	72.90	252.90
8150.00	0.61	91.09	8147.42	-21.03	-21.45	-69.43	0.42	72.67	252.84
8175.00	0.52	104.63	8172.42	-21.07	-21.48	-69.19	0.63	72.45	252.76
8200.00	0.48	106.83	8197.42	-21.13	-21.54	-68.98	0.19	72.26	252.66
8225.00	0.52	96.20	8222.42	-21.17	-21.58	-68.77	0.40	72.08	252.58
8250.00	0.47	107.12	8247.42	-21.21	-21.62	-68.56	0.41	71.89	252.50
8275.00	0.41	115.25	8272.42	-21.28	-21.69	-68.38	0.35	71.74	252.40
8300.00	0.42	125.16	8297.42	-21.38	-21.78	-68.22	0.29	71.61	252.29
8325.00	0.43	129.29	8322.42	-21.49	-21.89	-68.07	0.12	71.51	252.17
8350.00	0.50	126.54	8347.42	-21.62	-22.02	-67.91	0.31	71.39	252.04
8375.00	0.62	125.79	8372.42	-21.76	-22.16	-67.72	0.48	71.25	251.88
8400.00	0.51	129.14	8397.42	-21.91	-22.31	-67.52	0.45	71.11	251.71
8425.00	0.59	128.42	8422.41	-22.06	-22.46	-67.33	0.32	70.98	251.55
8450.00	0.49	122.10	8447.41	-22.20	-22.60	-67.14	0.46	70.84	251.40
8475.00	0.55	118.63	8472.41	-22.32	-22.71	-66.94	0.26	70.69	251.26
8500.00	0.49	126.85	8497.41	-22.44	-22.83	-66.75	0.38	70.55	251.12
8525.00	0.49	133.04	8522.41	-22.58	-22.97	-66.59	0.21	70.44	250.97
8550.00	0.48	136.65	8547.41	-22.73	-23.12	-66.44	0.14	70.35	250.81
8575.00	0.51	132.23	8572.41	-22.88	-23.27	-66.28	0.21	70.25	250.65
8600.00	0.46	136.22	8597.41	-23.03	-23.42	-66.13	0.26	70.16	250.50
8625.00	0.47	132.72	8622.41	-23.17	-23.56	-65.99	0.12	70.07	250.35
8650.00	0.48	139.50	8647.41	-23.32	-23.71	-65.84	0.23	69.98	250.19
8675.00	0.41	141.39	8672.40	-23.47	-23.86	-65.72	0.29	69.92	250.04
8700.00	0.38	145.41	8697.40	-23.61	-24.00	-65.61	0.17	69.87	249.91
8725.00	0.37	140.70	8722.40	-23.74	-24.13	-65.52	0.13	69.82	249.78
8750.00	0.37	145.40	8747.40	-23.87	-24.26	-65.42	0.12	69.77	249.65
8775.00	0.32	140.56	8772.40	-24.00	-24.38	-65.33	0.25	69.73	249.53
8800.00	0.42	145.28	8797.40	-24.13	-24.51	-65.23	0.42	69.69	249.41
8825.00	0.38	153.23	8822.40	-24.28	-24.66	-65.14	0.26	69.66	249.26
8850.00	0.49	149.33	8847.40	-24.44	-24.83	-65.05	0.45	69.63	249.11

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
8875.00	0.51	147.99	8872.40	-24.63	-25.01	-64.94	0.09	69.59	248.93
8900.00	0.53	152.59	8897.40	-24.83	-25.21	-64.83	0.19	69.56	248.75
8925.00	0.51	140.36	8922.40	-25.02	-25.40	-64.70	0.45	69.51	248.57
8950.00	0.52	142.32	8947.40	-25.19	-25.58	-64.56	0.08	69.44	248.39
8975.00	0.57	132.93	8972.40	-25.37	-25.75	-64.40	0.40	69.36	248.20
9000.00	0.52	121.95	8997.39	-25.52	-25.90	-64.21	0.46	69.24	248.04
9025.00	0.57	108.73	9022.39	-25.62	-26.00	-64.00	0.53	69.08	247.89
9050.00	0.58	104.38	9047.39	-25.69	-26.07	-63.76	0.18	68.88	247.76
9075.00	0.64	97.92	9072.39	-25.74	-26.12	-63.50	0.36	68.66	247.64
9100.00	0.68	91.24	9097.39	-25.76	-26.14	-63.21	0.35	68.41	247.53
9125.00	0.71	87.85	9122.39	-25.76	-26.14	-62.91	0.20	68.13	247.44
9150.00	0.74	89.89	9147.39	-25.76	-26.13	-62.60	0.16	67.83	247.34
9175.00	0.71	86.25	9172.38	-25.75	-26.12	-62.28	0.22	67.54	247.25
9200.00	0.76	87.89	9197.38	-25.74	-26.11	-61.96	0.21	67.24	247.15
9225.00	0.84	86.86	9222.38	-25.72	-26.09	-61.61	0.35	66.91	247.05
9250.00	0.88	88.17	9247.38	-25.71	-26.07	-61.24	0.16	66.56	246.94
9275.00	0.90	88.24	9272.37	-25.70	-26.06	-60.85	0.10	66.20	246.82
9300.00	0.98	82.80	9297.37	-25.67	-26.03	-60.44	0.46	65.81	246.70
9325.00	0.99	83.87	9322.37	-25.62	-25.98	-60.02	0.11	65.40	246.59
9350.00	0.99	83.74	9347.36	-25.58	-25.93	-59.59	0.03	64.98	246.48
9375.00	0.98	88.12	9372.36	-25.55	-25.90	-59.16	0.30	64.58	246.36
9400.00	0.97	86.49	9397.35	-25.53	-25.88	-58.73	0.11	64.18	246.22
9425.00	0.83	88.16	9422.35	-25.52	-25.86	-58.34	0.59	63.82	246.09
9450.00	0.64	81.31	9447.35	-25.49	-25.84	-58.02	0.84	63.51	246.00
9475.00	0.47	70.15	9472.35	-25.44	-25.78	-57.79	0.81	63.28	245.96
9500.00	0.23	38.82	9497.35	-25.36	-25.71	-57.66	1.18	63.13	245.97
9525.00	0.32	285.37	9522.35	-25.31	-25.65	-57.70	1.87	63.14	246.03
9550.00	0.62	268.52	9547.35	-25.29	-25.63	-57.90	1.29	63.32	246.12
9575.00	0.63	259.31	9572.35	-25.32	-25.66	-58.17	0.41	63.58	246.20
9600.00	0.62	260.08	9597.34	-25.36	-25.71	-58.44	0.06	63.85	246.25
9625.00	0.61	257.85	9622.34	-25.41	-25.76	-58.71	0.11	64.11	246.31
9650.00	0.41	274.64	9647.34	-25.43	-25.78	-58.93	0.99	64.32	246.37

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
9675.00	0.40	276.62	9672.34	-25.41	-25.77	-59.10	0.07	64.47	246.44
9700.00	0.40	290.56	9697.34	-25.37	-25.73	-59.27	0.39	64.61	246.54
9725.00	0.70	305.50	9722.34	-25.25	-25.61	-59.47	1.31	64.75	246.71
9750.00	1.02	304.44	9747.34	-25.04	-25.39	-59.78	1.32	64.95	246.99
9775.00	1.15	302.27	9772.33	-24.77	-25.13	-60.18	0.54	65.22	247.33
9800.00	1.41	295.94	9797.33	-24.50	-24.86	-60.67	1.18	65.57	247.72
9825.00	1.75	291.04	9822.32	-24.23	-24.59	-61.30	1.45	66.05	248.14
9850.00	1.83	290.66	9847.30	-23.94	-24.31	-62.03	0.33	66.63	248.60
9875.00	1.84	290.18	9872.29	-23.66	-24.03	-62.78	0.07	67.22	249.05
9900.00	1.71	288.97	9897.28	-23.40	-23.77	-63.51	0.55	67.81	249.48
9925.00	1.49	289.36	9922.27	-23.17	-23.55	-64.17	0.88	68.35	249.85
9950.00	1.34	292.01	9947.26	-22.94	-23.33	-64.74	0.62	68.82	250.18
9975.00	1.23	291.53	9972.26	-22.73	-23.12	-65.27	0.46	69.24	250.49
10000.00	1.21	292.90	9997.25	-22.53	-22.92	-65.76	0.14	69.64	250.78
10025.00	1.30	290.46	10022.24	-22.32	-22.72	-66.27	0.43	70.05	251.08
10050.00	1.28	289.55	10047.24	-22.13	-22.52	-66.80	0.13	70.49	251.36
10075.00	1.25	288.63	10072.23	-21.94	-22.34	-67.32	0.13	70.93	251.64
10100.00	1.18	294.86	10097.23	-21.75	-22.15	-67.81	0.59	71.34	251.91
10125.00	1.09	296.51	10122.22	-21.53	-21.93	-68.26	0.41	71.69	252.19
10150.00	0.97	295.79	10147.22	-21.33	-21.74	-68.66	0.47	72.02	252.43
10175.00	0.90	300.89	10172.21	-21.13	-21.54	-69.02	0.45	72.30	252.66
10200.00	0.84	300.99	10197.21	-20.94	-21.35	-69.34	0.21	72.56	252.89
10225.00	0.87	306.83	10222.21	-20.73	-21.14	-69.65	0.37	72.79	253.12
10250.00	0.91	309.57	10247.20	-20.48	-20.90	-69.96	0.23	73.01	253.37
10275.00	0.98	302.83	10272.20	-20.24	-20.66	-70.29	0.52	73.26	253.62
10300.00	0.89	313.21	10297.20	-19.99	-20.41	-70.61	0.75	73.50	253.88
10325.00	0.97	311.53	10322.19	-19.72	-20.14	-70.91	0.30	73.71	254.15
10350.00	0.95	310.80	10347.19	-19.44	-19.86	-71.23	0.07	73.94	254.42
10375.00	0.98	313.56	10372.19	-19.15	-19.58	-71.54	0.21	74.17	254.69
10400.00	0.93	321.08	10397.18	-18.85	-19.27	-71.82	0.53	74.36	254.98
10425.00	0.83	331.24	10422.18	-18.53	-18.96	-72.03	0.75	74.49	255.25
10450.00	0.71	347.14	10447.18	-18.22	-18.65	-72.15	0.96	74.53	255.51

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	"/100ft	ft	deg
10475.00	0.63	11.56	10472.18	-17.93	-18.36	-72.16	1.18	74.46	255.72
10500.00	0.58	28.53	10497.18	-17.69	-18.12	-72.07	0.73	74.32	255.89
10525.00	0.49	40.26	10522.18	-17.50	-17.92	-71.94	0.57	74.14	256.01
10550.00	0.44	39.33	10547.17	-17.34	-17.77	-71.81	0.20	73.98	256.10
10575.00	0.41	17.66	10572.17	-17.18	-17.61	-71.72	0.65	73.85	256.21
10600.00	0.50	354.05	10597.17	-16.98	-17.41	-71.71	0.82	73.79	256.35
10625.00	0.51	355.70	10622.17	-16.76	-17.19	-71.73	0.08	73.76	256.52
10650.00	0.69	343.80	10647.17	-16.51	-16.93	-71.78	0.86	73.75	256.73
10675.00	0.85	342.73	10672.17	-16.19	-16.61	-71.87	0.64	73.77	256.99
10700.00	0.97	344.66	10697.17	-15.80	-16.23	-71.98	0.49	73.79	257.29
10725.00	0.95	348.09	10722.16	-15.40	-15.82	-72.08	0.24	73.80	257.62
10750.00	0.94	349.50	10747.16	-14.99	-15.42	-72.16	0.12	73.79	257.94
10775.00	0.97	0.62	10772.15	-14.58	-15.01	-72.20	0.75	73.74	258.26
10800.00	0.86	3.62	10797.15	-14.18	-14.61	-72.18	0.45	73.65	258.56
10825.00	0.76	2.39	10822.15	-13.83	-14.26	-72.17	0.41	73.56	258.83
10850.00	0.68	349.08	10847.15	-13.51	-13.94	-72.19	0.74	73.52	259.07
10875.00	0.65	339.58	10872.15	-13.23	-13.66	-72.26	0.46	73.55	259.29
10900.00	0.61	338.66	10897.14	-12.98	-13.41	-72.36	0.15	73.59	259.50
10925.00	0.64	334.18	10922.14	-12.72	-13.16	-72.47	0.22	73.66	259.71
10950.00	0.67	330.34	10947.14	-12.47	-12.90	-72.61	0.23	73.74	259.92
10975.00	0.75	327.07	10972.14	-12.21	-12.64	-72.77	0.33	73.86	260.15
11000.00	0.75	329.46	10997.14	-11.93	-12.36	-72.94	0.12	73.98	260.38
11025.00	0.68	332.64	11022.13	-11.65	-12.09	-73.09	0.30	74.08	260.61
11050.00	0.53	333.37	11047.13	-11.42	-11.85	-73.21	0.60	74.16	260.81
11075.00	0.31	300.55	11072.13	-11.28	-11.71	-73.32	1.29	74.25	260.92
11100.00	0.24	285.12	11097.13	-11.23	-11.66	-73.43	0.40	74.35	260.97
11125.00	0.27	285.72	11122.13	-11.20	-11.64	-73.53	0.14	74.45	261.01
11150.00	0.37	291.86	11147.13	-11.15	-11.59	-73.67	0.42	74.57	261.06
11175.00	0.48	273.76	11172.13	-11.11	-11.55	-73.84	0.68	74.74	261.11
11200.00	0.93	253.37	11197.13	-11.16	-11.60	-74.14	2.03	75.04	261.11
11225.00	0.84	272.02	11222.13	-11.21	-11.65	-74.52	1.19	75.42	261.11
11250.00	0.85	272.45	11247.12	-11.20	-11.64	-74.89	0.07	75.79	261.16

MD	INC	AZIM	TVD	VS	+N/-S	+E/-W	DLS	CLOSURE DIST	CLOSURE DIR
ft	deg	deg	ft	ft	ft	ft	°/100ft	ft	deg
11275.00	0.91	270.11	11272.12	-11.19	-11.63	-75.27	0.27	76.17	261.22
11300.00	0.92	268.87	11297.12	-11.19	-11.64	-75.67	0.08	76.56	261.26
11325.00	1.03	272.79	11322.11	-11.18	-11.63	-76.09	0.52	76.98	261.31
11350.00	0.94	268.27	11347.11	-11.17	-11.62	-76.52	0.47	77.40	261.36
11375.00	0.98	264.19	11372.11	-11.19	-11.65	-76.94	0.32	77.82	261.39
11400.00	0.94	263.43	11397.10	-11.24	-11.70	-77.36	0.15	78.24	261.40
11419.33	0.90	275.04	11416.43	-11.24	-11.70	-77.67	0.99	78.54	261.43



COG Operating LLC

Lea Co., MN

Vast State

23H

Wellbore #1

Design: Surveys

Standard Survey Report

31 May, 2017



NABORS

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Project	Lea Co., MN		
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		Vast State			
Site Position:		Northing:	377,879.600 usft	Latitude:	32° 2' 12.19925 N
From:	Map	Easting:	730,586.600 usft	Longitude:	103° 35' 21.13916 W
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.39 °

Well	23H					
Well Position	+N/-S	0.00 ft	Northing:	377,879.600 usft	Latitude:	32° 2' 12.19925 N
	+E/-W	0.00 ft	Easting:	730,586.600 usft	Longitude:	103° 35' 21.13916 W
Position Uncertainty		2.00 ft	Wellhead Elevation:	ft	Ground Level:	3,261.30 ft

Wellbore					
Wellbore #1					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/27/2017	6.87	59.78	47,969.80000000

Design	Surveys				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	359.66	

Survey Program		Date	5/28/2017		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
100.00	11,419.33	Survey #2 SDI Gyro (Wellbore #1)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4	
11,419.33	12,247.00	Survey #3 NDS Surveys (Wellbore #1)	MWD+HRGM	OWSG MWD + HRGM	
12,247.00	13,124.00	Survey #4 NDS Surveys #2 (Wellbore #1)	MWD+HRGM	OWSG MWD + HRGM	
13,124.00	17,000.00	Survey #5 NDS Surveys #3 (Wellbore #1)	MWD+HRGM	OWSG MWD + HRGM	

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.39	263.03	100.00	-0.04	-0.34	-0.04	0.39	0.39	0.00
125.00	0.44	235.90	125.00	-0.11	-0.50	-0.10	0.80	0.20	-108.52
150.00	0.65	245.42	150.00	-0.22	-0.71	-0.21	0.91	0.84	38.08
175.00	0.83	244.43	175.00	-0.36	-1.00	-0.35	0.72	0.72	-3.96
200.00	0.81	241.11	199.99	-0.52	-1.32	-0.51	0.21	-0.08	-13.28
225.00	0.89	241.07	224.99	-0.70	-1.65	-0.69	0.32	0.32	-0.16
250.00	0.94	233.98	249.99	-0.91	-1.98	-0.90	0.49	0.20	-28.36



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
275.00	0.96	239.92	274.98	-1.14	-2.33	-1.12	0.40	0.08	23.76
300.00	0.99	241.10	299.98	-1.35	-2.70	-1.33	0.14	0.12	4.72
325.00	0.98	236.16	324.98	-1.57	-3.07	-1.55	0.34	-0.04	-19.76
350.00	1.01	233.62	349.97	-1.82	-3.42	-1.80	0.21	0.12	-10.16
375.00	0.99	235.01	374.97	-2.08	-3.77	-2.05	0.13	-0.08	5.56
400.00	1.00	233.21	399.96	-2.33	-4.13	-2.31	0.13	0.04	-7.20
425.00	1.01	235.53	424.96	-2.59	-4.48	-2.56	0.17	0.04	9.28
450.00	1.02	232.47	449.96	-2.85	-4.84	-2.82	0.22	0.04	-12.24
475.00	0.97	238.85	474.95	-3.09	-5.20	-3.06	0.49	-0.20	25.52
500.00	1.01	236.68	499.95	-3.32	-5.56	-3.29	0.22	0.16	-8.68
525.00	0.97	236.62	524.95	-3.56	-5.92	-3.52	0.16	-0.16	-0.24
550.00	0.95	237.65	549.94	-3.79	-6.28	-3.75	0.11	-0.08	4.12
575.00	0.97	238.92	574.94	-4.01	-6.63	-3.97	0.12	0.08	5.08
600.00	0.97	238.53	599.94	-4.23	-6.99	-4.18	0.03	0.00	-1.56
625.00	0.97	238.44	624.93	-4.45	-7.35	-4.40	0.01	0.00	-0.36
650.00	0.91	242.33	649.93	-4.65	-7.71	-4.60	0.35	-0.24	15.56
675.00	0.91	242.17	674.93	-4.83	-8.06	-4.79	0.01	0.00	-0.64
700.00	0.90	244.14	699.92	-5.01	-8.41	-4.96	0.13	-0.04	7.88
725.00	0.85	243.11	724.92	-5.18	-8.76	-5.13	0.21	-0.20	-4.12
750.00	0.86	240.02	749.92	-5.36	-9.08	-5.31	0.19	0.04	-12.36
775.00	0.89	240.45	774.91	-5.55	-9.42	-5.49	0.12	0.12	1.72
800.00	0.87	243.92	799.91	-5.73	-9.76	-5.67	0.23	-0.08	13.88
825.00	0.95	241.53	824.91	-5.91	-10.11	-5.85	0.35	0.32	-9.56
850.00	0.96	242.07	849.90	-6.11	-10.48	-6.05	0.05	0.04	2.16
875.00	1.01	238.92	874.90	-6.32	-10.85	-6.26	0.29	0.20	-12.60
900.00	1.03	239.04	899.90	-6.55	-11.23	-6.48	0.08	0.08	0.48
925.00	0.97	237.40	924.89	-6.78	-11.60	-6.71	0.27	-0.24	-6.56
950.00	1.00	236.58	949.89	-7.01	-11.96	-6.94	0.13	0.12	-3.28
975.00	0.94	241.75	974.89	-7.23	-12.32	-7.16	0.42	-0.24	20.68
1,000.00	0.97	236.02	999.88	-7.45	-12.68	-7.37	0.40	0.12	-22.92
1,025.00	0.92	231.10	1,024.88	-7.69	-13.01	-7.61	0.38	-0.20	-19.68
1,050.00	0.94	226.65	1,049.87	-7.96	-13.32	-7.88	0.30	0.08	-17.80
1,075.00	0.92	231.22	1,074.87	-8.22	-13.62	-8.14	0.31	-0.08	18.28
1,100.00	0.98	228.35	1,099.87	-8.49	-13.94	-8.41	0.31	0.24	-11.48
1,125.00	0.96	227.24	1,124.86	-8.78	-14.25	-8.69	0.11	-0.08	-4.44
1,150.00	1.04	225.42	1,149.86	-9.08	-14.57	-8.99	0.34	0.32	-7.28
1,175.00	1.07	229.09	1,174.86	-9.39	-14.91	-9.30	0.30	0.12	14.68
1,200.00	1.09	232.63	1,199.85	-9.69	-15.27	-9.59	0.28	0.08	14.16
1,225.00	1.15	236.48	1,224.85	-9.97	-15.67	-9.88	0.38	0.24	15.40
1,250.00	1.00	234.00	1,249.84	-10.24	-16.06	-10.14	0.63	-0.60	-9.92
1,275.00	1.03	236.47	1,274.84	-10.49	-16.42	-10.39	0.21	0.12	9.88
1,300.00	1.05	241.85	1,299.83	-10.72	-16.81	-10.62	0.40	0.08	21.52
1,325.00	1.09	244.26	1,324.83	-10.93	-17.22	-10.83	0.24	0.16	9.64

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,350.00	1.05	242.94	1,349.83	-11.14	-17.64	-11.03	0.19	-0.16	-5.28
1,375.00	1.09	241.85	1,374.82	-11.36	-18.06	-11.25	0.18	0.16	-4.36
1,400.00	1.09	241.22	1,399.82	-11.58	-18.47	-11.47	0.05	0.00	-2.52
1,425.00	1.03	239.24	1,424.81	-11.81	-18.88	-11.70	0.28	-0.24	-7.92
1,450.00	1.06	242.13	1,449.81	-12.03	-19.27	-11.92	0.24	0.12	11.56
1,475.00	1.02	240.00	1,474.80	-12.25	-19.67	-12.14	0.22	-0.16	-8.52
1,500.00	1.05	245.92	1,499.80	-12.46	-20.07	-12.34	0.44	0.12	23.68
1,525.00	1.04	239.71	1,524.80	-12.67	-20.48	-12.54	0.45	-0.04	-24.84
1,550.00	1.05	243.66	1,549.79	-12.88	-20.88	-12.76	0.29	0.04	15.80
1,575.00	1.10	242.06	1,574.79	-13.10	-21.30	-12.97	0.23	0.20	-6.40
1,600.00	1.10	243.57	1,599.78	-13.32	-21.72	-13.19	0.12	0.00	6.04
1,625.00	1.14	238.59	1,624.78	-13.55	-22.15	-13.42	0.42	0.16	-19.92
1,650.00	1.22	244.85	1,649.77	-13.79	-22.60	-13.66	0.61	0.32	25.04
1,675.00	1.21	245.18	1,674.77	-14.02	-23.08	-13.88	0.05	-0.04	1.32
1,700.00	1.28	249.02	1,699.76	-14.23	-23.58	-14.09	0.44	0.28	15.36
1,725.00	1.21	243.69	1,724.76	-14.45	-24.08	-14.30	0.54	-0.28	-21.32
1,750.00	1.33	248.46	1,749.75	-14.67	-24.59	-14.52	0.64	0.48	19.08
1,775.00	1.43	244.29	1,774.74	-14.91	-25.14	-14.76	0.57	0.40	-16.68
1,800.00	1.46	247.45	1,799.73	-15.17	-25.71	-15.02	0.34	0.12	12.64
1,825.00	1.54	246.99	1,824.73	-15.42	-26.32	-15.27	0.32	0.32	-1.84
1,850.00	1.55	247.37	1,849.72	-15.68	-26.94	-15.52	0.06	0.04	1.52
1,875.00	1.59	246.48	1,874.71	-15.95	-27.57	-15.79	0.19	0.16	-3.56
1,900.00	1.65	246.61	1,899.70	-16.23	-28.22	-16.07	0.24	0.24	0.52
1,925.00	1.62	246.45	1,924.69	-16.52	-28.87	-16.35	0.12	-0.12	-0.64
1,950.00	1.62	244.23	1,949.68	-16.81	-29.51	-16.64	0.25	0.00	-8.88
1,975.00	1.61	244.65	1,974.67	-17.12	-30.15	-16.94	0.06	-0.04	1.68
2,000.00	1.72	247.97	1,999.66	-17.41	-30.81	-17.22	0.59	0.44	13.28
2,025.00	1.72	246.25	2,024.65	-17.70	-31.51	-17.51	0.21	0.00	-6.88
2,050.00	1.75	246.33	2,049.63	-18.00	-32.20	-17.81	0.12	0.12	0.32
2,075.00	1.73	245.53	2,074.62	-18.31	-32.89	-18.12	0.13	-0.08	-3.20
2,100.00	1.77	247.80	2,099.61	-18.62	-33.59	-18.42	0.32	0.16	9.08
2,125.00	1.79	245.07	2,124.60	-18.93	-34.30	-18.72	0.35	0.08	-10.92
2,150.00	1.83	247.82	2,149.59	-19.24	-35.03	-19.03	0.38	0.16	11.00
2,175.00	1.87	250.43	2,174.57	-19.53	-35.78	-19.32	0.37	0.16	10.44
2,200.00	1.90	250.87	2,199.56	-19.80	-36.56	-19.58	0.13	0.12	1.76
2,225.00	1.95	255.30	2,224.55	-20.05	-37.36	-19.82	0.63	0.20	17.72
2,250.00	1.99	255.50	2,249.53	-20.26	-38.19	-20.03	0.16	0.16	0.80
2,275.00	2.01	256.58	2,274.52	-20.47	-39.04	-20.24	0.17	0.08	4.32
2,300.00	1.98	257.64	2,299.50	-20.67	-39.89	-20.43	0.19	-0.12	4.24
2,325.00	2.08	257.90	2,324.48	-20.85	-40.75	-20.61	0.40	0.40	1.04
2,350.00	2.02	257.94	2,349.47	-21.04	-41.63	-20.79	0.24	-0.24	0.16
2,375.00	2.03	257.50	2,374.45	-21.23	-42.49	-20.98	0.07	0.04	-1.76
2,400.00	2.08	259.76	2,399.44	-21.41	-43.37	-21.15	0.38	0.20	9.04
2,425.00	2.06	259.62	2,424.42	-21.57	-44.26	-21.30	0.08	-0.08	-0.56

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
2,450.00	2.08	260.46	2,449.40	-21.72	-45.15	-21.45	0.15	0.08	3.36
2,475.00	2.05	260.22	2,474.39	-21.87	-46.03	-21.60	0.12	-0.12	-0.96
2,500.00	2.04	260.41	2,499.37	-22.02	-46.91	-21.75	0.05	-0.04	0.76
2,525.00	2.02	258.97	2,524.36	-22.18	-47.79	-21.90	0.22	-0.08	-5.76
2,550.00	2.05	265.85	2,549.34	-22.30	-48.66	-22.01	0.98	0.12	27.52
2,575.00	2.02	268.40	2,574.33	-22.34	-49.55	-22.05	0.38	-0.12	10.20
2,600.00	2.04	270.06	2,599.31	-22.36	-50.44	-22.06	0.25	0.08	6.64
2,625.00	1.93	267.95	2,624.29	-22.37	-51.30	-22.07	0.53	-0.44	-8.44
2,650.00	1.99	268.98	2,649.28	-22.39	-52.16	-22.08	0.28	0.24	4.12
2,675.00	1.95	267.22	2,674.27	-22.42	-53.01	-22.11	0.29	-0.16	-7.04
2,700.00	1.94	265.70	2,699.25	-22.47	-53.86	-22.15	0.21	-0.04	-6.08
2,725.00	1.95	264.73	2,724.24	-22.54	-54.71	-22.22	0.14	0.04	-3.88
2,750.00	1.96	265.04	2,749.22	-22.62	-55.56	-22.29	0.06	0.04	1.24
2,775.00	1.97	267.56	2,774.21	-22.68	-56.41	-22.34	0.35	0.04	10.08
2,800.00	1.92	265.76	2,799.19	-22.73	-57.26	-22.39	0.32	-0.20	-7.20
2,825.00	1.81	262.03	2,824.18	-22.81	-58.07	-22.47	0.66	-0.44	-14.92
2,850.00	1.75	257.18	2,849.17	-22.95	-58.83	-22.60	0.65	-0.24	-19.40
2,875.00	1.69	256.55	2,874.16	-23.12	-59.56	-22.77	0.25	-0.24	-2.52
2,900.00	1.68	255.17	2,899.15	-23.30	-60.27	-22.94	0.17	-0.04	-5.52
2,925.00	1.54	258.77	2,924.14	-23.46	-60.96	-23.10	0.69	-0.56	14.40
2,950.00	1.31	260.10	2,949.13	-23.57	-61.57	-23.21	0.93	-0.92	5.32
2,975.00	1.15	264.78	2,974.12	-23.65	-62.10	-23.28	0.76	-0.64	18.72
3,000.00	1.10	270.55	2,999.12	-23.67	-62.59	-23.30	0.50	-0.20	23.08
3,025.00	0.99	276.67	3,024.11	-23.64	-63.04	-23.26	0.63	-0.44	24.48
3,050.00	0.76	294.07	3,049.11	-23.55	-63.41	-23.17	1.40	-0.92	69.60
3,075.00	0.72	323.77	3,074.11	-23.35	-63.65	-22.97	1.53	-0.16	118.80
3,100.00	0.80	330.24	3,099.11	-23.07	-63.83	-22.70	0.47	0.32	25.88
3,125.00	0.71	327.31	3,124.10	-22.79	-64.00	-22.41	0.39	-0.36	-11.72
3,150.00	0.77	325.98	3,149.10	-22.52	-64.18	-22.14	0.25	0.24	-5.32
3,175.00	0.84	323.77	3,174.10	-22.24	-64.38	-21.85	0.31	0.28	-8.84
3,200.00	0.63	312.81	3,199.10	-21.99	-64.59	-21.61	1.01	-0.84	-43.84
3,225.00	0.53	234.31	3,224.10	-21.97	-64.79	-21.58	2.95	-0.40	-314.00
3,250.00	0.95	211.85	3,249.09	-22.21	-64.99	-21.83	2.01	1.68	-89.84
3,275.00	1.08	209.70	3,274.09	-22.59	-65.22	-22.21	0.54	0.52	-8.60
3,300.00	1.04	209.36	3,299.09	-23.00	-65.45	-22.61	0.16	-0.16	-1.36
3,325.00	1.09	206.42	3,324.08	-23.41	-65.66	-23.02	0.30	0.20	-11.76
3,350.00	1.12	205.76	3,349.08	-23.84	-65.87	-23.45	0.13	0.12	-2.64
3,375.00	1.12	206.47	3,374.07	-24.28	-66.09	-23.88	0.06	0.00	2.84
3,400.00	0.93	207.04	3,399.07	-24.68	-66.29	-24.28	0.76	-0.76	2.28
3,425.00	0.76	203.83	3,424.07	-25.01	-66.45	-24.61	0.71	-0.68	-12.84
3,450.00	0.65	204.45	3,449.06	-25.29	-66.58	-24.89	0.44	-0.44	2.48
3,475.00	0.42	185.94	3,474.06	-25.51	-66.64	-25.11	1.14	-0.92	-74.04
3,500.00	0.45	138.06	3,499.06	-25.67	-66.59	-25.28	1.42	0.12	-191.52

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,525.00	0.74	118.64	3,524.06	-25.82	-66.38	-25.43	1.40	1.16	-77.68
3,550.00	0.75	100.39	3,549.06	-25.93	-66.08	-25.54	0.95	0.04	-73.00
3,575.00	1.00	103.25	3,574.06	-26.01	-65.70	-25.62	1.01	1.00	11.44
3,600.00	1.08	96.61	3,599.05	-26.09	-65.26	-25.70	0.58	0.32	-26.56
3,625.00	1.27	91.67	3,624.05	-26.12	-64.75	-25.74	0.86	0.76	-19.76
3,650.00	1.33	92.80	3,649.04	-26.15	-64.18	-25.76	0.26	0.24	4.52
3,675.00	1.19	85.95	3,674.03	-26.14	-63.63	-25.76	0.82	-0.56	-27.40
3,700.00	1.13	62.72	3,699.03	-26.01	-63.15	-25.64	1.88	-0.24	-92.92
3,725.00	1.18	51.23	3,724.02	-25.74	-62.73	-25.36	0.95	0.20	-45.96
3,750.00	1.24	49.88	3,749.02	-25.40	-62.33	-25.03	0.27	0.24	-5.40
3,775.00	1.28	47.05	3,774.01	-25.04	-61.92	-24.67	0.30	0.16	-11.32
3,800.00	1.26	46.06	3,799.01	-24.66	-61.51	-24.29	0.12	-0.08	-3.96
3,825.00	1.26	47.41	3,824.00	-24.28	-61.11	-23.92	0.12	0.00	5.40
3,850.00	1.28	46.72	3,848.99	-23.90	-60.71	-23.54	0.10	0.08	-2.76
3,875.00	1.25	45.94	3,873.99	-23.52	-60.31	-23.16	0.14	-0.12	-3.12
3,900.00	1.28	42.61	3,898.98	-23.12	-59.92	-22.77	0.32	0.12	-13.32
3,925.00	1.18	45.27	3,923.98	-22.74	-59.55	-22.38	0.46	-0.40	10.64
3,950.00	1.21	40.67	3,948.97	-22.36	-59.20	-22.01	0.40	0.12	-18.40
3,975.00	1.19	39.87	3,973.96	-21.96	-58.86	-21.61	0.10	-0.08	-3.20
4,000.00	1.09	46.15	3,998.96	-21.59	-58.52	-21.25	0.64	-0.40	25.12
4,025.00	1.02	48.69	4,023.96	-21.28	-58.18	-20.94	0.34	-0.28	10.16
4,050.00	1.00	47.58	4,048.95	-20.99	-57.85	-20.64	0.11	-0.08	-4.44
4,075.00	0.95	46.78	4,073.95	-20.70	-57.54	-20.36	0.21	-0.20	-3.20
4,100.00	0.96	47.47	4,098.94	-20.42	-57.24	-20.08	0.06	0.04	2.76
4,125.00	0.96	48.15	4,123.94	-20.13	-56.93	-19.80	0.05	0.00	2.72
4,150.00	0.91	46.62	4,148.94	-19.86	-56.62	-19.52	0.22	-0.20	-6.12
4,175.00	0.90	50.84	4,173.93	-19.60	-56.33	-19.26	0.27	-0.04	16.88
4,200.00	1.08	61.18	4,198.93	-19.36	-55.97	-19.03	1.01	0.72	41.36
4,225.00	1.20	64.47	4,223.93	-19.13	-55.53	-18.80	0.55	0.48	13.16
4,250.00	1.34	69.73	4,248.92	-18.92	-55.02	-18.59	0.73	0.56	21.04
4,275.00	1.49	72.94	4,273.91	-18.72	-54.43	-18.40	0.68	0.60	12.84
4,300.00	1.62	76.39	4,298.90	-18.54	-53.78	-18.22	0.64	0.52	13.80
4,325.00	1.61	77.75	4,323.89	-18.39	-53.09	-18.07	0.16	-0.04	5.44
4,350.00	1.75	79.54	4,348.88	-18.24	-52.37	-17.93	0.60	0.56	7.16
4,375.00	1.79	79.56	4,373.87	-18.10	-51.61	-17.80	0.16	0.16	0.08
4,400.00	1.74	77.81	4,398.86	-17.95	-50.86	-17.65	0.29	-0.20	-7.00
4,425.00	1.77	78.19	4,423.85	-17.79	-50.11	-17.49	0.13	0.12	1.52
4,450.00	1.84	80.18	4,448.83	-17.65	-49.34	-17.35	0.38	0.28	7.96
4,475.00	1.92	86.21	4,473.82	-17.55	-48.52	-17.26	0.85	0.32	24.12
4,500.00	2.01	93.85	4,498.81	-17.55	-47.67	-17.27	1.11	0.36	30.56
4,525.00	2.12	98.26	4,523.79	-17.65	-46.77	-17.37	0.77	0.44	17.64
4,550.00	2.26	106.32	4,548.77	-17.85	-45.84	-17.58	1.35	0.56	32.24
4,575.00	2.49	115.04	4,573.75	-18.22	-44.88	-17.95	1.71	0.92	34.88

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,600.00	2.59	120.76	4,598.73	-18.74	-43.90	-18.48	1.09	0.40	22.88
4,625.00	2.87	127.51	4,623.70	-19.41	-42.92	-19.15	1.70	1.12	27.00
4,650.00	2.91	132.17	4,648.67	-20.22	-41.95	-19.97	0.95	0.16	18.64
4,675.00	3.01	135.76	4,673.63	-21.11	-41.02	-20.87	0.84	0.40	14.36
4,700.00	2.96	139.74	4,698.60	-22.07	-40.15	-21.84	0.85	-0.20	15.92
4,725.00	2.33	168.12	4,723.57	-23.06	-39.62	-22.83	5.73	-2.52	113.52
4,750.00	2.50	214.27	4,748.55	-24.01	-39.83	-23.78	7.60	0.68	184.60
4,775.00	3.24	238.66	4,773.52	-24.83	-40.74	-24.59	5.65	2.96	97.56
4,800.00	3.60	243.38	4,798.48	-25.55	-42.04	-25.30	1.83	1.44	18.88
4,825.00	3.54	244.65	4,823.43	-26.23	-43.44	-25.97	0.40	-0.24	5.08
4,850.00	3.45	245.41	4,848.38	-26.88	-44.82	-26.61	0.40	-0.36	3.04
4,875.00	3.32	247.13	4,873.34	-27.47	-46.17	-27.20	0.66	-0.52	6.88
4,900.00	3.07	251.99	4,898.30	-27.96	-47.48	-27.68	1.47	-1.00	19.44
4,925.00	2.74	262.62	4,923.27	-28.24	-48.71	-27.95	2.52	-1.32	42.52
4,950.00	2.60	272.65	4,948.24	-28.29	-49.87	-28.00	1.95	-0.56	40.12
4,975.00	2.61	273.39	4,973.22	-28.23	-51.00	-27.93	0.14	0.04	2.96
5,000.00	2.54	272.87	4,998.19	-28.17	-52.12	-27.86	0.30	-0.28	-2.08
5,025.00	2.59	274.82	5,023.17	-28.10	-53.24	-27.78	0.40	0.20	7.80
5,050.00	2.60	275.02	5,048.14	-28.00	-54.37	-27.68	0.05	0.04	0.80
5,075.00	2.55	276.89	5,073.11	-27.88	-55.48	-27.55	0.39	-0.20	7.48
5,100.00	2.53	276.96	5,098.09	-27.75	-56.58	-27.41	0.08	-0.08	0.28
5,125.00	2.48	276.03	5,123.07	-27.63	-57.67	-27.28	0.26	-0.20	-3.72
5,150.00	2.50	277.93	5,148.04	-27.49	-58.75	-27.14	0.34	0.08	7.60
5,175.00	2.45	277.01	5,173.02	-27.35	-59.82	-27.00	0.26	-0.20	-3.68
5,200.00	2.35	277.35	5,198.00	-27.22	-60.86	-26.86	0.40	-0.40	1.36
5,225.00	2.36	276.76	5,222.98	-27.10	-61.88	-26.73	0.10	0.04	-2.36
5,250.00	2.31	274.84	5,247.96	-26.99	-62.89	-26.62	0.37	-0.20	-7.68
5,275.00	2.23	275.88	5,272.94	-26.90	-63.87	-26.52	0.36	-0.32	4.16
5,300.00	2.16	276.47	5,297.92	-26.80	-64.83	-26.41	0.29	-0.28	2.36
5,325.00	2.13	277.85	5,322.90	-26.68	-65.75	-26.29	0.24	-0.12	5.52
5,350.00	2.09	278.68	5,347.88	-26.55	-66.67	-26.15	0.20	-0.16	3.32
5,375.00	2.05	279.98	5,372.87	-26.40	-67.56	-26.00	0.25	-0.16	5.20
5,400.00	1.91	277.77	5,397.85	-26.27	-68.41	-25.86	0.64	-0.56	-8.84
5,425.00	1.96	276.76	5,422.84	-26.16	-69.25	-25.75	0.24	0.20	-4.04
5,450.00	1.84	276.75	5,447.82	-26.06	-70.07	-25.65	0.48	-0.48	-0.04
5,475.00	1.84	277.70	5,472.81	-25.96	-70.87	-25.54	0.12	0.00	3.80
5,500.00	1.90	276.85	5,497.80	-25.86	-71.68	-25.43	0.26	0.24	-3.40
5,525.00	1.81	277.07	5,522.78	-25.76	-72.48	-25.33	0.36	-0.36	0.88
5,550.00	1.80	278.82	5,547.77	-25.65	-73.26	-25.22	0.22	-0.04	7.00
5,575.00	1.86	278.05	5,572.76	-25.54	-74.05	-25.10	0.26	0.24	-3.08
5,600.00	1.84	279.84	5,597.75	-25.41	-74.85	-24.97	0.24	-0.08	7.16
5,625.00	1.79	277.19	5,622.73	-25.29	-75.63	-24.84	0.39	-0.20	-10.60
5,650.00	1.77	278.88	5,647.72	-25.19	-76.40	-24.73	0.22	-0.08	6.76
5,675.00	1.75	280.26	5,672.71	-25.06	-77.15	-24.60	0.19	-0.08	5.52

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
5,700.00	1.77	281.30	5,697.70	-24.91	-77.91	-24.45	0.15	0.08	4.16
5,725.00	1.80	282.09	5,722.69	-24.76	-78.67	-24.29	0.16	0.12	3.16
5,750.00	1.76	282.21	5,747.67	-24.59	-79.43	-24.12	0.16	-0.16	0.48
5,775.00	1.79	281.71	5,772.66	-24.43	-80.19	-23.96	0.14	0.12	-2.00
5,800.00	1.80	279.24	5,797.65	-24.29	-80.96	-23.81	0.31	0.04	-9.88
5,825.00	1.81	281.38	5,822.64	-24.15	-81.73	-23.66	0.27	0.04	8.56
5,850.00	1.39	295.28	5,847.63	-23.94	-82.39	-23.45	2.28	-1.68	55.60
5,875.00	0.95	317.62	5,872.62	-23.66	-82.81	-23.17	2.50	-1.76	89.36
5,900.00	0.64	333.47	5,897.62	-23.38	-83.01	-22.89	1.51	-1.24	63.40
5,925.00	0.57	343.26	5,922.62	-23.14	-83.11	-22.64	0.50	-0.28	39.16
5,950.00	0.59	346.40	5,947.62	-22.89	-83.17	-22.40	0.15	0.08	12.56
5,975.00	0.50	350.81	5,972.62	-22.66	-83.22	-22.17	0.40	-0.36	17.64
6,000.00	0.53	344.52	5,997.62	-22.44	-83.27	-21.95	0.26	0.12	-25.16
6,025.00	0.52	346.09	6,022.61	-22.22	-83.33	-21.72	0.07	-0.04	6.28
6,050.00	0.46	339.28	6,047.61	-22.02	-83.39	-21.52	0.33	-0.24	-27.24
6,075.00	0.46	341.85	6,072.61	-21.83	-83.46	-21.33	0.08	0.00	10.28
6,100.00	0.47	344.88	6,097.61	-21.63	-83.52	-21.14	0.11	0.04	12.12
6,125.00	0.50	346.98	6,122.61	-21.43	-83.57	-20.93	0.14	0.12	8.40
6,150.00	0.46	350.23	6,147.61	-21.22	-83.61	-20.72	0.19	-0.16	13.00
6,175.00	0.49	350.92	6,172.61	-21.02	-83.64	-20.52	0.12	0.12	2.76
6,200.00	0.49	3.23	6,197.61	-20.80	-83.65	-20.31	0.42	0.00	49.24
6,225.00	0.50	356.99	6,222.61	-20.59	-83.65	-20.09	0.22	0.04	-24.96
6,250.00	0.49	1.49	6,247.61	-20.37	-83.66	-19.88	0.16	-0.04	18.00
6,275.00	0.46	1.32	6,272.61	-20.17	-83.65	-19.67	0.12	-0.12	-0.68
6,300.00	0.51	359.60	6,297.60	-19.95	-83.65	-19.46	0.21	0.20	-6.88
6,325.00	0.54	358.67	6,322.60	-19.73	-83.65	-19.23	0.12	0.12	-3.72
6,350.00	0.55	0.04	6,347.60	-19.49	-83.66	-18.99	0.07	0.04	5.48
6,375.00	0.54	4.14	6,372.60	-19.25	-83.65	-18.75	0.16	-0.04	16.40
6,400.00	0.36	23.74	6,397.60	-19.06	-83.61	-18.56	0.94	-0.72	78.40
6,425.00	0.88	127.91	6,422.60	-19.11	-83.42	-18.61	4.12	2.08	416.68
6,450.00	1.41	135.94	6,447.59	-19.45	-83.06	-18.95	2.21	2.12	32.12
6,475.00	1.51	135.99	6,472.59	-19.90	-82.62	-19.41	0.40	0.40	0.20
6,500.00	1.57	140.87	6,497.58	-20.41	-82.17	-19.92	0.58	0.24	19.52
6,525.00	1.49	141.89	6,522.57	-20.93	-81.75	-20.44	0.34	-0.32	4.08
6,550.00	1.49	141.63	6,547.56	-21.44	-81.35	-20.96	0.03	0.00	-1.04
6,575.00	1.39	143.00	6,572.55	-21.94	-80.97	-21.45	0.42	-0.40	5.48
6,600.00	1.29	143.15	6,597.54	-22.40	-80.62	-21.92	0.40	-0.40	0.60
6,625.00	1.36	143.04	6,622.54	-22.86	-80.27	-22.39	0.28	0.28	-0.44
6,650.00	1.34	144.51	6,647.53	-23.34	-79.92	-22.87	0.16	-0.08	5.88
6,675.00	1.27	143.57	6,672.52	-23.80	-79.59	-23.33	0.29	-0.28	-3.76
6,700.00	1.22	141.64	6,697.52	-24.23	-79.26	-23.76	0.26	-0.20	-7.72
6,725.00	1.31	141.86	6,722.51	-24.67	-78.92	-24.20	0.36	0.36	0.88
6,750.00	1.36	142.97	6,747.51	-25.13	-78.56	-24.66	0.23	0.20	4.44



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,775.00	1.39	143.32	6,772.50	-25.61	-78.20	-25.14	0.12	0.12	1.40
6,800.00	1.38	142.48	6,797.49	-26.09	-77.84	-25.63	0.09	-0.04	-3.36
6,825.00	1.34	142.21	6,822.48	-26.56	-77.47	-26.10	0.16	-0.16	-1.08
6,850.00	1.32	141.40	6,847.48	-27.02	-77.11	-26.56	0.11	-0.08	-3.24
6,875.00	1.01	141.76	6,872.47	-27.41	-76.80	-26.96	1.24	-1.24	1.44
6,900.00	0.26	99.51	6,897.47	-27.60	-76.61	-27.14	3.34	-3.00	-169.00
6,925.00	0.48	4.30	6,922.47	-27.50	-76.54	-27.05	2.27	0.88	-380.84
6,950.00	0.61	357.48	6,947.47	-27.26	-76.54	-26.81	0.58	0.52	-27.28
6,975.00	0.51	354.94	6,972.47	-27.02	-76.56	-26.56	0.41	-0.40	-10.16
7,000.00	0.51	6.34	6,997.47	-26.80	-76.55	-26.34	0.41	0.00	45.60
7,025.00	0.49	10.60	7,022.47	-26.58	-76.52	-26.13	0.17	-0.08	17.04
7,050.00	0.46	18.05	7,047.47	-26.38	-76.47	-25.93	0.27	-0.12	29.80
7,075.00	0.53	16.64	7,072.46	-26.18	-76.41	-25.72	0.28	0.28	-5.64
7,100.00	0.53	18.55	7,097.46	-25.96	-76.34	-25.50	0.07	0.00	7.64
7,125.00	0.54	23.62	7,122.46	-25.74	-76.25	-25.28	0.19	0.04	20.28
7,150.00	0.58	19.80	7,147.46	-25.51	-76.16	-25.06	0.22	0.16	-15.28
7,175.00	0.51	25.45	7,172.46	-25.29	-76.07	-24.84	0.35	-0.28	22.60
7,200.00	0.50	18.25	7,197.46	-25.09	-75.99	-24.64	0.26	-0.04	-28.80
7,225.00	0.48	19.25	7,222.46	-24.88	-75.92	-24.43	0.09	-0.08	4.00
7,250.00	0.42	18.62	7,247.46	-24.70	-75.86	-24.25	0.24	-0.24	-2.52
7,275.00	0.39	15.12	7,272.46	-24.53	-75.81	-24.08	0.16	-0.12	-14.00
7,300.00	0.31	17.76	7,297.46	-24.38	-75.76	-23.93	0.33	-0.32	10.56
7,325.00	0.35	23.73	7,322.46	-24.25	-75.71	-23.80	0.21	0.16	23.88
7,350.00	0.30	36.06	7,347.46	-24.13	-75.64	-23.68	0.34	-0.20	49.32
7,375.00	0.30	44.76	7,372.46	-24.03	-75.56	-23.58	0.18	0.00	34.80
7,400.00	0.36	48.29	7,397.45	-23.93	-75.45	-23.48	0.25	0.24	14.12
7,425.00	0.41	51.82	7,422.45	-23.82	-75.32	-23.37	0.22	0.20	14.12
7,450.00	0.44	43.65	7,447.45	-23.70	-75.19	-23.25	0.27	0.12	-32.68
7,475.00	0.43	45.68	7,472.45	-23.56	-75.05	-23.12	0.07	-0.04	8.12
7,500.00	0.48	47.95	7,497.45	-23.43	-74.91	-22.98	0.21	0.20	9.08
7,525.00	0.48	57.60	7,522.45	-23.30	-74.74	-22.86	0.32	0.00	38.60
7,550.00	0.43	55.48	7,547.45	-23.19	-74.58	-22.75	0.21	-0.20	-8.48
7,575.00	0.42	68.09	7,572.45	-23.10	-74.42	-22.66	0.38	-0.04	50.44
7,600.00	0.47	76.62	7,597.45	-23.04	-74.23	-22.60	0.33	0.20	34.12
7,625.00	0.47	74.98	7,622.45	-22.99	-74.03	-22.55	0.05	0.00	-6.56
7,650.00	0.57	68.73	7,647.45	-22.92	-73.82	-22.48	0.46	0.40	-25.00
7,675.00	0.62	68.33	7,672.45	-22.83	-73.58	-22.39	0.20	0.20	-1.60
7,700.00	0.57	61.98	7,697.44	-22.72	-73.34	-22.28	0.33	-0.20	-25.40
7,725.00	0.57	67.71	7,722.44	-22.61	-73.11	-22.18	0.23	0.00	22.92
7,750.00	0.55	56.37	7,747.44	-22.50	-72.90	-22.07	0.45	-0.08	-45.36
7,775.00	0.55	61.99	7,772.44	-22.38	-72.69	-21.95	0.22	0.00	22.48
7,800.00	0.48	57.28	7,797.44	-22.26	-72.50	-21.83	0.33	-0.28	-18.84
7,825.00	0.50	57.99	7,822.44	-22.15	-72.32	-21.72	0.08	0.08	2.84

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
7,850.00	0.52	57.95	7,847.44	-22.03	-72.13	-21.60	0.08	0.08	-0.16
7,875.00	0.52	60.40	7,872.44	-21.92	-71.94	-21.49	0.09	0.00	9.80
7,900.00	0.59	69.83	7,897.44	-21.82	-71.72	-21.39	0.46	0.28	37.72
7,925.00	0.60	76.67	7,922.43	-21.74	-71.47	-21.32	0.29	0.04	27.36
7,950.00	0.55	86.12	7,947.43	-21.70	-71.22	-21.28	0.43	-0.20	37.80
7,975.00	0.46	79.49	7,972.43	-21.68	-71.00	-21.25	0.43	-0.36	-26.52
8,000.00	0.62	76.30	7,997.43	-21.63	-70.77	-21.21	0.65	0.64	-12.76
8,025.00	0.53	94.29	8,022.43	-21.60	-70.53	-21.18	0.80	-0.36	71.96
8,050.00	0.49	59.27	8,047.43	-21.56	-70.32	-21.14	1.24	-0.16	-140.08
8,075.00	0.43	81.58	8,072.43	-21.49	-70.13	-21.07	0.75	-0.24	89.24
8,100.00	0.60	81.51	8,097.43	-21.45	-69.91	-21.04	0.68	0.68	-0.28
8,125.00	0.52	96.51	8,122.43	-21.45	-69.67	-21.03	0.67	-0.32	60.00
8,150.00	0.61	91.09	8,147.42	-21.46	-69.42	-21.05	0.42	0.36	-21.68
8,175.00	0.52	104.63	8,172.42	-21.49	-69.18	-21.08	0.64	-0.36	54.16
8,200.00	0.48	106.83	8,197.42	-21.55	-68.97	-21.14	0.18	-0.16	8.80
8,225.00	0.52	96.20	8,222.42	-21.60	-68.76	-21.19	0.40	0.16	-42.52
8,250.00	0.47	107.12	8,247.42	-21.64	-68.55	-21.23	0.43	-0.20	43.68
8,275.00	0.41	115.25	8,272.42	-21.71	-68.37	-21.30	0.35	-0.24	32.52
8,300.00	0.42	125.16	8,297.42	-21.80	-68.21	-21.39	0.29	0.04	39.64
8,325.00	0.43	129.29	8,322.42	-21.91	-68.07	-21.51	0.13	0.04	16.52
8,350.00	0.50	126.54	8,347.42	-22.03	-67.90	-21.63	0.29	0.28	-11.00
8,375.00	0.62	125.79	8,372.42	-22.18	-67.71	-21.78	0.48	0.48	-3.00
8,400.00	0.51	129.14	8,397.42	-22.33	-67.51	-21.93	0.46	-0.44	13.40
8,425.00	0.59	128.42	8,422.41	-22.48	-67.32	-22.08	0.32	0.32	-2.88
8,450.00	0.49	122.10	8,447.41	-22.61	-67.13	-22.22	0.46	-0.40	-25.28
8,475.00	0.55	118.63	8,472.41	-22.73	-66.94	-22.33	0.27	0.24	-13.88
8,500.00	0.49	126.85	8,497.41	-22.85	-66.75	-22.45	0.38	-0.24	32.88
8,525.00	0.49	133.04	8,522.41	-22.99	-66.58	-22.59	0.21	0.00	24.76
8,550.00	0.48	136.65	8,547.41	-23.14	-66.43	-22.74	0.13	-0.04	14.44
8,575.00	0.51	132.23	8,572.41	-23.29	-66.28	-22.89	0.19	0.12	-17.68
8,600.00	0.46	136.22	8,597.41	-23.44	-66.13	-23.04	0.24	-0.20	15.96
8,625.00	0.47	132.72	8,622.41	-23.58	-65.98	-23.19	0.12	0.04	-14.00
8,650.00	0.48	139.50	8,647.41	-23.73	-65.84	-23.34	0.23	0.04	27.12
8,675.00	0.41	141.39	8,672.40	-23.88	-65.71	-23.49	0.29	-0.28	7.56
8,700.00	0.38	145.41	8,697.40	-24.01	-65.61	-23.62	0.16	-0.12	16.08
8,725.00	0.37	140.70	8,722.40	-24.14	-65.51	-23.76	0.13	-0.04	-18.84
8,750.00	0.37	145.40	8,747.40	-24.27	-65.42	-23.89	0.12	0.00	18.80
8,775.00	0.32	140.56	8,772.40	-24.39	-65.33	-24.01	0.23	-0.20	-19.36
8,800.00	0.42	145.28	8,797.40	-24.52	-65.23	-24.14	0.42	0.40	18.88
8,825.00	0.38	153.23	8,822.40	-24.67	-65.14	-24.29	0.27	-0.16	31.80
8,850.00	0.49	149.33	8,847.40	-24.84	-65.05	-24.45	0.46	0.44	-15.60
8,875.00	0.51	147.99	8,872.40	-25.02	-64.93	-24.64	0.09	0.08	-5.36
8,900.00	0.53	152.59	8,897.40	-25.22	-64.82	-24.84	0.19	0.08	18.40
8,925.00	0.51	140.36	8,922.40	-25.41	-64.70	-25.03	0.45	-0.08	-48.92

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,950.00	0.52	142.32	8,947.40	-25.59	-64.56	-25.20	0.08	0.04	7.84
8,975.00	0.57	132.93	8,972.40	-25.76	-64.40	-25.38	0.41	0.20	-37.56
9,000.00	0.52	121.95	8,997.39	-25.90	-64.21	-25.52	0.46	-0.20	-43.92
9,025.00	0.57	108.73	9,022.39	-26.00	-64.00	-25.62	0.54	0.20	-52.88
9,050.00	0.58	104.38	9,047.39	-26.08	-63.76	-25.70	0.18	0.04	-17.40
9,075.00	0.64	97.92	9,072.39	-26.13	-63.50	-25.75	0.36	0.24	-25.84
9,100.00	0.68	91.24	9,097.39	-26.15	-63.21	-25.77	0.35	0.16	-26.72
9,125.00	0.71	87.85	9,122.39	-26.15	-62.91	-25.77	0.20	0.12	-13.56
9,150.00	0.74	89.89	9,147.39	-26.14	-62.59	-25.77	0.16	0.12	8.16
9,175.00	0.71	86.25	9,172.38	-26.13	-62.27	-25.76	0.22	-0.12	-14.56
9,200.00	0.76	87.89	9,197.38	-26.11	-61.95	-25.75	0.22	0.20	6.56
9,225.00	0.84	86.86	9,222.38	-26.10	-61.60	-25.73	0.33	0.32	-4.12
9,250.00	0.88	88.17	9,247.38	-26.08	-61.23	-25.72	0.18	0.16	5.24
9,275.00	0.90	88.24	9,272.37	-26.07	-60.84	-25.71	0.08	0.08	0.28
9,300.00	0.98	82.80	9,297.37	-26.04	-60.43	-25.68	0.48	0.32	-21.76
9,325.00	0.99	83.87	9,322.37	-25.99	-60.01	-25.63	0.08	0.04	4.28
9,350.00	0.99	83.74	9,347.36	-25.94	-59.58	-25.59	0.01	0.00	-0.52
9,375.00	0.98	88.12	9,372.36	-25.91	-59.15	-25.56	0.30	-0.04	17.52
9,400.00	0.97	86.49	9,397.35	-25.89	-58.72	-25.54	0.12	-0.04	-6.52
9,425.00	0.83	88.16	9,422.35	-25.87	-58.33	-25.52	0.57	-0.56	6.68
9,450.00	0.64	81.31	9,447.35	-25.84	-58.01	-25.50	0.84	-0.76	-27.40
9,475.00	0.47	70.15	9,472.35	-25.79	-57.78	-25.44	0.80	-0.68	-44.64
9,500.00	0.23	38.82	9,497.35	-25.71	-57.65	-25.37	1.19	-0.96	-125.32
9,525.00	0.32	285.37	9,522.35	-25.66	-57.69	-25.31	1.85	0.36	-453.80
9,550.00	0.62	268.52	9,547.35	-25.64	-57.89	-25.30	1.31	1.20	-67.40
9,575.00	0.63	259.31	9,572.35	-25.67	-58.16	-25.32	0.40	0.04	-36.84
9,600.00	0.62	260.08	9,597.34	-25.72	-58.43	-25.37	0.05	-0.04	3.08
9,625.00	0.61	257.85	9,622.34	-25.77	-58.69	-25.42	0.10	-0.04	-8.92
9,650.00	0.41	274.64	9,647.34	-25.79	-58.91	-25.44	0.99	-0.80	67.16
9,675.00	0.40	276.62	9,672.34	-25.77	-59.09	-25.42	0.07	-0.04	7.92
9,700.00	0.40	290.56	9,697.34	-25.73	-59.25	-25.38	0.39	0.00	55.76
9,725.00	0.70	305.50	9,722.34	-25.61	-59.46	-25.26	1.32	1.20	59.76
9,750.00	1.02	304.44	9,747.34	-25.40	-59.77	-25.04	1.28	1.28	-4.24
9,775.00	1.15	302.27	9,772.33	-25.14	-60.16	-24.78	0.55	0.52	-8.68
9,800.00	1.41	295.94	9,797.33	-24.87	-60.65	-24.51	1.18	1.04	-25.32
9,825.00	1.75	291.04	9,822.32	-24.60	-61.28	-24.24	1.46	1.36	-19.60
9,850.00	1.83	290.66	9,847.30	-24.32	-62.01	-23.95	0.32	0.32	-1.52
9,875.00	1.84	290.18	9,872.29	-24.04	-62.76	-23.67	0.07	0.04	-1.92
9,900.00	1.71	288.97	9,897.28	-23.78	-63.49	-23.41	0.54	-0.52	-4.84
9,925.00	1.49	289.36	9,922.27	-23.55	-64.15	-23.17	0.88	-0.88	1.56
9,950.00	1.34	292.01	9,947.26	-23.34	-64.73	-22.95	0.65	-0.60	10.60
9,975.00	1.23	291.53	9,972.26	-23.13	-65.25	-22.74	0.44	-0.44	-1.92
10,000.00	1.21	292.90	9,997.25	-22.93	-65.74	-22.54	0.14	-0.08	5.48

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
10,025.00	1.30	290.46	10,022.24	-22.73	-66.25	-22.33	0.42	0.36	-9.76
10,050.00	1.28	289.55	10,047.24	-22.53	-66.78	-22.14	0.11	-0.08	-3.64
10,075.00	1.25	288.63	10,072.23	-22.35	-67.30	-21.95	0.14	-0.12	-3.68
10,100.00	1.18	294.86	10,097.23	-22.16	-67.80	-21.75	0.60	-0.28	24.92
10,125.00	1.09	296.51	10,122.22	-21.94	-68.24	-21.54	0.38	-0.36	6.60
10,150.00	0.97	295.79	10,147.22	-21.74	-68.65	-21.34	0.48	-0.48	-2.88
10,175.00	0.90	300.89	10,172.21	-21.55	-69.00	-21.14	0.43	-0.28	20.40
10,200.00	0.84	300.99	10,197.21	-21.36	-69.33	-20.94	0.24	-0.24	0.40
10,225.00	0.87	306.83	10,222.21	-21.15	-69.64	-20.73	0.37	0.12	23.36
10,250.00	0.91	309.57	10,247.20	-20.91	-69.94	-20.49	0.23	0.16	10.96
10,275.00	0.98	302.83	10,272.20	-20.67	-70.28	-20.25	0.52	0.28	-26.96
10,300.00	0.89	313.21	10,297.20	-20.42	-70.60	-20.00	0.77	-0.36	41.52
10,325.00	0.97	311.53	10,322.19	-20.14	-70.90	-19.72	0.34	0.32	-6.72
10,350.00	0.95	310.80	10,347.19	-19.87	-71.21	-19.44	0.09	-0.08	-2.92
10,375.00	0.98	313.56	10,372.19	-19.59	-71.53	-19.16	0.22	0.12	11.04
10,400.00	0.93	321.08	10,397.18	-19.28	-71.81	-18.85	0.54	-0.20	30.08
10,425.00	0.83	331.24	10,422.18	-18.96	-72.02	-18.54	0.74	-0.40	40.64
10,450.00	0.71	347.14	10,447.18	-18.65	-72.14	-18.23	0.98	-0.48	63.60
10,475.00	0.63	11.56	10,472.18	-18.37	-72.15	-17.94	1.18	-0.32	97.68
10,500.00	0.58	28.53	10,497.18	-18.12	-72.06	-17.69	0.74	-0.20	67.88
10,525.00	0.49	40.26	10,522.18	-17.93	-71.93	-17.50	0.57	-0.36	46.92
10,550.00	0.44	39.33	10,547.17	-17.77	-71.80	-17.35	0.20	-0.20	-3.72
10,575.00	0.41	17.66	10,572.17	-17.61	-71.72	-17.19	0.65	-0.12	-86.68
10,600.00	0.50	354.05	10,597.17	-17.42	-71.70	-16.99	0.82	0.36	-94.44
10,625.00	0.51	355.70	10,622.17	-17.20	-71.72	-16.77	0.07	0.04	6.60
10,650.00	0.69	343.80	10,647.17	-16.95	-71.77	-16.52	0.87	0.72	-47.60
10,675.00	0.85	342.73	10,672.17	-16.62	-71.87	-16.20	0.64	0.64	-4.28
10,700.00	0.97	344.66	10,697.16	-16.24	-71.98	-15.82	0.50	0.48	7.72
10,725.00	0.95	348.09	10,722.16	-15.84	-72.08	-15.41	0.24	-0.08	13.72
10,750.00	0.94	349.50	10,747.16	-15.43	-72.16	-15.00	0.10	-0.04	5.64
10,775.00	0.97	0.62	10,772.15	-15.02	-72.19	-14.59	0.75	0.12	44.48
10,800.00	0.86	3.62	10,797.15	-14.62	-72.18	-14.19	0.48	-0.44	12.00
10,825.00	0.76	2.39	10,822.15	-14.27	-72.16	-13.84	0.41	-0.40	-4.92
10,850.00	0.68	349.08	10,847.15	-13.96	-72.18	-13.53	0.74	-0.32	-53.24
10,875.00	0.65	339.58	10,872.15	-13.68	-72.26	-13.25	0.46	-0.12	-38.00
10,900.00	0.61	338.66	10,897.14	-13.42	-72.36	-12.99	0.17	-0.16	-3.68
10,925.00	0.64	334.18	10,922.14	-13.17	-72.46	-12.74	0.23	0.12	-17.92
10,950.00	0.67	330.34	10,947.14	-12.92	-72.60	-12.49	0.21	0.12	-15.36
10,975.00	0.75	327.07	10,972.14	-12.65	-72.76	-12.22	0.36	0.32	-13.08
11,000.00	0.75	329.46	10,997.14	-12.37	-72.93	-11.94	0.13	0.00	9.56
11,025.00	0.68	332.64	11,022.13	-12.10	-73.08	-11.67	0.32	-0.28	12.72
11,050.00	0.53	333.37	11,047.13	-11.87	-73.20	-11.43	0.60	-0.60	2.92
11,075.00	0.31	300.55	11,072.13	-11.73	-73.31	-11.29	1.27	-0.88	-131.28

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,100.00	0.24	285.12	11,097.13	-11.68	-73.42	-11.25	0.41	-0.28	-61.72
11,125.00	0.27	285.72	11,122.13	-11.65	-73.53	-11.21	0.12	0.12	2.40
11,150.00	0.37	291.86	11,147.13	-11.61	-73.66	-11.17	0.42	0.40	24.56
11,175.00	0.48	273.76	11,172.13	-11.57	-73.84	-11.13	0.69	0.44	-72.40
11,200.00	0.93	253.37	11,197.13	-11.62	-74.14	-11.18	2.03	1.80	-81.56
11,225.00	0.84	272.02	11,222.13	-11.67	-74.52	-11.23	1.20	-0.36	74.60
11,250.00	0.85	272.45	11,247.12	-11.66	-74.88	-11.21	0.05	0.04	1.72
11,275.00	0.91	270.11	11,272.12	-11.65	-75.27	-11.20	0.28	0.24	-9.36
11,300.00	0.92	268.87	11,297.12	-11.65	-75.67	-11.20	0.09	0.04	-4.96
11,325.00	1.03	272.79	11,322.11	-11.65	-76.09	-11.19	0.51	0.44	15.68
11,350.00	0.94	268.27	11,347.11	-11.64	-76.52	-11.19	0.48	-0.36	-18.08
11,375.00	0.98	264.19	11,372.11	-11.67	-76.94	-11.21	0.32	0.16	-16.32
11,400.00	0.94	263.43	11,397.10	-11.71	-77.36	-11.25	0.17	-0.16	-3.04
11,419.33	0.90	275.04	11,416.43	-11.72	-77.66	-11.26	0.98	-0.21	60.06
11,683.00	0.19	300.20	11,680.09	-11.32	-80.11	-10.84	0.28	-0.27	9.54
11,714.00	0.31	13.85	11,711.09	-11.21	-80.13	-10.73	1.02	0.39	237.58
11,777.00	0.69	293.52	11,774.08	-10.89	-80.44	-10.41	1.12	0.60	-127.51
11,791.97	1.93	291.52	11,789.05	-10.76	-80.75	-10.28	8.26	8.26	-13.39
VS 23H - KOP									
11,808.00	3.25	291.06	11,805.06	-10.50	-81.43	-10.02	8.26	8.26	-2.84
11,840.00	4.63	299.85	11,836.99	-9.53	-83.39	-9.04	4.70	4.31	27.47
11,872.00	6.44	307.58	11,868.84	-7.80	-85.94	-7.29	6.10	5.66	24.16
11,903.00	8.81	310.92	11,899.56	-5.18	-89.11	-4.65	7.77	7.65	10.77
11,934.00	10.56	307.23	11,930.12	-1.91	-93.17	-1.35	5.99	5.65	-11.90
11,965.00	12.13	300.20	11,960.51	1.45	-98.24	2.03	6.74	5.06	-22.68
11,997.00	15.38	313.56	11,991.60	6.07	-104.23	6.69	14.14	10.16	41.75
12,028.00	21.13	326.04	12,021.04	13.55	-110.33	14.20	22.33	18.55	40.26
12,059.00	27.13	334.48	12,049.33	24.57	-116.51	25.26	22.28	19.35	27.23
12,091.00	33.38	344.67	12,076.97	39.67	-121.99	40.39	25.22	19.53	31.84
12,122.00	35.25	355.75	12,102.60	56.84	-124.91	57.58	21.01	6.03	35.74
12,154.00	36.56	1.90	12,128.53	75.58	-125.28	76.32	11.99	4.09	19.22
12,185.00	42.25	1.72	12,152.47	95.24	-124.66	95.98	18.36	18.35	-0.58
12,216.00	46.81	4.01	12,174.57	116.94	-123.55	117.67	15.59	14.71	7.39
12,247.00	52.81	3.31	12,194.56	140.56	-122.05	141.28	19.43	19.35	-2.26
12,269.11	57.64	4.43	12,207.17	158.68	-120.82	159.39	22.26	21.87	5.06
VS 23H - FTP									
12,279.00	59.81	4.89	12,212.30	167.10	-120.13	167.81	22.26	21.90	4.67
12,307.00	67.31	3.83	12,224.76	192.08	-118.23	192.78	27.00	26.79	-3.79
12,339.00	71.63	2.60	12,235.98	221.99	-116.56	222.68	13.97	13.50	-3.84
12,371.00	74.06	0.85	12,245.42	252.55	-115.64	253.24	9.22	7.59	-5.47
12,402.00	75.94	359.61	12,253.44	282.50	-115.52	283.18	7.19	6.06	-4.00
12,433.00	77.63	358.91	12,260.53	312.67	-115.91	313.35	5.88	5.45	-2.26
12,464.00	79.38	358.91	12,266.71	343.04	-116.49	343.73	5.65	5.65	0.00
12,496.00	80.56	358.91	12,272.28	374.55	-117.09	375.23	3.69	3.69	0.00

Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
12,527.00	81.94	358.91	12,277.00	405.18	-117.67	405.87	4.45	4.45	0.00
12,558.00	83.44	359.44	12,280.94	435.92	-118.12	436.62	5.13	4.84	1.71
12,652.00	92.06	359.26	12,284.63	529.76	-119.18	530.45	9.17	9.17	-0.19
12,747.00	95.50	359.44	12,278.36	624.53	-120.26	625.23	3.63	3.62	0.19
12,841.00	91.44	0.32	12,272.68	718.34	-120.45	719.04	4.42	-4.32	0.94
12,935.00	91.81	359.26	12,270.01	812.30	-120.80	813.00	1.19	0.39	-1.13
13,029.00	91.94	358.91	12,266.93	906.23	-122.30	906.94	0.40	0.14	-0.37
13,124.00	90.69	358.91	12,264.75	1,001.19	-124.10	1,001.91	1.32	-1.32	0.00
13,218.00	90.44	359.44	12,263.83	1,095.18	-125.46	1,095.90	0.62	-0.27	0.56
13,313.00	90.88	0.49	12,262.73	1,190.17	-125.51	1,190.89	1.20	0.46	1.11
13,407.00	88.94	2.25	12,262.88	1,284.13	-123.27	1,284.84	2.79	-2.06	1.87
13,500.00	87.88	2.95	12,265.46	1,377.00	-119.05	1,377.68	1.37	-1.14	0.75
13,594.00	90.69	2.25	12,266.63	1,470.88	-114.79	1,471.54	3.08	2.99	-0.74
13,688.00	89.88	1.55	12,266.17	1,564.83	-111.67	1,565.47	1.14	-0.86	-0.74
13,782.00	93.63	0.49	12,263.29	1,658.75	-110.00	1,659.38	4.15	3.99	-1.13
13,876.00	92.50	359.44	12,258.26	1,752.62	-110.06	1,753.24	1.64	-1.20	-1.12
13,970.00	90.06	358.74	12,256.16	1,846.57	-111.55	1,847.20	2.70	-2.60	-0.74
14,065.00	92.88	359.26	12,253.73	1,941.52	-113.21	1,942.15	3.02	2.97	0.55
14,122.70	91.74	359.37	12,251.40	1,999.17	-113.90	1,999.81	1.99	-1.98	0.19
VS 23H - T1									
14,160.00	91.00	359.44	12,250.51	2,036.45	-114.28	2,037.09	1.99	-1.98	0.19
14,254.00	92.50	358.74	12,247.64	2,130.39	-115.77	2,131.04	1.76	1.60	-0.74
14,348.00	95.13	358.21	12,241.39	2,224.14	-118.27	2,224.81	2.85	2.80	-0.56
14,442.00	94.56	358.38	12,233.45	2,317.77	-121.06	2,318.44	0.63	-0.61	0.18
14,536.00	94.50	358.56	12,226.02	2,411.44	-123.56	2,412.13	0.20	-0.06	0.19
14,630.00	92.31	358.38	12,220.44	2,505.23	-126.06	2,505.94	2.34	-2.33	-0.19
14,724.00	93.88	357.51	12,215.36	2,599.03	-129.43	2,599.75	1.91	1.67	-0.93
14,818.00	97.25	357.68	12,206.25	2,692.49	-133.35	2,693.24	3.59	3.59	0.18
14,912.00	95.25	0.85	12,196.01	2,785.91	-134.55	2,786.66	3.97	-2.13	3.37
15,006.00	96.56	1.72	12,186.34	2,879.38	-132.45	2,880.12	1.67	1.39	0.93
15,100.00	93.63	3.48	12,178.00	2,972.90	-128.20	2,973.61	3.63	-3.12	1.87
15,125.84	93.11	3.38	12,176.48	2,998.65	-126.66	2,999.35	2.03	-2.00	-0.37
VS 23H - T2									
15,194.00	91.75	3.13	12,173.58	3,066.64	-122.79	3,067.31	2.03	-2.00	-0.37
15,288.00	88.06	1.90	12,173.74	3,160.53	-118.67	3,161.18	4.14	-3.93	-1.31
15,382.00	90.00	0.85	12,175.33	3,254.48	-116.41	3,255.12	2.35	2.06	-1.12
15,476.00	91.19	359.97	12,174.36	3,348.47	-115.74	3,349.10	1.57	1.27	-0.94
15,570.00	89.13	358.38	12,174.09	3,442.46	-117.09	3,443.09	2.77	-2.19	-1.69
15,663.00	88.00	356.98	12,176.42	3,535.35	-120.85	3,536.00	1.93	-1.22	-1.51
15,757.00	90.69	356.63	12,177.50	3,629.19	-126.09	3,629.87	2.89	2.86	-0.37
15,851.00	89.94	355.92	12,176.98	3,722.98	-132.20	3,723.70	1.10	-0.80	-0.76
15,945.00	91.44	357.51	12,175.85	3,816.82	-137.59	3,817.57	2.33	1.60	1.69
16,039.00	90.50	358.03	12,174.26	3,910.73	-141.24	3,911.50	1.14	-1.00	0.55
16,127.40	90.68	357.37	12,173.35	3,999.05	-144.79	3,999.84	0.77	0.20	-0.74



Survey Report



Company:	COG Operating LLC	Local Co-ordinate Reference:	Well 23H
Project:	Lea Co., MN	TVD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Site:	Vast State	MD Reference:	RT=25 @ 3286.30ft (Original Well Elev)
Well:	23H	North Reference:	Grid
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Surveys	Database:	Ryan USA

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
VS 23H - T3									
16,133.00	90.69	357.33	12,173.28	4,004.65	-145.05	4,005.44	0.77	0.20	-0.74
16,227.00	91.88	356.98	12,171.17	4,098.51	-149.71	4,099.32	1.32	1.27	-0.37
16,321.00	90.63	357.33	12,169.11	4,192.37	-154.38	4,193.21	1.38	-1.33	0.37
16,415.00	90.13	356.80	12,168.49	4,286.24	-159.19	4,287.11	0.78	-0.53	-0.56
16,509.00	92.00	358.74	12,166.74	4,380.14	-162.85	4,381.03	2.87	1.99	2.06
16,602.00	92.75	4.01	12,162.89	4,473.00	-160.62	4,473.88	5.72	0.81	5.67
16,697.00	93.75	4.36	12,157.50	4,567.60	-153.70	4,568.43	1.12	1.05	0.37
16,791.00	93.44	5.94	12,151.61	4,661.03	-145.28	4,661.81	1.71	-0.33	1.68
16,885.00	93.69	4.18	12,145.76	4,754.48	-137.00	4,755.21	1.89	0.27	-1.87
17,000.00	93.69	4.18	12,138.36	4,868.94	-128.64	4,869.61	0.00	0.00	0.00
VS 23H - BHL									

Checked By: _____ Approved By: _____ Date: _____