

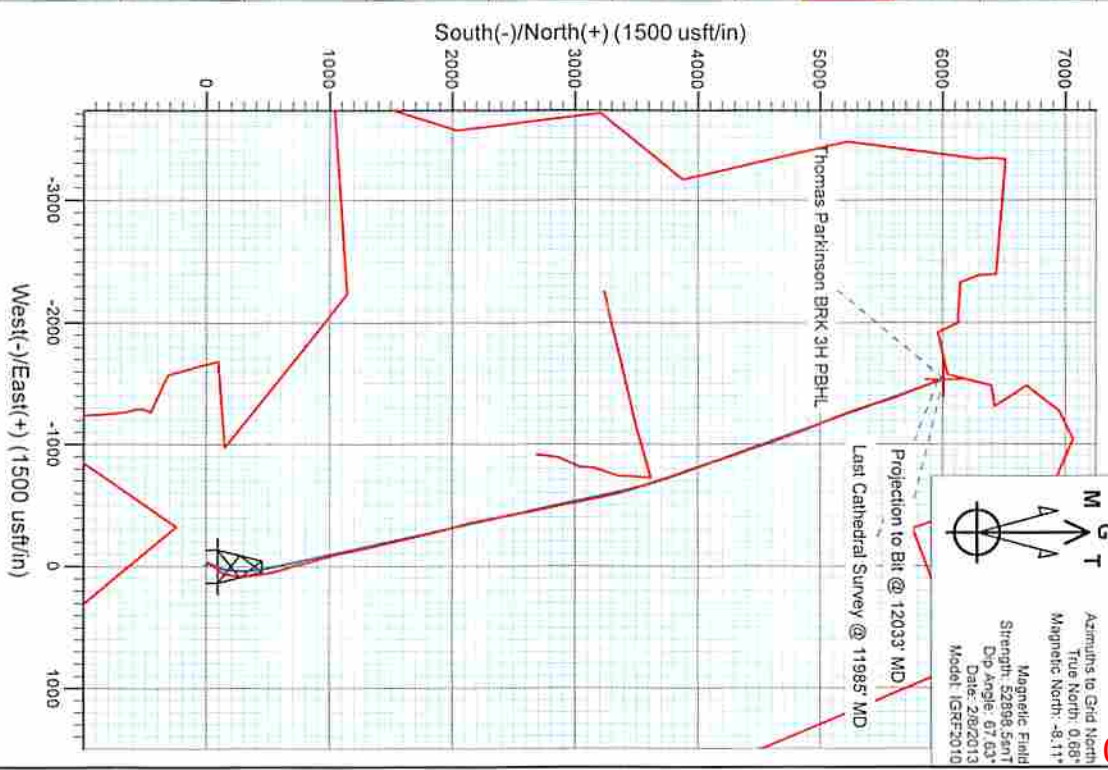
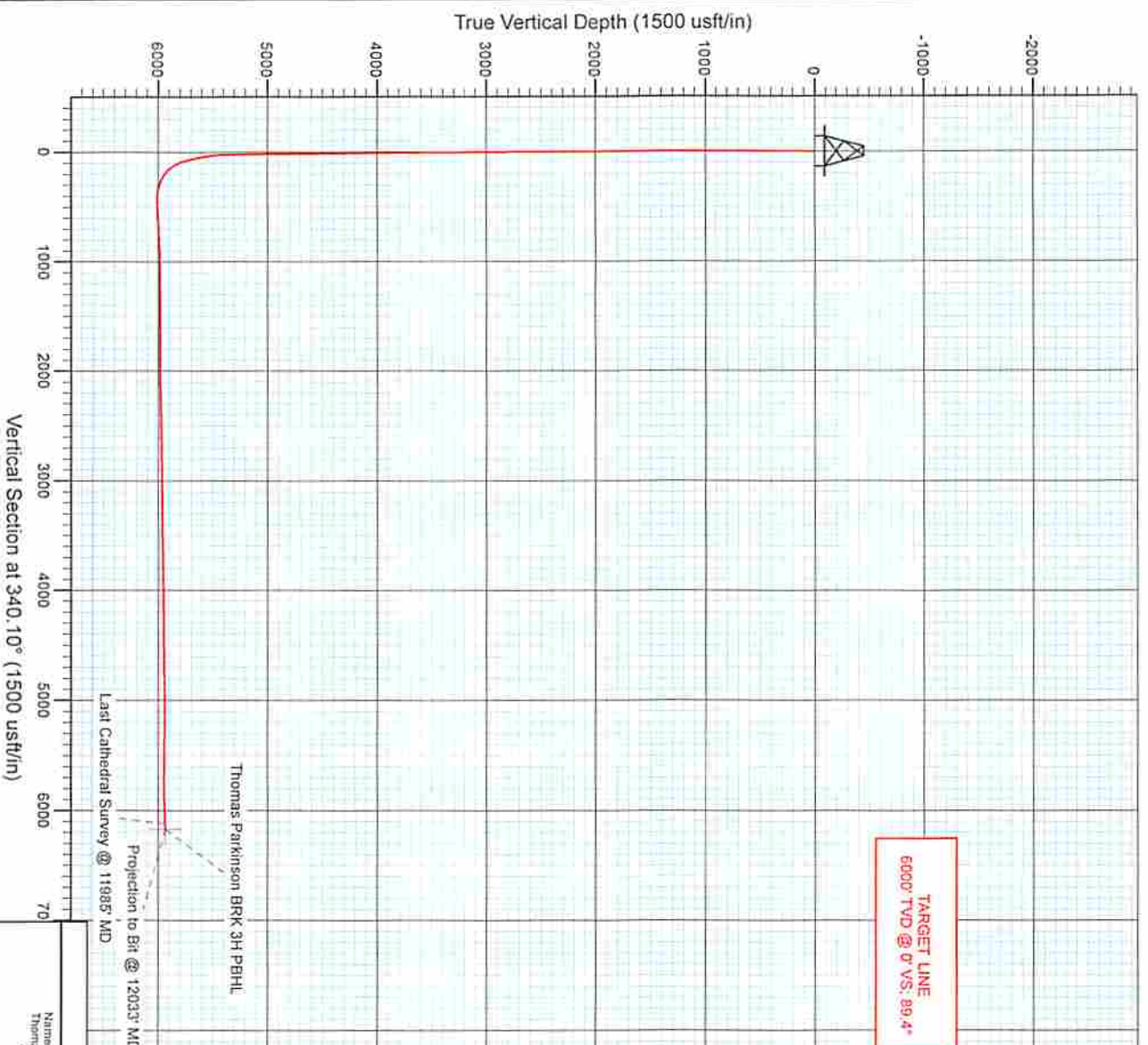
9-00107



Project: Brooke County, WV  
 Site: Thomas Parkinson  
 Well: Thomas Parkinson BRK 3H  
 Wellbore: HZ  
 Design: HZ



09/19/2014



Name		TVD		+N/S		+E/W		Ground Level		Latitude		Longitude	
Thomas Parkinson BRK 3H PBHL		340.10°		0.0		0.0		1180.0		43° 15' 45.25" N		80° 34' 12.50" W	
- survey misses light center by 7.25ft at 12033.00ft MD (5934.5 TVD, 6005.0 N, -1540.8 E)													

DESIGN TARGET DETAILS



# Cathedral Energy Services

## Survey Report

9-00107

<b>Company:</b>	Chesapeake Energy Corp	<b>Local Co-ordinate Reference:</b>	Well Thomas Parkinson BRK 3H
<b>Project:</b>	Brooke County, WV	<b>TVD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Site:</b>	Thomas Parkinson	<b>MD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Well:</b>	Thomas Parkinson BRK 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	HZ	<b>Database:</b>	USA EDM 5000 Multi Users DB

<b>Project</b>	Brooke County, WV		
<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>	West Virginia North 4701	Using geodetic scale factor	

<b>Site</b>	Thomas Parkinson				
<b>Site Position:</b>		<b>Northing:</b>	625,613.82 usft	<b>Latitude:</b>	40° 12' 46.000 N
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,702,749.67 usft	<b>Longitude:</b>	80° 33' 51.500 W
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16"	<b>Grid Convergence:</b>	-0.68 °

<b>Well</b>	Thomas Parkinson BRK 3H					
<b>Well Position</b>	<b>+N-S</b>	0.0 usft	<b>Northing:</b>	625,613.81 usft	<b>Latitude:</b>	40° 12' 46.000 N
	<b>+E-W</b>	0.0 usft	<b>Easting:</b>	1,702,749.67 usft	<b>Longitude:</b>	80° 33' 51.500 W
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	1,160.0 usft

<b>Wellbore</b>	HZ				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	2/8/2013	-8.79	67.63	52,898

<b>Design</b>	HZ				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<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	340.10	

<b>Survey Program</b>	Date 3/5/2013				
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
100.0	5,335.0	Survey #1 (HZ)	Gyro	Gyro	
5,357.0	12,033.0	Survey #2 (HZ)	MWD	Geolink MWD	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.24	305.69	100.0	0.1	-0.2	0.2	0.24	0.24	
200.0	0.22	239.45	200.0	0.1	-0.5	0.3	0.25	-0.02	
300.0	0.26	206.77	300.0	-0.2	-0.8	0.1	0.14	0.04	
400.0	0.10	241.35	400.0	-0.4	-1.0	-0.1	0.19	-0.16	
500.0	0.32	267.40	500.0	-0.5	-1.3	0.0	0.23	0.22	
600.0	0.16	254.98	600.0	-0.5	-1.7	0.1	0.17	-0.16	
700.0	0.37	235.16	700.0	-0.7	-2.1	0.0	0.23	0.21	
800.0	0.05	220.47	800.0	-0.9	-2.4	-0.1	0.32	-0.32	
900.0	0.31	195.70	900.0	-1.2	-2.5	-0.3	0.27	0.26	
1,000.0	0.29	198.97	1,000.0	-1.7	-2.7	-0.7	0.03	-0.02	
1,100.0	0.22	262.86	1,100.0	-2.0	-2.9	-0.9	0.28	-0.07	



# Cathedral Energy Services

## Survey Report

9-00107

<b>Company:</b>	Chesapeake Energy Corp	<b>Local Co-ordinate Reference:</b>	Well Thomas Parkinson BRK 3H
<b>Project:</b>	Brooke County, WV	<b>TVD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Site:</b>	Thomas Parkinson	<b>MD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Well:</b>	Thomas Parkinson BRK 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	HZ	<b>Database:</b>	USA EDM 5000 Multi Users DB

### Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
1,200.0	0.27	254.37	1,200.0	-2.1	-3.4	-0.8	0.05	0.05	
1,300.0	0.24	195.42	1,300.0	-2.3	-3.6	-1.0	0.25	-0.03	
1,400.0	0.23	139.52	1,400.0	-2.7	-3.6	-1.3	0.22	-0.01	
1,500.0	0.30	325.88	1,500.0	-2.6	-3.6	-1.3	0.53	0.07	
1,600.0	0.19	331.69	1,600.0	-2.3	-3.8	-0.8	0.11	-0.11	
1,700.0	0.22	338.85	1,700.0	-2.0	-4.0	-0.5	0.04	0.03	
1,800.0	0.10	301.22	1,800.0	-1.7	-4.1	-0.2	0.15	-0.12	
1,900.0	0.48	248.52	1,900.0	-1.8	-4.6	-0.2	0.43	0.38	
2,000.0	0.63	256.72	2,000.0	-2.1	-5.5	-0.1	0.17	0.15	
2,100.0	0.49	256.66	2,100.0	-2.3	-6.4	0.0	0.14	-0.14	
2,200.0	0.34	261.82	2,200.0	-2.5	-7.2	0.1	0.15	-0.15	
2,300.0	0.61	270.69	2,300.0	-2.5	-8.0	0.3	0.28	0.27	
2,400.0	0.63	266.18	2,400.0	-2.5	-9.1	0.7	0.05	0.02	
2,500.0	0.64	251.40	2,500.0	-2.8	-10.1	0.9	0.16	0.01	
2,600.0	0.65	288.74	2,600.0	-2.8	-11.2	1.2	0.41	0.01	
2,700.0	0.74	293.34	2,699.9	-2.3	-12.3	2.0	0.11	0.09	
2,800.0	0.50	312.42	2,799.9	-1.8	-13.2	2.8	0.31	-0.24	
2,900.0	0.41	280.83	2,899.9	-1.4	-13.9	3.4	0.26	-0.09	
3,000.0	0.48	265.70	2,999.9	-1.4	-14.7	3.7	0.14	0.07	
3,100.0	0.55	310.38	3,099.9	-1.1	-15.5	4.2	0.40	0.07	
3,200.0	0.24	301.83	3,199.9	-0.7	-16.0	4.8	0.31	-0.31	
3,300.0	0.41	327.57	3,299.9	-0.3	-16.4	5.3	0.22	0.17	
3,400.0	0.64	289.59	3,399.9	0.2	-17.1	6.0	0.41	0.23	
3,500.0	0.49	302.24	3,499.9	0.6	-18.0	6.7	0.19	-0.15	
3,600.0	0.95	339.44	3,599.9	1.7	-18.6	7.9	0.63	0.46	
3,700.0	0.74	316.72	3,699.9	2.9	-19.4	9.3	0.39	-0.21	
3,800.0	0.78	338.56	3,799.9	4.0	-20.1	10.6	0.29	0.04	
3,900.0	0.21	309.98	3,899.9	4.8	-20.5	11.4	0.60	-0.57	
4,000.0	0.22	335.92	3,999.9	5.0	-20.7	11.8	0.10	0.01	
4,100.0	0.39	341.25	4,099.9	5.5	-20.9	12.3	0.17	0.17	
4,200.0	0.64	345.22	4,199.9	6.4	-21.1	13.2	0.25	0.25	
4,300.0	0.23	354.12	4,299.9	7.1	-21.3	14.0	0.41	-0.41	
4,400.0	0.59	310.55	4,399.9	7.7	-21.7	14.5	0.45	0.36	
4,500.0	0.44	298.08	4,499.9	8.2	-22.4	15.3	0.19	-0.15	
4,600.0	0.60	338.37	4,599.9	8.9	-23.0	16.1	0.39	0.16	
4,700.0	0.39	314.89	4,699.9	9.6	-23.4	17.0	0.29	-0.21	
4,800.0	0.96	295.46	4,799.9	10.2	-24.4	17.9	0.61	0.57	
4,900.0	1.02	293.59	4,899.8	10.9	-26.0	19.1	0.07	0.06	
5,000.0	0.69	320.19	4,999.8	11.7	-27.2	20.3	0.51	-0.33	
5,100.0	0.86	312.46	5,099.8	12.7	-28.1	21.5	0.20	0.17	
5,200.0	0.98	319.34	5,199.8	13.8	-29.2	23.0	0.16	0.12	
5,300.0	0.75	303.75	5,299.8	14.9	-30.3	24.3	0.33	-0.23	
5,335.0	0.82	310.35	5,334.8	15.2	-30.7	24.7	0.33	0.20	Last Cathedral Survey @ 5,335' MD
5,357.0	0.40	327.50	5,356.8	15.3	-30.9	24.9	2.06	-1.91	
5,388.0	1.80	14.00	5,387.8	15.9	-30.8	25.4	5.01	4.52	
5,419.0	4.70	29.70	5,418.7	17.5	-30.0	26.6	9.70	9.35	
5,451.0	7.30	32.90	5,450.5	20.3	-28.3	28.7	8.19	8.13	
5,483.0	10.10	36.40	5,482.2	24.3	-25.5	31.5	8.90	8.75	
5,514.0	12.40	37.20	5,512.6	29.1	-21.9	34.8	7.44	7.42	
5,546.0	14.70	37.80	5,543.7	35.1	-17.3	38.9	7.20	7.19	
5,578.0	16.50	36.20	5,574.5	41.9	-12.2	43.6	5.78	5.63	
5,608.0	18.50	36.00	5,603.1	49.2	-6.8	48.6	6.67	6.67	
5,639.0	20.30	35.80	5,632.3	57.6	-0.8	54.4	5.81	5.81	



# Cathedral Energy Services

9-00107

## Survey Report

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<b>Project:</b>	Brooke County, WV	<b>TVD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Site:</b>	Thomas Parkinson	<b>MD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Well:</b>	Thomas Parkinson BRK 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	HZ	<b>Database:</b>	USA EDM 5000 Multi Users DB

### Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
5,671.0	21.50	35.90	5,662.2	66.8	5.9	60.8	3.75	3.75	
5,702.0	23.50	37.70	5,690.9	76.3	13.0	67.3	6.82	6.45	
5,734.0	24.90	38.30	5,720.1	86.6	21.1	74.3	4.44	4.38	
5,766.0	27.30	38.60	5,746.8	97.7	29.8	81.7	7.51	7.50	
5,798.0	29.80	37.50	5,776.9	109.7	39.2	89.8	7.98	7.81	
5,830.0	32.90	30.50	5,804.2	123.5	48.5	99.6	14.93	9.69	
5,862.0	36.10	24.40	5,830.6	139.6	56.8	111.9	14.71	10.00	
5,893.0	39.30	18.90	5,855.2	157.2	63.8	126.1	14.97	10.32	
5,924.0	42.60	13.50	5,878.6	176.7	69.4	142.5	15.60	10.65	
5,956.0	47.10	10.10	5,901.3	198.8	74.0	161.7	15.93	14.06	
5,987.0	51.70	7.20	5,921.4	222.1	77.5	182.4	16.45	14.84	
6,018.0	56.50	5.10	5,939.6	247.0	80.2	205.0	16.43	15.48	
6,048.0	61.20	1.80	5,955.1	272.6	81.7	228.6	18.27	15.66	
6,080.0	67.00	359.90	5,969.1	301.4	82.1	255.5	16.89	18.12	
6,112.0	71.20	358.40	5,980.5	331.3	81.7	283.7	13.84	13.12	
6,143.0	73.50	353.60	5,989.9	360.8	79.6	312.1	16.51	7.42	
6,174.0	76.80	352.00	5,997.9	390.5	75.8	341.3	11.76	10.65	
6,206.0	82.10	350.40	6,003.7	421.6	71.0	372.2	17.28	16.56	
6,237.0	87.50	349.90	6,006.5	452.0	65.7	402.6	17.49	17.42	
6,267.0	91.10	349.80	6,006.9	481.5	60.5	432.1	12.00	12.00	
6,298.0	91.90	347.80	6,006.1	511.9	54.4	462.8	6.95	2.58	
6,361.0	92.10	344.80	6,003.9	573.0	39.5	525.4	4.77	0.32	
6,425.0	92.70	344.40	6,001.2	634.7	22.6	589.1	1.13	0.94	
6,488.0	92.90	344.10	5,998.1	695.3	5.5	651.9	0.57	0.32	
6,552.0	91.70	344.40	5,995.6	756.8	-11.9	715.7	1.93	-1.87	
6,614.0	92.60	345.00	5,993.2	816.6	-28.2	777.4	1.74	1.45	
6,676.0	92.50	344.70	5,990.5	876.3	-44.4	839.1	0.51	-0.16	
6,738.0	92.40	344.20	5,987.8	936.0	-61.0	900.9	0.82	-0.16	
6,861.0	91.60	346.40	5,983.5	1,054.9	-92.2	1,023.3	1.90	-0.65	
6,987.0	89.90	348.90	5,981.9	1,178.0	-119.2	1,148.2	2.40	-1.35	
7,112.0	89.70	347.20	5,982.3	1,300.3	-145.0	1,272.0	1.37	-0.16	
7,239.0	90.40	347.30	5,982.2	1,424.1	-173.1	1,398.0	0.56	0.55	
7,365.0	90.30	346.40	5,981.4	1,546.8	-201.7	1,523.1	0.72	-0.08	
7,492.0	90.80	345.80	5,980.2	1,670.1	-232.2	1,649.4	0.61	0.39	
7,617.0	89.70	346.60	5,979.7	1,791.5	-262.1	1,773.7	1.09	-0.88	
7,742.0	89.70	345.90	5,980.3	1,912.9	-291.8	1,898.0	0.56	0.00	
7,868.0	90.40	345.00	5,980.2	2,034.9	-323.4	2,023.4	0.90	0.56	
7,994.0	90.80	346.90	5,978.9	2,157.1	-354.0	2,148.8	1.54	0.32	
8,118.0	90.80	349.30	5,977.2	2,278.4	-379.6	2,271.5	1.94	0.00	
8,243.0	91.20	350.20	5,975.0	2,401.4	-401.8	2,394.7	0.79	0.32	
8,369.0	91.60	350.00	5,971.9	2,525.5	-423.5	2,518.8	0.35	0.32	
8,496.0	91.60	348.60	5,968.4	2,650.2	-447.0	2,644.1	1.10	0.00	
8,621.0	91.10	347.70	5,965.4	2,772.5	-472.7	2,767.8	0.82	-0.40	
8,746.0	89.80	348.20	5,964.4	2,894.7	-498.8	2,891.7	1.11	-1.04	
8,872.0	90.30	349.20	5,964.3	3,018.3	-523.5	3,016.2	0.89	0.40	
8,998.0	90.80	349.20	5,963.1	3,142.0	-547.1	3,140.6	0.40	0.40	
9,125.0	91.00	347.80	5,961.1	3,266.5	-572.4	3,266.3	1.11	0.16	
9,251.0	90.20	343.40	5,959.8	3,388.5	-603.7	3,391.6	3.55	-0.63	
9,378.0	90.90	342.20	5,958.6	3,509.8	-641.3	3,518.5	1.09	0.55	
9,504.0	89.60	341.60	5,958.0	3,629.5	-680.4	3,644.4	1.14	-1.03	
9,630.0	91.10	340.50	5,957.3	3,748.7	-721.3	3,770.4	1.48	1.19	
9,755.0	92.00	339.90	5,953.9	3,866.3	-763.7	3,895.3	0.87	0.72	
9,882.0	90.90	340.10	5,950.7	3,985.6	-807.1	4,022.3	0.88	-0.67	



# Cathedral Energy Services

9-00107

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<b>Site:</b>	Thomas Parkinson	<b>MD Reference:</b>	WELL @ 1178.0usft (Nomac 37)
<b>Well:</b>	Thomas Parkinson BRK 3H	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	HZ	<b>Database:</b>	USA EDM 5000 Multi Users DB

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
10,007.0	89.90	342.10	5,949.8	4,103.8	-847.6	4,147.3	1.79	-0.80	
10,132.0	90.20	342.50	5,949.7	4,222.9	-885.6	4,272.2	0.40	0.24	
10,258.0	90.00	341.30	5,949.5	4,342.7	-924.7	4,398.1	0.97	-0.16	
10,382.0	90.80	341.70	5,948.6	4,460.3	-964.1	4,522.1	0.72	0.65	
10,507.0	91.20	340.30	5,946.4	4,578.4	-1,004.8	4,647.0	1.16	0.32	
10,631.0	91.20	339.40	5,943.8	4,694.8	-1,047.5	4,771.0	0.73	0.00	
10,757.0	90.40	338.90	5,942.1	4,812.5	-1,092.3	4,897.0	0.75	-0.63	
10,882.0	90.80	337.00	5,940.7	4,928.4	-1,139.2	5,021.9	1.55	0.32	
11,008.0	89.00	338.10	5,941.0	5,044.8	-1,187.3	5,147.7	1.67	-1.43	
11,133.0	89.90	337.80	5,942.2	5,160.7	-1,234.3	5,272.6	0.76	0.72	
11,259.0	89.30	341.10	5,943.0	5,278.6	-1,278.5	5,398.6	2.66	-0.48	
11,385.0	89.20	342.80	5,944.7	5,398.4	-1,317.5	5,524.5	1.35	-0.08	
11,511.0	89.30	344.60	5,946.3	5,519.3	-1,352.9	5,650.3	1.43	0.08	
11,636.0	89.80	338.40	5,947.3	5,637.8	-1,392.5	5,775.2	4.98	0.40	
11,761.0	91.40	338.10	5,946.0	5,753.9	-1,438.8	5,900.1	1.30	1.28	
11,889.0	92.30	338.10	5,941.9	5,872.6	-1,486.6	6,027.9	0.70	0.70	
11,985.0	93.20	337.70	5,937.3	5,961.5	-1,522.6	6,123.8	1.03	0.94	Last Cathedral Survey @ 11985' MD
12,033.0	93.20	337.70	5,934.6	6,005.8	-1,540.8	6,171.6	0.00	0.00	Projection to Bit @ 12033' MD

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Thomas Parkinson BRK - hit/miss target - Shape - Point	0.00	360.00	5,935.4	6,009.3	-1,534.5	631,623.04	1,701,215.17	40° 13' 45.200 N	80° 34' 12.200 W
- actual wellpath misses target center by 7.2usft at 12033.0usft MD (5934.6 TVD, 6005.8 N, -1540.8 E)									
Interp @ 5995.2 (Thoma - Point	0.00	0.00	5,995.2	517.8	41.3	626,131.59	1,702,791.00	40° 12' 51.121 N	80° 33' 51.046 W
- actual wellpath misses target center by 15.7usft at 6307.2usft MD (6005.8 TVD, 520.9 N, 52.5 E)									
Hardline Corner 50' Rad - Point	0.00	0.00	0.0	3,615.7	-721.8	629,229.49	1,702,027.87	40° 13' 21.644 N	80° 34' 1.356 W
- actual wellpath misses target center by 3687.0usft at 5.6usft MD (5.6 TVD, 0.0 N, 0.0 E)									
- Circle (radius 50.0)									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
5,335.0	5,334.8	15.2	-30.7	Last Cathedral Survey @ 5,335' MD
11,985.0	5,937.3	5,961.5	-1,522.6	Last Cathedral Survey @ 11985' MD
12,033.0	5,934.6	6,005.8	-1,540.8	Projection to Bit @ 12033' MD

Checked By: _____	Approved By: _____	Date: _____
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