



# Cathedral Energy Services

## Survey Report

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

<b>Project</b>	Weld County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

Site		S21-T10N-R58W			
Site Position:		Northing:	1,549,389.38 usft	Latitude:	40.830125
From:	Lat/Long	Easting:	3,450,038.37 usft	Longitude:	-103.873714
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.05 °

Well	Razor #21B-0910B					
Well Position	+N/-S	0.0 usft	Northing:	1,549,441.95 usft	Latitude:	40.830200
	+E/-W	0.0 usft	Easting:	3,451,413.05 usft	Longitude:	-103.868744
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,837.3 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	9/24/2014	7.96	67.42	53,099

<b>Design</b>	FINAL				
<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	359.39	

<b>Survey Program</b>	<b>Date</b>	10/22/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
255.0	13,997.0	Survey #1 (HZ)	ISCWSA MWD	MWD - ISCWSA	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usf)</b>	<b>Build Rate (°/100u)</b>	<b>Formations / Comments</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
255.0	0.23	127.01	255.0	-0.3	0.4	-0.3	0.09	0.09		
347.0	0.35	146.11	347.0	-0.7	0.7	-0.7	0.17	0.13		
439.0	0.20	116.66	439.0	-1.0	1.0	-1.0	0.22	-0.16		
529.0	0.25	63.15	529.0	-0.9	1.3	-1.0	0.23	0.06		
621.0	0.26	195.22	621.0	-1.1	1.5	-1.1	0.51	0.01		
713.0	1.86	239.31	713.0	-2.0	0.1	-2.0	1.83	1.74		
805.0	1.93	232.14	804.9	-3.7	-2.4	-3.7	0.27	0.08		
896.0	2.01	239.53	895.9	-5.5	-5.0	-5.4	0.29	0.09		
988.0	1.86	233.29	987.8	-7.2	-7.6	-7.1	0.28	-0.16		
1,079.0	1.79	245.15	1,078.8	-8.7	-10.0	-8.6	0.42	-0.08		
1,171.0	1.75	245.25	1,170.7	-9.9	-12.6	-9.7	0.04	-0.04		
1,262.0	2.36	255.34	1,261.7	-10.9	-15.7	-10.7	0.78	0.67		

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<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<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 (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,353.0	2.87	262.79	1,352.6	-11.7	-19.8	-11.5	0.67	0.56	
1,444.0	3.29	268.75	1,443.4	-12.0	-24.6	-11.8	0.58	0.46	
1,535.0	3.11	252.54	1,534.3	-12.8	-29.6	-12.5	1.01	-0.20	
1,627.0	3.28	253.10	1,626.2	-14.3	-34.5	-14.0	0.19	0.18	
1,710.0	2.83	253.30	1,709.0	-15.6	-38.7	-15.2	0.54	-0.54	
1,788.0	2.27	246.33	1,787.0	-16.8	-42.0	-16.3	0.82	-0.72	
1,880.0	3.11	213.82	1,878.9	-19.6	-45.1	-19.1	1.86	0.91	
1,971.0	3.30	214.36	1,969.7	-23.8	-47.9	-23.3	0.21	0.21	
2,062.0	3.68	212.76	2,060.6	-28.4	-51.0	-27.9	0.43	0.42	
2,154.0	3.44	205.64	2,152.4	-33.4	-53.8	-32.8	0.55	-0.26	
2,246.0	3.24	206.19	2,244.2	-38.2	-56.1	-37.6	0.22	-0.22	
2,337.0	2.96	198.69	2,335.1	-42.7	-58.0	-42.1	0.54	-0.31	
2,428.0	2.88	199.33	2,426.0	-47.1	-59.5	-46.5	0.09	-0.09	
2,519.0	3.04	185.12	2,516.9	-51.7	-60.5	-51.0	0.82	0.18	
2,610.0	2.95	191.88	2,607.7	-56.4	-61.2	-55.7	0.40	-0.10	
2,702.0	2.57	194.02	2,699.6	-60.7	-62.2	-60.0	0.43	-0.41	
2,793.0	2.56	190.03	2,790.5	-64.7	-63.0	-64.0	0.20	-0.01	
2,884.0	2.21	186.35	2,881.4	-68.4	-63.5	-67.7	0.42	-0.38	
2,975.0	2.27	191.31	2,972.4	-71.9	-64.1	-71.2	0.22	0.07	
3,067.0	1.51	183.24	3,064.3	-74.9	-64.5	-74.2	0.87	-0.83	
3,158.0	2.23	170.05	3,155.3	-77.9	-64.3	-77.2	0.92	0.79	
3,249.0	1.65	149.78	3,246.2	-80.8	-63.3	-80.1	0.98	-0.64	
3,340.0	1.76	171.34	3,337.2	-83.3	-62.4	-82.6	0.71	0.12	
3,431.0	1.18	249.86	3,428.2	-85.0	-63.1	-84.3	2.10	-0.64	
3,522.0	1.34	266.17	3,519.1	-85.4	-65.1	-84.7	0.43	0.18	
3,614.0	1.48	274.86	3,611.1	-85.3	-67.3	-84.6	0.28	0.15	
3,704.0	1.72	271.69	3,701.1	-85.2	-69.8	-84.4	0.28	0.27	
3,795.0	1.64	268.15	3,792.0	-85.2	-72.5	-84.4	0.14	-0.09	
3,887.0	1.10	309.77	3,884.0	-84.7	-74.5	-83.9	1.19	-0.59	
3,977.0	1.59	17.74	3,974.0	-82.9	-74.8	-82.1	1.73	0.54	
4,069.0	1.13	317.25	4,066.0	-81.1	-75.0	-80.2	1.55	-0.50	
4,160.0	1.59	313.17	4,156.9	-79.5	-76.5	-78.7	0.52	0.51	
4,252.0	2.10	317.04	4,248.9	-77.4	-78.6	-76.6	0.57	0.55	
4,343.0	3.06	251.57	4,339.8	-77.0	-82.0	-76.1	3.19	1.05	
4,434.0	2.31	232.20	4,430.7	-78.9	-85.8	-77.9	1.28	-0.82	
4,526.0	2.08	241.17	4,522.7	-80.8	-88.7	-79.8	0.45	-0.25	
4,618.0	2.55	242.37	4,614.6	-82.6	-92.0	-81.6	0.51	0.51	
4,710.0	2.65	261.70	4,706.5	-83.8	-95.9	-82.8	0.95	0.11	
4,801.0	1.61	138.89	4,797.5	-85.1	-97.2	-84.0	4.15	-1.14	
4,892.0	1.54	126.19	4,888.4	-86.8	-95.3	-85.7	0.39	-0.08	
4,983.0	1.84	121.57	4,979.4	-88.3	-93.1	-87.3	0.36	0.33	
5,074.0	1.52	130.06	5,070.3	-89.8	-90.9	-88.8	0.44	-0.35	
5,166.0	1.76	10.14	5,162.3	-89.2	-89.8	-88.2	3.09	0.26	
5,258.0	5.65	7.57	5,254.1	-83.3	-88.9	-82.4	4.23	4.23	
5,348.0	15.79	14.75	5,342.4	-67.0	-85.2	-66.1	11.34	11.27	
5,440.0	25.13	16.05	5,428.5	-36.1	-76.6	-35.3	10.16	10.15	
5,532.0	30.57	10.67	5,509.9	5.7	-66.8	6.4	6.51	5.91	
5,623.0	36.48	2.64	5,585.7	55.6	-61.3	56.2	8.11	6.49	
5,654.0	39.63	1.92	5,610.1	74.6	-60.6	75.3	10.26	10.16	
5,684.0	40.91	1.75	5,633.0	94.0	-59.9	94.7	4.28	4.27	
5,714.0	41.92	2.20	5,655.5	113.9	-59.2	114.5	3.51	3.37	
5,746.0	44.72	1.34	5,678.8	135.8	-58.6	136.4	8.94	8.75	
5,778.0	47.72	358.62	5,700.9	158.9	-58.6	159.5	11.20	9.38	

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<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<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 (°/100usf)	Build Rate (°/100u)	Formations / Comments
5,809.0	52.04	356.32	5,720.9	182.6	-59.7	183.2	15.04	13.94	
5,841.0	56.42	356.22	5,739.6	208.5	-61.3	209.1	13.69	13.69	
5,873.0	59.54	356.86	5,756.6	235.6	-63.0	236.2	9.90	9.75	
5,904.0	59.56	356.43	5,772.3	262.2	-64.5	262.9	1.20	0.06	
5,936.0	60.98	356.24	5,788.2	290.0	-66.3	290.7	4.47	4.44	
5,967.0	62.85	356.59	5,802.7	317.3	-68.0	318.0	6.11	6.03	
5,999.0	67.43	357.68	5,816.2	346.2	-69.5	347.0	14.64	14.31	
6,031.0	69.73	358.60	5,827.9	376.0	-70.4	376.7	7.67	7.19	
6,062.0	72.99	359.07	5,837.8	405.4	-71.0	406.1	10.61	10.52	
6,094.0	75.58	359.47	5,846.5	436.2	-71.4	436.9	8.18	8.09	
6,125.0	78.16	359.39	5,853.5	466.4	-71.7	467.1	8.33	8.32	
6,152.0	80.52	359.21	5,858.5	492.9	-72.1	493.6	8.77	8.74	
6,292.0	87.89	0.37	5,872.6	632.1	-72.6	632.8	5.33	5.26	
6,387.0	90.88	0.74	5,873.6	727.1	-71.6	727.8	3.17	3.15	
6,482.0	91.62	0.63	5,871.6	822.0	-70.5	822.7	0.79	0.78	
6,576.0	91.23	0.48	5,869.2	916.0	-69.6	916.7	0.44	-0.41	
6,671.0	89.78	359.68	5,868.4	1,011.0	-69.5	1,011.7	1.74	-1.53	
6,766.0	90.15	359.40	5,868.4	1,106.0	-70.2	1,106.7	0.49	0.39	
6,861.0	88.38	357.66	5,869.7	1,200.9	-72.7	1,201.7	2.61	-1.86	
6,956.0	88.56	357.10	5,872.2	1,295.8	-77.0	1,296.6	0.62	0.19	
7,051.0	87.92	356.47	5,875.1	1,390.6	-82.3	1,391.4	0.95	-0.67	
7,146.0	89.10	356.62	5,877.6	1,485.4	-88.0	1,486.3	1.25	1.24	
7,241.0	90.25	359.63	5,878.1	1,580.3	-91.2	1,581.2	3.39	1.21	
7,336.0	90.45	358.58	5,877.6	1,675.3	-92.6	1,676.2	1.13	0.21	
7,430.0	90.64	358.81	5,876.7	1,769.3	-94.8	1,770.2	0.32	0.20	
7,525.0	89.69	359.44	5,876.4	1,864.3	-96.2	1,865.2	1.20	-1.00	
7,620.0	89.57	359.03	5,877.0	1,959.3	-97.5	1,960.2	0.45	-0.13	
7,715.0	90.01	359.65	5,877.3	2,054.3	-98.6	2,055.2	0.80	0.46	
7,810.0	90.93	359.48	5,876.6	2,149.3	-99.3	2,150.2	0.98	0.97	
7,905.0	88.55	0.77	5,877.0	2,244.3	-99.1	2,245.2	2.85	-2.51	
8,000.0	88.77	1.20	5,879.2	2,339.2	-97.5	2,340.1	0.51	0.23	
8,094.0	89.04	0.76	5,881.0	2,433.2	-95.9	2,434.1	0.55	0.29	
8,189.0	88.19	0.01	5,883.3	2,528.2	-95.2	2,529.0	1.19	-0.89	
8,284.0	89.24	1.48	5,885.4	2,623.1	-94.0	2,624.0	1.90	1.11	
8,379.0	91.95	3.31	5,884.5	2,718.0	-90.0	2,718.8	3.44	2.85	
8,474.0	90.19	2.63	5,882.7	2,812.9	-85.1	2,813.6	1.99	-1.85	
8,569.0	88.77	1.92	5,883.5	2,907.8	-81.3	2,908.5	1.67	-1.49	
8,664.0	90.35	1.90	5,884.3	3,002.7	-78.2	3,003.4	1.66	1.66	
8,758.0	89.99	1.79	5,884.0	3,096.7	-75.1	3,097.3	0.40	-0.38	
8,853.0	89.27	1.57	5,884.6	3,191.6	-72.4	3,192.2	0.79	-0.76	
8,948.0	88.91	1.28	5,886.1	3,286.6	-70.0	3,287.2	0.49	-0.38	
9,043.0	92.33	2.62	5,885.1	3,381.5	-66.8	3,382.0	3.87	3.60	
9,137.0	91.90	2.08	5,881.6	3,475.4	-62.9	3,475.8	0.73	-0.46	
9,232.0	91.08	0.36	5,879.1	3,570.3	-60.9	3,570.8	2.01	-0.86	
9,327.0	91.02	0.05	5,877.4	3,665.3	-60.5	3,665.7	0.33	-0.06	
9,422.0	88.91	359.76	5,877.5	3,760.3	-60.7	3,760.7	2.24	-2.22	
9,517.0	87.80	359.06	5,880.2	3,855.2	-61.7	3,855.7	1.38	-1.17	
9,612.0	87.44	358.19	5,884.1	3,950.1	-64.0	3,950.6	0.99	-0.38	
9,705.0	89.27	358.50	5,886.8	4,043.1	-66.6	4,043.5	2.00	1.97	
9,799.0	89.12	358.10	5,888.1	4,137.0	-69.4	4,137.5	0.45	-0.16	
9,891.0	88.58	356.98	5,890.0	4,228.9	-73.4	4,229.4	1.35	-0.59	
9,982.0	88.12	0.27	5,892.6	4,319.8	-75.6	4,320.4	3.65	-0.51	
10,073.0	88.90	2.09	5,895.0	4,410.8	-73.7	4,411.3	2.18	0.86	

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<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<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 (°/100usf)	Build Rate (°/100u)	Formations / Comments
10,164.0	91.10	1.23	5,895.0	4,501.7	-71.1	4,502.2	2.60	2.42	
10,257.0	90.72	0.57	5,893.5	4,594.7	-69.6	4,595.2	0.82	-0.41	
10,349.0	90.01	0.45	5,892.9	4,686.7	-68.8	4,687.2	0.78	-0.77	
10,440.0	88.74	359.64	5,893.9	4,777.7	-68.7	4,778.1	1.66	-1.40	
10,531.0	90.42	359.20	5,894.6	4,868.7	-69.6	4,869.1	1.91	1.85	
10,623.0	90.52	359.28	5,893.8	4,960.6	-70.8	4,961.1	0.14	0.11	
10,714.0	91.16	359.05	5,892.5	5,051.6	-72.2	5,052.1	0.75	0.70	
10,806.0	91.70	358.71	5,890.2	5,143.6	-74.0	5,144.1	0.69	0.59	
10,897.0	92.26	358.04	5,887.0	5,234.5	-76.5	5,235.0	0.96	0.62	
10,988.0	92.36	359.10	5,883.4	5,325.4	-78.8	5,325.9	1.17	0.11	
11,079.0	92.77	357.66	5,879.3	5,416.3	-81.4	5,416.8	1.64	0.45	
11,170.0	91.98	0.05	5,875.5	5,507.1	-83.2	5,507.7	2.76	-0.87	
11,262.0	89.35	2.13	5,874.4	5,599.1	-81.5	5,599.7	3.64	-2.86	
11,353.0	89.77	2.21	5,875.1	5,690.0	-78.0	5,690.6	0.47	0.46	
11,444.0	90.46	1.29	5,875.0	5,781.0	-75.2	5,781.5	1.26	0.76	
11,535.0	89.11	1.71	5,875.3	5,872.0	-72.8	5,872.4	1.55	-1.48	
11,627.0	88.65	0.36	5,877.1	5,963.9	-71.2	5,964.3	1.55	-0.50	
11,718.0	90.47	0.02	5,877.8	6,054.9	-70.9	6,055.3	2.03	2.00	
11,809.0	91.55	359.88	5,876.2	6,145.9	-71.0	6,146.3	1.20	1.19	
11,900.0	91.28	1.43	5,874.0	6,236.9	-69.9	6,237.3	1.73	-0.30	
11,991.0	89.32	0.46	5,873.5	6,327.8	-68.4	6,328.2	2.40	-2.15	
12,082.0	89.07	0.10	5,874.8	6,418.8	-68.0	6,419.2	0.48	-0.27	
12,173.0	88.29	358.25	5,876.9	6,509.8	-69.3	6,510.2	2.21	-0.86	
12,264.0	87.01	357.63	5,880.6	6,600.7	-72.6	6,601.1	1.56	-1.41	
12,355.0	87.99	359.92	5,884.6	6,691.5	-74.5	6,692.0	2.74	1.08	
12,446.0	89.49	359.15	5,886.6	6,782.5	-75.2	6,782.9	1.85	1.65	
12,538.0	88.85	358.19	5,887.9	6,874.5	-77.4	6,874.9	1.25	-0.70	
12,629.0	90.93	359.34	5,888.1	6,965.5	-79.3	6,965.9	2.61	2.29	
12,720.0	89.51	358.75	5,887.7	7,056.4	-80.8	7,056.9	1.69	-1.56	
12,812.0	88.02	358.82	5,889.7	7,148.4	-82.8	7,148.9	1.62	-1.62	
12,903.0	89.06	359.47	5,892.0	7,239.4	-84.2	7,239.8	1.35	1.14	
12,995.0	93.06	0.99	5,890.3	7,331.3	-83.8	7,331.8	4.65	4.35	
13,086.0	94.43	0.71	5,884.4	7,422.1	-82.4	7,422.6	1.54	1.51	
13,178.0	92.11	1.27	5,879.1	7,513.9	-80.9	7,514.4	2.59	-2.52	
13,270.0	90.61	2.09	5,876.9	7,605.9	-78.2	7,606.3	1.86	-1.63	
13,361.0	90.22	1.74	5,876.3	7,696.8	-75.1	7,697.2	0.58	-0.43	
13,452.0	90.54	1.04	5,875.7	7,787.8	-72.9	7,788.1	0.85	0.35	
13,543.0	89.00	1.69	5,876.0	7,878.8	-70.7	7,879.1	1.84	-1.69	
13,635.0	89.79	1.45	5,877.0	7,970.7	-68.2	7,971.0	0.90	0.86	
13,726.0	88.14	0.96	5,878.7	8,061.7	-66.3	8,061.9	1.89	-1.81	
13,817.0	88.63	0.11	5,881.2	8,152.6	-65.5	8,152.9	1.08	0.54	
13,942.0	88.91	359.63	5,883.9	8,277.6	-65.7	8,277.9	0.44	0.22	Last CES Survey @ 13,942' MD
13,997.0	88.91	359.63	5,884.9	8,332.6	-66.1	8,332.8	0.00	0.00	PTB @ 13,997' MD - TD - 2612' FSL, 2114' FEL

# Cathedral Energy Services

## Survey Report

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
21B-0910B BHL P2 - actual wellpath misses target center by 129.1usft at 13942.0usft MD (5883.9 TVD, 8277.6 N, -65.7 E) - Point	0.00	1.05	6,011.0	8,277.5	-88.5	1,557,716.44	3,451,172.27	40.852919	-103.869064
21B-0910B TGT P2 - actual wellpath misses target center by 135.8usft at 13440.6usft MD (5875.8 TVD, 7776.4 N, -73.1 E) - Point	0.00	1.05	6,011.0	7,777.6	-85.5	1,557,216.70	3,451,184.51	40.851547	-103.869053
21B-0910B VP P3 - actual wellpath misses target center by 12.0usft at 5193.0usft MD (5189.3 TVD, -88.1 N, -89.6 E) - Point	0.00	1.05	5,190.1	-100.0	-88.5	1,549,340.33	3,451,326.37	40.829925	-103.869064
21B-0910B TGT - actual wellpath misses target center by 12.7usft at 13441.5usft MD (5875.8 TVD, 7777.3 N, -73.1 E) - Point	0.00	1.05	5,878.5	7,777.6	-85.5	1,557,216.70	3,451,184.51	40.851547	-103.869053
21B-0910B BHL - actual wellpath misses target center by 23.4usft at 13941.8usft MD (5883.9 TVD, 8277.5 N, -65.7 E) - Point	0.00	1.05	5,878.5	8,277.5	-88.5	1,557,716.44	3,451,172.27	40.852919	-103.869064
21B-0910B BHL P4 - actual wellpath misses target center by 31.6usft at 13941.5usft MD (5883.9 TVD, 8277.1 N, -65.7 E) - Point	0.00	1.05	5,862.0	8,277.5	-88.5	1,557,716.44	3,451,172.27	40.852919	-103.869064
21B-0910B VP P4 - actual wellpath misses target center by 11.1usft at 5045.0usft MD (5041.4 TVD, -89.3 N, -91.6 E) - Point	0.00	1.05	5,041.1	-100.0	-88.5	1,549,340.33	3,451,326.37	40.829925	-103.869064

Casing Points				
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,210.0	5,866.5	7" - 224' FSL, 2195' FEL	0	0

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
13,942.0	5,883.9	8,277.6	-65.7	Last CES Survey @ 13,942' MD
13,997.0	5,884.9	8,332.6	-66.1	PTB @ 13,997' MD
13,997.0	5,884.9	8,332.6	-66.1	TD - 2612' FSL, 2114' FEL

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

# **Whiting Petroleum Corporation**

**Weld County, CO**

**S21-T10N-R58W**

**Razor #21B-0910B**

**HZ**

**Design: FINAL**

## **Survey Report - Geographic**

**22 October, 2014**

# Cathedral Energy Services

## Survey Report - Geographic

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

<b>Project</b>	Weld County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Northern Zone		

Site	S21-T10N-R58W				
Site Position:		Northing:	1,549,389.39 usft	Latitude:	40.830125
From:	Lat/Long	Easting:	3,450,038.36 usft	Longitude:	-103.873714
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	1.05 °

Well		Razor #21B-0910B				
Well Position	+N-S	0.0 usft	Northing:	1,549,441.95 usft	Latitude:	40.830200
	+E-W	0.0 usft	Easting:	3,451,413.04 usft	Longitude:	-103.868744
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,837.3 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	9/24/2014	7.96	67.42	53,099

<b>Design</b>	FINAL				
<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	359.39	

<b>Survey Program</b>	<b>Date</b>	10/22/2014			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
255.0	13,997.0	Survey #1 (HZ)	ISCWSA MWD	MWD - ISCWSA	

<b>Survey</b>									
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>
0.0	0.00	0.00	0.0	0.0	0.0	1,549,441.95	3,451,413.04	40.830200	-103.868744
255.0	0.23	127.01	255.0	-0.3	0.4	1,549,441.65	3,451,413.46	40.830199	-103.868743
347.0	0.35	146.11	347.0	-0.7	0.7	1,549,441.31	3,451,413.77	40.830198	-103.868742
439.0	0.20	116.66	439.0	-1.0	1.0	1,549,441.01	3,451,414.07	40.830197	-103.868741
529.0	0.25	63.15	529.0	-0.9	1.3	1,549,441.03	3,451,414.39	40.830197	-103.868739
621.0	0.26	195.22	621.0	-1.1	1.5	1,549,440.93	3,451,414.52	40.830197	-103.868739
713.0	1.86	239.31	713.0	-2.0	0.1	1,549,439.94	3,451,413.19	40.830195	-103.868744
805.0	1.93	232.14	804.9	-3.7	-2.4	1,549,438.18	3,451,410.72	40.830190	-103.868753
896.0	2.01	239.53	895.9	-5.5	-5.0	1,549,436.38	3,451,408.17	40.830185	-103.868762
988.0	1.86	233.29	987.8	-7.2	-7.6	1,549,434.62	3,451,405.61	40.830180	-103.868772
1,079.0	1.79	245.15	1,078.8	-8.7	-10.0	1,549,433.10	3,451,403.17	40.830176	-103.868781
1,171.0	1.75	245.25	1,170.7	-9.9	-12.6	1,549,431.86	3,451,400.61	40.830173	-103.868790



# Cathedral Energy Services

## Survey Report - Geographic

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,262.0	2.36	255.34	1,261.7	-10.9	-15.7	1,549,430.75	3,451,397.55	40.830170	-103.868801
1,353.0	2.87	262.79	1,352.6	-11.7	-19.8	1,549,429.91	3,451,393.50	40.830168	-103.868816
1,444.0	3.29	268.75	1,443.4	-12.0	-24.6	1,549,429.48	3,451,388.63	40.830167	-103.868833
1,535.0	3.11	252.54	1,534.3	-12.8	-29.6	1,549,428.59	3,451,383.68	40.830165	-103.868851
1,627.0	3.28	253.10	1,626.2	-14.3	-34.5	1,549,426.99	3,451,378.81	40.830161	-103.868869
1,710.0	2.83	253.30	1,709.0	-15.6	-38.7	1,549,425.63	3,451,374.60	40.830157	-103.868884
1,788.0	2.27	246.33	1,787.0	-16.8	-42.0	1,549,424.40	3,451,371.36	40.830154	-103.868896
1,880.0	3.11	213.82	1,878.9	-19.6	-45.1	1,549,421.54	3,451,368.36	40.830146	-103.868907
1,971.0	3.30	214.36	1,969.7	-23.8	-47.9	1,549,417.27	3,451,365.58	40.830135	-103.868917
2,062.0	3.68	212.76	2,060.6	-28.4	-51.0	1,549,412.60	3,451,362.61	40.830122	-103.868928
2,154.0	3.44	205.64	2,152.4	-33.4	-53.8	1,549,407.58	3,451,359.91	40.830108	-103.868939
2,246.0	3.24	206.19	2,244.2	-38.2	-56.1	1,549,402.71	3,451,357.66	40.830095	-103.868947
2,337.0	2.96	198.69	2,335.1	-42.7	-58.0	1,549,398.15	3,451,355.85	40.830083	-103.868954
2,428.0	2.88	199.33	2,426.0	-47.1	-59.5	1,549,393.74	3,451,354.43	40.830071	-103.868959
2,519.0	3.04	185.12	2,516.9	-51.7	-60.5	1,549,389.16	3,451,353.54	40.830058	-103.868963
2,610.0	2.95	191.88	2,607.7	-56.4	-61.2	1,549,384.45	3,451,352.93	40.830045	-103.868965
2,702.0	2.57	194.02	2,699.6	-60.7	-62.2	1,549,380.12	3,451,352.02	40.830033	-103.868969
2,793.0	2.56	190.03	2,790.5	-64.7	-63.0	1,549,376.12	3,451,351.24	40.830023	-103.868972
2,884.0	2.21	186.35	2,881.4	-68.4	-63.5	1,549,372.37	3,451,350.76	40.830012	-103.868974
2,975.0	2.27	191.31	2,972.4	-71.9	-64.1	1,549,368.85	3,451,350.28	40.830003	-103.868976
3,067.0	1.51	183.24	3,064.3	-74.9	-64.5	1,549,365.84	3,451,349.91	40.829994	-103.868977
3,158.0	2.23	170.05	3,155.3	-77.9	-64.3	1,549,362.91	3,451,350.20	40.829986	-103.868977
3,249.0	1.65	149.78	3,246.2	-80.8	-63.3	1,549,360.05	3,451,351.22	40.829978	-103.868973
3,340.0	1.76	171.34	3,337.2	-83.3	-62.4	1,549,357.55	3,451,352.14	40.829972	-103.868970
3,431.0	1.18	249.86	3,428.2	-85.0	-63.1	1,549,355.83	3,451,351.50	40.829967	-103.868972
3,522.0	1.34	266.17	3,519.1	-85.4	-65.1	1,549,355.41	3,451,349.57	40.829966	-103.868979
3,614.0	1.48	274.86	3,611.1	-85.3	-67.3	1,549,355.39	3,451,347.31	40.829966	-103.868988
3,704.0	1.72	271.69	3,701.1	-85.2	-69.8	1,549,355.48	3,451,344.80	40.829966	-103.868997
3,795.0	1.64	268.15	3,792.0	-85.2	-72.5	1,549,355.43	3,451,342.13	40.829966	-103.869006
3,887.0	1.10	309.77	3,884.0	-84.7	-74.5	1,549,355.92	3,451,340.13	40.829968	-103.869013
3,977.0	1.59	17.74	3,974.0	-82.9	-74.8	1,549,357.66	3,451,339.81	40.829972	-103.869014
4,069.0	1.13	317.25	4,066.0	-81.1	-75.0	1,549,359.53	3,451,339.55	40.829978	-103.869015
4,160.0	1.59	313.17	4,156.9	-79.5	-76.5	1,549,361.03	3,451,337.99	40.829982	-103.869021
4,252.0	2.10	317.04	4,248.9	-77.4	-78.6	1,549,363.10	3,451,335.88	40.829988	-103.869028
4,343.0	3.06	251.57	4,339.8	-77.0	-82.0	1,549,363.49	3,451,332.43	40.829989	-103.869041
4,434.0	2.31	232.20	4,430.7	-78.9	-85.8	1,549,361.52	3,451,328.71	40.829984	-103.869054
4,526.0	2.08	241.17	4,522.7	-80.8	-88.7	1,549,359.53	3,451,325.82	40.829978	-103.869065
4,618.0	2.55	242.37	4,614.6	-82.6	-92.0	1,549,357.72	3,451,322.57	40.829973	-103.869077
4,710.0	2.65	261.70	4,706.5	-83.8	-95.9	1,549,356.39	3,451,318.68	40.829970	-103.869091
4,801.0	1.61	138.89	4,797.5	-85.1	-97.2	1,549,355.10	3,451,317.46	40.829967	-103.869095
4,892.0	1.54	126.19	4,888.4	-86.8	-95.3	1,549,353.45	3,451,319.32	40.829962	-103.869089
4,983.0	1.84	121.57	4,979.4	-88.3	-93.1	1,549,352.00	3,451,321.58	40.829958	-103.869081
5,074.0	1.52	130.06	5,070.3	-89.8	-90.9	1,549,350.50	3,451,323.78	40.829954	-103.869073
5,166.0	1.76	10.14	5,162.3	-89.2	-89.8	1,549,351.13	3,451,324.95	40.829955	-103.869069
5,258.0	5.65	7.57	5,254.1	-83.3	-88.9	1,549,357.02	3,451,325.68	40.829971	-103.869066
5,348.0	15.79	14.75	5,342.4	-67.0	-85.2	1,549,373.36	3,451,329.10	40.830016	-103.869052
5,440.0	25.13	16.05	5,428.5	-36.1	-76.6	1,549,404.46	3,451,337.13	40.830101	-103.869021
5,532.0	30.57	10.67	5,509.9	5.7	-66.8	1,549,446.44	3,451,346.10	40.830216	-103.868986
5,623.0	36.48	2.64	5,585.7	55.6	-61.3	1,549,496.36	3,451,350.72	40.830353	-103.868966
5,654.0	39.63	1.92	5,610.1	74.6	-60.6	1,549,515.47	3,451,351.13	40.830405	-103.868963
5,684.0	40.91	1.75	5,633.0	94.0	-59.9	1,549,534.86	3,451,351.39	40.830458	-103.868961
5,714.0	41.92	2.20	5,655.5	113.9	-59.2	1,549,554.70	3,451,351.71	40.830513	-103.868958
5,746.0	44.72	1.34	5,678.8	135.8	-58.6	1,549,576.65	3,451,351.98	40.830573	-103.868956
5,778.0	47.72	358.62	5,700.9	158.9	-58.6	1,549,599.74	3,451,351.53	40.830636	-103.868956
5,809.0	52.04	356.32	5,720.9	182.6	-59.7	1,549,623.39	3,451,350.04	40.830701	-103.868960

# Cathedral Energy Services

## Survey Report - Geographic

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,841.0	56.42	356.22	5,739.6	208.5	-61.3	1,549,649.26	3,451,347.87	40.830772	-103.868966
5,873.0	59.54	356.86	5,756.6	235.6	-63.0	1,549,676.30	3,451,345.74	40.830847	-103.868972
5,904.0	59.56	356.43	5,772.3	262.2	-64.5	1,549,702.95	3,451,343.69	40.830920	-103.868977
5,936.0	60.98	356.24	5,788.2	290.0	-66.3	1,549,730.64	3,451,341.40	40.830996	-103.868984
5,967.0	62.85	356.59	5,802.7	317.3	-68.0	1,549,757.90	3,451,339.19	40.831071	-103.868990
5,999.0	67.43	357.68	5,816.2	346.2	-69.5	1,549,786.86	3,451,337.21	40.831150	-103.868995
6,031.0	69.73	358.60	5,827.9	376.0	-70.4	1,549,816.61	3,451,335.70	40.831232	-103.868999
6,062.0	72.99	359.07	5,837.8	405.4	-71.0	1,549,845.95	3,451,334.56	40.831313	-103.869001
6,094.0	75.58	359.47	5,846.5	436.2	-71.4	1,549,876.74	3,451,333.60	40.831397	-103.869002
6,125.0	78.16	359.39	5,853.5	466.4	-71.7	1,549,906.92	3,451,332.75	40.831480	-103.869003
6,152.0	80.52	359.21	5,858.5	492.9	-72.1	1,549,933.44	3,451,331.93	40.831553	-103.869005
6,292.0	87.89	0.37	5,872.6	632.1	-72.6	1,550,072.60	3,451,328.87	40.831935	-103.869006
6,387.0	90.88	0.74	5,873.6	727.1	-71.6	1,550,167.58	3,451,328.05	40.832196	-103.869003
6,482.0	91.62	0.63	5,871.6	822.0	-70.5	1,550,262.55	3,451,327.43	40.832456	-103.868999
6,576.0	91.23	0.48	5,869.2	916.0	-69.6	1,550,356.52	3,451,326.62	40.832714	-103.868996
6,671.0	89.78	359.68	5,868.4	1,011.0	-69.5	1,550,451.50	3,451,325.00	40.832975	-103.868995
6,766.0	90.15	359.40	5,868.4	1,106.0	-70.2	1,550,546.47	3,451,322.49	40.833236	-103.868998
6,861.0	88.38	357.66	5,869.7	1,200.9	-72.7	1,550,641.36	3,451,318.31	40.833496	-103.869007
6,956.0	88.56	357.10	5,872.2	1,295.8	-77.0	1,550,736.13	3,451,312.22	40.833757	-103.869023
7,051.0	87.92	356.47	5,875.1	1,390.6	-82.3	1,550,830.82	3,451,305.16	40.834017	-103.869042
7,146.0	89.10	356.62	5,877.6	1,485.4	-88.0	1,550,925.49	3,451,297.69	40.834277	-103.869062
7,241.0	90.25	359.63	5,878.1	1,580.3	-91.2	1,551,020.36	3,451,292.84	40.834538	-103.869074
7,336.0	90.45	358.58	5,877.6	1,675.3	-92.6	1,551,115.30	3,451,289.61	40.834798	-103.869079
7,430.0	90.64	358.81	5,876.7	1,769.3	-94.8	1,551,209.21	3,451,285.74	40.835056	-103.869087
7,525.0	89.69	359.44	5,876.4	1,864.3	-96.2	1,551,304.16	3,451,282.54	40.835317	-103.869092
7,620.0	89.57	359.03	5,877.0	1,959.3	-97.5	1,551,399.11	3,451,279.52	40.835578	-103.869097
7,715.0	90.01	359.65	5,877.3	2,054.3	-98.6	1,551,494.06	3,451,276.68	40.835838	-103.869101
7,810.0	90.93	359.48	5,876.6	2,149.3	-99.3	1,551,589.03	3,451,274.21	40.836099	-103.869103
7,905.0	88.55	0.77	5,877.0	2,244.3	-99.1	1,551,684.01	3,451,272.67	40.836360	-103.869102
8,000.0	88.77	1.20	5,879.2	2,339.2	-97.5	1,551,778.98	3,451,272.56	40.836620	-103.869097
8,094.0	89.04	0.76	5,881.0	2,433.2	-95.9	1,551,872.96	3,451,272.44	40.836878	-103.869091
8,189.0	88.19	0.01	5,883.3	2,528.2	-95.2	1,551,967.93	3,451,271.33	40.837139	-103.869088
8,284.0	89.24	1.48	5,885.4	2,623.1	-94.0	1,552,062.90	3,451,270.82	40.837400	-103.869084
8,379.0	91.95	3.31	5,884.5	2,718.0	-90.0	1,552,157.85	3,451,273.04	40.837660	-103.869070
8,474.0	90.19	2.63	5,882.7	2,812.9	-85.1	1,552,252.78	3,451,276.21	40.837920	-103.869052
8,569.0	88.77	1.92	5,883.5	2,907.8	-81.3	1,552,347.75	3,451,278.24	40.838181	-103.869038
8,664.0	90.35	1.90	5,884.3	3,002.7	-78.2	1,552,442.73	3,451,279.66	40.838442	-103.869027
8,758.0	89.99	1.79	5,884.0	3,096.7	-75.1	1,552,536.72	3,451,280.96	40.838699	-103.869016
8,853.0	89.27	1.57	5,884.6	3,191.6	-72.4	1,552,631.72	3,451,281.99	40.838960	-103.869006
8,948.0	88.91	1.28	5,886.1	3,286.6	-70.0	1,552,726.70	3,451,282.61	40.839221	-103.868997
9,043.0	92.33	2.62	5,885.1	3,381.5	-66.8	1,552,821.67	3,451,284.09	40.839481	-103.868986
9,137.0	91.90	2.08	5,881.6	3,475.4	-62.9	1,552,915.58	3,451,286.22	40.839739	-103.868972
9,232.0	91.08	0.36	5,879.1	3,570.3	-60.9	1,553,010.54	3,451,286.49	40.839999	-103.868964
9,327.0	91.02	0.05	5,877.4	3,665.3	-60.5	1,553,105.52	3,451,285.08	40.840260	-103.868963
9,422.0	88.91	359.76	5,877.5	3,760.3	-60.7	1,553,200.49	3,451,283.18	40.840521	-103.868964
9,517.0	87.80	359.06	5,880.2	3,855.2	-61.7	1,553,295.41	3,451,280.46	40.840781	-103.868967
9,612.0	87.44	358.19	5,884.1	3,950.1	-64.0	1,553,390.24	3,451,276.43	40.841042	-103.868975
9,705.0	89.27	358.50	5,886.8	4,043.1	-66.6	1,553,483.10	3,451,272.04	40.841297	-103.868985
9,799.0	89.12	358.10	5,888.1	4,137.0	-69.4	1,553,576.98	3,451,267.52	40.841555	-103.868995
9,891.0	88.58	356.98	5,890.0	4,228.9	-73.4	1,553,668.78	3,451,261.89	40.841807	-103.869009
9,982.0	88.12	0.27	5,892.6	4,319.8	-75.6	1,553,759.65	3,451,258.03	40.842057	-103.869017
10,073.0	88.90	2.09	5,895.0	4,410.8	-73.7	1,553,850.62	3,451,258.23	40.842306	-103.869011
10,164.0	91.10	1.23	5,895.0	4,501.7	-71.1	1,553,941.61	3,451,259.19	40.842556	-103.869001
10,257.0	90.72	0.57	5,893.5	4,594.7	-69.6	1,554,034.59	3,451,258.94	40.842811	-103.868996
10,349.0	90.01	0.45	5,892.9	4,686.7	-68.8	1,554,126.59	3,451,258.07	40.843063	-103.868993

# Cathedral Energy Services

## Survey Report - Geographic

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,440.0	88.74	359.64	5,893.9	4,777.7	-68.7	1,554,217.54	3,451,256.47	40.843313	-103.868993
10,531.0	90.42	359.20	5,894.6	4,868.7	-69.6	1,554,308.50	3,451,253.87	40.843563	-103.868996
10,623.0	90.52	359.28	5,893.8	4,960.6	-70.8	1,554,400.45	3,451,250.96	40.843815	-103.869000
10,714.0	91.16	359.05	5,892.5	5,051.6	-72.2	1,554,491.39	3,451,247.96	40.844065	-103.869005
10,806.0	91.70	358.71	5,890.2	5,143.6	-74.0	1,554,583.30	3,451,244.47	40.844317	-103.869012
10,897.0	92.26	358.04	5,887.0	5,234.5	-76.5	1,554,674.14	3,451,240.22	40.844567	-103.869021
10,988.0	92.36	359.10	5,883.4	5,325.4	-78.8	1,554,764.98	3,451,236.28	40.844816	-103.869029
11,079.0	92.77	357.66	5,879.3	5,416.3	-81.4	1,554,855.79	3,451,232.04	40.845066	-103.869038
11,170.0	91.98	0.05	5,875.5	5,507.1	-83.2	1,554,946.63	3,451,228.55	40.845315	-103.869045
11,262.0	89.35	2.13	5,874.4	5,599.1	-81.5	1,555,038.61	3,451,228.61	40.845568	-103.869039
11,353.0	89.77	2.21	5,875.1	5,690.0	-78.0	1,555,129.59	3,451,230.38	40.845817	-103.869026
11,444.0	90.46	1.29	5,875.0	5,781.0	-75.2	1,555,220.59	3,451,231.49	40.846067	-103.869016
11,535.0	89.11	1.71	5,875.3	5,872.0	-72.8	1,555,311.58	3,451,232.20	40.846317	-103.869008
11,627.0	88.65	0.36	5,877.1	5,963.9	-71.2	1,555,403.56	3,451,232.17	40.846569	-103.869002
11,718.0	90.47	0.02	5,877.8	6,054.9	-70.9	1,555,494.54	3,451,230.79	40.846819	-103.869000
11,809.0	91.55	359.88	5,876.2	6,145.9	-71.0	1,555,585.51	3,451,229.04	40.847069	-103.869001
11,900.0	91.28	1.43	5,874.0	6,236.9	-69.9	1,555,676.48	3,451,228.41	40.847318	-103.868997
11,991.0	89.32	0.46	5,873.5	6,327.8	-68.4	1,555,767.47	3,451,228.24	40.847568	-103.868992
12,082.0	89.07	0.10	5,874.8	6,418.8	-68.0	1,555,858.45	3,451,227.01	40.847818	-103.868990
12,173.0	88.29	358.25	5,876.9	6,509.8	-69.3	1,555,949.37	3,451,224.02	40.848067	-103.868995
12,264.0	87.01	357.63	5,880.6	6,600.7	-72.6	1,556,040.16	3,451,219.08	40.848317	-103.869006
12,355.0	87.99	359.92	5,884.6	6,691.5	-74.5	1,556,131.00	3,451,215.47	40.848566	-103.869014
12,446.0	89.49	359.15	5,886.6	6,782.5	-75.2	1,556,221.94	3,451,213.06	40.848816	-103.869016
12,538.0	88.85	358.19	5,887.9	6,874.5	-77.4	1,556,313.85	3,451,209.23	40.849068	-103.869024
12,629.0	90.93	359.34	5,888.1	6,965.5	-79.3	1,556,404.77	3,451,205.60	40.849318	-103.869031
12,720.0	89.51	358.75	5,887.7	7,056.4	-80.8	1,556,495.71	3,451,202.41	40.849568	-103.869036
12,812.0	88.02	358.82	5,889.7	7,148.4	-82.8	1,556,587.61	3,451,198.77	40.849820	-103.869044
12,903.0	89.06	359.47	5,892.0	7,239.4	-84.2	1,556,678.53	3,451,195.74	40.850070	-103.869048
12,995.0	93.06	0.99	5,890.3	7,331.3	-83.8	1,556,770.48	3,451,194.41	40.850322	-103.869047
13,086.0	94.43	0.71	5,884.4	7,422.1	-82.4	1,556,861.29	3,451,194.09	40.850571	-103.869042
13,178.0	92.11	1.27	5,879.1	7,513.9	-80.9	1,556,953.13	3,451,193.99	40.850823	-103.869037
13,270.0	90.61	2.09	5,876.9	7,605.9	-78.2	1,557,045.09	3,451,194.99	40.851076	-103.869027
13,361.0	90.22	1.74	5,876.3	7,696.8	-75.1	1,557,136.08	3,451,196.36	40.851325	-103.869016
13,452.0	90.54	1.04	5,875.7	7,787.8	-72.9	1,557,227.08	3,451,196.89	40.851575	-103.869008
13,543.0	89.00	1.69	5,876.0	7,878.8	-70.7	1,557,318.07	3,451,197.39	40.851825	-103.869000
13,635.0	89.79	1.45	5,877.0	7,970.7	-68.2	1,557,410.06	3,451,198.22	40.852077	-103.868991
13,726.0	88.14	0.96	5,878.7	8,061.7	-66.3	1,557,501.04	3,451,198.46	40.852327	-103.868984
13,817.0	88.63	0.11	5,881.2	8,152.6	-65.5	1,557,592.00	3,451,197.63	40.852576	-103.868981
13,942.0	88.91	359.63	5,883.9	8,277.6	-65.7	1,557,716.97	3,451,195.05	40.852919	-103.868982
Last CES Survey @ 13,942' MD									
13,997.0	88.91	359.63	5,884.9	8,332.6	-66.1	1,557,771.92	3,451,193.68	40.853070	-103.868983
PTB @ 13,997' MD - TD - 2612' FSL, 2114' FEL									

# Cathedral Energy Services

## Survey Report - Geographic

<b>Company:</b>	Whiting Petroleum Corporation	<b>Local Co-ordinate Reference:</b>	Well Razor #21B-0910B
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	KB=17' @ 4854.3usft
<b>Site:</b>	S21-T10N-R58W	<b>MD Reference:</b>	KB=17' @ 4854.3usft
<b>Well:</b>	Razor #21B-0910B	<b>North Reference:</b>	True
<b>Wellbore:</b>	HZ	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	FINAL	<b>Database:</b>	USA EDM 5000 Multi Users DB

### Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
21B-0910B VP P4 - actual wellpath misses target center by 11.1usft at 5045.0usft MD (5041.4 TVD, -89.3 N, -91.6 E) - Point	0.00	1.05	5,041.1	-100.0	-88.5	1,549,340.34	3,451,326.37	40.829926	-103.869064
21B-0910B BHL P4 - actual wellpath misses target center by 31.6usft at 13941.5usft MD (5883.9 TVD, 8277.1 N, -65.7 E) - Point	0.00	1.05	5,862.0	8,277.5	-88.5	1,557,716.45	3,451,172.27	40.852919	-103.869064

### Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,210.0	5,866.5	7" - 224' FSL, 2195' FEL	0	0

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
13,942.0	5,883.9	8,277.6	-65.7	Last CES Survey @ 13,942' MD
13,997.0	5,884.9	8,332.6	-66.1	PTB @ 13,997' MD
13,997.0	5,884.9	8,332.6	-66.1	TD - 2612' FSL, 2114' FEL

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