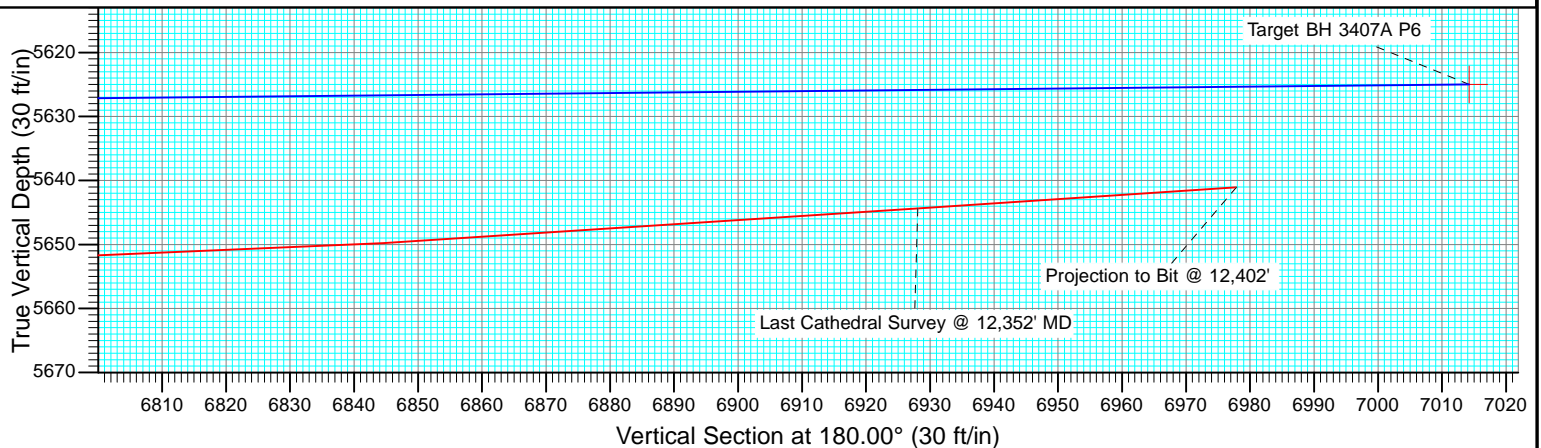
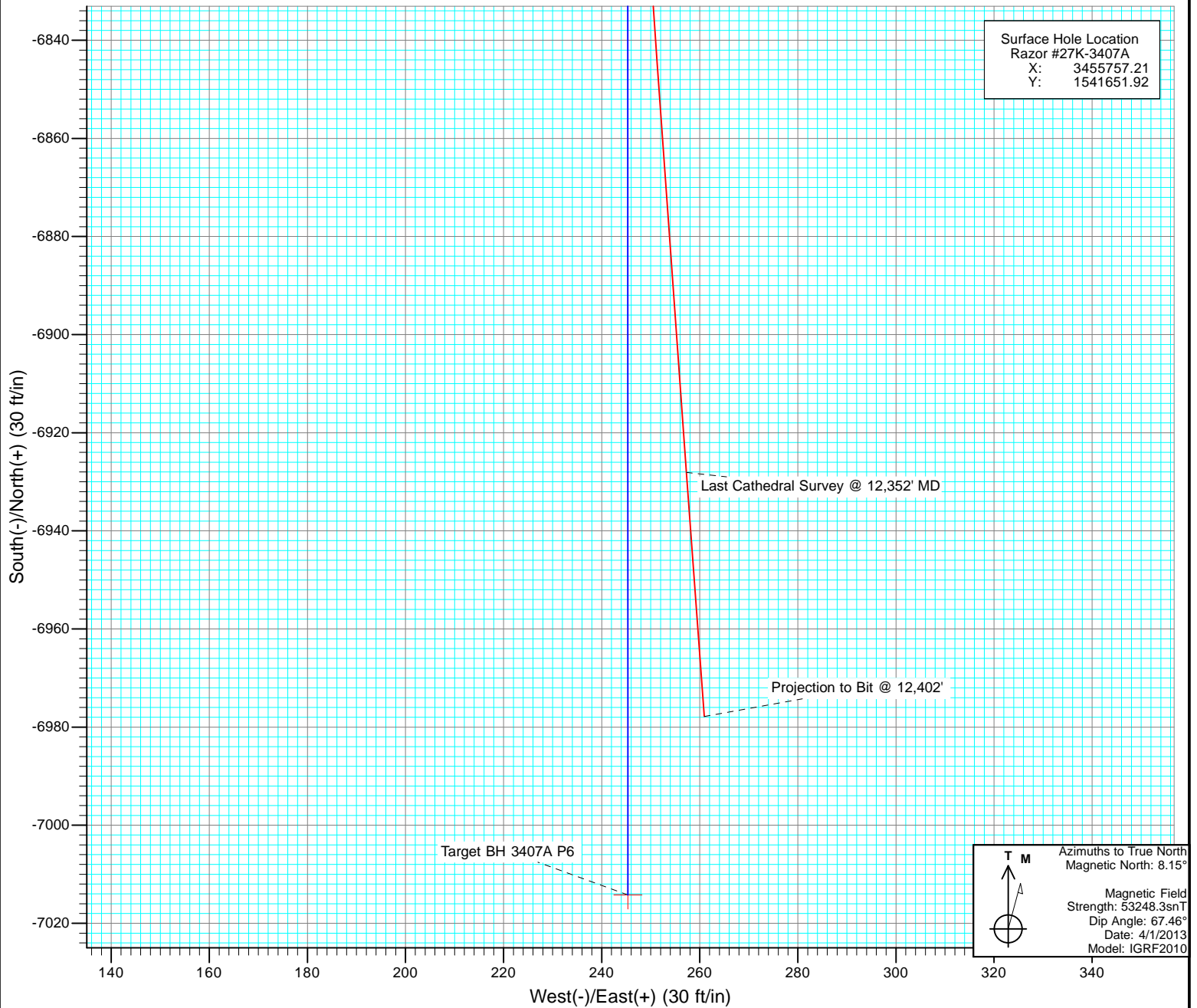




Project: Weld County, CO
Site: S27-T10N-R58W
Well: Razor #27K-3407A
Wellbore: HZ
Design: FINAL



Cathedral Energy Services

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well Razor #27K-3407A
Project:	Weld County, CO	TVD Reference:	16.8' RKB @ 4767.8ft
Site:	S27-T10N-R58W	MD Reference:	16.8' RKB @ 4767.8ft
Well:	Razor #27K-3407A	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

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

Site		S27-T10N-R58W			
Site Position:		Northing:	1,541,650.73 ft	Latitude:	40.808594
From:	Lat/Long	Easting:	3,455,691.89 ft	Longitude:	-103.853833
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	1.06 °

Well	Razor #27K-3407A					
Well Position	+N/-S	0.0 ft	Northing:	1,541,651.92 ft	Latitude:	40.808594
	+E/-W	0.0 ft	Easting:	3,455,757.21 ft	Longitude:	-103.853597
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,751.0 ft

Wellbore	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	4/1/2013	8.15	67.46	53,248

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	180.00	

Survey Program	Date	9/19/2013			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
443.0	12,402.0	Survey #1 (HZ)	ISCWSA MWD	MWD - ISCWSA	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
443.0	0.30	329.00	443.0	1.0	-0.6	-1.0	0.07	0.07		
809.0	2.80	12.10	808.8	10.6	0.8	-10.6	0.71	0.68		
900.0	2.50	12.10	899.7	14.7	1.7	-14.7	0.33	-0.33		
991.0	1.60	1.10	990.7	17.9	2.1	-17.9	1.07	-0.99		
1,082.0	1.40	345.20	1,081.7	20.2	1.8	-20.2	0.51	-0.22		
1,173.0	1.00	353.20	1,172.6	22.1	1.5	-22.1	0.48	-0.44		
1,264.0	0.10	357.90	1,263.6	23.0	1.4	-23.0	0.99	-0.99		
1,356.0	1.30	190.90	1,355.6	22.0	1.2	-22.0	1.52	1.30		
1,447.0	2.60	197.80	1,446.6	19.0	0.3	-19.0	1.45	1.43		
1,538.0	2.90	205.90	1,537.5	15.0	-1.3	-15.0	0.54	0.33		
1,667.0	3.50	208.80	1,666.3	8.6	-4.6	-8.6	0.48	0.47		
1,759.0	1.50	242.30	1,758.2	5.6	-7.0	-5.6	2.60	-2.17		

Cathedral Energy Services

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well Razor #27K-3407A
Project:	Weld County, CO	TVD Reference:	16.8' RKB @ 4767.8ft
Site:	S27-T10N-R58W	MD Reference:	16.8' RKB @ 4767.8ft
Well:	Razor #27K-3407A	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
1,850.0	0.50	344.30	1,849.2	5.4	-8.2	-5.4	1.84	-1.10	
1,941.0	0.40	270.20	1,940.2	5.8	-8.6	-5.8	0.60	-0.11	
2,032.0	1.30	62.10	2,031.2	6.3	-8.0	-6.3	1.83	0.99	
2,123.0	1.10	33.40	2,122.1	7.5	-6.6	-7.5	0.69	-0.22	
2,214.0	0.80	72.50	2,213.1	8.4	-5.5	-8.4	0.76	-0.33	
2,306.0	1.10	97.10	2,305.1	8.5	-4.1	-8.5	0.54	0.33	
2,396.0	1.90	93.70	2,395.1	8.3	-1.7	-8.3	0.89	0.89	
2,488.0	1.10	97.10	2,487.0	8.1	0.7	-8.1	0.87	-0.87	
2,579.0	1.30	92.20	2,578.0	7.9	2.6	-7.9	0.25	0.22	
2,670.0	1.20	98.80	2,669.0	7.8	4.6	-7.8	0.19	-0.11	
2,762.0	1.80	50.80	2,761.0	8.5	6.6	-8.5	1.45	0.65	
2,853.0	1.00	119.80	2,852.0	9.0	8.4	-9.0	1.89	-0.88	
2,945.0	0.80	340.00	2,943.9	9.2	8.9	-9.2	1.84	-0.22	
3,036.0	0.80	301.40	3,034.9	10.2	8.1	-10.2	0.58	0.00	
3,128.0	0.70	6.10	3,126.9	11.1	7.7	-11.1	0.88	-0.11	
3,220.0	1.70	357.10	3,218.9	13.0	7.6	-13.0	1.10	1.09	
3,312.0	0.90	82.60	3,310.9	14.4	8.3	-14.4	2.02	-0.87	
3,403.0	1.40	202.20	3,401.9	13.5	8.6	-13.5	2.20	0.55	
3,495.0	1.10	215.70	3,493.9	11.7	7.6	-11.7	0.45	-0.33	
3,587.0	1.20	205.80	3,585.8	10.2	6.7	-10.2	0.24	0.11	
3,679.0	1.20	195.20	3,677.8	8.4	6.0	-8.4	0.24	0.00	
3,771.0	1.00	162.00	3,769.8	6.7	6.0	-6.7	0.71	-0.22	
3,863.0	1.00	149.30	3,861.8	5.2	6.7	-5.2	0.24	0.00	
3,954.0	0.70	154.80	3,952.8	4.0	7.3	-4.0	0.34	-0.33	
4,046.0	0.50	140.40	4,044.8	3.2	7.8	-3.2	0.27	-0.22	
4,138.0	0.90	156.40	4,136.8	2.2	8.4	-2.2	0.48	0.43	
4,228.0	0.90	160.90	4,226.8	0.9	8.9	-0.9	0.08	0.00	
4,321.0	1.10	156.90	4,319.7	-0.6	9.5	0.6	0.23	0.22	
4,412.0	0.70	145.50	4,410.7	-1.8	10.1	1.8	0.48	-0.44	
4,503.0	0.01	139.50	4,501.7	-2.3	10.5	2.3	0.76	-0.76	
4,595.0	0.20	204.80	4,593.7	-2.5	10.4	2.5	0.21	0.21	
4,686.0	0.50	206.30	4,684.7	-3.0	10.1	3.0	0.33	0.33	
4,778.0	0.60	205.80	4,776.7	-3.8	9.8	3.8	0.11	0.11	
4,874.0	0.80	169.20	4,872.7	-4.9	9.7	4.9	0.50	0.21	
4,961.0	0.80	170.70	4,959.7	-6.1	9.9	6.1	0.02	0.00	
5,053.0	0.30	164.30	5,051.7	-6.9	10.0	6.9	0.55	-0.54	
5,083.0	2.30	168.60	5,081.7	-7.6	10.2	7.6	6.67	6.67	
5,114.0	5.40	169.60	5,112.6	-9.6	10.6	9.6	10.00	10.00	
5,145.0	8.20	171.50	5,143.4	-13.3	11.2	13.3	9.06	9.03	
5,175.0	9.50	173.90	5,173.1	-17.8	11.7	17.8	4.50	4.33	
5,205.0	10.90	174.00	5,202.6	-23.1	12.3	23.1	4.67	4.67	
5,236.0	12.30	172.80	5,232.9	-29.3	13.0	29.3	4.58	4.52	
5,266.0	15.20	172.30	5,262.1	-36.4	14.0	36.4	9.67	9.67	
5,297.0	18.50	173.00	5,291.7	-45.3	15.1	45.3	10.67	10.65	
5,327.0	21.20	174.70	5,320.0	-55.4	16.2	55.4	9.20	9.00	
5,358.0	24.70	175.00	5,348.5	-67.5	17.3	67.5	11.30	11.29	
5,388.0	28.50	173.00	5,375.3	-80.8	18.7	80.8	13.01	12.67	
5,419.0	31.90	171.30	5,402.1	-96.3	20.8	96.3	11.31	10.97	
5,449.0	36.40	169.70	5,426.9	-112.9	23.6	112.9	15.29	15.00	
5,480.0	40.70	168.60	5,451.2	-131.8	27.3	131.8	14.05	13.87	
5,510.0	44.70	167.80	5,473.2	-151.7	31.4	151.7	13.46	13.33	
5,540.0	49.60	166.90	5,493.6	-173.2	36.2	173.2	16.48	16.33	
5,571.0	54.20	167.10	5,512.7	-197.0	41.7	197.0	14.85	14.84	

Cathedral Energy Services

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well Razor #27K-3407A
Project:	Weld County, CO	TVD Reference:	16.8' RKB @ 4767.8ft
Site:	S27-T10N-R58W	MD Reference:	16.8' RKB @ 4767.8ft
Well:	Razor #27K-3407A	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
5,602.0	56.80	168.60	5,530.3	-221.9	47.1	221.9	9.29	8.39	
5,632.0	59.30	169.20	5,546.2	-246.9	52.0	246.9	8.50	8.33	
5,663.0	62.50	169.30	5,561.2	-273.5	57.0	273.5	10.33	10.32	
5,693.0	66.20	169.30	5,574.2	-300.1	62.1	300.1	12.33	12.33	
5,723.0	70.00	169.00	5,585.4	-327.4	67.3	327.4	12.70	12.67	
5,754.0	72.50	168.70	5,595.4	-356.2	73.0	356.2	8.12	8.06	
5,784.0	72.80	168.50	5,604.3	-384.3	78.6	384.3	1.19	1.00	
5,815.0	74.90	168.50	5,612.9	-413.5	84.6	413.5	6.77	6.77	
5,845.0	77.90	168.70	5,620.0	-442.0	90.3	442.0	10.02	10.00	
5,875.0	79.20	168.00	5,626.0	-470.8	96.3	470.8	4.90	4.33	
5,906.0	80.60	167.30	5,631.4	-500.6	102.8	500.6	5.03	4.52	
5,936.0	82.80	166.70	5,635.7	-529.6	109.5	529.6	7.60	7.33	
5,967.0	85.30	166.20	5,638.9	-559.5	116.7	559.5	8.22	8.06	
5,997.0	87.40	165.70	5,640.8	-588.6	124.0	588.6	7.19	7.00	
6,028.0	89.20	166.10	5,641.8	-618.6	131.5	618.6	5.95	5.81	
6,058.0	90.60	166.90	5,641.8	-647.8	138.5	647.8	5.38	4.67	
6,090.0	91.60	167.20	5,641.2	-679.0	145.7	679.0	3.26	3.12	
6,121.0	92.20	166.90	5,640.2	-709.2	152.6	709.2	2.16	1.94	
6,153.0	92.40	166.80	5,638.9	-740.3	159.9	740.3	0.70	0.62	
6,184.0	91.80	166.40	5,637.8	-770.4	167.1	770.4	2.33	-1.94	
6,212.0	91.70	166.70	5,636.9	-797.7	173.6	797.7	1.13	-0.36	
6,301.0	91.50	167.20	5,634.4	-884.3	193.7	884.3	0.60	-0.22	
6,395.0	90.10	169.80	5,633.1	-976.4	212.4	976.4	3.14	-1.49	
6,490.0	89.30	171.60	5,633.6	-1,070.2	227.8	1,070.2	2.07	-0.84	
6,585.0	88.30	175.00	5,635.6	-1,164.5	238.9	1,164.5	3.73	-1.05	
6,680.0	88.50	177.10	5,638.2	-1,259.2	245.4	1,259.2	2.22	0.21	
6,775.0	89.70	179.60	5,639.7	-1,354.2	248.1	1,354.2	2.92	1.26	
6,870.0	91.20	180.00	5,639.0	-1,449.2	248.5	1,449.2	1.63	1.58	
6,964.0	91.90	180.20	5,636.4	-1,543.1	248.3	1,543.1	0.77	0.74	
7,059.0	92.30	179.10	5,633.0	-1,638.1	248.9	1,638.1	1.23	0.42	
7,154.0	91.60	179.20	5,629.7	-1,733.0	250.3	1,733.0	0.74	-0.74	
7,249.0	90.70	180.20	5,627.8	-1,828.0	250.8	1,828.0	1.42	-0.95	
7,344.0	89.50	179.50	5,627.7	-1,923.0	251.0	1,923.0	1.46	-1.26	
7,438.0	90.30	179.90	5,627.8	-2,017.0	251.5	2,017.0	0.95	0.85	
7,533.0	89.50	179.20	5,628.0	-2,112.0	252.3	2,112.0	1.12	-0.84	
7,625.0	90.30	179.20	5,628.2	-2,203.9	253.6	2,203.9	0.87	0.87	
7,717.0	90.00	181.00	5,627.9	-2,295.9	253.4	2,295.9	1.98	-0.33	
7,808.0	91.20	181.80	5,627.0	-2,386.9	251.2	2,386.9	1.58	1.32	
7,900.0	88.80	181.70	5,627.0	-2,478.9	248.4	2,478.9	2.61	-2.61	
7,991.0	89.20	181.80	5,628.5	-2,569.8	245.6	2,569.8	0.45	0.44	
8,082.0	88.70	180.90	5,630.2	-2,660.8	243.4	2,660.8	1.13	-0.55	
8,174.0	89.30	180.40	5,631.8	-2,752.7	242.4	2,752.7	0.85	0.65	
8,265.0	90.50	181.00	5,632.0	-2,843.7	241.3	2,843.7	1.47	1.32	
8,356.0	89.30	179.50	5,632.1	-2,934.7	240.9	2,934.7	2.11	-1.32	
8,447.0	90.90	179.80	5,632.0	-3,025.7	241.5	3,025.7	1.79	1.76	
8,538.0	89.80	177.70	5,631.4	-3,116.7	243.4	3,116.7	2.61	-1.21	
8,629.0	88.10	177.80	5,633.1	-3,207.6	247.0	3,207.6	1.87	-1.87	
8,721.0	88.40	177.50	5,635.9	-3,299.5	250.8	3,299.5	0.46	0.33	
8,812.0	88.00	178.20	5,638.8	-3,390.4	254.2	3,390.4	0.89	-0.44	
8,903.0	89.80	177.90	5,640.5	-3,481.3	257.3	3,481.3	2.01	1.98	
8,995.0	90.10	178.00	5,640.6	-3,573.2	260.6	3,573.2	0.34	0.33	
9,086.0	90.70	179.10	5,639.9	-3,664.2	262.9	3,664.2	1.38	0.66	
9,178.0	92.60	182.70	5,637.3	-3,756.1	261.4	3,756.1	4.42	2.07	

Cathedral Energy Services

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well Razor #27K-3407A
Project:	Weld County, CO	TVD Reference:	16.8' RKB @ 4767.8ft
Site:	S27-T10N-R58W	MD Reference:	16.8' RKB @ 4767.8ft
Well:	Razor #27K-3407A	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
9,269.0	92.50	181.30	5,633.2	-3,847.0	258.3	3,847.0	1.54	-0.11	
9,360.0	90.40	181.50	5,630.9	-3,937.9	256.0	3,937.9	2.32	-2.31	
9,452.0	89.10	179.20	5,631.3	-4,029.9	255.5	4,029.9	2.87	-1.41	
9,544.0	90.10	181.50	5,632.0	-4,121.9	254.9	4,121.9	2.73	1.09	
9,635.0	90.30	181.90	5,631.7	-4,212.9	252.2	4,212.9	0.49	0.22	
9,727.0	90.10	180.80	5,631.4	-4,304.8	250.1	4,304.8	1.22	-0.22	
9,819.0	90.50	181.20	5,630.9	-4,396.8	248.4	4,396.8	0.61	0.43	
9,911.0	90.00	179.90	5,630.5	-4,488.8	247.6	4,488.8	1.51	-0.54	
10,003.0	90.50	180.00	5,630.1	-4,580.8	247.6	4,580.8	0.55	0.54	
10,094.0	89.20	180.60	5,630.3	-4,671.8	247.2	4,671.8	1.57	-1.43	
10,186.0	88.60	180.20	5,632.1	-4,763.8	246.5	4,763.8	0.78	-0.65	
10,278.0	88.40	179.90	5,634.5	-4,855.8	246.4	4,855.8	0.39	-0.22	
10,369.0	87.90	179.10	5,637.4	-4,946.7	247.2	4,946.7	1.04	-0.55	
10,461.0	90.90	179.80	5,638.4	-5,038.7	248.1	5,038.7	3.35	3.26	
10,552.0	91.10	178.70	5,636.8	-5,129.7	249.3	5,129.7	1.23	0.22	
10,644.0	91.20	178.90	5,634.9	-5,221.6	251.2	5,221.6	0.24	0.11	
10,736.0	88.90	180.20	5,634.9	-5,313.6	252.0	5,313.6	2.87	-2.50	
10,827.0	88.40	178.80	5,637.0	-5,404.6	252.8	5,404.6	1.63	-0.55	
10,918.0	89.10	180.90	5,639.0	-5,495.6	253.0	5,495.6	2.43	0.77	
11,009.0	90.00	180.60	5,639.7	-5,586.6	251.8	5,586.6	1.04	0.99	
11,101.0	89.90	180.80	5,639.8	-5,678.5	250.7	5,678.5	0.24	-0.11	
11,192.0	89.40	179.20	5,640.3	-5,769.5	250.7	5,769.5	1.84	-0.55	
11,284.0	90.00	181.90	5,640.8	-5,861.5	249.8	5,861.5	3.01	0.65	
11,376.0	88.40	182.00	5,642.1	-5,953.5	246.7	5,953.5	1.74	-1.74	
11,468.0	88.10	182.40	5,644.9	-6,045.3	243.1	6,045.3	0.54	-0.33	
11,559.0	88.10	181.90	5,647.9	-6,136.2	239.7	6,136.2	0.55	0.00	
11,652.0	88.70	182.20	5,650.5	-6,229.1	236.4	6,229.1	0.72	0.65	
11,743.0	89.50	180.60	5,652.0	-6,320.1	234.2	6,320.1	1.97	0.88	
11,834.0	88.80	179.90	5,653.3	-6,411.1	233.8	6,411.1	1.09	-0.77	
11,925.0	89.00	179.20	5,655.1	-6,502.1	234.5	6,502.1	0.80	0.22	
12,017.0	90.70	177.90	5,655.3	-6,594.0	236.8	6,594.0	2.33	1.85	
12,108.0	90.30	176.80	5,654.5	-6,684.9	241.0	6,684.9	1.29	-0.44	
12,177.0	91.20	176.30	5,653.6	-6,753.8	245.2	6,753.8	1.49	1.30	
12,268.0	93.60	176.00	5,649.8	-6,844.5	251.3	6,844.5	2.66	2.64	
12,352.0	93.80	175.80	5,644.4	-6,928.1	257.3	6,928.1	0.34	0.24	Last Cathedral Survey @ 12,352' MD Projection to Bit @ 12,402'
12,402.0	93.80	175.80	5,641.1	-6,977.8	260.9	6,977.8	0.00	0.00	

Cathedral Energy Services

Survey Report

Company:	Whiting Petroleum Corporation	Local Co-ordinate Reference:	Well Razor #27K-3407A
Project:	Weld County, CO	TVD Reference:	16.8' RKB @ 4767.8ft
Site:	S27-T10N-R58W	MD Reference:	16.8' RKB @ 4767.8ft
Well:	Razor #27K-3407A	North Reference:	True
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Target BH 3407A P5 - hit/miss target - Shape - Point	0.00	1.06	5,640.0	-7,014.2	245.3	1,534,643.46	3,456,132.74	40.789342	-103.852711
- actual wellpath misses target center by 39.6ft at 12402.0ft MD (5641.1 TVD, -6977.8 N, 260.9 E)									
Razor 27K-3407A LP - actual wellpath misses target center by 10.0ft at 5906.7ft MD (5631.5 TVD, -501.3 N, 103.0 E) - Point	0.00	0.00	5,640.0	-501.2	97.7	1,541,152.59	3,455,864.18	40.807218	-103.853244
Target BH 3407A - actual wellpath misses target center by 47.5ft at 12402.0ft MD (5641.1 TVD, -6977.8 N, 260.9 E) - Point	0.00	1.06	5,667.3	-7,014.2	245.3	1,534,643.46	3,456,132.74	40.789342	-103.852711
Razor 27K-3407A WP1 - actual wellpath misses target center by 8.3ft at 11417.4ft MD (5643.3 TVD, -5994.8 N, 245.2 E) - Point	0.00	0.00	5,635.0	-5,995.1	245.3	1,535,662.41	3,456,113.77	40.792139	-103.852711
PBHL 3407A - actual wellpath misses target center by 537.4ft at 12402.0ft MD (5641.1 TVD, -6977.8 N, 260.9 E) - Point	0.00	1.06	5,667.3	-7,514.5	250.6	1,534,143.41	3,456,147.29	40.787969	-103.852692
Target BH 3407A P6 - actual wellpath misses target center by 42.7ft at 12402.0ft MD (5641.1 TVD, -6977.8 N, 260.9 E) - Point	0.00	1.06	5,625.0	-7,014.2	245.3	1,534,643.46	3,456,132.74	40.789342	-103.852711

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name		Casing Diameter (in)	Hole Diameter (in)
6,250.0	5,635.8	7" - 1,481' FSL, 2,156' FWL			

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
12,352.0	5,644.4	-6,928.1	257.3	Last Cathedral Survey @ 12,352' MD	
12,402.0	5,641.1	-6,977.8	260.9	Projection to Bit @ 12,402'	

Checked By: _____ Approved By: _____ Date: _____