

PDC Energy Inc. DJ Basin

Well Name: **Thistle Down 31G-332**

Surface Location: Thistle Down 5N64W31H Pad Sec.31-T5N-R64W

North American Datum 1983 , US State Plane 1983, Colorado Northern Zone

Ground Elevation: 4805.0

+N/-S+E/-W Northing Easting Latitude Longitude Slot

0.0 0.0 1372559.143251619.11 40.352560 -104.597170

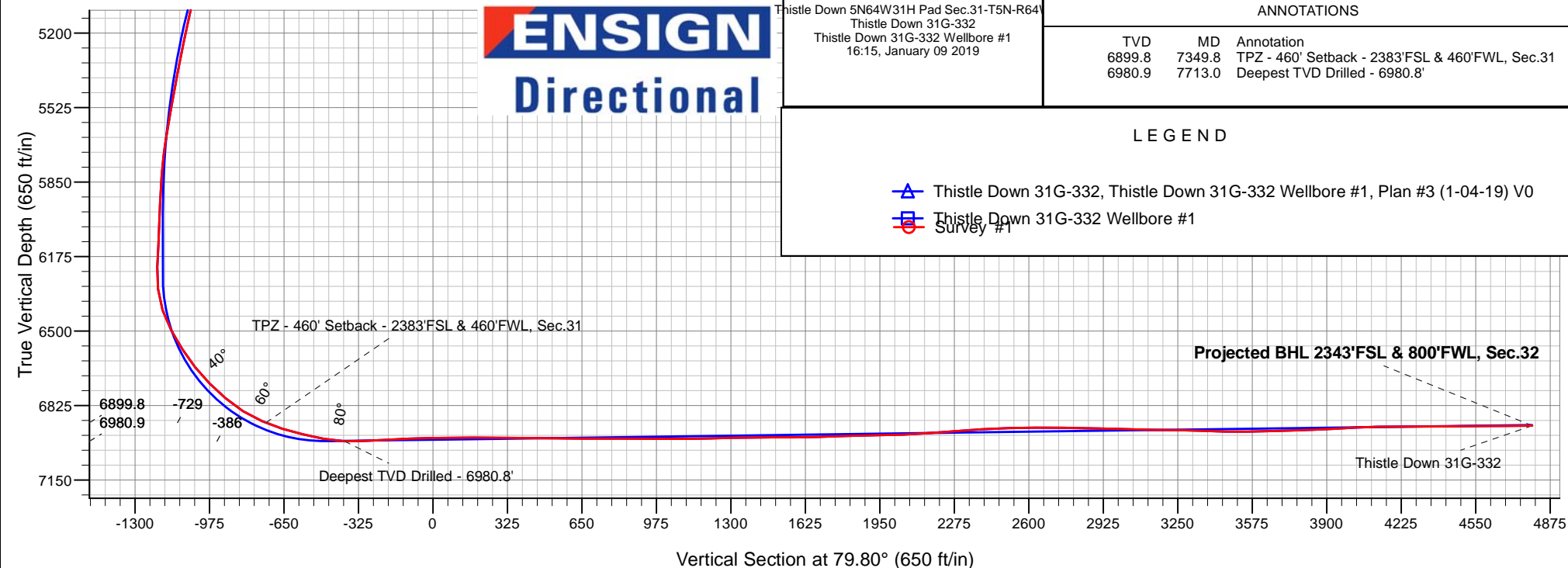
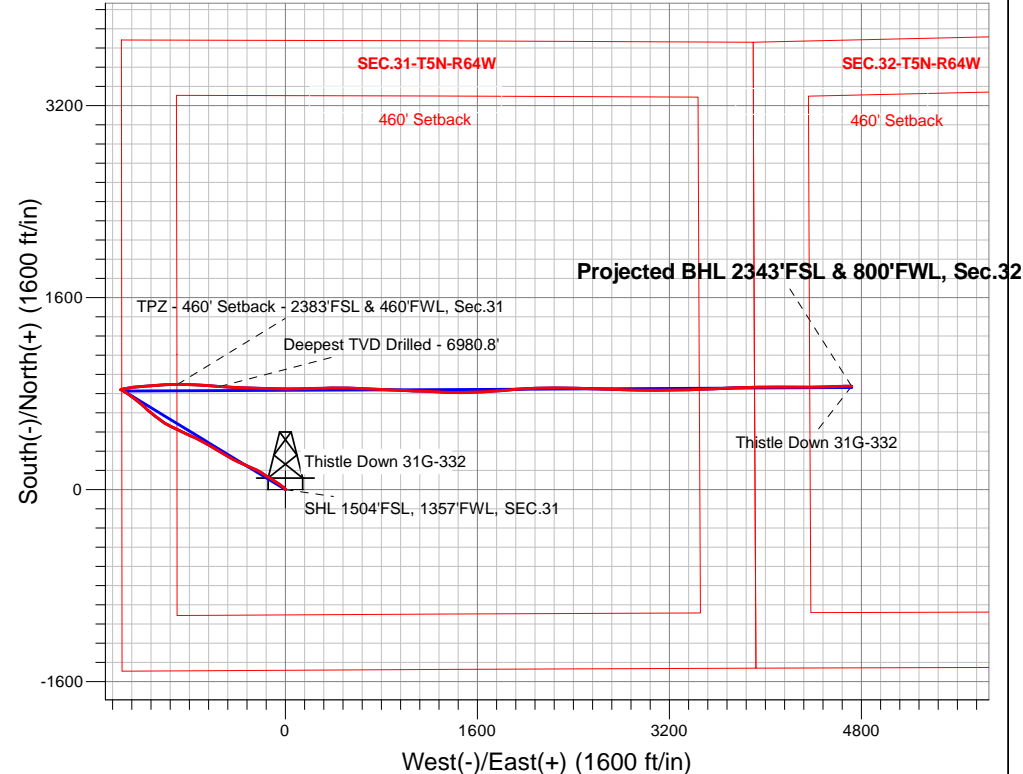
Original Well Elev WELL @ 4828.0ft (Original Well Elev)

FINAL SURVEY

Projected Bottom Hole Location

12,983'MD 6912'TVD 861'N & 4718'E of SHL

90.74 degree Incl @ 89.31 degree AZM





PDC Energy Inc. DJ Basin

SEC.31-T5N-R64W

Thistle Down 5N64W31H Pad Sec.31-T5N-R64W

Thistle Down 31G-332

Thistle Down 31G-332 Wellbore #1

Survey: Survey #1

Standard Survey Report

09 January, 2019

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Thistle Down 31G-332
Project:	SEC.31-T5N-R64W	TVD Reference:	WELL @ 4828.0ft (Original Well Elev)
Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4828.0ft (Original Well Elev)
Well:	Thistle Down 31G-332	North Reference:	True
Wellbore:	Thistle Down 31G-332 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 31G-332 Wellbore #1	Database:	US_EDM

Project	SEC.31-T5N-R64W, Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W				
Site Position:		Northing:	1,372,559.16 usft	Latitude:	40.352560
From:	Lat/Long	Easting:	3,251,619.12 usft	Longitude:	-104.597170
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.58 °

Well	Thistle Down 31G-332					
Well Position	+N/-S	0.0 ft	Northing:	1,372,559.14 usft	Latitude:	40.352560
	+E/-W	0.0 ft	Easting:	3,251,619.12 usft	Longitude:	-104.597170
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,805.0 ft

Wellbore	Thistle Down 31G-332 Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	1/4/2019	8.15	66.83	52,176

Design	Thistle Down 31G-332 Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	79.80	

Survey Program	Date	1/9/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
156.0	12,983.0	Survey #1 (Thistle Down 31G-332 Wellbor	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
156.0	0.30	63.80	156.0	0.2	0.4	0.4	0.19	0.19	0.00	
251.0	0.30	69.00	251.0	0.4	0.8	0.9	0.03	0.00	5.47	
346.0	0.20	68.20	346.0	0.5	1.2	1.3	0.11	-0.11	-0.84	
441.0	0.20	80.30	441.0	0.6	1.5	1.6	0.04	0.00	12.74	
537.0	1.40	315.60	537.0	1.5	0.9	1.1	1.59	1.25	-129.90	
632.0	3.30	307.30	631.9	4.0	-2.1	-1.4	2.03	2.00	-8.74	
728.0	6.60	319.20	727.5	9.8	-7.9	-6.1	3.58	3.44	12.40	
823.0	9.90	308.50	821.5	19.0	-17.9	-14.2	3.82	3.47	-11.26	
918.0	13.40	306.30	914.6	30.6	-33.2	-27.2	3.71	3.68	-2.32	

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Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4828.0ft (Original Well Elev)
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Wellbore:	Thistle Down 31G-332 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 31G-332 Wellbore #1	Database:	US_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,014.0	14.40	306.00	1,007.8	44.3	-51.8	-43.1	1.04	1.04	-0.31
1,109.0	14.70	302.00	1,099.7	57.6	-71.6	-60.2	1.10	0.32	-4.21
1,205.0	14.70	303.90	1,192.6	70.8	-92.0	-78.0	0.50	0.00	1.98
1,300.0	15.00	303.50	1,284.4	84.3	-112.2	-95.5	0.33	0.32	-0.42
1,395.0	15.80	302.30	1,376.0	98.0	-133.4	-114.0	0.91	0.84	-1.26
1,491.0	16.50	301.50	1,468.2	112.1	-156.1	-133.8	0.77	0.73	-0.83
1,586.0	16.90	302.30	1,559.2	126.6	-179.3	-154.0	0.49	0.42	0.84
1,682.0	15.20	301.30	1,651.4	140.6	-201.8	-173.7	1.79	-1.77	-1.04
1,777.0	13.90	299.60	1,743.4	152.7	-222.4	-191.8	1.44	-1.37	-1.79
1,873.0	14.20	296.80	1,836.5	163.7	-242.9	-210.1	0.77	0.31	-2.92
1,968.0	14.60	293.60	1,928.5	173.7	-264.3	-229.3	0.94	0.42	-3.37
2,063.0	14.50	293.20	2,020.5	183.2	-286.2	-249.2	0.15	-0.11	-0.42
2,158.0	14.50	293.00	2,112.5	192.5	-308.1	-269.1	0.05	0.00	-0.21
2,253.0	14.20	293.90	2,204.5	201.9	-329.7	-288.7	0.39	-0.32	0.95
2,348.0	13.50	293.90	2,296.7	211.1	-350.5	-307.5	0.74	-0.74	0.00
2,442.0	11.90	293.90	2,388.4	219.5	-369.4	-324.6	1.70	-1.70	0.00
2,513.0	12.10	294.30	2,457.9	225.5	-382.8	-336.8	0.31	0.28	0.56
2,632.0	14.68	293.20	2,573.6	236.6	-408.1	-359.7	2.18	2.17	-0.92
2,727.0	17.72	297.90	2,664.9	248.1	-431.9	-381.1	3.48	3.20	4.95
2,822.0	20.20	302.45	2,754.7	263.7	-458.5	-404.6	3.04	2.61	4.79
2,917.0	23.96	302.00	2,842.7	282.7	-488.8	-430.9	3.96	3.96	-0.47
3,037.0	24.20	301.06	2,952.3	308.3	-530.5	-467.5	0.38	0.20	-0.78
3,132.0	23.88	300.54	3,039.0	328.1	-563.7	-496.7	0.40	-0.34	-0.55
3,227.0	23.55	299.75	3,126.0	347.3	-596.8	-525.8	0.48	-0.35	-0.83
3,323.0	22.25	298.57	3,214.5	365.5	-629.4	-554.7	1.44	-1.35	-1.23
3,418.0	21.22	298.67	3,302.7	382.4	-660.3	-582.1	1.08	-1.08	0.11
3,514.0	19.40	297.94	3,392.7	398.2	-689.6	-608.2	1.91	-1.90	-0.76
3,609.0	19.01	297.04	3,482.4	412.6	-717.3	-632.9	0.52	-0.41	-0.95
3,705.0	17.69	295.70	3,573.6	426.0	-744.4	-657.1	1.44	-1.38	-1.40
3,800.0	16.74	295.38	3,664.3	438.2	-769.8	-680.0	1.00	-1.00	-0.34
3,895.0	16.86	294.40	3,755.2	449.7	-794.7	-702.4	0.32	0.13	-1.03
3,991.0	20.29	296.05	3,846.2	462.8	-822.3	-727.3	3.61	3.57	1.72
4,087.0	20.07	295.53	3,936.3	477.2	-852.1	-754.1	0.30	-0.23	-0.54
4,182.0	19.47	295.20	4,025.7	491.0	-881.2	-780.2	0.64	-0.63	-0.35
4,278.0	18.59	294.48	4,116.5	504.1	-909.6	-805.9	0.95	-0.92	-0.75
4,373.0	19.45	295.45	4,206.3	517.2	-937.6	-831.2	0.96	0.91	1.02
4,469.0	21.64	298.36	4,296.2	532.5	-967.6	-858.0	2.52	2.28	3.03
4,564.0	20.05	297.27	4,385.0	548.2	-997.5	-884.6	1.72	-1.67	-1.15
4,659.0	21.90	308.72	4,473.7	566.8	-1,025.8	-909.2	4.72	1.95	12.05
4,755.0	21.37	307.64	4,563.0	588.7	-1,053.7	-932.7	0.69	-0.55	-1.13
4,851.0	20.56	307.18	4,652.6	609.5	-1,080.9	-955.9	0.86	-0.84	-0.48
4,946.0	19.46	307.71	4,741.9	629.3	-1,106.7	-977.8	1.17	-1.16	0.56

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Survey									
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5,041.0	19.18	308.50	4,831.5	648.7	-1,131.5	-998.7	0.40	-0.29	0.83
5,137.0	20.53	313.77	4,921.8	670.2	-1,156.0	-1,019.0	2.33	1.41	5.49
5,232.0	19.74	311.95	5,011.0	692.4	-1,179.9	-1,038.6	1.06	-0.83	-1.92
5,328.0	19.11	310.97	5,101.5	713.6	-1,203.9	-1,058.4	0.74	-0.66	-1.02
5,423.0	18.13	309.05	5,191.6	733.1	-1,227.1	-1,077.8	1.22	-1.03	-2.02
5,518.0	16.87	308.22	5,282.2	750.9	-1,249.4	-1,096.6	1.35	-1.33	-0.87
5,614.0	15.76	307.08	5,374.3	767.4	-1,270.7	-1,114.7	1.20	-1.16	-1.19
5,709.0	14.82	306.08	5,465.9	782.3	-1,290.9	-1,131.9	1.03	-0.99	-1.05
5,804.0	13.47	304.67	5,558.1	795.8	-1,309.8	-1,148.1	1.47	-1.42	-1.48
5,900.0	12.43	300.56	5,651.6	807.4	-1,327.9	-1,163.8	1.45	-1.08	-4.28
5,995.0	8.85	303.47	5,745.0	816.6	-1,342.8	-1,176.9	3.81	-3.77	3.06
6,090.0	5.42	304.64	5,839.2	823.2	-1,352.6	-1,185.3	3.61	-3.61	1.23
6,186.0	3.22	295.35	5,934.9	826.9	-1,358.7	-1,190.8	2.40	-2.29	-9.68
6,282.0	3.01	295.99	6,030.8	829.2	-1,363.4	-1,195.0	0.22	-0.22	0.67
6,377.0	2.76	288.99	6,125.7	831.0	-1,367.8	-1,199.0	0.45	-0.26	-7.37
6,472.0	2.70	280.17	6,220.6	832.2	-1,372.2	-1,203.1	0.45	-0.06	-9.28
6,568.0	6.27	75.33	6,316.4	833.9	-1,369.4	-1,200.0	9.16	3.72	161.63
6,663.0	17.83	80.60	6,409.2	837.6	-1,349.9	-1,180.2	12.21	12.17	5.55
6,759.0	28.86	77.19	6,497.2	845.2	-1,312.7	-1,142.2	11.57	11.49	-3.55
6,854.0	32.38	84.81	6,579.0	852.5	-1,265.0	-1,094.0	5.51	3.71	8.02
6,950.0	38.20	87.80	6,657.3	856.0	-1,209.7	-1,038.9	6.32	6.06	3.11
7,046.0	45.44	82.41	6,728.8	861.7	-1,146.0	-975.2	8.41	7.54	-5.61
7,141.0	49.40	84.06	6,793.1	869.9	-1,076.6	-905.4	4.36	4.17	1.74
7,236.0	58.09	90.86	6,849.2	873.0	-1,000.2	-829.7	10.81	9.15	7.16
7,332.0	67.46	88.05	6,893.1	873.9	-914.9	-745.6	10.10	9.76	-2.93
7,427.0	71.69	90.80	6,926.3	874.8	-825.9	-657.9	5.21	4.45	2.89
7,523.0	78.59	93.52	6,950.9	871.3	-733.3	-567.3	7.69	7.19	2.83
7,618.0	78.02	94.33	6,970.1	864.9	-640.5	-477.1	1.03	-0.60	0.85
7,714.0	89.12	94.12	6,980.9	857.9	-545.5	-384.9	11.56	11.56	-0.22
7,808.0	93.13	93.04	6,979.0	852.0	-451.7	-293.6	4.42	4.27	-1.15
7,904.0	92.88	92.45	6,974.0	847.4	-355.9	-200.2	0.67	-0.26	-0.61
8,000.0	91.84	91.67	6,970.0	844.0	-260.1	-106.5	1.35	-1.08	-0.81
8,095.0	91.40	91.78	6,967.4	841.1	-165.2	-13.5	0.48	-0.46	0.12
8,191.0	90.52	90.62	6,965.7	839.1	-69.2	80.5	1.52	-0.92	-1.21
8,287.0	90.10	90.00	6,965.2	838.6	26.8	174.9	0.78	-0.44	-0.65
8,382.0	89.62	89.43	6,965.5	839.0	121.8	268.5	0.78	-0.51	-0.60
8,478.0	89.76	88.68	6,966.0	840.6	217.8	363.3	0.79	0.15	-0.78
8,573.0	89.20	88.42	6,966.8	843.0	312.8	457.1	0.65	-0.59	-0.27
8,669.0	88.98	88.07	6,968.4	846.0	408.7	552.1	0.43	-0.23	-0.36
8,764.0	89.98	91.64	6,969.2	846.2	503.7	645.6	3.90	1.05	3.76
8,860.0	90.10	92.38	6,969.2	842.8	599.6	739.4	0.78	0.13	0.77
8,955.0	89.85	92.89	6,969.2	838.5	694.5	832.1	0.60	-0.26	0.54
9,051.0	89.71	92.46	6,969.6	834.0	790.4	925.6	0.47	-0.15	-0.45

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9,146.0	89.50	92.88	6,970.2	829.6	885.3	1,018.3	0.49	-0.22	0.44
9,242.0	90.50	92.96	6,970.2	824.7	981.2	1,111.8	1.04	1.04	0.08
9,338.0	91.69	92.20	6,968.4	820.4	1,077.1	1,205.4	1.47	1.24	-0.79
9,433.0	91.32	91.87	6,965.9	817.0	1,172.0	1,298.2	0.52	-0.39	-0.35
9,528.0	90.45	92.45	6,964.4	813.4	1,266.9	1,390.9	1.10	-0.92	0.61
9,624.0	89.87	92.02	6,964.2	809.7	1,362.8	1,484.7	0.75	-0.60	-0.45
9,720.0	90.41	89.80	6,963.9	808.1	1,458.8	1,578.9	2.38	0.56	-2.31
9,816.0	92.15	87.56	6,961.8	810.4	1,554.7	1,673.7	2.95	1.81	-2.33
9,910.0	91.73	86.94	6,958.6	814.9	1,648.6	1,766.8	0.80	-0.45	-0.66
10,005.0	91.40	86.52	6,956.0	820.3	1,743.4	1,861.1	0.56	-0.35	-0.44
10,101.0	91.15	85.41	6,953.9	827.0	1,839.1	1,956.5	1.18	-0.26	-1.16
10,196.0	92.04	86.26	6,951.2	833.9	1,933.8	2,051.0	1.30	0.94	0.89
10,292.0	93.87	87.08	6,946.3	839.5	2,029.5	2,146.2	2.09	1.91	0.85
10,388.0	94.10	86.70	6,939.6	844.7	2,125.2	2,241.2	0.46	0.24	-0.40
10,484.0	94.51	89.52	6,932.4	847.8	2,220.8	2,335.9	2.96	0.43	2.94
10,579.0	93.14	90.81	6,926.1	847.6	2,315.6	2,429.1	1.98	-1.44	1.36
10,675.0	91.09	91.84	6,922.5	845.4	2,411.5	2,523.1	2.39	-2.14	1.07
10,770.0	90.29	92.53	6,921.4	841.7	2,506.4	2,615.9	1.11	-0.84	0.73
10,866.0	88.91	92.44	6,922.0	837.6	2,602.3	2,709.6	1.44	-1.44	-0.09
10,961.0	89.01	91.73	6,923.8	834.1	2,697.3	2,802.4	0.75	0.11	-0.75
11,057.0	89.15	91.28	6,925.3	831.6	2,793.2	2,896.4	0.49	0.15	-0.47
11,152.0	88.75	90.91	6,927.0	829.8	2,888.2	2,989.5	0.57	-0.42	-0.39
11,248.0	88.96	90.54	6,929.0	828.6	2,984.2	3,083.7	0.44	0.22	-0.39
11,344.0	88.80	89.91	6,930.8	828.2	3,080.1	3,178.1	0.68	-0.17	-0.66
11,439.0	88.67	89.48	6,932.9	828.7	3,175.1	3,271.7	0.47	-0.14	-0.45
11,534.0	88.37	89.10	6,935.4	829.9	3,270.1	3,365.4	0.51	-0.32	-0.40
11,630.0	88.17	88.85	6,938.3	831.6	3,366.0	3,460.1	0.33	-0.21	-0.26
11,726.0	91.34	88.00	6,938.7	834.2	3,462.0	3,555.0	3.42	3.30	-0.89
11,821.0	91.39	87.36	6,936.4	838.1	3,556.9	3,649.1	0.68	0.05	-0.67
11,917.0	91.40	86.73	6,934.1	843.0	3,652.7	3,744.3	0.66	0.01	-0.66
12,013.0	92.84	88.12	6,930.5	847.3	3,748.5	3,839.4	2.08	1.50	1.45
12,109.0	92.66	88.94	6,925.9	849.8	3,844.4	3,934.1	0.87	-0.19	0.85
12,204.0	93.00	88.23	6,921.3	852.1	3,939.2	4,027.9	0.83	0.36	-0.75
12,300.0	90.88	90.15	6,918.0	853.5	4,035.2	4,122.5	2.98	-2.21	2.00
12,396.0	90.19	90.32	6,917.1	853.1	4,131.2	4,217.0	0.74	-0.72	0.18
12,491.0	90.34	90.03	6,916.7	852.8	4,226.2	4,310.4	0.34	0.16	-0.31
12,587.0	90.45	89.56	6,916.0	853.1	4,322.2	4,404.9	0.50	0.11	-0.49
12,683.0	90.31	88.89	6,915.4	854.4	4,418.1	4,499.6	0.71	-0.15	-0.70
12,778.0	90.42	88.85	6,914.8	856.3	4,513.1	4,593.4	0.12	0.12	-0.04
12,874.0	90.71	88.08	6,913.8	858.9	4,609.1	4,688.3	0.86	0.30	-0.80
12,926.0	90.74	89.31	6,913.2	860.1	4,661.1	4,739.7	2.37	0.06	2.37
12,983.0	90.74	89.31	6,912.4	860.8	4,718.1	4,795.9	0.00	0.00	0.00

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Thistle Down 31G-332
Project:	SEC.31-T5N-R64W	TVD Reference:	WELL @ 4828.0ft (Original Well Elev)
Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	MD Reference:	WELL @ 4828.0ft (Original Well Elev)
Well:	Thistle Down 31G-332	North Reference:	True
Wellbore:	Thistle Down 31G-332 Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Thistle Down 31G-332 Wellbore #1	Database:	US_EDM

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
SHL 1504'FSL, 1357'FW	0.00	0.00	1.0	0.0	0.0	1,372,559.16	3,251,619.12	40.352560	-104.597170
- survey hits target center									
- Point									

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,349.8	6,899.8	874.4	-898.4	TPZ - 460' Setback - 2383'FSL & 460'FWL, Sec.31	
7,713.0	6,980.9	857.9	-546.5	Deepest TVD Drilled - 6980.8'	

Checked By: _____	Approved By: _____	Date: _____
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