

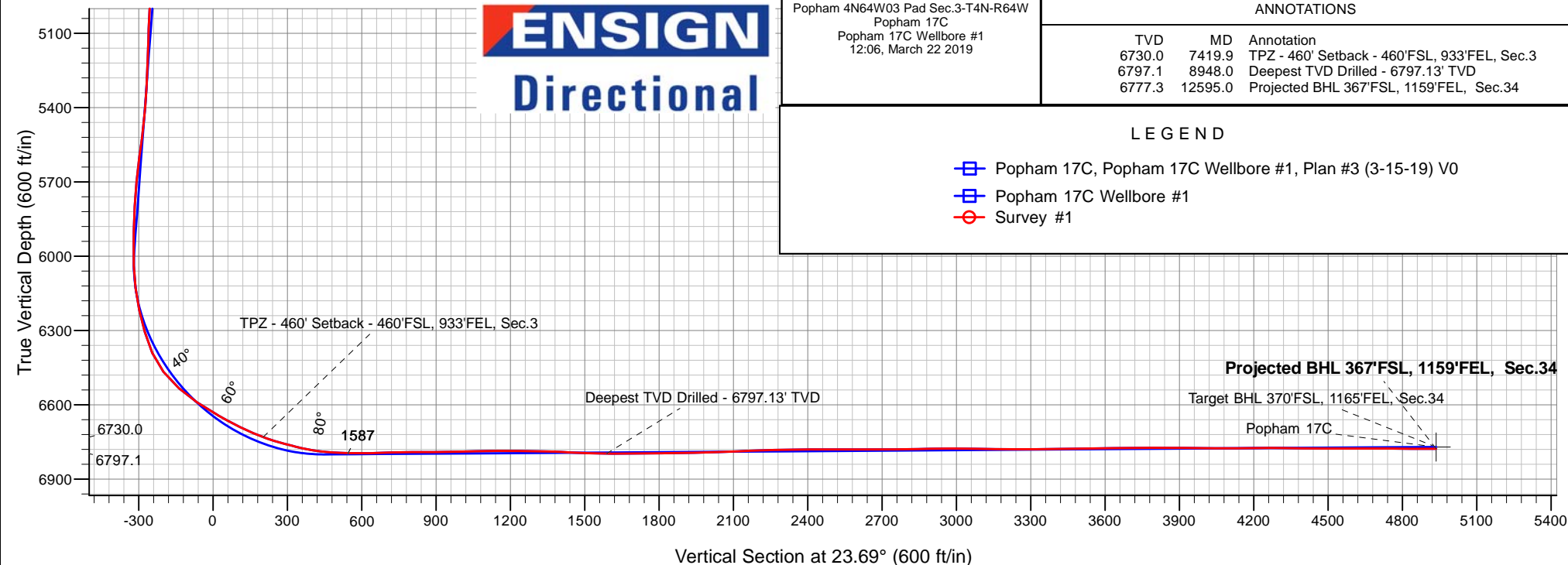
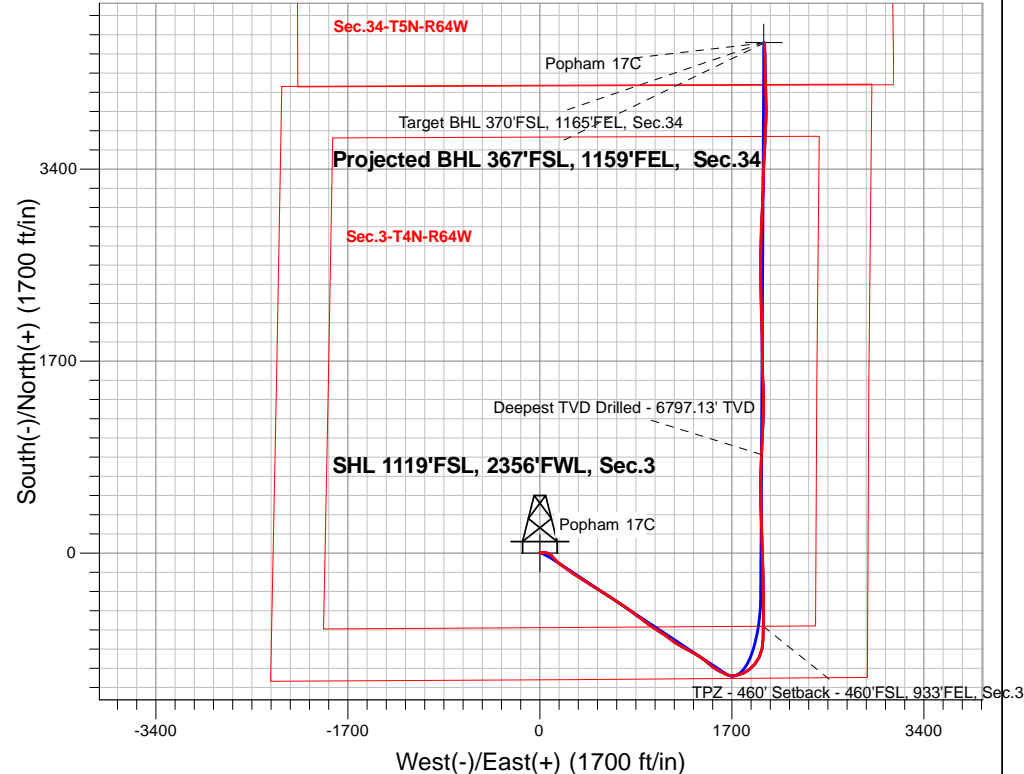
PDC Energy Inc. DJ Basin

Well Name: **Popham 17C**

Surface Location: Popham 4N64W03 Pad Sec.3-T4N-R64W
 North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
 Ground Elevation: 4662.0
 +N/-S +E/-W Northing Easting Latitude Longitude Slot
 0.0 0.0 1367138.823268306.35 40.337200 -104.537510
 WELL @ 4685.0ft

FINAL SURVEY

Projected Bottom Hole Location
12,595'MD 6777'TVD 4517'N & 1990'E of SHL
90.0 degree Incl @ 358.40 degree AZM



ENSIGN
Directional

Popham 4N64W03 Pad Sec.3-T4N-R64W
 Popham 17C
 Popham 17C Wellbore #1
 12:06, March 22 2019

ANNOTATIONS

TVD	MD	Annotation
6730.0	7419.9	TPZ - 460' Setback - 460'FSL, 933'FEL, Sec.3
6797.1	8948.0	Deepest TVD Drilled - 6797.13' TVD
6777.3	12595.0	Projected BHL 367'FSL, 1159'FEL, Sec.34

LEGEND

- Popham 17C, Popham 17C Wellbore #1, Plan #3 (3-15-19) V0
- Popham 17C Wellbore #1
- Survey #1



PDC Energy Inc. DJ Basin

SEC.3-T4N-R64W

Popham 4N64W03 Pad Sec.3-T4N-R64W

Popham 17C

Popham 17C Wellbore #1

Survey: Survey #1

Standard Survey Report

22 March, 2019

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 17C
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft
Well:	Popham 17C	North Reference:	True
Wellbore:	Popham 17C Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 17C Wellbore #1	Database:	US_EDM

Project	SEC.3-T4N-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	Popham 4N64W03 Pad Sec.3-T4N-R64W				
Site Position:		Northing:	1,367,183.37 usft	Latitude:	40.337327
From:	Lat/Long	Easting:	3,268,156.99 usft	Longitude:	-104.538045
Position Uncertainty:	0.0 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.62 °

Well	Popham 17C					
Well Position	+N/-S	0.0 ft	Northing:	1,367,138.82 usft	Latitude:	40.337200
	+E/-W	0.0 ft	Easting:	3,268,306.35 usft	Longitude:	-104.537511
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,662.0 ft

Wellbore	Popham 17C Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/15/2019	8.15	66.85	52,171

Design	Popham 17C 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	23.69	

Survey Program	Date	3/22/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
157.0	12,595.0	Survey #1 (Popham 17C Wellbore #1)	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	
1.0	0.00	83.17	1.0	0.0	0.0	0.0	0.31	0.31	0.00	
SHL 1119'FSL, 2356'FWL, Sec.3										
157.0	0.48	83.17	157.0	0.1	0.7	0.3	0.31	0.31	0.00	
252.0	0.42	75.05	252.0	0.2	1.4	0.8	0.09	-0.06	-8.55	
347.0	0.62	70.98	347.0	0.5	2.2	1.3	0.21	0.21	-4.28	
443.0	0.23	68.76	443.0	0.7	2.9	1.8	0.41	-0.41	-2.31	
538.0	0.13	71.22	538.0	0.8	3.2	2.0	0.11	-0.11	2.59	
633.0	0.20	359.57	633.0	1.0	3.3	2.2	0.21	0.07	-75.42	
728.0	0.32	300.58	728.0	1.3	3.0	2.4	0.29	0.13	-62.09	
823.0	1.18	70.22	823.0	1.8	3.7	3.1	1.48	0.91	136.46	

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 17C
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft
Well:	Popham 17C	North Reference:	True
Wellbore:	Popham 17C Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 17C 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)
918.0	2.86	73.30	917.9	2.8	6.9	5.3	1.77	1.77	3.24
1,014.0	4.99	83.88	1,013.7	3.9	13.4	9.0	2.33	2.22	11.02
1,109.0	7.05	86.64	1,108.2	4.7	23.3	13.7	2.19	2.17	2.91
1,204.0	8.10	92.51	1,202.3	4.8	35.8	18.7	1.37	1.11	6.18
1,299.0	9.50	98.49	1,296.2	3.3	50.2	23.2	1.76	1.47	6.29
1,395.0	10.28	109.23	1,390.8	-0.7	66.2	26.0	2.08	0.81	11.19
1,490.0	10.07	117.08	1,484.3	-7.3	81.6	26.1	1.48	-0.22	8.26
1,593.0	9.49	130.19	1,585.8	-16.8	96.1	23.2	2.23	-0.56	12.73
1,676.0	10.27	135.53	1,667.6	-26.5	106.5	18.5	1.45	0.94	6.43
1,772.0	12.96	139.03	1,761.6	-40.8	119.5	10.7	2.90	2.80	3.65
1,868.0	16.91	138.62	1,854.4	-59.4	135.8	0.2	4.12	4.11	-0.43
1,963.0	19.92	132.82	1,944.5	-80.8	156.8	-10.9	3.71	3.17	-6.11
2,058.0	22.16	124.61	2,033.2	-101.9	183.5	-19.6	3.89	2.36	-8.64
2,153.0	23.18	124.77	2,120.8	-122.8	213.6	-26.6	1.08	1.07	0.17
2,247.0	25.14	126.02	2,206.6	-145.1	244.9	-34.4	2.15	2.09	1.33
2,343.0	23.98	126.00	2,293.9	-168.5	277.2	-42.9	1.21	-1.21	-0.02
2,438.0	25.15	123.35	2,380.3	-191.0	309.7	-50.4	1.69	1.23	-2.79
2,533.0	23.95	122.22	2,466.7	-212.4	342.9	-56.7	1.36	-1.26	-1.19
2,628.0	26.44	122.78	2,552.7	-234.1	377.0	-62.9	2.63	2.62	0.59
2,723.0	26.17	123.22	2,637.8	-257.0	412.3	-69.7	0.35	-0.28	0.46
2,819.0	26.10	122.91	2,724.0	-280.1	447.7	-76.6	0.16	-0.07	-0.32
2,915.0	25.81	121.71	2,810.3	-302.6	483.2	-82.9	0.62	-0.30	-1.25
3,010.0	25.02	121.36	2,896.1	-323.9	518.0	-88.4	0.85	-0.83	-0.37
3,105.0	24.59	121.64	2,982.4	-344.7	551.9	-93.8	0.47	-0.45	0.29
3,200.0	23.52	120.84	3,069.1	-364.8	585.0	-98.9	1.18	-1.13	-0.84
3,295.0	23.99	123.76	3,156.1	-385.2	617.4	-104.7	1.33	0.49	3.07
3,391.0	22.59	122.25	3,244.3	-405.9	649.2	-110.8	1.59	-1.46	-1.57
3,486.0	23.87	122.86	3,331.6	-426.1	680.8	-116.6	1.37	1.35	0.64
3,581.0	25.23	126.42	3,418.0	-448.5	713.2	-124.1	2.11	1.43	3.75
3,677.0	24.28	125.59	3,505.1	-472.2	745.7	-132.7	1.05	-0.99	-0.86
3,773.0	23.13	126.23	3,593.0	-494.8	777.0	-140.9	1.23	-1.20	0.67
3,869.0	23.52	125.63	3,681.2	-517.1	807.8	-148.9	0.48	0.41	-0.63
3,965.0	23.59	126.37	3,769.2	-539.7	838.8	-157.1	0.32	0.07	0.77
4,060.0	22.56	125.24	3,856.6	-561.4	869.0	-164.9	1.18	-1.08	-1.19
4,156.0	24.35	126.47	3,944.7	-583.8	900.0	-173.0	1.93	1.86	1.28
4,251.0	23.56	127.23	4,031.5	-607.0	930.8	-181.8	0.89	-0.83	0.80
4,347.0	22.14	126.80	4,119.9	-629.4	960.6	-190.3	1.49	-1.48	-0.45
4,443.0	23.46	124.28	4,208.4	-651.0	990.9	-198.0	1.71	1.38	-2.63
4,538.0	21.76	122.18	4,296.1	-671.0	1,021.4	-204.0	1.98	-1.79	-2.21
4,634.0	22.56	121.64	4,385.0	-690.2	1,052.1	-209.2	0.86	0.83	-0.56
4,729.0	23.40	123.97	4,472.5	-710.3	1,083.3	-215.1	1.30	0.88	2.45
4,825.0	23.55	126.76	4,560.6	-732.4	1,114.5	-222.8	1.17	0.16	2.91
4,920.0	24.32	127.16	4,647.4	-755.6	1,145.3	-231.7	0.83	0.81	0.42

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 17C
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft
Well:	Popham 17C	North Reference:	True
Wellbore:	Popham 17C Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 17C 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)
5,015.0	24.04	124.73	4,734.1	-778.4	1,176.8	-239.9	1.09	-0.29	-2.56
5,111.0	23.51	122.19	4,821.9	-799.8	1,209.0	-246.5	1.20	-0.55	-2.65
5,207.0	24.56	119.99	4,909.6	-819.9	1,242.5	-251.5	1.44	1.09	-2.29
5,302.0	25.47	119.14	4,995.7	-839.8	1,277.5	-255.6	1.03	0.96	-0.89
5,397.0	24.80	119.02	5,081.7	-859.4	1,312.7	-259.4	0.71	-0.71	-0.13
5,493.0	23.14	117.17	5,169.4	-877.8	1,347.1	-262.4	1.90	-1.73	-1.93
5,587.0	22.35	119.54	5,256.1	-895.0	1,379.1	-265.4	1.29	-0.84	2.52
5,683.0	21.25	123.35	5,345.2	-913.6	1,409.5	-270.1	1.87	-1.15	3.97
5,779.0	23.18	125.68	5,434.1	-934.2	1,439.4	-277.0	2.21	2.01	2.43
5,873.0	23.00	131.10	5,520.6	-957.0	1,468.3	-286.3	2.27	-0.19	5.77
5,968.0	25.21	131.04	5,607.3	-982.5	1,497.5	-297.9	2.33	2.33	-0.06
6,062.0	26.11	126.10	5,692.0	-1,007.8	1,529.3	-308.3	2.47	0.96	-5.26
6,157.0	26.60	119.51	5,777.2	-1,030.6	1,564.7	-315.0	3.12	0.52	-6.94
6,252.0	24.87	117.36	5,862.8	-1,050.3	1,601.0	-318.4	2.07	-1.82	-2.26
6,347.0	23.17	116.01	5,949.5	-1,067.7	1,635.5	-320.4	1.88	-1.79	-1.42
6,442.0	20.43	107.74	6,037.7	-1,080.9	1,668.1	-319.5	4.33	-2.88	-8.71
6,537.0	19.14	93.00	6,127.2	-1,086.8	1,699.5	-312.2	5.41	-1.36	-15.52
6,632.0	19.82	77.95	6,216.8	-1,084.3	1,730.8	-297.3	5.32	0.72	-15.84
6,728.0	23.42	72.41	6,306.1	-1,075.1	1,765.0	-275.2	4.31	3.75	-5.77
6,823.0	31.53	68.68	6,390.3	-1,060.3	1,806.2	-245.1	8.72	8.54	-3.93
6,917.0	41.09	52.43	6,466.1	-1,032.4	1,853.8	-200.5	14.36	10.17	-17.29
7,012.0	49.56	40.17	6,533.0	-985.6	1,902.0	-138.2	12.77	8.92	-12.91
7,107.0	56.27	24.98	6,590.4	-921.8	1,942.2	-63.7	14.55	7.06	-15.99
7,201.0	60.85	12.07	6,639.6	-846.0	1,967.4	15.9	12.68	4.87	-13.73
7,297.0	64.68	0.27	6,683.7	-761.3	1,976.4	97.0	11.63	3.99	-12.29
7,392.0	69.49	1.60	6,720.6	-673.9	1,977.8	177.7	5.22	5.06	1.40
7,419.9	71.13	1.50	6,730.0	-647.6	1,978.5	202.0	5.90	5.89	-0.36
TPZ - 460' Setback - 460'FSL, 933'FEL, Sec.3									
7,488.0	75.14	1.26	6,749.8	-582.5	1,980.1	262.3	5.90	5.89	-0.35
7,583.0	77.46	359.34	6,772.3	-490.2	1,980.6	347.0	3.13	2.44	-2.02
7,705.0	85.75	359.08	6,790.1	-369.6	1,978.9	456.8	6.80	6.80	-0.21
LPL 737'FSL, 955'FEL, Sec.3									
7,801.0	88.20	359.11	6,795.1	-273.8	1,977.4	543.9	2.55	2.55	0.03
7,897.0	91.60	358.78	6,795.3	-177.8	1,975.6	631.1	3.56	3.54	-0.34
7,993.0	91.72	357.67	6,792.5	-81.9	1,972.7	717.7	1.16	0.13	-1.16
8,088.0	90.17	358.91	6,791.0	13.0	1,969.8	803.5	2.09	-1.63	1.31
8,184.0	90.03	358.08	6,790.8	109.0	1,967.3	890.4	0.88	-0.15	-0.86
8,279.0	91.25	358.38	6,789.7	204.0	1,964.4	976.1	1.32	1.28	0.32
8,375.0	91.95	357.69	6,787.1	299.9	1,961.1	1,062.6	1.02	0.73	-0.72
8,471.0	89.68	358.45	6,785.7	395.8	1,957.8	1,149.2	2.49	-2.36	0.79
8,566.0	89.15	359.89	6,786.7	490.8	1,956.5	1,235.6	1.62	-0.56	1.52
8,662.0	89.31	359.15	6,787.9	586.8	1,955.7	1,323.2	0.79	0.17	-0.77
8,757.0	88.05	1.14	6,790.1	681.7	1,955.9	1,410.2	2.48	-1.33	2.09
8,852.0	87.35	1.38	6,794.0	776.6	1,958.0	1,498.0	0.78	-0.74	0.25

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Wellbore:	Popham 17C Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 17C 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)
8,948.0	88.85	3.11	6,797.1	872.5	1,961.8	1,587.3	2.38	1.56	1.80
Deepest TVD Drilled - 6797.13' TVD									
9,043.0	91.24	3.11	6,797.1	967.3	1,966.9	1,676.2	2.52	2.52	0.00
9,139.0	90.55	3.35	6,795.6	1,063.2	1,972.3	1,766.1	0.76	-0.72	0.25
9,235.0	90.45	2.77	6,794.7	1,159.0	1,977.4	1,856.0	0.61	-0.10	-0.60
9,331.0	91.51	359.74	6,793.1	1,255.0	1,979.5	1,944.7	3.34	1.10	-3.16
9,426.0	91.55	359.00	6,790.5	1,349.9	1,978.5	2,031.2	0.78	0.04	-0.78
9,521.0	91.62	358.60	6,787.9	1,444.9	1,976.5	2,117.4	0.43	0.07	-0.42
9,617.0	92.42	358.14	6,784.5	1,540.8	1,973.8	2,204.1	0.96	0.83	-0.48
9,713.0	90.80	359.29	6,781.8	1,636.7	1,971.6	2,291.1	2.07	-1.69	1.20
9,808.0	91.12	359.15	6,780.2	1,731.7	1,970.3	2,377.5	0.37	0.34	-0.15
9,903.0	89.76	359.63	6,779.5	1,826.7	1,969.3	2,464.1	1.52	-1.43	0.51
9,999.0	89.51	359.08	6,780.1	1,922.7	1,968.2	2,551.6	0.63	-0.26	-0.57
10,094.0	90.00	358.69	6,780.5	2,017.7	1,966.4	2,637.8	0.66	0.52	-0.41
10,190.0	90.32	358.08	6,780.3	2,113.6	1,963.7	2,724.6	0.72	0.33	-0.64
10,285.0	91.01	357.68	6,779.2	2,208.6	1,960.2	2,810.1	0.84	0.73	-0.42
10,381.0	91.20	358.02	6,777.3	2,304.5	1,956.6	2,896.5	0.41	0.20	0.35
10,476.0	89.83	0.61	6,776.5	2,399.4	1,955.4	2,983.0	3.08	-1.44	2.73
10,572.0	89.08	0.25	6,777.4	2,495.4	1,956.2	3,071.2	0.87	-0.78	-0.38
10,667.0	89.46	359.63	6,778.6	2,590.4	1,956.1	3,158.1	0.77	0.40	-0.65
10,763.0	89.69	1.49	6,779.3	2,686.4	1,957.0	3,246.4	1.95	0.24	1.94
10,859.0	90.44	1.89	6,779.2	2,782.4	1,959.8	3,335.4	0.89	0.78	0.42
10,954.0	91.23	1.59	6,777.8	2,877.3	1,962.7	3,423.5	0.89	0.83	-0.32
11,049.0	89.94	2.67	6,776.8	2,972.2	1,966.2	3,511.8	1.77	-1.36	1.14
11,144.0	91.29	2.76	6,775.8	3,067.1	1,970.7	3,600.5	1.42	1.42	0.09
11,240.0	91.34	2.30	6,773.6	3,163.0	1,975.0	3,690.0	0.48	0.05	-0.48
11,335.0	89.08	0.86	6,773.3	3,258.0	1,977.6	3,778.0	2.82	-2.38	-1.52
11,431.0	90.26	1.81	6,773.8	3,353.9	1,979.8	3,866.8	1.58	1.23	0.99
11,526.0	89.18	2.68	6,774.3	3,448.9	1,983.6	3,955.2	1.46	-1.14	0.92
11,622.0	89.50	2.67	6,775.4	3,544.7	1,988.0	4,044.8	0.33	0.33	-0.01
11,717.0	90.74	2.68	6,775.2	3,639.6	1,992.5	4,133.5	1.31	1.31	0.01
11,813.0	90.35	3.02	6,774.3	3,735.5	1,997.2	4,223.2	0.54	-0.41	0.35
11,909.0	89.32	2.15	6,774.5	3,831.4	2,001.6	4,312.8	1.40	-1.07	-0.91
12,004.0	89.43	359.40	6,775.6	3,926.4	2,002.9	4,400.3	2.90	0.12	-2.89
12,100.0	89.90	358.89	6,776.1	4,022.4	2,001.4	4,487.6	0.72	0.49	-0.53
12,195.0	89.96	358.74	6,776.3	4,117.4	1,999.5	4,573.8	0.17	0.06	-0.16
12,291.0	90.23	358.22	6,776.1	4,213.3	1,996.9	4,660.6	0.61	0.28	-0.54
12,386.0	89.29	359.09	6,776.5	4,308.3	1,994.7	4,746.7	1.35	-0.99	0.92
12,482.0	89.85	358.62	6,777.2	4,404.3	1,992.8	4,833.8	0.76	0.58	-0.49
12,535.0	90.00	358.40	6,777.3	4,457.3	1,991.4	4,881.8	0.50	0.28	-0.42
12,595.0	90.00	358.40	6,777.3	4,517.2	1,989.7	4,936.0	0.00	0.00	0.00
Projected BHL 367°FSL, 1159°FEL, Sec.34 - Target BHL 370°FSL, 1165°FEL, Sec.34									

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 17C
Project:	SEC.3-T4N-R64W	TVD Reference:	WELL @ 4685.0ft
Site:	Popham 4N64W03 Pad Sec.3-T4N-R64W	MD Reference:	WELL @ 4685.0ft
Well:	Popham 17C	North Reference:	True
Wellbore:	Popham 17C Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 17C Wellbore #1	Database:	US_EDM

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 1119'FSL, 2356'FW	0.00	0.00	1.0	0.0	0.0	1,367,138.83	3,268,306.35	40.337200	-104.537511	
- survey hits target center										
- Point										
Target BHL 370'FSL, 116'	0.00	0.00	6,770.0	4,520.2	1,983.7	1,371,680.14	3,270,240.77	40.349608	-104.530394	
- survey misses target center by 9.9ft at 12595.0ft MD (6777.3 TVD, 4517.2 N, 1989.7 E)										
- Point										

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,419.9	6,730.0	-647.6	1,978.5	TPZ - 460' Setback - 460'FSL, 933'FEL, Sec.3	
8,948.0	6,797.1	872.5	1,961.8	Deepest TVD Drilled - 6797.13' TVD	
12,595.0	6,777.3	4,517.2	1,989.7	Projected BHL 367'FSL, 1159'FEL, Sec.34	

Checked By: _____	Approved By: _____	Date: _____
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