

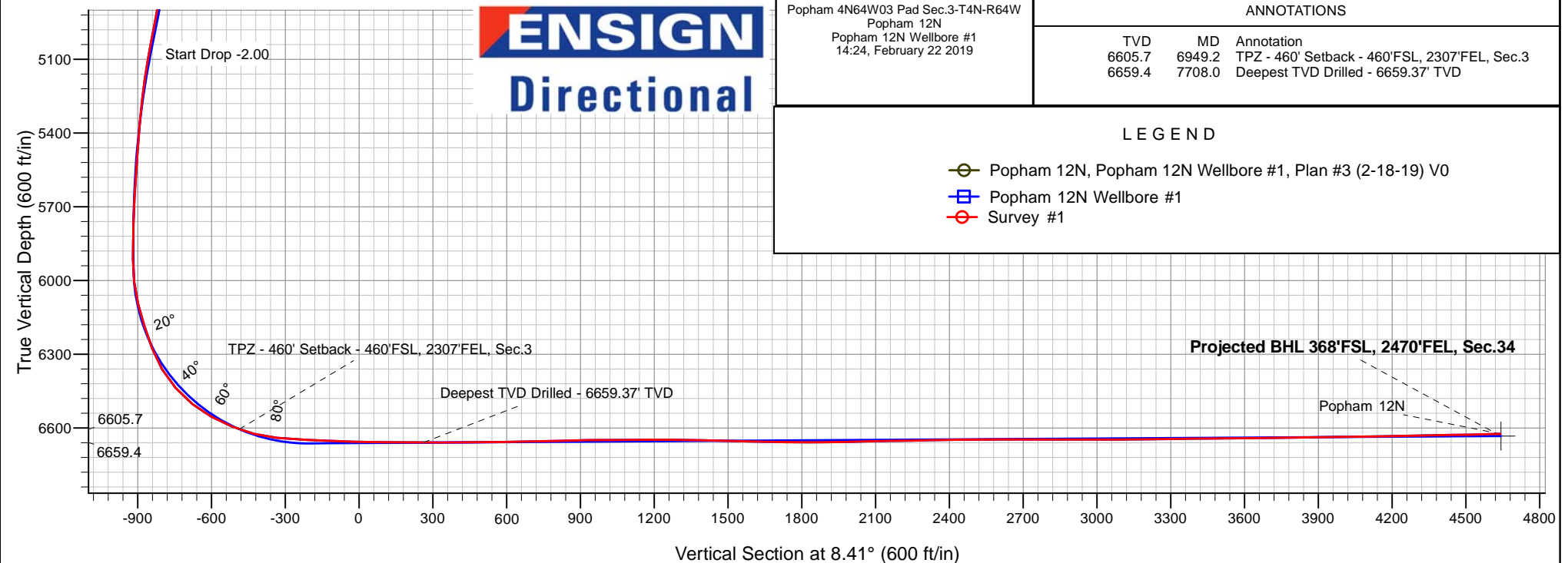
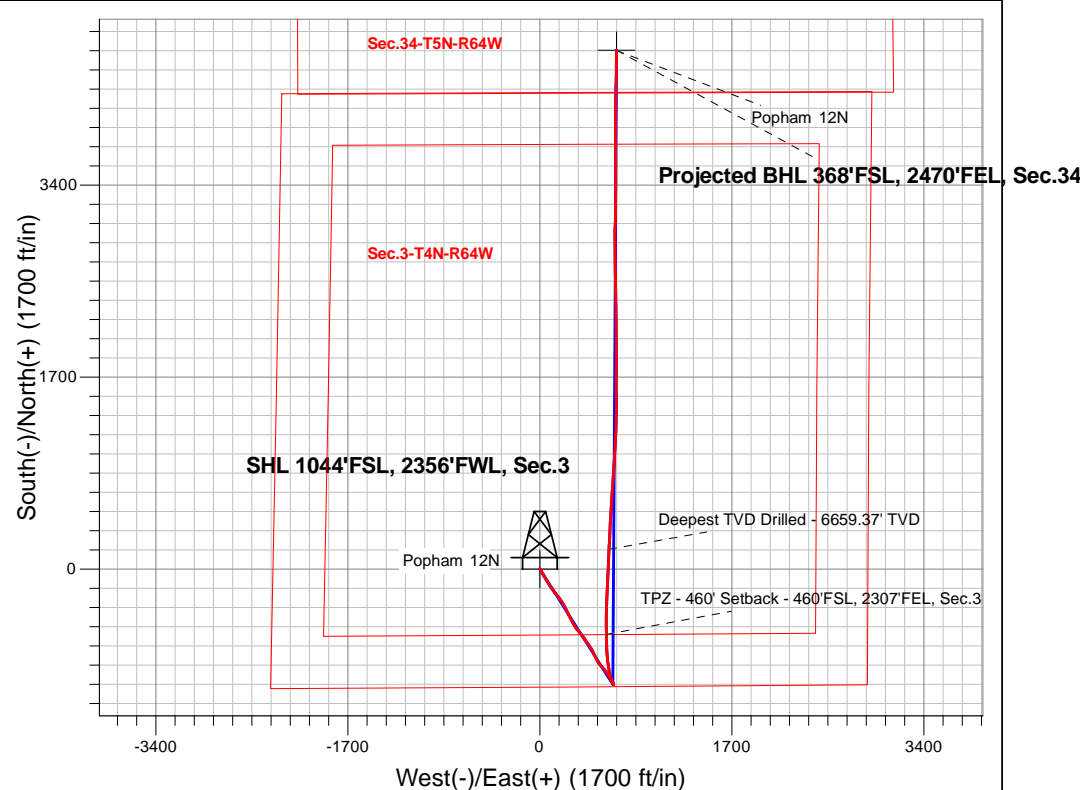
PDC Energy Inc. DJ Basin

Well Name: **Popham 12N**

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 1367062.333268307.31 40.336990 -104.537510
WELL @ 4685.0ft

FINAL SURVEY

Projected Bottom Hole Location
12,127'MD 6624'TVD 4591'N & 678'E of SHL
91.68 degree Incl @ 0.34 degree AZM





PDC Energy Inc. DJ Basin

SEC.3-T4N-R64W

Popham 4N64W03 Pad Sec.3-T4N-R64W

Popham 12N

Popham 12N Wellbore #1

Survey: Survey #1

Standard Survey Report

22 February, 2019

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 12N
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 12N	North Reference:	True
Wellbore:	Popham 12N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 12N 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 12N					
Well Position	+N/-S	0.0 ft	Northing:	1,367,062.33 usft	Latitude:	40.336990
	+E/-W	0.0 ft	Easting:	3,268,307.32 usft	Longitude:	-104.537510
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,662.0 ft

Wellbore	Popham 12N Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	2/18/2019	8.15	66.85	52,180

Design	Popham 12N 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	8.41	

Survey Program	Date	2/22/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
252.0	12,127.0	Survey #1 (Popham 12N 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	46.57	1.0	0.0	0.0	0.0	0.00	0.00	0.00
SHL 1044'FSL, 2356'FWL, Sec.3									
252.0	0.16	46.57	252.0	0.2	0.3	0.3	0.06	0.06	0.00
347.0	1.13	161.11	347.0	-0.6	0.7	-0.5	1.27	1.02	120.57
443.0	2.35	45.24	443.0	-0.1	2.4	0.3	3.15	1.27	-120.70
538.0	3.78	150.04	537.9	-1.4	5.3	-0.6	5.19	1.51	110.32
633.0	4.68	152.25	632.6	-7.5	8.7	-6.2	0.96	0.95	2.33
728.0	6.70	159.93	727.2	-16.2	12.4	-14.2	2.27	2.13	8.08
823.0	8.02	155.86	821.4	-27.4	17.0	-24.7	1.49	1.39	-4.28
918.0	9.27	149.69	915.3	-40.1	23.6	-36.2	1.64	1.32	-6.49

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 12N
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 12N	North Reference:	True
Wellbore:	Popham 12N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 12N 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	10.62	151.19	1,009.8	-54.5	31.7	-49.3	1.43	1.41	1.56
1,109.0	11.92	147.83	1,103.0	-70.5	41.2	-63.7	1.53	1.37	-3.54
1,204.0	12.87	147.27	1,195.8	-87.7	52.1	-79.1	1.01	1.00	-0.59
1,299.0	14.20	149.85	1,288.2	-106.7	63.7	-96.2	1.54	1.40	2.72
1,395.0	15.29	147.78	1,381.0	-127.6	76.4	-115.0	1.26	1.14	-2.16
1,490.0	13.39	145.90	1,473.0	-147.3	89.2	-132.7	2.06	-2.00	-1.98
1,595.0	13.30	147.06	1,575.2	-167.5	102.6	-150.7	0.27	-0.09	1.10
1,676.0	13.19	144.64	1,654.0	-182.8	113.0	-164.3	0.70	-0.14	-2.99
1,772.0	14.98	142.60	1,747.2	-201.6	126.9	-180.9	1.93	1.86	-2.13
1,868.0	16.75	142.64	1,839.5	-222.5	142.8	-199.2	1.84	1.84	0.04
1,963.0	15.80	140.64	1,930.7	-243.4	159.3	-217.5	1.16	-1.00	-2.11
2,058.0	18.84	143.58	2,021.4	-265.7	176.6	-237.0	3.33	3.20	3.09
2,153.0	19.26	144.69	2,111.2	-290.8	194.8	-259.2	0.58	0.44	1.17
2,248.0	18.07	147.07	2,201.2	-316.0	211.9	-281.6	1.49	-1.25	2.51
2,343.0	17.77	155.19	2,291.6	-341.5	226.0	-304.8	2.65	-0.32	8.55
2,438.0	16.70	155.02	2,382.3	-367.1	237.8	-328.3	1.13	-1.13	-0.18
2,533.0	15.53	154.98	2,473.6	-391.0	248.9	-350.4	1.23	-1.23	-0.04
2,628.0	15.39	154.09	2,565.1	-413.8	259.8	-371.4	0.29	-0.15	-0.94
2,724.0	15.01	153.19	2,657.8	-436.4	271.0	-392.1	0.47	-0.40	-0.94
2,819.0	14.87	153.57	2,749.6	-458.3	282.0	-412.1	0.18	-0.15	0.40
2,914.0	14.27	151.53	2,841.5	-479.5	293.0	-431.5	0.83	-0.63	-2.15
3,010.0	14.00	147.96	2,934.6	-499.7	304.8	-449.8	0.95	-0.28	-3.72
3,105.0	13.50	145.18	3,026.9	-518.6	317.2	-466.6	0.87	-0.53	-2.93
3,200.0	13.87	140.95	3,119.2	-536.5	330.7	-482.4	1.12	0.39	-4.45
3,295.0	15.15	137.02	3,211.2	-554.4	346.4	-497.8	1.70	1.35	-4.14
3,390.0	15.65	142.45	3,302.8	-573.7	362.6	-514.5	1.61	0.53	5.72
3,486.0	13.66	140.91	3,395.6	-592.7	377.7	-531.2	2.11	-2.07	-1.60
3,581.0	13.72	146.47	3,487.9	-610.8	391.0	-547.1	1.39	0.06	5.85
3,677.0	15.64	145.04	3,580.8	-630.9	404.7	-565.0	2.04	2.00	-1.49
3,773.0	15.63	144.85	3,673.2	-652.1	419.5	-583.8	0.05	-0.01	-0.20
3,868.0	15.73	144.56	3,764.7	-673.1	434.4	-602.3	0.13	0.11	-0.31
3,964.0	16.78	149.52	3,856.9	-695.6	448.9	-622.5	1.81	1.09	5.17
4,060.0	16.73	153.22	3,948.8	-719.9	462.2	-644.6	1.11	-0.05	3.85
4,156.0	15.42	153.91	4,041.0	-743.7	474.0	-666.4	1.38	-1.36	0.72
4,251.0	14.75	154.14	4,132.8	-765.9	484.9	-686.8	0.71	-0.71	0.24
4,346.0	14.03	154.18	4,224.8	-787.2	495.2	-706.3	0.76	-0.76	0.04
4,442.0	12.74	153.33	4,318.2	-807.1	505.0	-724.6	1.36	-1.34	-0.89
4,538.0	13.83	144.17	4,411.6	-825.9	516.5	-741.5	2.47	1.14	-9.54
4,633.0	13.15	142.50	4,504.0	-843.6	529.7	-757.1	0.82	-0.72	-1.76
4,729.0	11.98	138.09	4,597.7	-859.7	543.0	-771.1	1.58	-1.22	-4.59
4,825.0	13.92	135.41	4,691.3	-875.4	557.7	-784.4	2.11	2.02	-2.79
4,920.0	14.82	144.59	4,783.3	-893.4	572.8	-800.1	2.58	0.95	9.66
5,016.0	14.40	142.23	4,876.2	-912.9	587.2	-817.2	0.76	-0.44	-2.46

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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 12N	North Reference:	True
Wellbore:	Popham 12N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 12N 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)
5,110.0	14.52	142.09	4,967.2	-931.4	601.6	-833.4	0.13	0.13	-0.15
5,206.0	13.25	154.38	5,060.4	-950.8	613.8	-850.9	3.34	-1.32	12.80
5,302.0	10.19	154.80	5,154.4	-968.4	622.2	-867.0	3.19	-3.19	0.44
5,397.0	8.54	150.14	5,248.1	-982.1	629.3	-879.6	1.91	-1.74	-4.91
5,492.0	7.24	145.30	5,342.2	-993.2	636.2	-889.5	1.54	-1.37	-5.09
5,588.0	6.22	142.68	5,437.6	-1,002.3	642.8	-897.5	1.11	-1.06	-2.73
5,682.0	5.63	141.33	5,531.1	-1,009.9	648.7	-904.2	0.64	-0.63	-1.44
5,778.0	4.04	163.86	5,626.7	-1,016.9	652.6	-910.5	2.55	-1.66	23.47
5,874.0	2.29	189.14	5,722.6	-1,022.0	653.3	-915.5	2.29	-1.82	26.33
5,968.0	0.80	161.94	5,816.6	-1,024.5	653.2	-918.0	1.72	-1.59	-28.94
6,063.0	0.86	222.29	5,911.5	-1,025.6	652.9	-919.2	0.88	0.06	63.53
6,157.0	8.50	331.96	6,005.2	-1,020.0	649.1	-914.2	9.39	8.13	116.67
6,252.0	15.46	337.83	6,098.1	-1,002.1	641.1	-897.6	7.43	7.33	6.18
6,347.0	20.05	345.72	6,188.6	-974.6	632.2	-871.6	5.44	4.83	8.31
6,442.0	21.46	344.72	6,277.4	-942.0	623.7	-840.7	1.53	1.48	-1.05
6,537.0	31.91	350.69	6,362.2	-900.3	615.0	-800.8	11.34	11.00	6.28
6,632.0	43.06	351.14	6,437.4	-843.3	605.9	-745.7	11.74	11.74	0.47
6,728.0	51.28	353.35	6,502.6	-773.6	596.5	-678.1	8.73	8.56	2.30
6,823.0	62.26	359.37	6,554.7	-694.5	591.7	-600.5	12.71	11.56	6.34
6,918.0	67.98	358.51	6,594.6	-608.4	590.1	-515.5	6.08	6.02	-0.91
6,949.2	70.56	358.68	6,605.7	-579.2	589.4	-486.8	8.29	8.27	0.53
TPZ - 460' Setback - 460'FSL, 2307'FEL, Sec.3									
7,013.0	75.84	359.00	6,624.1	-518.1	588.2	-426.6	8.29	8.27	0.51
7,107.0	84.31	1.05	6,640.3	-425.6	588.2	-335.1	9.26	9.01	2.18
7,231.0	87.85	2.82	6,648.7	-302.0	592.4	-212.2	3.19	2.85	1.43
7,233.4	87.83	2.77	6,648.8	-299.7	592.5	-209.8	2.27	-0.82	-2.11
LPL 737'FSL, 2260'FEL, Sec.3									
7,326.0	87.07	0.81	6,653.0	-207.2	595.4	-117.9	2.27	-0.82	-2.12
7,421.0	88.72	3.59	6,656.4	-112.3	599.1	-23.5	3.40	1.74	2.93
7,517.0	89.27	2.93	6,658.1	-16.5	604.5	72.1	0.89	0.57	-0.69
7,612.0	89.57	2.39	6,659.1	78.4	608.9	166.6	0.65	0.32	-0.57
7,708.0	90.10	2.02	6,659.4	174.3	612.6	262.0	0.67	0.55	-0.39
Deepest TVD Drilled - 6659.37' TVD									
7,803.0	90.08	4.16	6,659.2	269.2	617.7	356.6	2.25	-0.02	2.25
7,898.0	90.45	3.03	6,658.8	364.0	623.7	451.3	1.25	0.39	-1.19
7,994.0	90.63	1.37	6,657.9	459.9	627.4	546.7	1.74	0.19	-1.73
8,090.0	90.86	3.98	6,656.6	555.8	631.9	642.2	2.73	0.24	2.72
8,186.0	91.27	4.20	6,654.8	651.5	638.7	737.9	0.48	0.43	0.23
8,281.0	91.95	3.67	6,652.2	746.3	645.2	832.6	0.91	0.72	-0.56
8,376.0	90.58	4.27	6,650.1	841.0	651.8	927.3	1.57	-1.44	0.63
8,472.0	90.38	3.31	6,649.3	936.8	658.1	1,023.0	1.02	-0.21	-1.00
8,568.0	90.09	3.34	6,648.9	1,032.6	663.7	1,118.6	0.30	-0.30	0.03
8,664.0	89.87	2.85	6,648.9	1,128.5	668.9	1,214.2	0.56	-0.23	-0.51
8,759.0	89.41	1.86	6,649.5	1,223.4	672.8	1,308.6	1.15	-0.48	-1.04

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Well:	Popham 12N	North Reference:	True
Wellbore:	Popham 12N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 12N 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)
8,855.0	89.34	1.29	6,650.6	1,319.4	675.4	1,403.9	0.60	-0.07	-0.59
8,950.0	88.89	0.15	6,652.0	1,414.4	676.6	1,498.1	1.29	-0.47	-1.20
9,045.0	88.63	359.83	6,654.1	1,509.3	676.6	1,592.0	0.43	-0.27	-0.34
9,140.0	87.82	359.39	6,657.0	1,604.3	676.0	1,685.9	0.97	-0.85	-0.46
9,236.0	90.24	0.45	6,658.6	1,700.3	675.8	1,780.8	2.75	2.52	1.10
9,332.0	89.99	0.52	6,658.5	1,796.3	676.6	1,875.9	0.27	-0.26	0.07
9,428.0	91.43	0.26	6,657.3	1,892.2	677.3	1,970.9	1.52	1.50	-0.27
9,523.0	91.34	0.06	6,655.0	1,987.2	677.6	2,064.9	0.23	-0.09	-0.21
9,619.0	90.94	359.39	6,653.1	2,083.2	677.1	2,159.8	0.81	-0.42	-0.70
9,714.0	90.97	358.91	6,651.5	2,178.2	675.7	2,253.6	0.51	0.03	-0.51
9,810.0	91.11	358.79	6,649.7	2,274.1	673.8	2,348.2	0.19	0.15	-0.13
9,905.0	90.67	359.05	6,648.3	2,369.1	672.0	2,441.9	0.54	-0.46	0.27
10,000.0	90.36	359.68	6,647.4	2,464.1	670.9	2,535.7	0.74	-0.33	0.66
10,096.0	90.16	359.26	6,647.0	2,560.1	670.0	2,630.5	0.48	-0.21	-0.44
10,191.0	89.85	358.93	6,647.0	2,655.1	668.5	2,724.3	0.48	-0.33	-0.35
10,287.0	89.31	358.75	6,647.7	2,751.1	666.6	2,819.0	0.59	-0.56	-0.19
10,382.0	90.45	359.85	6,647.9	2,846.0	665.4	2,912.8	1.67	1.20	1.16
10,478.0	89.85	359.73	6,647.6	2,942.0	665.1	3,007.7	0.64	-0.63	-0.13
10,573.0	90.75	2.17	6,647.1	3,037.0	666.7	3,101.9	2.74	0.95	2.57
10,669.0	90.44	1.17	6,646.1	3,133.0	669.5	3,197.2	1.09	-0.32	-1.04
10,764.0	90.73	0.79	6,645.1	3,228.0	671.1	3,291.4	0.50	0.31	-0.40
10,860.0	90.72	0.42	6,643.9	3,323.9	672.1	3,386.5	0.39	-0.01	-0.39
10,955.0	90.49	359.21	6,642.9	3,418.9	671.8	3,480.4	1.30	-0.24	-1.27
11,051.0	90.43	358.63	6,642.2	3,514.9	670.0	3,575.1	0.61	-0.06	-0.60
11,146.0	90.44	0.78	6,641.4	3,609.9	669.5	3,669.0	2.26	0.01	2.26
11,241.0	90.74	0.22	6,640.5	3,704.9	670.3	3,763.1	0.67	0.32	-0.59
11,337.0	90.81	359.37	6,639.2	3,800.9	670.0	3,858.0	0.89	0.07	-0.89
11,432.0	91.70	359.44	6,637.1	3,895.9	669.0	3,951.8	0.94	0.94	0.07
11,528.0	90.09	1.45	6,635.6	3,991.8	669.7	4,046.9	2.68	-1.68	2.09
11,623.0	90.85	1.17	6,634.8	4,086.8	671.9	4,141.1	0.85	0.80	-0.29
11,719.0	91.43	0.56	6,632.9	4,182.8	673.4	4,236.3	0.88	0.60	-0.64
11,814.0	91.53	1.14	6,630.4	4,277.7	674.8	4,330.4	0.62	0.11	0.61
11,910.0	90.42	1.00	6,628.8	4,373.7	676.6	4,425.6	1.17	-1.16	-0.15
12,006.0	91.18	0.39	6,627.5	4,469.7	677.7	4,520.7	1.02	0.79	-0.64
12,067.0	91.68	0.34	6,625.9	4,530.7	678.1	4,581.1	0.82	0.82	-0.08
12,127.0	91.68	0.34	6,624.2	4,590.6	678.5	4,640.5	0.00	0.00	0.00
Projected BHL 368°FSL, 2470°FEL, Sec.34									

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 12N
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 12N	North Reference:	True
Wellbore:	Popham 12N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 12N Wellbore #1	Database:	US_EDM

Design Targets									
Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
SHL 1044'FSL, 2356'FW - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,367,062.34	3,268,307.32	40.336990	-104.537510
Projected BHL 368'FSL, - survey misses target center by 9.1ft at 12127.0ft MD (6624.2 TVD, 4590.6 N, 678.5 E) - Point	0.00	0.00	6,633.0	4,592.9	678.8	1,371,662.12	3,268,936.19	40.349597	-104.535075

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
6,949.2	6,605.7	-579.2	589.4	TPZ - 460' Setback - 460'FSL, 2307'FEL, Sec.3	
7,708.0	6,659.4	174.3	612.6	Deepest TVD Drilled - 6659.37' TVD	

Checked By: _____	Approved By: _____	Date: _____
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