

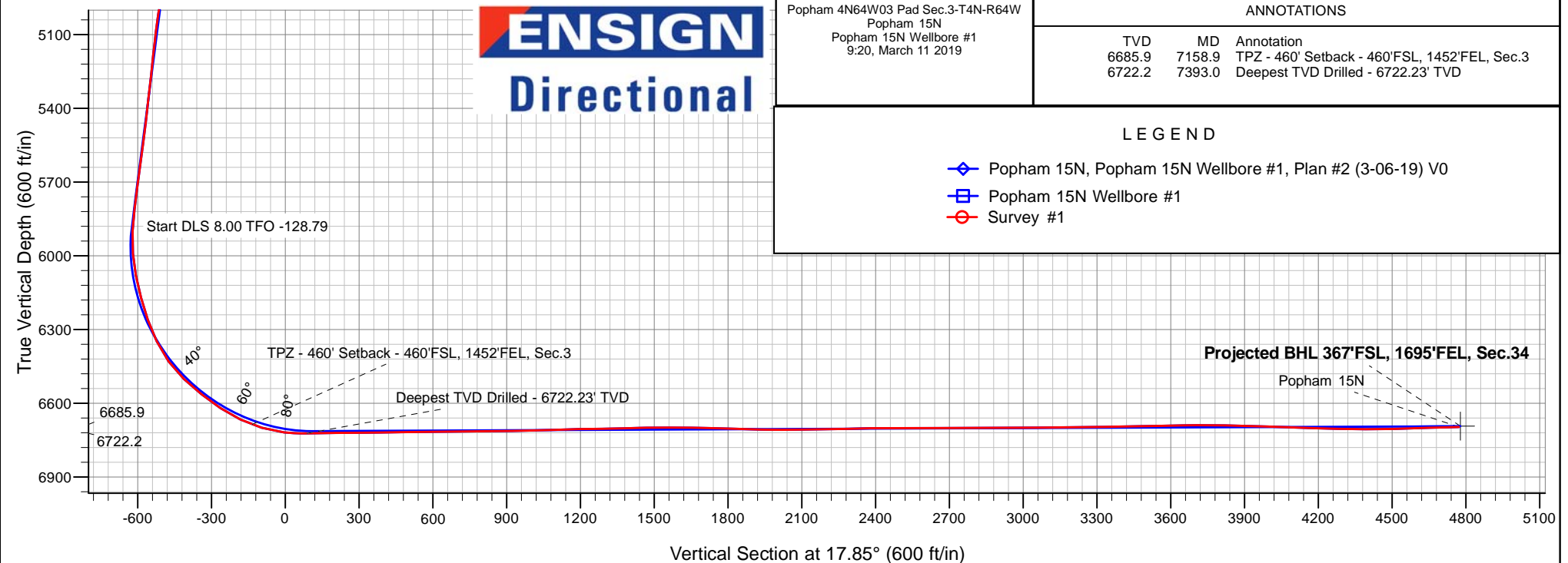
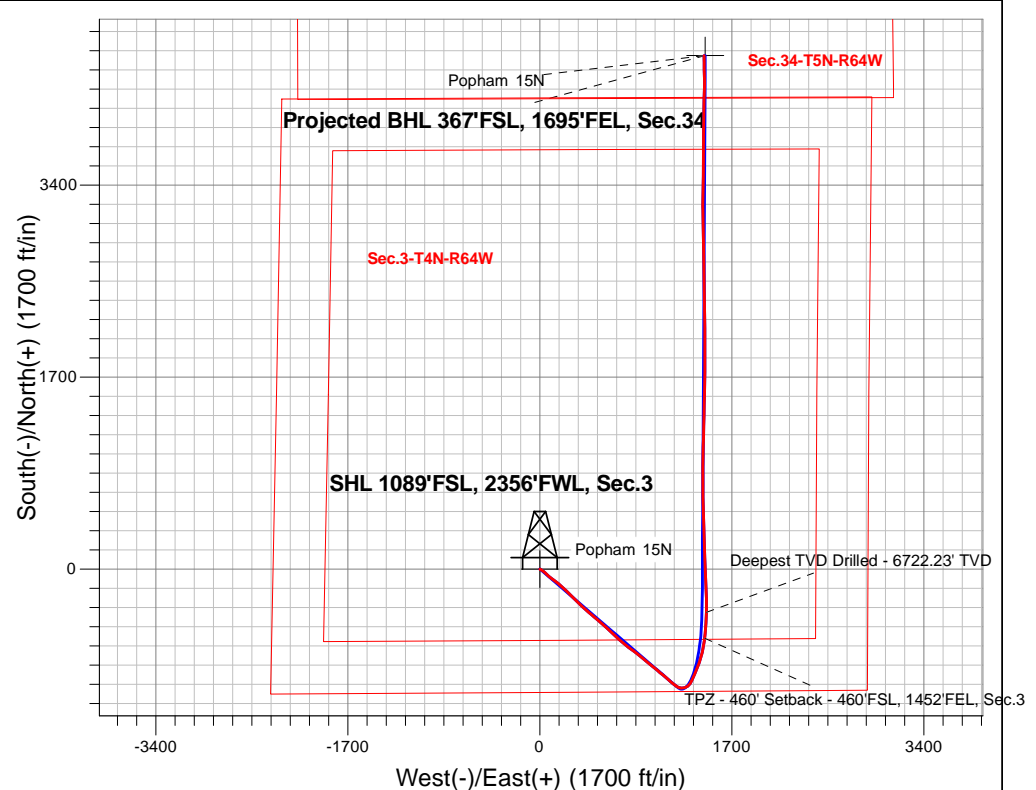
PDC Energy Inc. DJ Basin

Well Name: **Popham 15N**

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 1367109.683268306.80 40.337120 -104.537510
WELL @ 4685.0ft

FINAL SURVEY

Projected Bottom Hole Location
12,323'MD 6696'TVD 4545'N & 1454'E of SHL
91.59 degree Incl @ 358.78 degree AZM



ENSIGN
Directional

Popham 4N64W03 Pad Sec.3-T4N-R64W
Popham 15N
Popham 15N Wellbore #1
9:20, March 11 2019

ANNOTATIONS

TVD	MD	Annotation
6685.9	7158.9	TPZ - 460' Setback - 460'FSL, 1452'FEL, Sec.3
6722.2	7393.0	Deepest TVD Drilled - 6722.23' TVD

LEGEND

- ◆ Popham 15N, Popham 15N Wellbore #1, Plan #2 (3-06-19) V0
- Popham 15N Wellbore #1
- Survey #1



PDC Energy Inc. DJ Basin

SEC.3-T4N-R64W

Popham 4N64W03 Pad Sec.3-T4N-R64W

Popham 15N

Popham 15N Wellbore #1

Survey: Survey #1

Standard Survey Report

11 March, 2019

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 15N
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 15N	North Reference:	True
Wellbore:	Popham 15N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 15N 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 15N					
Well Position	+N/-S	0.0 ft	Northing:	1,367,109.68 usft	Latitude:	40.337120
	+E/-W	0.0 ft	Easting:	3,268,306.80 usft	Longitude:	-104.537510
Position Uncertainty		0.0 ft	Wellhead Elevation:	0.0 ft	Ground Level:	4,662.0 ft

Wellbore	Popham 15N Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	3/5/2019	8.15	66.85	52,175

Design	Popham 15N 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	17.85	

Survey Program	Date	3/11/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
157.0	12,323.0	Survey #1 (Popham 15N 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	101.02	1.0	0.0	0.0	0.0	0.33	0.33	0.00	
SHL 1089'FSL, 2356'FWL, Sec.3										
157.0	0.52	101.02	157.0	-0.1	0.7	0.1	0.33	0.33	0.00	
252.0	0.28	121.36	252.0	-0.3	1.3	0.1	0.29	-0.25	21.41	
347.0	0.17	151.32	347.0	-0.6	1.6	-0.1	0.17	-0.12	31.54	
443.0	0.23	175.35	443.0	-0.9	1.7	-0.3	0.11	0.06	25.03	
538.0	0.15	92.54	538.0	-1.1	1.8	-0.5	0.27	-0.08	-87.17	
633.0	0.67	133.51	633.0	-1.5	2.3	-0.7	0.60	0.55	43.13	
728.0	3.54	117.43	727.9	-3.2	5.3	-1.4	3.05	3.02	-16.93	
823.0	5.16	118.94	822.6	-6.6	11.7	-2.7	1.71	1.71	1.59	

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 15N
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 15N	North Reference:	True
Wellbore:	Popham 15N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 15N 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	5.29	121.11	917.2	-11.0	19.2	-4.6	0.25	0.14	2.28
1,014.0	6.54	126.42	1,012.7	-16.5	27.4	-7.3	1.42	1.30	5.53
1,109.0	7.51	130.86	1,107.0	-23.8	36.4	-11.5	1.17	1.02	4.67
1,204.0	8.54	132.73	1,201.1	-32.6	46.3	-16.9	1.12	1.08	1.97
1,299.0	9.71	134.49	1,294.9	-43.0	57.2	-23.4	1.27	1.23	1.85
1,395.0	11.15	134.16	1,389.3	-55.2	69.6	-31.2	1.50	1.50	-0.34
1,490.0	13.77	130.16	1,482.1	-68.9	84.9	-39.5	2.90	2.76	-4.21
1,593.0	17.57	126.50	1,581.2	-86.0	106.7	-49.2	3.81	3.69	-3.55
1,677.0	18.38	126.15	1,661.1	-101.4	127.6	-57.4	0.97	0.96	-0.42
1,773.0	17.60	127.56	1,752.4	-119.1	151.3	-67.0	0.93	-0.81	1.47
1,868.0	17.93	129.00	1,842.9	-137.1	174.1	-77.1	0.58	0.35	1.52
1,963.0	18.81	131.86	1,933.0	-156.5	196.9	-88.6	1.33	0.93	3.01
2,058.0	20.33	136.11	2,022.6	-178.6	219.7	-102.7	2.19	1.60	4.47
2,153.0	19.88	135.83	2,111.8	-202.1	242.4	-118.1	0.48	-0.47	-0.29
2,248.0	20.06	135.19	2,201.1	-225.3	265.1	-133.1	0.30	0.19	-0.67
2,343.0	21.13	133.92	2,290.0	-248.7	289.0	-148.1	1.22	1.13	-1.34
2,438.0	20.13	133.50	2,378.9	-271.8	313.2	-162.8	1.06	-1.05	-0.44
2,533.0	19.36	132.98	2,468.3	-293.8	336.5	-176.5	0.83	-0.81	-0.55
2,629.0	20.80	133.65	2,558.5	-316.4	360.5	-190.7	1.52	1.50	0.70
2,724.0	20.53	132.80	2,647.4	-339.4	384.9	-205.1	0.42	-0.28	-0.89
2,819.0	20.41	131.86	2,736.4	-361.8	409.5	-218.8	0.37	-0.13	-0.99
2,915.0	20.13	131.51	2,826.4	-383.9	434.3	-232.3	0.32	-0.29	-0.36
3,010.0	19.56	131.15	2,915.8	-405.2	458.6	-245.1	0.61	-0.60	-0.38
3,105.0	19.33	130.79	3,005.4	-425.9	482.4	-257.5	0.27	-0.24	-0.38
3,200.0	18.40	129.77	3,095.2	-445.8	505.9	-269.3	1.04	-0.98	-1.07
3,295.0	18.87	131.03	3,185.3	-465.5	529.0	-280.9	0.65	0.49	1.33
3,391.0	17.92	131.02	3,276.4	-485.3	551.8	-292.8	0.99	-0.99	-0.01
3,486.0	18.58	131.59	3,366.6	-505.0	574.2	-304.7	0.72	0.69	0.60
3,582.0	19.24	133.33	3,457.4	-526.0	597.1	-317.6	0.90	0.69	1.81
3,678.0	18.11	132.99	3,548.3	-547.0	619.5	-330.8	1.18	-1.18	-0.35
3,773.0	18.19	133.17	3,638.6	-567.2	641.2	-343.4	0.10	0.08	0.19
3,869.0	19.03	134.69	3,729.6	-588.5	663.2	-356.9	1.01	0.88	1.58
3,965.0	19.63	132.73	3,820.2	-610.4	686.2	-370.7	0.92	0.63	-2.04
4,156.0	18.27	130.03	4,000.8	-651.5	732.7	-395.5	0.85	-0.71	-1.41
4,251.0	19.45	128.62	4,090.7	-670.9	756.4	-406.7	1.33	1.24	-1.48
4,347.0	18.57	126.71	4,181.5	-690.0	781.2	-417.3	1.12	-0.92	-1.99
4,443.0	18.50	125.08	4,272.5	-707.9	805.9	-426.8	0.54	-0.07	-1.70
4,538.0	18.93	127.55	4,362.5	-726.0	830.4	-436.5	0.95	0.45	2.60
4,634.0	17.58	126.56	4,453.7	-744.1	854.4	-446.4	1.44	-1.41	-1.03
4,729.0	17.41	129.59	4,544.3	-761.7	876.9	-456.2	0.98	-0.18	3.19
4,825.0	18.57	128.94	4,635.6	-780.5	899.9	-467.0	1.23	1.21	-0.68
4,921.0	19.11	130.10	4,726.4	-800.2	923.8	-478.5	0.68	0.56	1.21
5,015.0	17.36	130.30	4,815.7	-819.2	946.3	-489.7	1.86	-1.86	0.21

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 15N
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 15N	North Reference:	True
Wellbore:	Popham 15N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 15N 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)
5,111.0	19.12	130.25	4,906.9	-838.6	969.2	-501.1	1.83	1.83	-0.05
5,207.0	20.83	129.76	4,997.1	-859.7	994.3	-513.5	1.79	1.78	-0.51
5,302.0	18.65	129.62	5,086.5	-880.2	1,019.0	-525.4	2.30	-2.29	-0.15
5,397.0	16.66	129.09	5,177.0	-898.5	1,041.3	-536.0	2.10	-2.09	-0.56
5,493.0	17.11	128.55	5,268.9	-915.9	1,063.0	-546.0	0.50	0.47	-0.56
5,587.0	17.33	129.74	5,358.7	-933.5	1,084.6	-556.1	0.44	0.23	1.27
5,683.0	17.13	129.15	5,450.4	-951.6	1,106.5	-566.6	0.28	-0.21	-0.61
5,779.0	17.76	131.48	5,542.0	-970.2	1,128.5	-577.6	0.98	0.66	2.43
5,873.0	18.73	132.14	5,631.2	-989.8	1,150.4	-589.5	1.06	1.03	0.70
5,968.0	18.73	130.03	5,721.2	-1,009.9	1,173.4	-601.5	0.71	0.00	-2.22
6,062.0	19.11	128.99	5,810.1	-1,029.2	1,196.9	-612.8	0.54	0.40	-1.11
6,157.0	18.49	116.56	5,900.1	-1,045.8	1,222.5	-620.7	4.26	-0.65	-13.08
6,252.0	19.54	94.43	5,990.0	-1,053.7	1,251.8	-619.3	7.63	1.11	-23.29
6,347.0	18.77	73.23	6,079.9	-1,050.6	1,282.3	-606.9	7.33	-0.81	-22.32
6,442.0	17.97	54.11	6,170.1	-1,037.5	1,308.9	-586.4	6.37	-0.84	-20.13
6,537.0	20.13	32.62	6,260.0	-1,015.2	1,329.6	-558.7	7.68	2.27	-22.62
6,632.0	25.91	23.79	6,347.4	-982.4	1,346.8	-522.2	7.07	6.08	-9.29
6,728.0	35.09	23.54	6,430.1	-937.8	1,366.3	-473.8	9.56	9.56	-0.26
6,823.0	47.03	23.07	6,501.6	-880.6	1,390.9	-411.8	12.57	12.57	-0.49
6,917.0	51.68	18.65	6,562.8	-813.9	1,416.2	-340.6	6.10	4.95	-4.70
7,012.0	56.07	12.49	6,618.8	-740.0	1,436.7	-264.0	6.98	4.62	-6.48
7,107.0	64.78	9.32	6,665.7	-659.0	1,452.2	-182.1	9.62	9.17	-3.34
7,158.9	69.35	7.40	6,685.9	-611.7	1,459.1	-135.0	9.44	8.80	-3.70
TPZ - 460' Setback - 460'FSL, 1452'FEL, Sec.3									
7,201.0	73.07	5.93	6,699.5	-572.1	1,463.7	-95.9	9.44	8.84	-3.50
7,297.0	84.51	2.59	6,718.1	-478.4	1,470.7	-4.5	12.39	11.92	-3.48
7,393.0	90.56	1.79	6,722.2	-382.6	1,474.3	87.8	6.36	6.30	-0.83
Deepest TVD Drilled - 6722.23' TVD									
7,430.9	90.65	0.82	6,721.8	-344.7	1,475.2	124.1	2.57	0.25	-2.56
LPL 737'FSL, 1474'FEL, Sec.3									
7,517.0	90.87	358.62	6,720.7	-258.6	1,474.8	205.9	2.57	0.25	-2.56
7,612.0	90.31	357.98	6,719.7	-163.7	1,472.0	295.4	0.90	-0.59	-0.67
7,707.0	90.69	357.70	6,718.9	-68.7	1,468.4	384.7	0.50	0.40	-0.29
7,803.0	90.79	357.30	6,717.6	27.2	1,464.2	474.7	0.43	0.10	-0.42
7,899.0	90.65	356.86	6,716.4	123.0	1,459.3	564.4	0.48	-0.15	-0.46
7,995.0	90.64	357.06	6,715.3	218.9	1,454.2	654.1	0.21	-0.01	0.21
8,090.0	90.66	359.83	6,714.3	313.8	1,451.6	743.7	2.92	0.02	2.92
8,186.0	90.52	359.53	6,713.3	409.8	1,451.1	834.9	0.34	-0.15	-0.31
8,281.0	90.71	358.14	6,712.3	504.8	1,449.2	924.7	1.48	0.20	-1.46
8,377.0	91.30	358.32	6,710.6	600.7	1,446.2	1,015.1	0.64	0.61	0.19
8,473.0	91.95	357.94	6,707.9	696.6	1,443.1	1,105.5	0.78	0.68	-0.40
8,568.0	91.42	0.20	6,705.1	791.6	1,441.5	1,195.4	2.44	-0.56	2.38
8,664.0	90.48	1.55	6,703.5	887.6	1,443.0	1,287.2	1.71	-0.98	1.41
8,759.0	91.25	1.32	6,702.0	982.5	1,445.4	1,378.3	0.85	0.81	-0.24

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 15N
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 15N	North Reference:	True
Wellbore:	Popham 15N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 15N 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)
8,854.0	91.65	1.02	6,699.6	1,077.5	1,447.3	1,469.3	0.53	0.42	-0.32
8,950.0	89.42	1.42	6,698.7	1,173.4	1,449.4	1,561.2	2.36	-2.32	0.42
9,045.0	89.44	1.22	6,699.7	1,268.4	1,451.5	1,652.3	0.21	0.02	-0.21
9,141.0	88.80	1.43	6,701.2	1,364.4	1,453.8	1,744.3	0.70	-0.67	0.22
9,236.0	88.37	0.94	6,703.5	1,459.3	1,455.7	1,835.3	0.69	-0.45	-0.52
9,332.0	87.92	0.98	6,706.6	1,555.3	1,457.3	1,927.1	0.47	-0.47	0.04
9,428.0	90.73	0.84	6,707.7	1,651.2	1,458.9	2,018.9	2.93	2.93	-0.15
9,523.0	90.72	0.60	6,706.5	1,746.2	1,460.0	2,109.7	0.25	-0.01	-0.25
9,619.0	90.80	0.53	6,705.3	1,842.2	1,461.0	2,201.4	0.11	0.08	-0.07
9,714.0	91.30	359.95	6,703.5	1,937.2	1,461.4	2,291.9	0.81	0.53	-0.61
9,810.0	91.11	359.70	6,701.5	2,033.2	1,461.1	2,383.2	0.33	-0.20	-0.26
9,905.0	89.97	359.92	6,700.6	2,128.1	1,460.8	2,473.5	1.22	-1.20	0.23
10,001.0	89.90	359.55	6,700.7	2,224.1	1,460.3	2,564.7	0.39	-0.07	-0.39
10,096.0	89.76	359.05	6,701.0	2,319.1	1,459.2	2,654.8	0.55	-0.15	-0.53
10,191.0	90.47	359.35	6,700.8	2,414.1	1,457.9	2,744.8	0.81	0.75	0.32
10,287.0	90.52	359.12	6,700.0	2,510.1	1,456.6	2,835.8	0.25	0.05	-0.24
10,383.0	90.36	358.74	6,699.2	2,606.1	1,454.8	2,926.6	0.43	-0.17	-0.40
10,478.0	90.08	357.80	6,698.9	2,701.1	1,451.9	3,016.1	1.03	-0.29	-0.99
10,574.0	90.23	358.74	6,698.6	2,797.0	1,449.0	3,106.5	0.99	0.16	0.98
10,669.0	90.71	0.03	6,697.8	2,892.0	1,448.0	3,196.6	1.45	0.51	1.36
10,765.0	90.79	359.10	6,696.6	2,988.0	1,447.3	3,287.8	0.97	0.08	-0.97
10,860.0	91.09	358.41	6,695.0	3,082.9	1,445.2	3,377.5	0.79	0.32	-0.73
10,956.0	90.71	359.22	6,693.5	3,178.9	1,443.2	3,468.3	0.93	-0.40	0.84
11,051.0	91.57	1.56	6,691.6	3,273.9	1,443.9	3,558.9	2.62	0.91	2.46
11,146.0	90.45	0.90	6,689.9	3,368.8	1,445.9	3,649.9	1.37	-1.18	-0.69
11,241.0	90.57	0.18	6,689.1	3,463.8	1,446.8	3,740.6	0.77	0.13	-0.76
11,337.0	88.25	1.39	6,690.1	3,559.8	1,448.1	3,832.3	2.73	-2.42	1.26
11,433.0	88.45	0.53	6,692.9	3,655.8	1,449.7	3,924.2	0.92	0.21	-0.90
11,528.0	88.22	0.20	6,695.6	3,750.7	1,450.3	4,014.7	0.42	-0.24	-0.35
11,624.0	88.24	359.64	6,698.6	3,846.7	1,450.2	4,106.0	0.58	0.02	-0.58
11,719.0	88.27	359.55	6,701.5	3,941.6	1,449.5	4,196.2	0.10	0.03	-0.09
11,815.0	89.01	2.04	6,703.8	4,037.6	1,450.9	4,287.9	2.71	0.77	2.59
11,911.0	89.08	1.49	6,705.4	4,133.5	1,453.8	4,380.2	0.58	0.07	-0.57
12,006.0	91.50	1.16	6,704.9	4,228.5	1,456.0	4,471.2	2.57	2.55	-0.35
12,102.0	91.63	359.96	6,702.3	4,324.4	1,456.9	4,562.9	1.26	0.14	-1.25
12,197.0	91.45	359.18	6,699.7	4,419.4	1,456.2	4,653.0	0.84	-0.19	-0.82
12,263.0	91.59	358.78	6,697.9	4,485.4	1,455.1	4,715.5	0.64	0.21	-0.61
12,323.0	91.59	358.78	6,696.3	4,545.3	1,453.8	4,772.2	0.00	0.00	0.00
Projected BHL 367°FSL, 1695°FEL, Sec.34									

Company:	PDC Energy Inc. DJ Basin	Local Co-ordinate Reference:	Well Popham 15N
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 15N	North Reference:	True
Wellbore:	Popham 15N Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Popham 15N 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 1089'FSL, 2356'FW - survey hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,367,109.69	3,268,306.83	40.337120	-104.537510
Projected BHL 367'FSL, - survey misses target center by 11.6ft at 12323.0ft MD (6696.3 TVD, 4545.3 N, 1453.8 E) - Point	0.00	0.00	6,693.0	4,547.9	1,464.6	1,371,672.97	3,269,721.93	40.349603	-104.532256

Survey Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates			
		+N/-S (ft)	+E/-W (ft)	Comment	
7,158.9	6,685.9	-611.7	1,459.1	TPZ - 460' Setback - 460'FSL, 1452'FEL, Sec.3	
7,393.0	6,722.2	-382.6	1,474.3	Deepest TVD Drilled - 6722.23' TVD	

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------