PDC Energy Inc. DJ Basin

Well Name: **Thistle Down 31I-212**

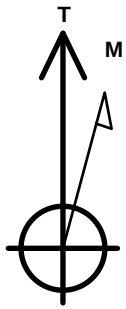
Surface Location: Thistle Down 5N64W31H Pad Sec.31-T5N-R64W
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone
Ground Elevation: 4803.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	12453.51	3251620.19	40.352270	-104.597170	

Original Well Elev WELL @ 4826.0ft (Original Well Elev)

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
SHL 1399'FSL, 1357'FWL, SEC.31	1.0	0.0	0.0	Point
BHL 450'FSL, 800'FWL, SEC.32	6856.0	-928.5	4727.2	Point
LPL 450'FSL, 735'FWL, SEC.31	6896.0	-954.5	-620.4	Point



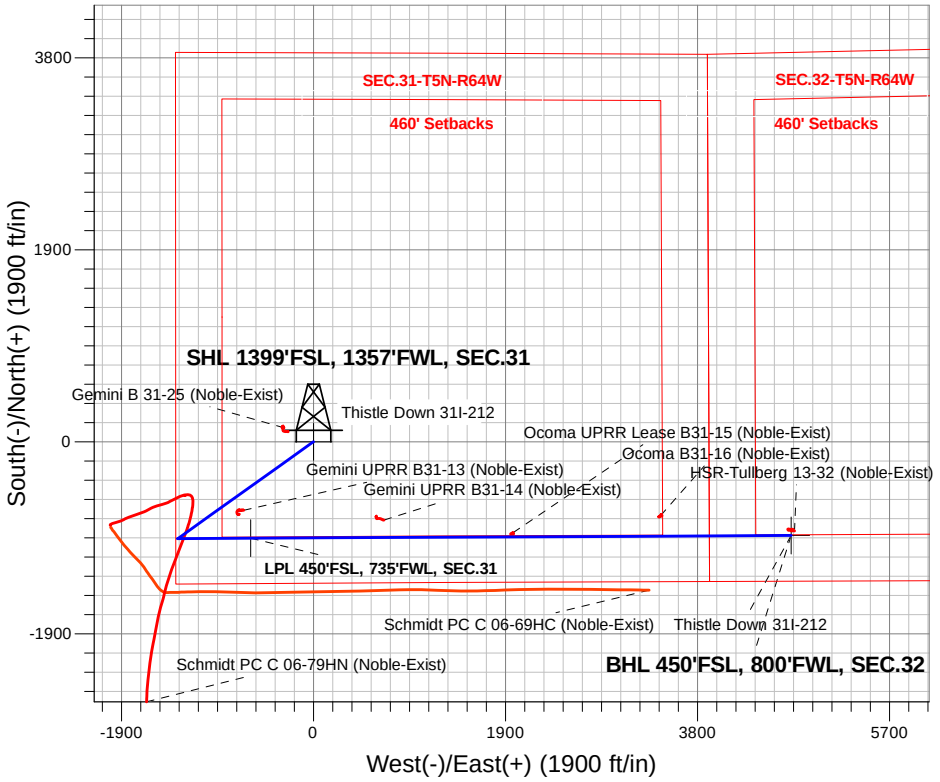
Azimuths to True North
Magnetic North: 8.00°

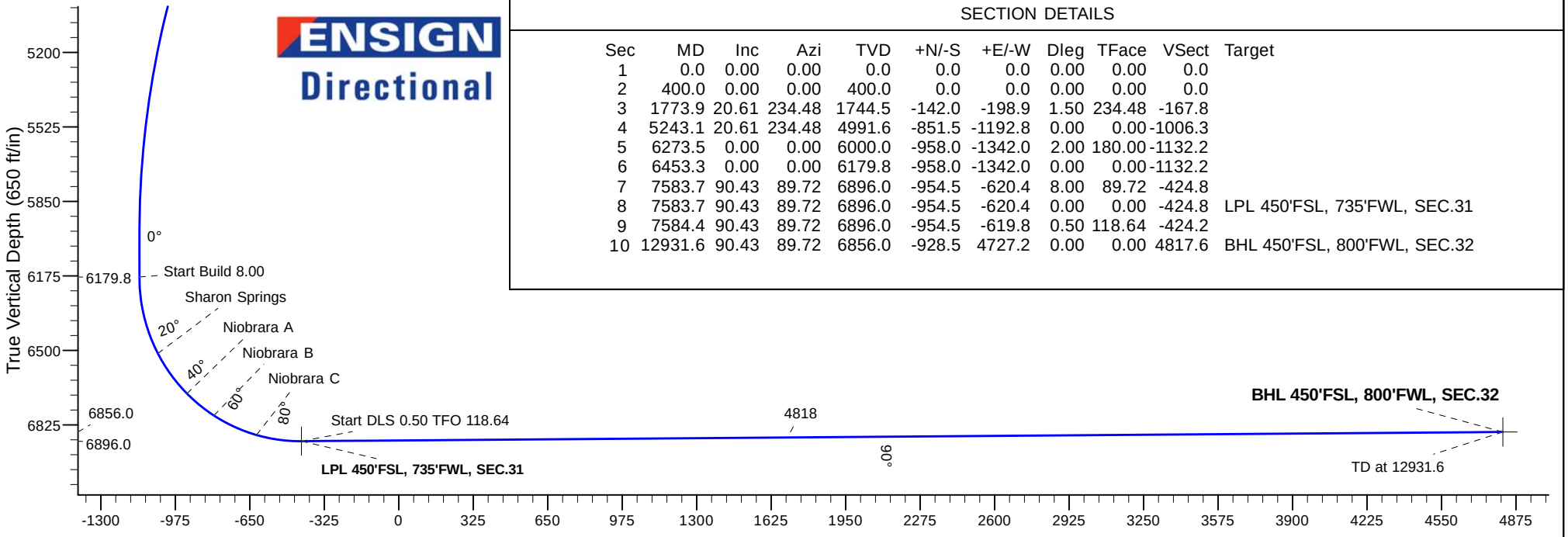
Magnetic Field
Strength: 52520.2snT
Dip Angle: 66.84°
Date: 3/8/2017
Model: IGRF2010

Thistle Down 5N64W31H Pad Sec.31-T5N-R64W
Thistle Down 31I-212
Plan #1 (2-28-17)
10:19, March 08 2017

ANNOTATIONS

TVD	MD	Annotation
400.0	400.0	KOP - Start Build 1.50
4991.7	5243.1	Start Drop -2.00
6179.8	6453.3	Start Build 8.00
6896.0	7583.7	Start DLS 0.50 TFO 118.64
6896.0	7584.4	Start 5347.3 hold at 7584.4 MD
6856.0	12931.6	TD at 12931.6





SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	400.0	0.00	0.00	400.0	0.0	0.0	0.00	0.00	0.0	
3	1773.9	20.61	234.48	1744.5	-142.0	-198.9	1.50	234.48	-167.8	
4	5243.1	20.61	234.48	4991.6	-851.5	-1192.8	0.00	0.00	-1006.3	
5	6273.5	0.00	0.00	6000.0	-958.0	-1342.0	2.00	180.00	-1132.2	
6	6453.3	0.00	0.00	6179.8	-958.0	-1342.0	0.00	0.00	-1132.2	
7	7583.7	90.43	89.72	6896.0	-954.5	-620.4	8.00	89.72	-424.8	
8	7583.7	90.43	89.72	6896.0	-954.5	-620.4	0.00	0.00	-424.8	LPL 450'FSL, 735'FWL, SEC.31
9	7584.4	90.43	89.72	6896.0	-954.5	-619.8	0.50	118.64	-424.2	
10	12931.6	90.43	89.72	6856.0	-928.5	4727.2	0.00	0.00	4817.6	BHL 450'FSL, 800'FWL, SEC.32

ENSIGN Directional

PDC Energy Inc. DJ Basin

SEC.31-T5N-R64W
Thistle Down 5N64W31H Pad Sec.31-T5N-R64W
Thistle Down 31I-212

Wellbore #1
Plan #1 (2-28-17)

Anticollision Report

08 March, 2017

PDC ENERGY
Growing E&P Value

Company:	PDC Energy Inc. DJ Basin	**Local Co-ordinate Reference:**	Well Thistle Down 31I-212
Project:	SEC.31-T5N-R64W	**TVD Reference:**	WELL @ 4826.0ft (Original Well Elev)
Reference Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	**MD Reference:**	WELL @ 4826.0ft (Original Well Elev)
Site Error:	0.0 ft	**North Reference:**	True
Reference Well:	Thistle Down 31I-212	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0 ft	**Output errors are at**	2.45 sigma
Reference Wellbore	Wellbore #1	**Database:**	US_EDM
Reference Design:	Plan #1 (2-28-17)	**Offset TVD Reference:**	Offset Datum

Reference Plan #1 (2-28-17)

Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	**Error Model:**	ISCWSA
Depth Range:	Unlimited	**Scan Method:**	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 800.0 ft	**Error Surface:**	Elliptical Conic
Warning Levels Evaluated at:	2.45 **Sigma**	**Casing Method:**	Not applied

Survey Tool Program **Date** 3/8/2017

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	12,931.6	Plan #1 (2-28-17) (Wellbore #1)	MWD	MWD - Standard

Summary

Site Name Offset Well - Wellbore - Design	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Existing Wells Sec.31-T5N-R64W (GRID)						
Gemini B 31-25 (Noble-Exist) - Wellbore #1 - Wellbore #	1,478.7	1,432.5	238.3	228.6	24.687	CC
Gemini B 31-25 (Noble-Exist) - Wellbore #1 - Wellbore #	1,500.0	1,453.1	238.4	228.5	24.184	ES
Gemini B 31-25 (Noble-Exist) - Wellbore #1 - Wellbore #	1,900.0	1,833.3	271.3	257.7	19.948	SF
Gemini UPRR B31-13 (Noble-Exist) - Wellbore #1 - Well	3,875.4	3,675.4	127.1	93.0	3.723	CC, ES
Gemini UPRR B31-13 (Noble-Exist) - Wellbore #1 - Well	3,900.0	3,698.5	127.4	93.0	3.701	SF
Gemini UPRR B31-14 (Noble-Exist) - Wellbore #1 - Well	8,902.5	6,868.4	171.6	88.7	2.069	CC, ES, SF
Ocoma B31-16 (Noble-Exist) - Wellbore #1 - Wellbore #1	11,636.5	6,822.9	200.6	31.8	1.188	Level 2, CC, ES, SF
Ocoma UPRR Lease B31-15 (Noble-Exist) - Wellbore #1	10,179.0	6,843.9	42.6	-77.9	0.354	Level 1, CC, ES, SF
Existing Wells Sec.32-T5N-R64W (GRID)						
HSR-Tullberg 13-32 (Noble-Exist) - Wellbore #1 - Wellbo	12,931.6	6,786.9	50.5	-161.5	0.238	Level 1, CC, ES, SF
Existing Wells Sec.36-T5N-R65W						
Schmidt PC C 06-69HC (Noble-Exist) - Wellbore #1 - We	9,187.4	9,117.6	521.0	356.3	3.162	CC
Schmidt PC C 06-69HC (Noble-Exist) - Wellbore #1 - We	11,500.0	11,418.7	541.2	226.5	1.719	ES
Schmidt PC C 06-69HC (Noble-Exist) - Wellbore #1 - We	11,600.0	11,454.0	547.4	228.1	1.714	SF
Schmidt PC C 06-79HN (Noble-Exist) - Wellbore #1 - We	5,220.7	4,996.6	335.4	282.5	6.344	CC, ES
Schmidt PC C 06-79HN (Noble-Exist) - Wellbore #1 - We	5,243.1	5,015.3	335.6	282.6	6.323	SF

Company:	PDC Energy Inc. DJ Basin	**Local Co-ordinate Reference:**	Well Thistle Down 31I-212
Project:	SEC.31-T5N-R64W	**TVD Reference:**	WELL @ 4826.0ft (Original Well Elev)
Reference Site:	Thistle Down 5N64W31H Pad Sec.31-T5N-R64W	**MD Reference:**	WELL @ 4826.0ft (Original Well Elev)
Site Error:	0.0 ft	**North Reference:**	True
Reference Well:	Thistle Down 31I-212	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0 ft	**Output errors are at**	2.45 sigma
Reference Wellbore	Wellbore #1	**Database:**	US_EDM
Reference Design:	Plan #1 (2-28-17)	**Offset TVD Reference:**	Offset Datum

Summary

Site Name Offset Well - Wellbore - Design	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Thistle Down 5N64W31H Pad Sec.31-T5N-R64W						
Thistle Down 31G-232 - Wellbore #1 - Plan #1 (2-28-17)	366.0	368.0	91.1	89.3	52.179	CC
Thistle Down 31G-232 - Wellbore #1 - Plan #1 (2-28-17)	400.0	402.0	91.1	89.1	47.128	ES
Thistle Down 31G-232 - Wellbore #1 - Plan #1 (2-28-17)	3,200.0	3,080.0	780.9	747.3	23.262	SF
Thistle Down 31G-332 - Wellbore #1 - Plan #1 (2-28-17)	166.0	168.0	105.6	105.0	163.984	CC
Thistle Down 31G-332 - Wellbore #1 - Plan #1 (2-28-17)	200.0	202.0	105.6	104.8	127.075	ES
Thistle Down 31G-332 - Wellbore #1 - Plan #1 (2-28-17)	2,800.0	2,656.9	774.0	745.9	27.540	SF
Thistle Down 31H-202 - Wellbore #1 - Plan #1 (2-28-17)	400.0	401.0	61.9	60.0	32.089	CC, ES
Thistle Down 31H-202 - Wellbore #1 - Plan #1 (2-28-17)	4,500.0	4,439.9	795.8	743.4	15.186	SF
Thistle Down 31H-232 - Wellbore #1 - Plan #1 (2-28-17)	400.0	401.0	29.1	27.2	15.102	CC, ES
Thistle Down 31H-232 - Wellbore #1 - Plan #1 (2-28-17)	12,931.6	12,870.6	557.5	161.7	1.409	Level 3, SF
Thistle Down 31H-302 - Wellbore #1 - Plan #1 (2-28-17)	400.0	401.0	47.4	45.4	24.540	CC, ES
Thistle Down 31H-302 - Wellbore #1 - Plan #1 (2-28-17)	5,900.0	5,852.1	797.2	726.5	11.279	SF
Thistle Down 31H-312 - Wellbore #1 - Plan #1 (2-28-17)	400.0	401.0	76.5	74.6	39.639	CC, ES
Thistle Down 31H-312 - Wellbore #1 - Plan #1 (2-28-17)	3,700.0	3,609.5	776.5	736.4	19.389	SF
Thistle Down 31H-332 - Wellbore #1 - Plan #1 (2-28-17)	400.0	400.0	14.6	12.6	7.563	CC
Thistle Down 31H-332 - Wellbore #1 - Plan #1 (2-28-17)	12,931.6	12,955.5	305.8	-77.7	0.797	Level 1, ES, SF
Thistle Down 31I-302 - Wellbore #1 - Plan #1 (2-28-17)	200.0	200.0	14.6	13.7	17.637	CC
Thistle Down 31I-302 - Wellbore #1 - Plan #1 (2-28-17)	12,931.6	13,053.5	298.7	-81.2	0.786	Level 1, ES, SF

Offset Design Existing Wells Sec.31-T5N-R64W (GRID) - Gemini B 31-25 (Noble-Exist) - Wellbore #1 - Wellbore #1

Survey Program: 100-NS-GYRO-MS

Offset Site Error: 0.0 ft

Offset Well Error: 0.0 ft

Reference Measured Depth (ft)	Reference Vertical Depth (ft)	Offset Measured Depth (ft)	Offset Vertical Depth (ft)	Semi Major Axis Reference (ft)	Semi Major Axis Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	-68.59	98.4	-250.8	271.1				
100.0	100.0	69.0	69.0	0.1	0.1	-68.60	98.4	-251.0	269.6	269.3	0.25	1,078.211	
200.0	200.0	169.0	169.0	0.4	0.4	-68.63	98.4	-251.4	270.0	269.2	0.80	338.149	
300.0	300.0	268.8	268.8	0.7	0.7	-68.66	98.4	-251.8	270.4	269.0	1.40	193.632	
400.0	400.0	368.6	368.6	1.0	1.0	-68.68	98.5	-252.3	270.9	268.9	1.99	136.302	
500.0	500.0	468.0	468.0	1.2	1.3	57.11	98.9	-252.8	270.8	268.2	2.54	106.548	
600.0	599.9	567.1	567.1	1.5	1.6	57.89	99.5	-253.5	269.6	266.5	3.09	87.336	
700.0	699.7	666.0	666.0	1.7	1.9	59.14	100.1	-254.6	267.3	263.7	3.66	72.993	
800.0	799.3	765.5	765.5	2.0	2.3	60.85	100.6	-256.0	264.2	260.0	4.27	61.833	
900.0	898.6	864.7	864.6	2.4	2.6	63.08	101.0	-257.4	260.1	255.2	4.92	52.912	
1,000.0	997.5	963.5	963.4	2.7	2.9	65.87	101.2	-259.0	255.5	249.9	5.60	45.633	
1,100.0	1,096.1	1,062.2	1,062.1	3.1	3.2	69.29	101.5	-260.7	250.6	244.2	6.33	39.579	
1,200.0	1,194.2	1,160.5	1,160.4	3.6	3.5	73.34	101.6	-262.5	245.8	238.6	7.12	34.518	
1,300.0	1,291.7	1,258.3	1,258.2	4.1	3.9	78.07	101.7	-264.3	241.7	233.7	7.97	30.315	
1,400.0	1,388.6	1,355.9	1,355.8	4.7	4.2	83.51	101.8	-266.1	239.0	230.2	8.89	26.888	
1,478.7	1,464.4	1,432.5	1,432.4	5.2	4.4	88.24	101.9	-267.3	238.3	228.6	9.65	24.687	CC
1,500.0	1,484.9	1,453.1	1,453.0	5.4	4.5	89.58	101.8	-267.6	238.4	228.5	9.86	24.184	ES
1,600.0	1,580.4	1,549.3	1,549.1	6.1	4.8	96.10	101.7	-268.8	240.6	229.7	10.84	22.185	
1,700.0	1,675.0	1,644.6	1,644.5	6.9	5.1	102.90	101.6	-270.0	246.6	234.8	11.82	20.860	
1,773.9	1,744.5	1,714.6	1,714.5	7.5	5.3	107.95	101.4	-270.8	253.8	241.3	12.52	20.280	
1,800.0	1,768.9	1,739.2	1,739.1	7.7	5.4	109.74	101.3	-271.0	256.9	244.2	12.75	20.151	
1,900.0	1,862.5	1,833.3	1,833.2	8.5	5.7	116.19	100.9	-272.1	271.3	257.7	13.60	19.948	SF
2,000.0	1,956.1	1,926.9	1,926.7	9.4	6.0	121.98	100.6	-273.0	289.1	274.7	14.37	20.115	
2,100.0	2,049.7	2,020.6	2,020.5	10.3	6.3	127.10	100.5	-274.1	309.7	294.7	15.08	20.538	
2,200.0	2,143.3	2,115.2	2,115.0	11.2	6.6	131.61	100.2	-275.3	332.5	316.8	15.74	21.119	

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation