

# PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Thornton 15F-432**

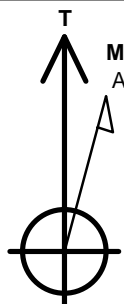
Surface Location: Thornton Pad Sec.15-T7N-R66W  
North American Datum 1983 , US State Plane 1983, Colorado Northern Zone  
Ground Elevation: 4970.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1455450.50	3202072.04	40.581335	-104.772500	

Original Well Elev WELL @ 4985.0ft (Original Well Elev)

## DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
SHL 300'FNL & 285'FWL	1.0	0.0	0.0	Point
BHL 1520'FNL, 500'FEL	7495.0	-1087.1	4569.6	Point



Azimuths to True North  
Magnetic North: 8.32°

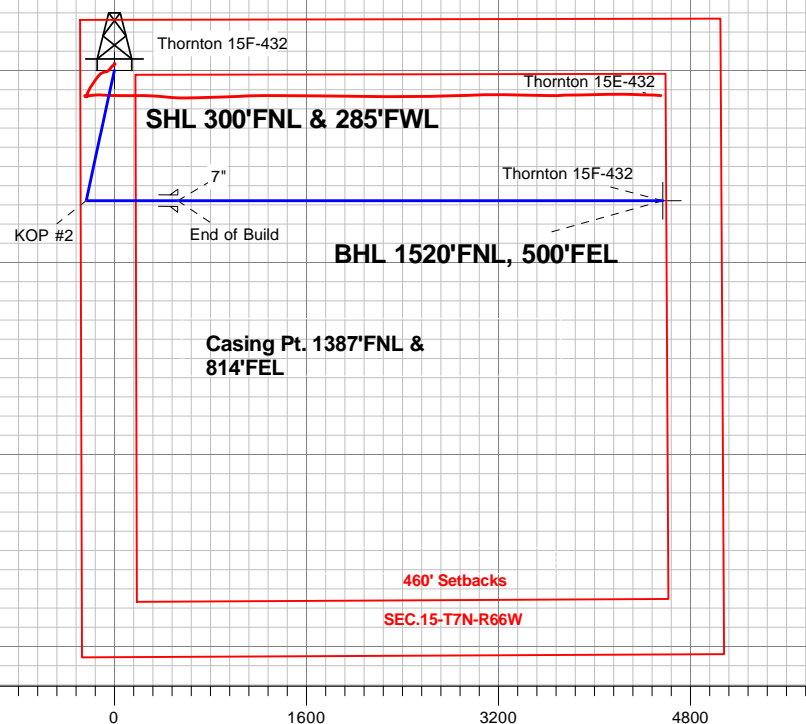
Magnetic Field  
Strength: 52785.4snT  
Dip Angle: 67.05°  
Date: 8/13/2015  
Model: IGRF2010

## ANNOTATIONS

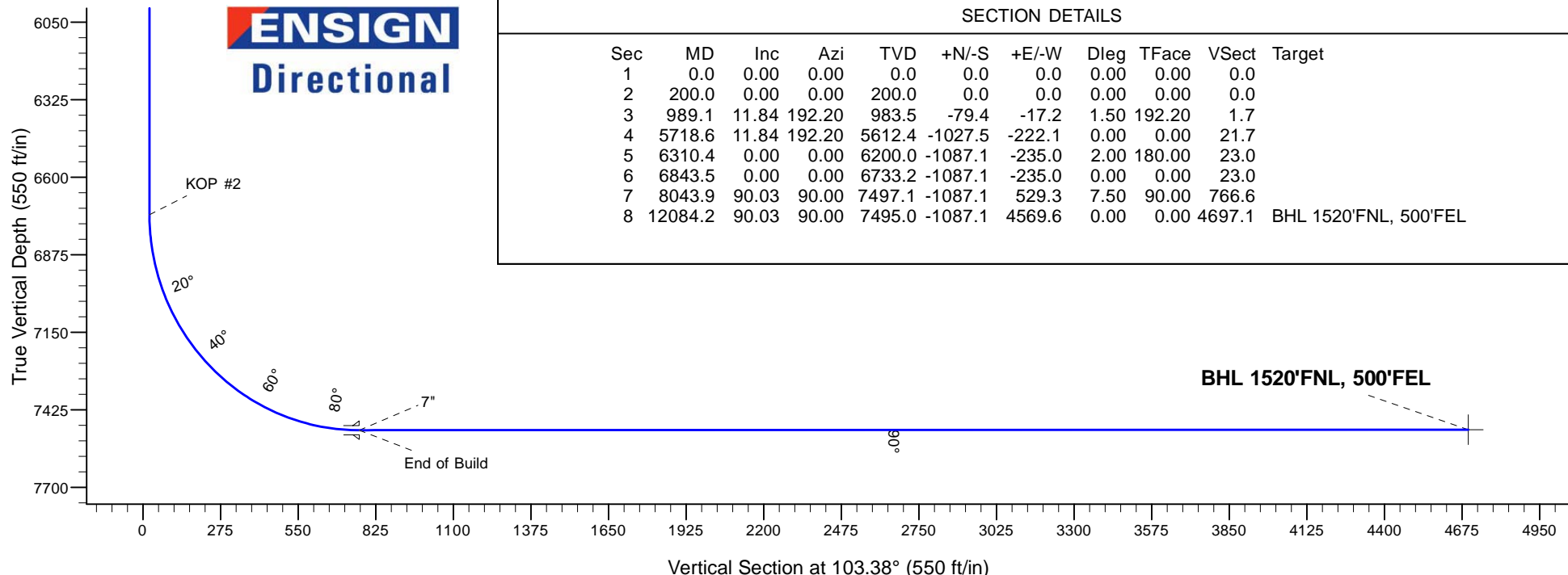
TVD	MD	Annotation
200.0	200.0	KOP #1
6733.2	6843.5	KOP #2
7497.1	8043.9	End of Build

Thornton Pad Sec.15-T7N-R66W  
Thornton 15F-432  
Plan #2 (8-13-15)

South(-)/North(+) (1600 ft/in)



West(-)/East(+) (1600 ft/in)



## 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	200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.0	
3	989.1	11.84	192.20	983.5	-79.4	-17.2	1.50	192.20	1.7	
4	5718.6	11.84	192.20	5612.4	-1027.5	-222.1	0.00	0.00	21.7	
5	6310.4	0.00	0.00	6200.0	-1087.1	-235.0	2.00	180.00	23.0	
6	6843.5	0.00	0.00	6733.2	-1087.1	-235.0	0.00	0.00	23.0	
7	8043.9	90.03	90.00	7497.1	-1087.1	529.3	7.50	90.00	766.6	
8	12084.2	90.03	90.00	7495.0	-1087.1	4569.6	0.00	0.00	4697.1	BHL 1520'FNL, 500'FEL



# **PETROLEUM DEVELOPMENT CORP Weld County CO**

**SEC.15-T7N-R66W**

**Thornton Pad Sec.15-T7N-R66W**

**Thornton 15F-432**

**Wellbore #1**

**Plan: Plan #2 (8-13-15)**

## **Standard Planning Report**

**13 August, 2015**

<b>Database:</b>	US_EDM	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #2 (8-13-15)		

<b>Project</b>	SEC.15-T7N-R66W, Weld County, Colorado		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

<b>Site</b>	Thornton Pad Sec.15-T7N-R66W		
<b>Site Position:</b>		<b>Northing:</b>	1,455,601.69 usft
<b>From:</b>	Lat/Long	<b>Easting:</b>	3,202,070.80 usft
<b>Position Uncertainty:</b>	0.0 ft	<b>Slot Radius:</b>	13-3/16 "
		<b>Latitude:</b>	40.581750
		<b>Longitude:</b>	-104.772500
		<b>Grid Convergence:</b>	0.47 °

<b>Well</b>	Thornton 15F-432		
<b>Well Position</b>	<b>+N/-S</b>	-151.2 ft	<b>Northing:</b>
	<b>+E/-W</b>	0.0 ft	<b>Easting:</b>
<b>Position Uncertainty</b>		0.0 ft	<b>Wellhead Elevation:</b>
			<b>Latitude:</b>
			<b>Longitude:</b>
			<b>Ground Level:</b>

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	8/13/2015	8.32	67.05	52,785

<b>Design</b>	Plan #2 (8-13-15)			
<b>Audit Notes:</b>				
<b>Version:</b>	<b>Phase:</b>	PROTOTYPE	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD)</b>	<b>+N/-S</b>	<b>+E/-W</b>	<b>Direction</b>
	(ft)	(ft)	(ft)	(°)
	0.0	0.0	0.0	103.38

<b>Plan Sections</b>										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.00	0.00	
989.1	11.84	192.20	983.5	-79.4	-17.2	1.50	1.50	0.00	192.20	
5,718.6	11.84	192.20	5,612.4	-1,027.5	-222.1	0.00	0.00	0.00	0.00	
6,310.4	0.00	0.00	6,200.0	-1,087.1	-235.0	2.00	-2.00	0.00	180.00	
6,843.5	0.00	0.00	6,733.2	-1,087.1	-235.0	0.00	0.00	0.00	0.00	
8,043.9	90.03	90.00	7,497.1	-1,087.1	529.3	7.50	7.50	0.00	90.00	
12,084.2	90.03	90.00	7,495.0	-1,087.1	4,569.6	0.00	0.00	0.00	0.00	BHL 1520'FNL, 500'F

<b>Database:</b>	US_EDM	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #2 (8-13-15)		

Planned 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
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
<b>KOP #1</b>									
300.0	1.50	192.20	300.0	-1.3	-0.3	0.0	1.50	1.50	0.00
400.0	3.00	192.20	399.9	-5.1	-1.1	0.1	1.50	1.50	0.00
500.0	4.50	192.20	499.7	-11.5	-2.5	0.2	1.50	1.50	0.00
600.0	6.00	192.20	599.3	-20.5	-4.4	0.4	1.50	1.50	0.00
700.0	7.50	192.20	698.6	-31.9	-6.9	0.7	1.50	1.50	0.00
800.0	9.00	192.20	797.5	-46.0	-9.9	1.0	1.50	1.50	0.00
900.0	10.50	192.20	896.1	-62.5	-13.5	1.3	1.50	1.50	0.00
989.1	11.84	192.20	983.5	-79.4	-17.2	1.7	1.50	1.50	0.00
1,000.0	11.84	192.20	994.2	-81.6	-17.6	1.7	0.00	0.00	0.00
1,100.0	11.84	192.20	1,092.0	-101.6	-22.0	2.1	0.00	0.00	0.00
1,200.0	11.84	192.20	1,189.9	-121.7	-26.3	2.6	0.00	0.00	0.00
1,300.0	11.84	192.20	1,287.8	-141.7	-30.6	3.0	0.00	0.00	0.00
1,400.0	11.84	192.20	1,385.7	-161.8	-35.0	3.4	0.00	0.00	0.00
1,500.0	11.84	192.20	1,483.5	-181.8	-39.3	3.8	0.00	0.00	0.00
1,600.0	11.84	192.20	1,581.4	-201.9	-43.6	4.3	0.00	0.00	0.00
1,700.0	11.84	192.20	1,679.3	-221.9	-48.0	4.7	0.00	0.00	0.00
1,800.0	11.84	192.20	1,777.2	-242.0	-52.3	5.1	0.00	0.00	0.00
1,900.0	11.84	192.20	1,875.0	-262.0	-56.6	5.5	0.00	0.00	0.00
2,000.0	11.84	192.20	1,972.9	-282.0	-61.0	6.0	0.00	0.00	0.00
2,100.0	11.84	192.20	2,070.8	-302.1	-65.3	6.4	0.00	0.00	0.00
2,200.0	11.84	192.20	2,168.7	-322.1	-69.6	6.8	0.00	0.00	0.00
2,300.0	11.84	192.20	2,266.5	-342.2	-74.0	7.2	0.00	0.00	0.00
2,400.0	11.84	192.20	2,364.4	-362.2	-78.3	7.7	0.00	0.00	0.00
2,500.0	11.84	192.20	2,462.3	-382.3	-82.6	8.1	0.00	0.00	0.00
2,600.0	11.84	192.20	2,560.1	-402.3	-87.0	8.5	0.00	0.00	0.00
2,700.0	11.84	192.20	2,658.0	-422.4	-91.3	8.9	0.00	0.00	0.00
2,800.0	11.84	192.20	2,755.9	-442.4	-95.6	9.3	0.00	0.00	0.00
2,900.0	11.84	192.20	2,853.8	-462.5	-100.0	9.8	0.00	0.00	0.00
3,000.0	11.84	192.20	2,951.6	-482.5	-104.3	10.2	0.00	0.00	0.00
3,100.0	11.84	192.20	3,049.5	-502.6	-108.6	10.6	0.00	0.00	0.00
3,200.0	11.84	192.20	3,147.4	-522.6	-113.0	11.0	0.00	0.00	0.00
3,300.0	11.84	192.20	3,245.3	-542.7	-117.3	11.5	0.00	0.00	0.00
3,400.0	11.84	192.20	3,343.1	-562.7	-121.6	11.9	0.00	0.00	0.00
3,500.0	11.84	192.20	3,441.0	-582.8	-126.0	12.3	0.00	0.00	0.00
3,600.0	11.84	192.20	3,538.9	-602.8	-130.3	12.7	0.00	0.00	0.00
3,700.0	11.84	192.20	3,636.8	-622.9	-134.6	13.2	0.00	0.00	0.00
3,800.0	11.84	192.20	3,734.6	-642.9	-139.0	13.6	0.00	0.00	0.00
3,900.0	11.84	192.20	3,832.5	-663.0	-143.3	14.0	0.00	0.00	0.00
4,000.0	11.84	192.20	3,930.4	-683.0	-147.7	14.4	0.00	0.00	0.00
4,100.0	11.84	192.20	4,028.3	-703.1	-152.0	14.9	0.00	0.00	0.00
4,200.0	11.84	192.20	4,126.1	-723.1	-156.3	15.3	0.00	0.00	0.00
4,300.0	11.84	192.20	4,224.0	-743.2	-160.7	15.7	0.00	0.00	0.00
4,400.0	11.84	192.20	4,321.9	-763.2	-165.0	16.1	0.00	0.00	0.00
4,500.0	11.84	192.20	4,419.8	-783.2	-169.3	16.5	0.00	0.00	0.00
4,600.0	11.84	192.20	4,517.6	-803.3	-173.7	17.0	0.00	0.00	0.00
4,700.0	11.84	192.20	4,615.5	-823.3	-178.0	17.4	0.00	0.00	0.00
4,800.0	11.84	192.20	4,713.4	-843.4	-182.3	17.8	0.00	0.00	0.00
4,900.0	11.84	192.20	4,811.2	-863.4	-186.7	18.2	0.00	0.00	0.00
5,000.0	11.84	192.20	4,909.1	-883.5	-191.0	18.7	0.00	0.00	0.00

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<b>Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #2 (8-13-15)		

Planned 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)
5,100.0	11.84	192.20	5,007.0	-903.5	-195.3	19.1	0.00	0.00	0.00
5,200.0	11.84	192.20	5,104.9	-923.6	-199.7	19.5	0.00	0.00	0.00
5,300.0	11.84	192.20	5,202.7	-943.6	-204.0	19.9	0.00	0.00	0.00
5,400.0	11.84	192.20	5,300.6	-963.7	-208.3	20.4	0.00	0.00	0.00
5,500.0	11.84	192.20	5,398.5	-983.7	-212.7	20.8	0.00	0.00	0.00
5,600.0	11.84	192.20	5,496.4	-1,003.8	-217.0	21.2	0.00	0.00	0.00
5,700.0	11.84	192.20	5,594.2	-1,023.8	-221.3	21.6	0.00	0.00	0.00
5,718.6	11.84	192.20	5,612.4	-1,027.5	-222.1	21.7	0.00	0.00	0.00
5,800.0	10.21	192.20	5,692.3	-1,042.8	-225.4	22.0	2.00	-2.00	0.00
5,900.0	8.21	192.20	5,791.0	-1,058.4	-228.8	22.4	2.00	-2.00	0.00
6,000.0	6.21	192.20	5,890.3	-1,070.7	-231.5	22.6	2.00	-2.00	0.00
6,100.0	4.21	192.20	5,989.8	-1,079.5	-233.4	22.8	2.00	-2.00	0.00
6,200.0	2.21	192.20	6,089.7	-1,085.0	-234.6	22.9	2.00	-2.00	0.00
6,300.0	0.21	192.20	6,189.6	-1,087.1	-235.0	23.0	2.00	-2.00	0.00
6,310.4	0.00	0.00	6,200.0	-1,087.1	-235.0	23.0	2.00	-2.00	0.00
6,400.0	0.00	0.00	6,289.6	-1,087.1	-235.0	23.0	0.00	0.00	0.00
6,500.0	0.00	0.00	6,389.6	-1,087.1	-235.0	23.0	0.00	0.00	0.00
6,600.0	0.00	0.00	6,489.6	-1,087.1	-235.0	23.0	0.00	0.00	0.00
6,700.0	0.00	0.00	6,589.6	-1,087.1	-235.0	23.0	0.00	0.00	0.00
6,800.0	0.00	0.00	6,689.6	-1,087.1	-235.0	23.0	0.00	0.00	0.00
6,843.5	0.00	0.00	6,733.1	-1,087.1	-235.0	23.0	0.00	0.00	0.00
KOP #2									
6,900.0	4.24	90.00	6,789.6	-1,087.1	-232.9	25.0	7.50	7.50	0.00
7,000.0	11.74	90.00	6,888.6	-1,087.1	-219.0	38.5	7.50	7.50	0.00
7,100.0	19.24	90.00	6,984.9	-1,087.1	-192.4	64.5	7.50	7.50	0.00
7,200.0	26.74	90.00	7,076.8	-1,087.1	-153.3	102.4	7.50	7.50	0.00
7,300.0	34.24	90.00	7,163.0	-1,087.1	-102.6	151.7	7.50	7.50	0.00
7,400.0	41.74	90.00	7,241.7	-1,087.1	-41.1	211.6	7.50	7.50	0.00
7,500.0	49.24	90.00	7,311.8	-1,087.1	30.1	280.9	7.50	7.50	0.00
7,600.0	56.74	90.00	7,371.9	-1,087.1	109.9	358.5	7.50	7.50	0.00
7,700.0	64.24	90.00	7,421.2	-1,087.1	196.9	443.1	7.50	7.50	0.00
7,800.0	71.74	90.00	7,458.6	-1,087.1	289.5	533.2	7.50	7.50	0.00
7,900.0	79.24	90.00	7,483.7	-1,087.1	386.3	627.4	7.50	7.50	0.00
8,000.0	86.74	90.00	7,495.9	-1,087.1	485.4	723.9	7.50	7.50	0.00
8,043.9	90.03	90.00	7,497.1	-1,087.1	529.3	766.5	7.50	7.50	0.00
End of Build - 7"									
8,100.0	90.03	90.00	7,497.1	-1,087.1	585.4	821.1	0.00	0.00	0.00
8,200.0	90.03	90.00	7,497.0	-1,087.1	685.4	918.4	0.00	0.00	0.00
8,300.0	90.03	90.00	7,497.0	-1,087.1	785.4	1,015.7	0.00	0.00	0.00
8,400.0	90.03	90.00	7,496.9	-1,087.1	885.4	1,113.0	0.00	0.00	0.00
8,500.0	90.03	90.00	7,496.9	-1,087.1	985.4	1,210.3	0.00	0.00	0.00
8,600.0	90.03	90.00	7,496.8	-1,087.1	1,085.4	1,307.5	0.00	0.00	0.00
8,700.0	90.03	90.00	7,496.8	-1,087.1	1,185.4	1,404.8	0.00	0.00	0.00
8,800.0	90.03	90.00	7,496.7	-1,087.1	1,285.4	1,502.1	0.00	0.00	0.00
8,900.0	90.03	90.00	7,496.7	-1,087.1	1,385.4	1,599.4	0.00	0.00	0.00
9,000.0	90.03	90.00	7,496.6	-1,087.1	1,485.4	1,696.7	0.00	0.00	0.00
9,100.0	90.03	90.00	7,496.6	-1,087.1	1,585.4	1,794.0	0.00	0.00	0.00
9,200.0	90.03	90.00	7,496.5	-1,087.1	1,685.4	1,891.2	0.00	0.00	0.00
9,300.0	90.03	90.00	7,496.5	-1,087.1	1,785.4	1,988.5	0.00	0.00	0.00
9,400.0	90.03	90.00	7,496.4	-1,087.1	1,885.4	2,085.8	0.00	0.00	0.00
9,500.0	90.03	90.00	7,496.4	-1,087.1	1,985.4	2,183.1	0.00	0.00	0.00
9,600.0	90.03	90.00	7,496.3	-1,087.1	2,085.4	2,280.4	0.00	0.00	0.00
9,700.0	90.03	90.00	7,496.2	-1,087.1	2,185.4	2,377.7	0.00	0.00	0.00

<b>Database:</b>	US_EDM	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #2 (8-13-15)		

Planned 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)
9,800.0	90.03	90.00	7,496.2	-1,087.1	2,285.4	2,475.0	0.00	0.00	0.00
9,900.0	90.03	90.00	7,496.1	-1,087.1	2,385.4	2,572.2	0.00	0.00	0.00
10,000.0	90.03	90.00	7,496.1	-1,087.1	2,485.4	2,669.5	0.00	0.00	0.00
10,100.0	90.03	90.00	7,496.0	-1,087.1	2,585.4	2,766.8	0.00	0.00	0.00
10,200.0	90.03	90.00	7,496.0	-1,087.1	2,685.4	2,864.1	0.00	0.00	0.00
10,300.0	90.03	90.00	7,495.9	-1,087.1	2,785.4	2,961.4	0.00	0.00	0.00
10,400.0	90.03	90.00	7,495.9	-1,087.1	2,885.4	3,058.7	0.00	0.00	0.00
10,500.0	90.03	90.00	7,495.8	-1,087.1	2,985.4	3,156.0	0.00	0.00	0.00
10,600.0	90.03	90.00	7,495.8	-1,087.1	3,085.4	3,253.2	0.00	0.00	0.00
10,700.0	90.03	90.00	7,495.7	-1,087.1	3,185.4	3,350.5	0.00	0.00	0.00
10,800.0	90.03	90.00	7,495.7	-1,087.1	3,285.4	3,447.8	0.00	0.00	0.00
10,900.0	90.03	90.00	7,495.6	-1,087.1	3,385.4	3,545.1	0.00	0.00	0.00
11,000.0	90.03	90.00	7,495.6	-1,087.1	3,485.4	3,642.4	0.00	0.00	0.00
11,100.0	90.03	90.00	7,495.5	-1,087.1	3,585.4	3,739.7	0.00	0.00	0.00
11,200.0	90.03	90.00	7,495.5	-1,087.1	3,685.4	3,836.9	0.00	0.00	0.00
11,300.0	90.03	90.00	7,495.4	-1,087.1	3,785.4	3,934.2	0.00	0.00	0.00
11,400.0	90.03	90.00	7,495.4	-1,087.1	3,885.4	4,031.5	0.00	0.00	0.00
11,500.0	90.03	90.00	7,495.3	-1,087.1	3,985.4	4,128.8	0.00	0.00	0.00
11,600.0	90.03	90.00	7,495.3	-1,087.1	4,085.4	4,226.1	0.00	0.00	0.00
11,700.0	90.03	90.00	7,495.2	-1,087.1	4,185.4	4,323.4	0.00	0.00	0.00
11,800.0	90.03	90.00	7,495.1	-1,087.1	4,285.4	4,420.7	0.00	0.00	0.00
11,900.0	90.03	90.00	7,495.1	-1,087.1	4,385.4	4,517.9	0.00	0.00	0.00
12,000.0	90.03	90.00	7,495.0	-1,087.1	4,485.4	4,615.2	0.00	0.00	0.00
12,084.2	90.03	90.00	7,495.0	-1,087.1	4,569.6	4,697.1	0.00	0.00	0.00

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 300'FNL & 285'FWL - plan hits target center - Point	0.00	0.00	1.0	0.0	0.0	1,455,450.50	3,202,072.04	40.581335	-104.772500
BHL 1520'FNL, 500'FEL - plan hits target center - Point	0.00	0.00	7,495.0	-1,087.1	4,569.6	1,454,400.98	3,206,650.25	40.578350	-104.756050

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")	
8,043.9	7,497.1	7"	7	8-3/4	

<b>Database:</b>	US_EDM	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #2 (8-13-15)		

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
200.0	200.0	0.0	0.0	KOP #1
6,843.5	6,733.2	-79.4	-17.2	KOP #2
8,043.9	7,497.1	-1,027.5	-222.1	End of Build



## **Directional**

# **PETROLEUM DEVELOPMENT CORP Weld County CO**

**SEC.15-T7N-R66W**

**Thornton Pad Sec.15-T7N-R66W**

**Thornton 15F-432**

**Wellbore #1**

**Plan #2 (8-13-15)**

## **Anticollision Report**

**13 August, 2015**





<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

<b>Reference</b>	Plan #2 (8-13-15)		
<b>Filter type:</b>	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
<b>Interpolation Method:</b>	Stations	<b>Error Model:</b>	ISCWSA
<b>Depth Range:</b>	Unlimited	<b>Scan Method:</b>	Closest Approach 3D
<b>Results Limited by:</b>	Maximum center-center distance of 1,000.0 ft	<b>Error Surface:</b>	Elliptical Conic
<b>Warning Levels Evaluated at:</b>	2.00 Sigma	<b>Casing Method:</b>	Not applied

<b>Survey Tool Program</b>	<b>Date</b> 8/13/2015			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
0.0	12,096.6	Plan #2 (8-13-15) (Wellbore #1)	MWD	MWD - Standard

<b>Summary</b>						
<b>Site Name</b>	<b>Reference Measured Depth (ft)</b>	<b>Offset Measured Depth (ft)</b>	<b>Distance Between Centres (ft)</b>	<b>Distance Between Ellipses (ft)</b>	<b>Separation Factor</b>	<b>Warning</b>
<b>Offset Well - Wellbore - Design</b>						
Thornton Pad Sec.15-T7N-R66W						
Thornton 15E-232 - Wellbore #1 - Plan #1 (6-12-12)	200.0	200.0	151.2	150.5	224.207	CC, ES
Thornton 15E-232 - Wellbore #1 - Plan #1 (6-12-12)	4,500.0	4,391.4	984.0	962.2	45.302	SF
Thornton 15E-432 - Wellbore #1 - Wellbore #1	228.2	228.6	59.1	58.3	78.336	CC, ES
Thornton 15E-432 - Wellbore #1 - Wellbore #1	12,084.2	11,996.5	877.7	616.1	3.355	SF
Thornton 15F-212 - Wellbore #1 - Plan #1 (6-13-12)	200.0	200.0	89.2	88.6	132.356	CC, ES
Thornton 15F-212 - Wellbore #1 - Plan #1 (6-13-12)	12,084.2	11,873.6	476.7	236.5	1.984	SF

<b>Offset Design</b>													<b>Offset Site Error:</b>	0.0 ft
Thornton Pad Sec.15-T7N-R66W - Thornton 15E-232 - Wellbore #1 - Plan #1 (6-12-12)													<b>Offset Well Error:</b>	0.0 ft
<b>Survey Program:</b> 0-MWD														
<b>Reference</b>	<b>Offset</b>	<b>Semi Major Axis</b>			<b>Distance</b>									
<b>Measured Depth (ft)</b>	<b>Vertical Depth (ft)</b>	<b>Measured Depth (ft)</b>	<b>Vertical Depth (ft)</b>	<b>Reference (ft)</b>	<b>Offset (ft)</b>	<b>Highside Toolface (°)</b>	<b>Offset Wellbore Centre +N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Between Centres (ft)</b>	<b>Between Ellipses (ft)</b>	<b>Minimum Separation (ft)</b>	<b>Separation Factor</b>	<b>Warning</b>	
0.0	0.0	0.0	0.0	0.0	0.0	0.00	151.2	0.0	151.2					
100.0	100.0	100.0	100.0	0.1	0.1	0.00	151.2	0.0	151.2	151.0	0.22	672.620		
200.0	200.0	200.0	200.0	0.3	0.3	0.00	151.2	0.0	151.2	150.5	0.67	224.207	CC, ES	
300.0	300.0	300.0	300.0	0.5	0.6	167.90	151.2	0.0	152.5	151.4	1.11	137.667		
400.0	399.9	399.9	399.9	0.7	0.8	168.19	151.2	0.0	156.3	154.8	1.54	101.358		
500.0	499.7	499.7	499.7	1.0	1.0	168.64	151.2	0.0	162.7	160.7	1.99	81.751		
600.0	599.3	599.3	599.3	1.2	1.2	169.22	151.2	0.0	171.7	169.2	2.45	70.214		
700.0	698.6	698.6	698.6	1.5	1.5	169.88	151.2	0.0	183.3	180.3	2.90	63.096		
800.0	797.5	797.5	797.5	1.8	1.7	170.57	151.2	0.0	197.4	194.0	3.37	58.638		
900.0	896.1	896.1	896.1	2.2	1.9	171.28	151.2	0.0	214.1	210.3	3.83	55.898		
989.1	983.5	983.5	983.5	2.6	2.1	171.89	151.2	0.0	231.2	227.0	4.25	54.452		
1,000.0	994.2	994.2	994.2	2.6	2.1	171.97	151.2	0.0	233.4	229.1	4.30	54.333		
1,100.0	1,092.0	1,092.0	1,092.0	3.0	2.3	172.61	151.2	0.0	253.8	249.0	4.76	53.329		
1,200.0	1,189.9	1,189.9	1,189.9	3.5	2.6	173.16	151.2	0.0	274.1	268.9	5.22	52.469		
1,300.0	1,287.8	1,287.8	1,287.8	3.9	2.8	173.64	151.2	0.0	294.5	288.8	5.69	51.728		
1,400.0	1,385.7	1,385.7	1,385.7	4.3	3.0	174.05	151.2	0.0	314.9	308.7	6.16	51.084		
1,500.0	1,483.5	1,483.5	1,483.5	4.8	3.2	174.42	151.2	0.0	335.3	328.7	6.64	50.520		
1,600.0	1,581.4	1,581.4	1,581.4	5.2	3.4	174.74	151.2	0.0	355.7	348.6	7.11	50.023		
1,700.0	1,679.3	1,679.3	1,679.3	5.7	3.7	175.02	151.2	0.0	376.2	368.6	7.59	49.581		
1,800.0	1,777.2	1,777.2	1,777.2	6.1	3.9	175.28	151.2	0.0	396.6	388.5	8.06	49.188		
1,900.0	1,875.0	1,875.0	1,875.0	6.6	4.1	175.51	151.2	0.0	417.0	408.5	8.54	48.834		

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

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Thornton Pad Sec.15-T7N-R66W - Thornton 15E-232 - Wellbore #1 - Plan #1 (6-12-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
2,000.0	1,972.9	1,972.9	1,972.9	7.0	4.3	175.72	151.2	0.0	437.5	428.5	9.02	48.515		
2,100.0	2,070.8	2,070.8	2,070.8	7.5	4.5	175.91	151.2	0.0	458.0	448.5	9.50	48.225		
2,200.0	2,168.7	2,168.7	2,168.7	7.9	4.8	176.09	151.2	0.0	478.4	468.4	9.98	47.962		
2,300.0	2,266.5	2,266.5	2,266.5	8.4	5.0	176.25	151.2	0.0	498.9	488.4	10.45	47.721		
2,400.0	2,364.4	2,364.4	2,364.4	8.8	5.2	176.40	151.2	0.0	519.4	508.4	10.93	47.499		
2,500.0	2,462.3	2,462.3	2,462.3	9.3	5.4	176.53	151.2	0.0	539.8	528.4	11.41	47.295		
2,600.0	2,560.1	2,560.1	2,560.1	9.7	5.6	176.66	151.2	0.0	560.3	548.4	11.89	47.107		
2,700.0	2,658.0	2,658.0	2,658.0	10.2	5.9	176.78	151.2	0.0	580.8	568.4	12.38	46.932		
2,800.0	2,755.9	2,755.9	2,755.9	10.6	6.1	176.89	151.2	0.0	601.3	588.4	12.86	46.770		
2,900.0	2,853.8	2,853.8	2,853.8	11.1	6.3	176.99	151.2	0.0	621.8	608.4	13.34	46.618		
3,000.0	2,951.6	2,951.6	2,951.6	11.5	6.5	177.09	151.2	0.0	642.2	628.4	13.82	46.477		
3,100.0	3,049.5	3,048.1	3,048.1	12.0	6.7	177.14	151.3	-0.4	662.8	648.5	14.29	46.371		
3,200.0	3,147.4	3,143.1	3,143.0	12.4	6.9	176.95	152.2	-3.4	683.7	668.9	14.76	46.320		
3,300.0	3,245.3	3,237.6	3,237.3	12.9	7.1	176.52	154.0	-9.4	705.0	689.8	15.23	46.296		
3,400.0	3,343.1	3,331.5	3,330.8	13.3	7.3	175.87	156.7	-18.4	726.9	711.1	15.71	46.279		
3,500.0	3,441.0	3,425.1	3,423.5	13.8	7.6	175.02	160.2	-30.1	749.3	733.1	16.20	46.259		
3,600.0	3,538.9	3,521.7	3,519.1	14.2	7.8	174.11	164.1	-43.5	772.1	755.4	16.71	46.200		
3,700.0	3,636.8	3,618.3	3,614.8	14.7	8.0	173.24	168.1	-56.8	795.1	777.9	17.24	46.129		
3,800.0	3,734.6	3,715.0	3,710.4	15.2	8.3	172.42	172.1	-70.1	818.3	800.5	17.77	46.045		
3,900.0	3,832.5	3,811.6	3,806.0	15.6	8.5	171.65	176.0	-83.5	841.6	823.2	18.31	45.951		
4,000.0	3,930.4	3,908.2	3,901.6	16.1	8.8	170.92	180.0	-96.8	865.0	846.1	18.87	45.851		
4,100.0	4,028.3	4,004.8	3,997.2	16.5	9.0	170.23	184.0	-110.1	888.6	869.2	19.42	45.746		
4,200.0	4,126.1	4,101.5	4,092.9	17.0	9.3	169.57	188.0	-123.5	912.3	892.3	19.99	45.637		
4,300.0	4,224.0	4,198.1	4,188.5	17.4	9.6	168.95	191.9	-136.8	936.1	915.5	20.56	45.526		
4,400.0	4,321.9	4,294.7	4,284.1	17.9	9.9	168.35	195.9	-150.1	960.0	938.8	21.14	45.414		
4,500.0	4,419.8	4,391.4	4,379.7	18.3	10.2	167.79	199.9	-163.5	984.0	962.2	21.72	45.302 SF		

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Thornton Pad Sec.15-T7N-R66W - Thornton 15E-432 - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 121-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
0.0	0.0	0.0	0.0	0.0	0.0	0.00	60.1	0.0	60.1					
100.0	100.0	100.3	100.3	0.1	0.1	0.21	59.8	0.2	59.8	59.6	0.23	265.336		
200.0	200.0	200.4	200.4	0.3	0.3	0.63	59.2	0.7	59.2	58.5	0.64	92.772		
228.2	228.2	228.6	228.6	0.4	0.4	168.53	59.0	0.7	59.1	58.3	0.75	78.336 CC, ES		
300.0	300.0	300.7	300.7	0.5	0.5	169.05	58.3	1.0	59.6	58.5	1.06	56.427		
400.0	399.9	400.9	400.9	0.7	0.7	170.42	56.8	1.7	62.0	60.6	1.48	41.898		
500.0	499.7	500.7	500.7	1.0	0.9	172.52	55.1	3.0	66.8	64.9	1.92	34.843		
600.0	599.3	599.8	599.8	1.2	1.2	173.76	54.0	3.4	74.9	72.5	2.35	31.799		
700.0	698.6	699.0	699.0	1.5	1.4	174.59	53.4	3.3	86.0	83.2	2.80	30.769		
800.0	797.5	798.6	798.5	1.8	1.6	175.66	52.7	3.8	99.7	96.4	3.25	30.710		
900.0	896.1	898.3	898.2	2.2	1.8	176.91	51.2	4.8	115.2	111.5	3.70	31.136		
989.1	983.5	986.4	986.3	2.6	2.0	177.85	49.1	5.7	130.5	126.4	4.11	31.767		
1,000.0	994.2	996.7	996.6	2.6	2.0	177.93	48.9	5.8	132.5	128.4	4.16	31.884		
1,100.0	1,092.0	1,090.5	1,090.4	3.0	2.2	178.21	48.5	5.7	152.7	148.1	4.59	33.228		
1,200.0	1,189.9	1,187.2	1,187.1	3.5	2.4	178.17	50.0	5.2	174.6	169.6	5.04	34.615		
1,300.0	1,287.8	1,286.9	1,286.7	3.9	2.6	178.25	51.4	5.1	196.4	190.9	5.50	35.714		
1,400.0	1,385.7	1,389.5	1,389.3	4.3	2.8	177.96	51.2	3.3	216.4	210.5	5.96	36.328		
1,500.0	1,483.5	1,493.6	1,493.3	4.8	3.0	177.23	48.8	-0.9	234.0	227.6	6.43	36.417		
1,600.0	1,581.4	1,597.6	1,597.1	5.2	3.3	176.29	44.2	-6.8	249.3	242.4	6.90	36.123		
1,700.0	1,679.3	1,702.2	1,701.2	5.7	3.5	175.24	37.5	-14.0	262.6	255.2	7.40	35.499		
1,800.0	1,777.2	1,801.1	1,799.5	6.1	3.7	174.22	29.8	-21.6	274.4	266.5	7.88	34.806		
1,900.0	1,875.0	1,895.5	1,893.5	6.6	4.0	173.51	23.6	-27.8	287.6	279.2	8.36	34.398		
2,000.0	1,972.9	1,994.2	1,991.9	7.0	4.2	173.06	18.0	-33.1	302.0	293.1	8.85	34.139		
2,100.0	2,070.8	2,095.3	2,092.7	7.5	4.4	172.88	11.7	-37.2	315.8	306.5	9.33	33.840		
2,200.0	2,168.7	2,194.1	2,191.2	7.9	4.7	172.77	5.2	-40.9	329.3	319.5	9.82	33.544		
2,300.0	2,266.5	2,292.0	2,288.8	8.4	4.9	172.43	-1.0	-46.0	343.0	332.7	10.31	33.284		
2,400.0	2,364.4	2,384.1	2,380.6	8.8	5.1	171.97	-5.7	-51.8	357.9	347.1	10.79	33.175		
2,500.0	2,462.3	2,474.0	2,470.2	9.3	5.3	171.44	-8.4	-58.0	374.8	363.5	11.27	33.260		
2,600.0	2,560.1	2,571.9	2,567.8	9.7	5.5	170.78	-10.1	-65.5	392.9	381.1	11.78	33.353		
2,700.0	2,658.0	2,669.0	2,664.6	10.2	5.8	170.06	-11.3	-73.9	411.5	399.2	12.30	33.460		
2,800.0	2,755.9	2,775.7	2,770.7	10.6	6.0	169.18	-13.7	-84.2	429.2	416.3	12.86	33.370		
2,900.0	2,853.8	2,883.0	2,877.3	11.1	6.3	168.19	-18.1	-96.0	445.0	431.6	13.44	33.108		
3,000.0	2,951.6	2,991.1	2,984.4	11.5	6.6	167.23	-24.8	-108.2	458.9	444.9	14.04	32.685		
3,100.0	3,049.5	3,098.8	3,091.1	12.0	6.9	166.37	-33.6	-120.1	471.0	456.3	14.64	32.167		
3,200.0	3,147.4	3,206.3	3,197.6	12.4	7.3	165.75	-44.2	-130.2	481.4	466.1	15.23	31.598		
3,300.0	3,245.3	3,307.6	3,297.9	12.9	7.5	165.33	-55.4	-138.6	490.6	474.8	15.80	31.052		
3,400.0	3,343.1	3,406.9	3,396.3	13.3	7.8	164.91	-66.4	-146.9	499.8	483.5	16.36	30.550		
3,500.0	3,441.0	3,503.7	3,492.2	13.8	8.1	164.55	-76.8	-154.7	509.4	492.5	16.91	30.124		
3,600.0	3,538.9	3,600.0	3,587.8	14.2	8.4	164.33	-86.6	-161.5	519.5	502.1	17.45	29.774		
3,700.0	3,636.8	3,696.4	3,683.6	14.7	8.6	164.18	-95.7	-167.7	530.2	512.3	17.97	29.503		
3,800.0	3,734.6	3,792.7	3,779.3	15.2	8.9	164.06	-104.3	-173.7	541.5	523.1	18.50	29.280		
3,900.0	3,832.5	3,897.8	3,883.7	15.6	9.2	163.89	-113.9	-180.6	552.7	533.6	19.05	29.005		
4,000.0	3,930.4	4,004.5	3,989.6	16.1	9.5	163.63	-125.0	-188.5	562.7	543.0	19.63	28.662		
4,100.0	4,028.3	4,117.6	4,101.4	16.5	9.9	163.29	-138.8	-197.6	570.8	550.5	20.25	28.184		
4,200.0	4,126.1	4,226.2	4,208.5	17.0	10.2	162.90	-154.5	-206.6	576.7	555.8	20.87	27.634		
4,300.0	4,224.0	4,325.8	4,306.6	17.4	10.5	162.58	-169.7	-214.6	581.9	560.5	21.46	27.118		
4,400.0	4,321.9	4,413.7	4,393.5	17.9	10.8	162.49	-181.8	-220.0	588.4	566.4	21.98	26.771		
4,500.0	4,419.8	4,502.8	4,481.9	18.3	11.1	162.58	-192.2	-223.5	596.8	574.3	22.46	26.569		
4,600.0	4,517.6	4,591.7	4,570.3	18.8	11.3	162.77	-200.9	-226.3	606.9	584.0	22.93	26.471		
4,700.0	4,615.5	4,679.8	4,658.1	19.2	11.5	162.97	-208.0	-228.8	618.9	595.5	23.38	26.465		
4,800.0	4,713.4	4,766.3	4,744.5	19.7	11.7	163.21	-213.4	-231.0	632.7	608.8	23.83	26.554		

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

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Thornton Pad Sec.15-T7N-R66W - Thornton 15E-432 - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 121-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
4,900.0	4,811.2	4,851.5	4,829.5	20.1	11.9	163.55	-216.7	-232.0	648.5	624.3	24.25	26.749		
5,000.0	4,909.1	4,945.1	4,923.1	20.6	12.0	164.01	-218.9	-232.0	666.0	641.4	24.66	27.012		
5,100.0	5,007.0	5,041.9	5,019.9	21.0	12.2	164.50	-220.8	-231.6	683.8	658.8	25.07	27.280		
5,200.0	5,104.9	5,132.0	5,110.0	21.5	12.4	164.92	-222.1	-231.4	702.3	676.8	25.48	27.564		
5,300.0	5,202.7	5,219.8	5,197.8	22.0	12.6	165.21	-222.1	-232.5	722.1	696.2	25.90	27.882		
5,400.0	5,300.6	5,313.7	5,291.6	22.4	12.7	165.43	-221.2	-234.7	743.0	716.7	26.34	28.207		
5,500.0	5,398.5	5,411.3	5,389.3	22.9	12.9	165.67	-220.0	-236.7	764.1	737.3	26.79	28.521		
5,600.0	5,496.4	5,509.9	5,487.8	23.3	13.1	165.93	-218.9	-238.3	785.2	757.9	27.24	28.824		
5,700.0	5,594.2	5,608.9	5,586.8	23.8	13.3	166.16	-218.0	-240.1	806.1	778.4	27.69	29.108		
5,718.6	5,612.4	5,627.3	5,605.2	23.9	13.3	166.19	-217.8	-240.5	810.0	782.2	27.78	29.158		
5,800.0	5,692.3	5,709.9	5,687.8	24.2	13.5	166.45	-217.3	-241.7	825.7	797.5	28.15	29.332		
5,900.0	5,791.0	5,812.1	5,790.0	24.4	13.7	166.79	-216.9	-241.7	841.6	813.1	28.54	29.486		
6,000.0	5,890.3	5,908.6	5,886.5	24.6	13.8	167.09	-216.7	-240.9	854.1	825.2	28.88	29.570		
6,100.0	5,989.8	6,004.8	5,982.6	24.8	14.0	167.28	-216.0	-240.6	863.5	834.4	29.19	29.581		
6,200.0	6,089.7	6,107.6	6,085.4	25.0	14.2	167.38	-215.3	-240.8	869.7	840.2	29.49	29.489		
6,300.0	6,189.6	6,210.6	6,188.5	25.1	14.4	167.35	-215.1	-241.9	872.0	842.3	29.76	29.298		
6,310.4	6,200.0	6,220.6	6,198.5	25.1	14.4	-0.46	-215.0	-242.0	872.1	833.5	38.57	22.610		
6,400.0	6,289.6	6,307.3	6,285.2	25.2	14.6	-0.53	-214.8	-243.0	872.4	833.5	38.83	22.467		
6,500.0	6,389.6	6,404.7	6,382.5	25.3	14.7	-0.58	-214.1	-243.8	873.1	834.0	39.11	22.326		
6,600.0	6,489.6	6,507.5	6,485.3	25.4	14.9	-0.63	-213.4	-244.6	873.7	834.3	39.39	22.179		
6,700.0	6,589.6	6,608.2	6,586.0	25.5	15.1	-0.70	-213.1	-245.7	874.1	834.4	39.68	22.029		
6,800.0	6,689.6	6,703.1	6,681.0	25.6	15.3	-0.79	-212.4	-247.0	874.8	834.8	39.95	21.895		
6,843.5	6,733.2	6,757.4	6,735.2	25.6	15.4	-0.83	-212.3	-247.7	874.9	834.8	40.10	21.817		
6,850.0	6,739.6	6,763.7	6,741.5	25.6	15.4	-90.83	-212.3	-247.7	874.9	843.1	31.76	27.547		
6,900.0	6,789.6	6,821.2	6,799.0	25.7	15.5	-90.85	-212.6	-245.2	874.6	842.6	31.94	27.385		
6,950.0	6,839.3	6,891.4	6,868.3	25.7	15.6	-90.72	-213.9	-234.6	873.6	841.6	32.07	27.241		
7,000.0	6,888.6	6,922.6	6,898.7	25.7	15.7	-90.71	-214.7	-227.9	872.5	840.4	32.15	27.142		
7,015.4	6,903.6	6,930.0	6,905.9	25.8	15.7	-90.70	-214.7	-226.1	872.4	840.3	32.16	27.126		
7,050.0	6,937.1	6,945.7	6,921.1	25.8	15.7	-90.66	-214.6	-222.2	872.8	840.6	32.19	27.110		
7,100.0	6,984.9	6,970.7	6,945.1	25.8	15.7	-90.57	-213.6	-215.4	874.7	842.5	32.23	27.142		
7,150.0	7,031.5	7,012.2	6,984.4	25.8	15.7	-90.48	-211.1	-202.2	877.7	845.4	32.26	27.205		
7,200.0	7,076.8	7,074.0	7,041.7	25.8	15.7	-90.48	-207.7	-179.2	880.5	848.2	32.32	27.245		
7,250.0	7,120.7	7,150.0	7,110.0	25.8	15.7	-90.58	-204.9	-146.1	882.4	850.0	32.41	27.230		
7,300.0	7,163.0	7,249.2	7,194.2	25.8	15.8	-90.66	-206.2	-93.7	881.5	848.9	32.57	27.061		
7,350.0	7,203.4	7,298.1	7,233.4	25.8	15.8	-90.76	-207.9	-64.5	879.7	847.0	32.74	26.872		
7,400.0	7,241.7	7,340.0	7,264.9	25.9	15.8	-90.81	-209.0	-37.0	878.4	845.4	32.94	26.667		
7,450.0	7,277.9	7,377.4	7,291.4	25.9	15.9	-90.80	-209.5	-10.6	877.7	844.5	33.20	26.439		
7,500.0	7,311.8	7,425.0	7,323.1	25.9	15.9	-90.78	-209.6	24.9	877.6	844.0	33.59	26.127		
7,550.0	7,343.2	7,474.5	7,353.5	25.9	16.2	-90.74	-209.8	63.9	877.4	843.2	34.11	25.721		
7,577.9	7,359.6	7,500.5	7,368.1	25.9	16.4	-90.69	-209.8	85.4	877.3	842.9	34.46	25.459		
7,600.0	7,371.9	7,519.0	7,377.9	26.0	16.6	-90.64	-209.8	101.1	877.4	842.6	34.74	25.257		
7,650.0	7,398.0	7,575.2	7,404.3	26.0	17.1	-90.42	-209.5	150.7	877.6	842.0	35.62	24.637		
7,700.0	7,421.2	7,630.9	7,427.2	26.1	17.7	-90.22	-209.8	201.6	877.3	840.6	36.69	23.913		
7,750.0	7,441.4	7,705.3	7,452.9	26.2	18.7	-89.99	-211.3	271.3	876.3	838.1	38.19	22.942		
7,800.0	7,458.6	7,771.8	7,471.8	26.3	19.7	-89.89	-214.3	335.0	874.1	834.3	39.82	21.950		
7,850.0	7,472.7	7,856.4	7,489.1	26.5	21.2	-89.72	-220.9	417.4	870.0	828.0	41.96	20.733		
7,900.0	7,483.7	7,898.2	7,493.8	26.8	22.0	-89.76	-224.8	458.8	865.4	821.9	43.51	19.892		
7,950.0	7,491.4	7,932.4	7,496.6	27.1	22.7	-89.88	-227.3	492.8	861.6	816.6	45.00	19.149		
8,000.0	7,495.9	7,964.0	7,498.6	27.5	23.3	-90.03	-229.1	524.2	858.8	812.3	46.51	18.465		
8,043.9	7,497.1	7,989.5	7,499.9	28.0	23.8	-90.19	-230.0	549.8	857.3	809.4	47.85	17.916		
8,100.0	7,497.1	8,027.6	7,501.3	28.7	24.6	-90.28	-230.4	587.8	856.7	806.9	49.73	17.227		

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

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Thornton Pad Sec.15-T7N-R66W - Thornton 15E-432 - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 121-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis			Distance							
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
8,113.1	7,497.1	8,038.0	7,501.6	28.9	24.8	-90.30	-230.5	598.2	856.6	806.4	50.21	17.059		
8,200.0	7,497.0	8,094.5	7,502.5	30.2	26.0	-90.36	-229.4	654.7	858.2	805.0	53.21	16.129		
8,300.0	7,497.0	8,216.6	7,504.6	31.9	28.8	-90.51	-225.2	776.6	861.9	803.8	58.14	14.826		
8,400.0	7,496.9	8,296.6	7,502.5	33.9	30.6	-90.37	-223.8	856.6	863.8	801.5	62.27	13.871		
8,500.0	7,496.9	8,389.5	7,502.3	36.1	32.8	-90.35	-220.4	949.4	867.4	800.6	66.85	12.976		
8,600.0	7,496.8	8,481.0	7,503.8	38.3	35.1	-90.46	-216.1	1,040.8	872.1	800.6	71.51	12.196		
8,700.0	7,496.8	8,594.5	7,506.3	40.6	37.9	-90.62	-211.9	1,154.2	875.8	799.0	76.84	11.398		
8,800.0	7,496.7	8,733.4	7,509.2	43.0	41.4	-90.82	-209.5	1,293.0	877.7	794.7	82.92	10.584		
8,900.0	7,496.7	8,826.8	7,507.8	45.5	43.9	-90.73	-210.6	1,386.4	876.6	788.7	87.90	9.973		
8,903.2	7,496.7	8,829.0	7,507.8	45.6	43.9	-90.73	-210.6	1,388.6	876.6	788.5	88.04	9.957		
9,000.0	7,496.6	8,933.9	7,508.5	48.0	46.7	-90.78	-210.1	1,493.5	877.1	783.8	93.28	9.402		
9,100.0	7,496.6	9,028.8	7,508.2	50.5	49.2	-90.76	-211.4	1,588.4	875.7	777.3	98.40	8.900		
9,200.0	7,496.5	9,137.7	7,509.7	53.1	52.1	-90.86	-212.0	1,697.2	875.3	771.4	103.93	8.422		
9,300.0	7,496.5	9,246.9	7,509.9	55.7	55.0	-90.88	-214.0	1,806.4	873.5	764.0	109.51	7.976		
9,400.0	7,496.4	9,351.5	7,509.1	58.3	57.8	-90.84	-216.5	1,911.0	871.1	756.1	114.98	7.576		
9,500.0	7,496.4	9,439.2	7,508.0	60.9	60.2	-90.77	-218.5	1,998.7	868.7	748.7	120.02	7.238		
9,593.8	7,496.3	9,519.7	7,506.9	63.4	62.4	-90.70	-219.4	2,079.2	867.7	743.0	124.72	6.958		
9,600.0	7,496.3	9,524.2	7,506.9	63.5	62.5	-90.70	-219.4	2,083.7	867.7	742.7	125.01	6.942		
9,700.0	7,496.2	9,618.5	7,507.1	66.2	65.0	-90.71	-218.4	2,178.0	868.8	738.6	130.26	6.670		
9,800.0	7,496.2	9,726.0	7,506.6	68.9	68.0	-90.69	-218.6	2,285.4	868.6	732.7	135.90	6.392		
9,800.0	7,496.2	9,726.0	7,506.6	68.9	68.0	-90.69	-218.6	2,285.4	868.6	732.7	135.90	6.392		
9,900.0	7,496.1	9,823.9	7,506.5	71.6	70.6	-90.68	-218.4	2,383.4	868.7	727.5	141.28	6.149		
10,000.0	7,496.1	9,922.0	7,507.6	74.2	73.3	-90.76	-217.8	2,481.4	869.4	722.7	146.69	5.927		
10,100.0	7,496.0	10,011.9	7,508.5	76.9	75.8	-90.82	-216.8	2,571.3	870.4	718.6	151.88	5.731		
10,200.0	7,496.0	10,112.8	7,507.4	79.6	78.5	-90.75	-215.4	2,672.3	871.8	714.5	157.38	5.540		
10,300.0	7,495.9	10,204.0	7,506.8	82.4	81.0	-90.71	-213.6	2,763.4	873.9	711.3	162.61	5.374		
10,400.0	7,495.9	10,300.6	7,505.0	85.1	83.7	-90.60	-210.9	2,859.9	876.6	708.6	168.00	5.218		
10,500.0	7,495.8	10,404.1	7,501.9	87.8	86.5	-90.39	-207.7	2,963.3	879.7	706.1	173.58	5.068		
10,600.0	7,495.8	10,489.4	7,499.6	90.5	88.8	-90.25	-205.6	3,048.5	882.3	703.6	178.67	4.938		
10,700.0	7,495.7	10,625.5	7,500.2	93.3	92.6	-90.29	-202.3	3,184.6	884.8	699.6	185.18	4.778		
10,800.0	7,495.7	10,738.6	7,498.3	96.0	95.7	-90.17	-203.1	3,297.7	884.0	693.0	191.07	4.627		
10,900.0	7,495.6	10,849.3	7,495.9	98.8	98.8	-90.02	-205.2	3,408.3	882.1	685.2	196.89	4.480		
11,000.0	7,495.6	10,951.0	7,493.9	101.5	101.6	-89.89	-208.2	3,510.0	879.2	676.7	202.47	4.342		
11,100.0	7,495.5	11,038.2	7,492.8	104.3	104.0	-89.82	-210.4	3,597.1	876.7	669.1	207.66	4.222		
11,134.8	7,495.5	11,062.4	7,492.6	105.2	104.7	-89.81	-210.6	3,621.4	876.5	667.2	209.29	4.188		
11,200.0	7,495.5	11,108.4	7,492.6	107.0	106.0	-89.81	-210.2	3,667.3	877.1	664.7	212.37	4.130		
11,300.0	7,495.4	11,202.0	7,493.6	109.8	108.6	-89.88	-207.4	3,760.9	880.0	662.3	217.74	4.042		
11,400.0	7,495.4	11,308.8	7,493.7	112.5	111.5	-89.89	-204.6	3,867.7	882.6	659.2	223.47	3.950		
11,500.0	7,495.3	11,413.8	7,492.9	115.3	114.4	-89.85	-203.0	3,972.7	884.1	655.0	229.16	3.858		
11,600.0	7,495.3	11,512.5	7,490.6	118.1	117.2	-89.70	-201.4	4,071.3	885.8	651.1	234.67	3.775		
11,700.0	7,495.2	11,607.0	7,488.2	120.8	119.8	-89.55	-199.3	4,165.7	888.0	648.0	240.06	3.699		
11,800.0	7,495.1	11,754.0	7,489.5	123.6	123.9	-89.63	-200.5	4,312.7	887.0	640.0	246.93	3.592		
11,900.0	7,495.1	11,857.4	7,489.2	126.4	126.8	-89.62	-203.9	4,416.0	883.7	631.1	252.60	3.499		
12,000.0	7,495.0	11,965.0	7,487.0	129.1	129.8	-89.48	-208.1	4,523.6	879.8	621.4	258.38	3.405		
12,069.6	7,495.0	11,996.5	7,486.2	131.1	130.7	-89.42	-209.5	4,555.0	877.6	616.4	261.19	3.360		
12,084.2	7,495.0	11,996.5	7,486.2	131.5	130.7	-89.42	-209.5	4,555.0	877.7	616.1	261.59	3.355 SF		

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design Thornton Pad Sec.15-T7N-R66W - Thornton 15F-212 - Wellbore #1 - Plan #1 (6-13-12)												Offset Site Error:	0.0 ft
Survey Program: 0-MWD												Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Semi Major Axis Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	0.00	89.2	0.0	89.2				
100.0	100.0	100.0	100.0	0.1	0.1	0.00	89.2	0.0	89.2	89.0	0.22	397.067	
200.0	200.0	200.0	200.0	0.3	0.3	0.00	89.2	0.0	89.2	88.6	0.67	132.356 CC, ES	
300.0	300.0	300.0	300.0	0.5	0.6	167.97	89.2	0.0	90.5	89.4	1.11	81.742	
400.0	399.9	399.9	399.9	0.7	0.8	168.46	89.2	0.0	94.4	92.8	1.54	61.196	
500.0	499.7	499.7	499.7	1.0	1.0	169.18	89.2	0.0	100.8	98.8	1.99	50.638	
600.0	599.3	599.3	599.3	1.2	1.2	170.06	89.2	0.0	109.8	107.3	2.45	44.901	
700.0	698.6	702.8	702.7	1.5	1.4	170.81	87.5	-0.6	119.7	116.8	2.88	41.565	
800.0	797.5	806.7	806.5	1.8	1.6	171.23	82.1	-2.2	128.6	125.3	3.30	38.999	
900.0	896.1	911.1	910.5	2.2	1.9	171.40	73.1	-5.0	136.7	132.9	3.74	36.563	
989.1	983.5	1,004.4	1,003.0	2.6	2.1	171.36	62.1	-8.5	143.0	138.9	4.15	34.500	
1,000.0	994.2	1,015.8	1,014.4	2.6	2.1	171.35	60.5	-9.0	143.8	139.6	4.20	34.243	
1,100.0	1,092.0	1,120.2	1,117.4	3.0	2.4	171.03	44.3	-14.1	148.3	143.7	4.68	31.709	
1,200.0	1,189.9	1,220.2	1,215.8	3.5	2.7	170.61	27.5	-19.3	151.6	146.4	5.17	29.326	
1,300.0	1,287.8	1,320.1	1,314.1	3.9	3.1	170.21	10.7	-24.6	154.8	149.1	5.67	27.297	
1,400.0	1,385.7	1,420.1	1,412.5	4.3	3.4	169.82	-6.1	-29.9	158.1	151.9	6.18	25.560	
1,500.0	1,483.5	1,520.0	1,510.9	4.8	3.8	169.46	-22.9	-35.1	161.3	154.6	6.71	24.057	
1,600.0	1,581.4	1,619.9	1,609.3	5.2	4.2	169.10	-39.7	-40.4	164.6	157.3	7.23	22.765	
1,700.0	1,679.3	1,719.9	1,707.7	5.7	4.6	168.76	-56.5	-45.7	167.8	160.1	7.76	21.623	
1,800.0	1,777.2	1,819.8	1,806.0	6.1	5.0	168.43	-73.3	-50.9	171.1	162.8	8.30	20.617	
1,900.0	1,875.0	1,919.8	1,904.4	6.6	5.3	168.12	-90.1	-56.2	174.4	165.6	8.84	19.725	
2,000.0	1,972.9	2,019.7	2,002.8	7.0	5.7	167.81	-106.9	-61.5	177.7	168.3	9.39	18.928	
2,100.0	2,070.8	2,119.7	2,101.2	7.5	6.1	167.52	-123.7	-66.7	181.0	171.0	9.94	18.213	
2,200.0	2,168.7	2,219.6	2,199.6	7.9	6.5	167.24	-140.5	-72.0	184.3	173.8	10.49	17.568	
2,300.0	2,266.5	2,319.5	2,297.9	8.4	6.9	166.97	-157.3	-77.3	187.6	176.5	11.04	16.983	
2,400.0	2,364.4	2,419.5	2,396.3	8.8	7.3	166.71	-174.1	-82.5	190.9	179.3	11.60	16.450	
2,500.0	2,462.3	2,519.4	2,494.7	9.3	7.7	166.45	-190.9	-87.8	194.2	182.0	12.16	15.964	
2,600.0	2,560.1	2,619.4	2,593.1	9.7	8.1	166.21	-207.7	-93.0	197.5	184.8	12.73	15.518	
2,700.0	2,658.0	2,719.3	2,691.4	10.2	8.5	165.97	-224.5	-98.3	200.8	187.5	13.29	15.107	
2,800.0	2,755.9	2,819.2	2,789.8	10.6	8.9	165.74	-241.3	-103.6	204.1	190.3	13.86	14.728	
2,900.0	2,853.8	2,919.2	2,888.2	11.1	9.3	165.52	-258.1	-108.8	207.4	193.0	14.43	14.377	
3,000.0	2,951.6	3,019.1	2,986.6	11.5	9.7	165.30	-274.9	-114.1	210.8	195.8	15.00	14.050	
3,100.0	3,049.5	3,119.1	3,085.0	12.0	10.1	165.09	-291.7	-119.4	214.1	198.5	15.57	13.747	
3,200.0	3,147.4	3,219.0	3,183.3	12.4	10.5	164.89	-308.5	-124.6	217.4	201.3	16.15	13.464	
3,300.0	3,245.3	3,319.0	3,281.7	12.9	10.9	164.70	-325.3	-129.9	220.7	204.0	16.72	13.199	
3,400.0	3,343.1	3,418.9	3,380.1	13.3	11.3	164.51	-342.1	-135.2	224.1	206.8	17.30	12.951	
3,500.0	3,441.0	3,518.8	3,478.5	13.8	11.7	164.32	-358.9	-140.4	227.4	209.5	17.88	12.718	
3,600.0	3,538.9	3,618.8	3,576.8	14.2	12.1	164.14	-375.7	-145.7	230.7	212.3	18.46	12.499	
3,700.0	3,636.8	3,718.7	3,675.2	14.7	12.6	163.97	-392.5	-151.0	234.1	215.0	19.04	12.292	
3,800.0	3,734.6	3,818.7	3,773.6	15.2	13.0	163.80	-409.3	-156.2	237.4	217.8	19.63	12.097	
3,900.0	3,832.5	3,918.6	3,872.0	15.6	13.4	163.64	-426.1	-161.5	240.8	220.6	20.21	11.913	
4,000.0	3,930.4	4,018.5	3,970.4	16.1	13.8	163.48	-442.9	-166.8	244.1	223.3	20.80	11.738	
4,100.0	4,028.3	4,118.5	4,068.7	16.5	14.2	163.32	-459.7	-172.0	247.5	226.1	21.38	11.573	
4,200.0	4,126.1	4,218.4	4,167.1	17.0	14.6	163.17	-476.5	-177.3	250.8	228.8	21.97	11.416	
4,300.0	4,224.0	4,318.4	4,265.5	17.4	15.0	163.02	-493.4	-182.5	254.2	231.6	22.56	11.266	
4,400.0	4,321.9	4,418.3	4,363.9	17.9	15.4	162.88	-510.2	-187.8	257.5	234.4	23.15	11.124	
4,500.0	4,419.8	4,518.3	4,462.3	18.3	15.8	162.74	-527.0	-193.1	260.9	237.1	23.74	10.989	
4,600.0	4,517.6	4,618.2	4,560.6	18.8	16.2	162.60	-543.8	-198.3	264.2	239.9	24.33	10.860	
4,700.0	4,615.5	4,718.1	4,659.0	19.2	16.6	162.47	-560.6	-203.6	267.6	242.7	24.92	10.736	
4,800.0	4,713.4	4,818.1	4,757.4	19.7	17.0	162.34	-577.4	-208.9	271.0	245.4	25.52	10.618	
4,900.0	4,811.2	4,918.0	4,855.8	20.1	17.4	162.21	-594.2	-214.1	274.3	248.2	26.11	10.505	

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

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design		Thornton Pad Sec.15-T7N-R66W - Thornton 15F-212 - Wellbore #1 - Plan #1 (6-13-12)											Offset Site Error:		0.0 ft
Survey Program:		0-MWD											Offset Well Error:		0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning	
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre		Between Centres	Between Ellipses	Minimum Separation	Separation Factor			
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)	(ft)				
5,000.0	4,909.1	5,018.0	4,954.1	20.6	17.8	162.09	-611.0	-219.4	277.7	251.0	26.71	10.397			
5,100.0	5,007.0	5,113.1	5,047.9	21.0	18.2	162.01	-626.5	-224.3	281.5	254.3	27.26	10.328			
5,200.0	5,104.9	5,204.5	5,138.4	21.5	18.4	162.15	-638.9	-228.1	288.1	260.4	27.72	10.393			
5,300.0	5,202.7	5,295.5	5,228.8	22.0	18.6	162.50	-648.5	-231.2	297.5	269.4	28.12	10.580			
5,400.0	5,300.6	5,385.8	5,318.8	22.4	18.8	163.04	-655.3	-233.3	309.9	281.5	28.48	10.882			
5,500.0	5,398.5	5,475.3	5,408.2	22.9	18.9	163.71	-659.3	-234.6	325.3	296.5	28.80	11.294			
5,600.0	5,496.4	5,567.1	5,500.0	23.3	19.0	164.52	-660.8	-235.0	343.5	314.4	29.10	11.805			
5,700.0	5,594.2	5,661.4	5,594.2	23.8	19.1	165.35	-660.8	-235.0	363.3	333.9	29.39	12.362			
5,718.6	5,612.4	5,679.5	5,612.4	23.9	19.2	165.50	-660.8	-235.0	367.0	337.6	29.44	12.465			
5,800.0	5,692.3	5,759.5	5,692.3	24.2	19.3	166.15	-660.8	-235.0	382.1	352.5	29.68	12.876			
5,900.0	5,791.0	5,858.2	5,791.0	24.4	19.4	166.78	-660.8	-235.0	397.7	367.8	29.94	13.285			
6,000.0	5,890.3	5,957.4	5,890.3	24.6	19.5	167.23	-660.8	-235.0	409.9	379.7	30.18	13.581			
6,100.0	5,989.8	6,057.0	5,989.8	24.8	19.6	167.55	-660.8	-235.0	418.8	388.4	30.42	13.769			
6,200.0	6,089.7	6,156.8	6,089.7	25.0	19.7	167.73	-660.8	-235.0	424.2	393.6	30.63	13.852			
6,300.0	6,189.6	6,256.8	6,189.6	25.1	19.8	167.80	-660.8	-235.0	426.3	395.5	30.81	13.835			
6,310.4	6,200.0	6,267.1	6,200.0	25.1	19.8	0.00	-660.8	-235.0	426.3	382.2	44.17	9.653			
6,400.0	6,289.6	6,356.8	6,289.6	25.2	20.0	0.00	-660.8	-235.0	426.3	381.9	44.38	9.607			
6,500.0	6,389.6	6,456.8	6,389.6	25.3	20.1	0.00	-660.8	-235.0	426.3	381.7	44.60	9.559			
6,600.0	6,489.6	6,556.8	6,489.6	25.4	20.2	0.00	-660.8	-235.0	426.3	381.5	44.82	9.512			
6,660.0	6,549.7	6,616.8	6,549.7	25.4	20.3	0.00	-660.8	-235.0	426.3	381.4	44.96	9.483			
6,700.0	6,589.6	6,656.7	6,589.6	25.5	20.3	0.03	-660.8	-234.8	426.3	381.3	45.05	9.463			
6,800.0	6,689.6	6,755.7	6,688.1	25.6	20.4	1.21	-660.7	-226.0	426.4	381.0	45.40	9.394			
6,843.5	6,733.2	6,797.7	6,729.5	25.6	20.5	2.22	-660.7	-218.5	426.7	381.1	45.58	9.361			
6,850.0	6,739.6	6,803.9	6,735.5	25.6	20.5	-87.60	-660.7	-217.1	426.8	394.6	32.21	13.251			
6,900.0	6,789.6	6,851.3	6,781.5	25.7	20.5	-86.25	-660.7	-205.5	427.3	395.2	32.16	13.288			
6,950.0	6,839.3	6,898.2	6,826.1	25.7	20.5	-84.93	-660.7	-191.3	428.2	396.1	32.11	13.333			
7,000.0	6,888.6	6,944.5	6,869.3	25.7	20.5	-83.64	-660.6	-174.5	429.2	397.1	32.08	13.381			
7,050.0	6,937.1	6,990.3	6,910.9	25.8	20.6	-82.39	-660.6	-155.4	430.5	398.4	32.05	13.429			
7,100.0	6,984.9	7,035.7	6,950.9	25.8	20.6	-81.17	-660.5	-134.0	431.9	399.8	32.05	13.473			
7,150.0	7,031.5	7,080.6	6,989.2	25.8	20.6	-80.00	-660.5	-110.6	433.4	401.3	32.08	13.512			
7,200.0	7,076.8	7,125.1	7,025.7	25.8	20.6	-78.88	-660.4	-85.2	435.1	403.0	32.13	13.543			
7,250.0	7,120.7	7,169.2	7,060.4	25.8	20.6	-77.81	-660.4	-57.9	436.9	404.6	32.21	13.564			
7,300.0	7,163.0	7,212.9	7,093.2	25.8	20.6	-76.79	-660.3	-29.0	438.7	406.4	32.33	13.571			
7,350.0	7,203.4	7,256.3	7,124.0	25.8	20.6	-75.84	-660.2	1.6	440.6	408.1	32.49	13.562			
7,400.0	7,241.7	7,300.0	7,153.2	25.9	20.6	-74.93	-660.1	34.0	442.4	409.7	32.69	13.533			
7,450.0	7,277.9	7,342.3	7,179.7	25.9	20.7	-74.10	-660.1	66.9	444.3	411.3	32.96	13.479			
7,500.0	7,311.8	7,384.9	7,204.5	25.9	20.7	-73.33	-660.0	101.6	446.1	412.8	33.29	13.402			
7,550.0	7,343.2	7,427.2	7,227.2	25.9	20.7	-72.62	-659.9	137.3	447.9	414.2	33.70	13.290			
7,600.0	7,371.9	7,469.4	7,247.8	26.0	20.8	-71.98	-659.8	174.1	449.5	415.3	34.19	13.149			
7,650.0	7,398.0	7,511.3	7,266.3	26.0	20.9	-71.41	-659.7	211.7	451.1	416.3	34.76	12.976			
7,700.0	7,421.2	7,550.0	7,281.5	26.1	21.1	-70.93	-659.7	247.3	452.5	417.1	35.39	12.785			
7,750.0	7,441.4	7,594.8	7,296.7	26.2	21.3	-70.47	-659.6	289.4	453.8	417.5	36.21	12.532			
7,800.0	7,458.6	7,636.3	7,308.7	26.3	21.6	-70.10	-659.5	329.2	454.9	417.8	37.09	12.264			
7,850.0	7,472.7	7,677.8	7,318.4	26.5	22.0	-69.80	-659.4	369.5	455.8	417.7	38.08	11.970			
7,900.0	7,483.7	7,719.1	7,326.0	26.8	22.5	-69.56	-659.3	410.1	456.6	417.4	39.17	11.656			
7,950.0	7,491.4	7,760.4	7,331.3	27.1	23.1	-69.40	-659.2	451.1	457.1	416.8	40.36	11.326			
8,000.0	7,495.9	7,800.0	7,334.3	27.5	23.8	-69.31	-659.1	490.5	457.5	415.9	41.61	10.993			
8,043.9	7,497.1	7,838.0	7,335.3	28.0	24.4	-69.29	-659.0	528.5	457.6	414.8	42.85	10.680			
8,100.0	7,497.1	7,892.7	7,334.9	28.7	25.4	-69.25	-658.9	568.2	457.9	413.0	44.90	10.199			
8,200.0	7,497.0	7,992.7	7,334.1	30.2	27.4	-69.18	-658.7	683.2	458.3	409.5	48.81	9.391			
8,300.0	7,497.0	8,092.7	7,333.4	31.9	29.6	-69.11	-658.4	783.2	458.8	405.8	52.95	8.665			

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



<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Offset Design		Thornton Pad Sec.15-T7N-R66W - Thornton 15F-212 - Wellbore #1 - Plan #1 (6-13-12)											Offset Site Error:		0.0 ft
Survey Program:		0-MWD											Offset Well Error:		0.0 ft
Reference		Offset		Semi Major Axis			Distance							Warning	
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre		Between Centres	Between Ellipses	Minimum Separation	Separation Factor			
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)	(ft)				
8,400.0	7,496.9	8,192.7	7,332.6	33.9	31.8	-69.04	-658.2	883.2	459.3	402.0	57.27	8.019			
8,500.0	7,496.9	8,292.7	7,331.9	36.1	34.2	-68.97	-658.0	983.2	459.7	398.0	61.73	7.447			
8,600.0	7,496.8	8,392.7	7,331.1	38.3	36.6	-68.89	-657.8	1,083.2	460.2	393.9	66.30	6.940			
8,700.0	7,496.8	8,492.7	7,330.4	40.6	39.1	-68.82	-657.5	1,183.2	460.6	389.7	70.97	6.491			
8,800.0	7,496.7	8,592.7	7,329.6	43.0	41.6	-68.75	-657.3	1,283.2	461.1	385.4	75.70	6.091			
8,900.0	7,496.7	8,692.7	7,328.9	45.5	44.1	-68.68	-657.1	1,383.2	461.6	381.1	80.49	5.734			
9,000.0	7,496.6	8,792.7	7,328.1	48.0	46.7	-68.61	-656.9	1,483.2	462.0	376.7	85.33	5.415			
9,100.0	7,496.6	8,892.7	7,327.4	50.5	49.3	-68.54	-656.6	1,583.2	462.5	372.3	90.21	5.127			
9,200.0	7,496.5	8,992.7	7,326.6	53.1	51.9	-68.47	-656.4	1,683.2	463.0	367.8	95.12	4.867			
9,300.0	7,496.5	9,092.7	7,325.9	55.7	54.6	-68.40	-656.2	1,783.2	463.4	363.4	100.06	4.632			
9,400.0	7,496.4	9,192.7	7,325.1	58.3	57.2	-68.33	-656.0	1,883.2	463.9	358.9	105.02	4.417			
9,500.0	7,496.4	9,292.7	7,324.4	60.9	59.9	-68.26	-655.7	1,983.2	464.4	354.4	109.99	4.222			
9,600.0	7,496.3	9,392.7	7,323.6	63.5	62.6	-68.19	-655.5	2,083.1	464.8	349.9	114.99	4.043			
9,700.0	7,496.2	9,492.7	7,322.9	66.2	65.3	-68.12	-655.3	2,183.1	465.3	345.3	119.99	3.878			
9,800.0	7,496.2	9,592.7	7,322.1	68.9	68.0	-68.05	-655.1	2,283.1	465.8	340.8	125.01	3.726			
9,900.0	7,496.1	9,692.7	7,321.4	71.6	70.7	-67.98	-654.8	2,383.1	466.3	336.2	130.04	3.586			
10,000.0	7,496.1	9,792.7	7,320.6	74.2	73.4	-67.92	-654.6	2,483.1	466.7	331.7	135.07	3.455			
10,100.0	7,496.0	9,892.7	7,319.9	76.9	76.1	-67.85	-654.4	2,583.1	467.2	327.1	140.11	3.335			
10,200.0	7,496.0	9,992.7	7,319.1	79.6	78.8	-67.78	-654.1	2,683.1	467.7	322.5	145.15	3.222			
10,300.0	7,495.9	10,092.7	7,318.4	82.4	81.6	-67.71	-653.9	2,783.1	468.1	317.9	150.20	3.117			
10,400.0	7,495.9	10,192.7	7,317.6	85.1	84.3	-67.64	-653.7	2,883.1	468.6	313.4	155.25	3.018			
10,500.0	7,495.8	10,292.7	7,316.9	87.8	87.1	-67.57	-653.5	2,983.1	469.1	308.8	160.31	2.926			
10,600.0	7,495.8	10,392.7	7,316.1	90.5	89.8	-67.50	-653.2	3,083.1	469.6	304.2	165.36	2.840			
10,700.0	7,495.7	10,492.7	7,315.4	93.3	92.6	-67.44	-653.0	3,183.1	470.0	299.6	170.42	2.758			
10,800.0	7,495.7	10,592.7	7,314.6	96.0	95.3	-67.37	-652.8	3,283.1	470.5	295.0	175.48	2.681			
10,900.0	7,495.6	10,692.7	7,313.9	98.8	98.1	-67.30	-652.6	3,383.1	471.0	290.5	180.53	2.609			
11,000.0	7,495.6	10,792.6	7,313.1	101.5	100.8	-67.23	-652.3	3,483.1	471.5	285.9	185.59	2.540			
11,100.0	7,495.5	10,892.6	7,312.4	104.3	103.6	-67.17	-652.1	3,583.1	472.0	281.3	190.65	2.476			
11,200.0	7,495.5	10,992.6	7,311.6	107.0	106.4	-67.10	-651.9	3,683.1	472.4	276.7	195.70	2.414			
11,300.0	7,495.4	11,092.6	7,310.9	109.8	109.1	-67.03	-651.7	3,783.0	472.9	272.2	200.75	2.356			
11,400.0	7,495.4	11,192.6	7,310.1	112.5	111.9	-66.96	-651.4	3,883.0	473.4	267.6	205.81	2.300			
11,500.0	7,495.3	11,292.6	7,309.4	115.3	114.7	-66.90	-651.2	3,983.0	473.9	263.0	210.86	2.247			
11,600.0	7,495.3	11,392.6	7,308.6	118.1	117.4	-66.83	-651.0	4,083.0	474.4	258.5	215.91	2.197			
11,700.0	7,495.2	11,492.6	7,307.9	120.8	120.2	-66.76	-650.8	4,183.0	474.8	253.9	220.95	2.149			
11,800.0	7,495.1	11,592.6	7,307.1	123.6	123.0	-66.70	-650.5	4,283.0	475.3	249.3	226.00	2.103			
11,900.0	7,495.1	11,692.6	7,306.4	126.4	125.8	-66.63	-650.3	4,383.0	475.8	244.8	231.04	2.059			
12,000.0	7,495.0	11,792.6	7,305.6	129.1	128.6	-66.56	-650.1	4,483.0	476.3	240.2	236.08	2.018			
12,084.2	7,495.0	11,873.6	7,305.0	131.5	130.8	-66.51	-649.9	4,563.9	476.7	236.5	240.23	1.984 SF			



Reference Depths are relative to WELL @ 4985.0ft (Original Well Elev)	Coordinates are relative to: Thornton 15F-432
Offset Depths are relative to Offset Datum	Coordinate System is US State Plane 1983, Colorado Northern Zone
Central Meridian is -105.500000	Grid Convergence at Surface is: 0.47°



<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Thornton 15F-432
<b>Project:</b>	SEC.15-T7N-R66W	<b>TVD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Reference Site:</b>	Thornton Pad Sec.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4985.0ft (Original Well Elev)
<b>Site Error:</b>	0.0 ft	<b>North Reference:</b>	True
<b>Reference Well:</b>	Thornton 15F-432	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Well Error:</b>	0.0 ft	<b>Output errors are at</b>	2.00 sigma
<b>Reference Wellbore</b>	Wellbore #1	<b>Database:</b>	US_EDM
<b>Reference Design:</b>	Plan #2 (8-13-15)	<b>Offset TVD Reference:</b>	Offset Datum

Reference Depths are relative to WELL @ 4985.0ft (Original Well Elev)  
Offset Depths are relative to Offset Datum  
Central Meridian is -105.500000

Coordinates are relative to: Thornton 15F-432  
Coordinate System is US State Plane 1983, Colorado Northern Zone  
Grid Convergence at Surface is: 0.47°

