PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Thornton 28W-443**

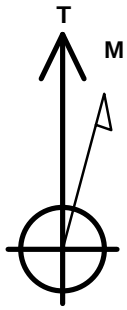
Surface Location: Thornton 28SW-HZ Pad Sec.28-T7N-R66W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone
Ground Elevation: 4935.0

+N/-S	+E/-W	Northing	Easting	Latittude	Longitude	Slot
0.0	0.0	1442378.66	3200970.33	40.545480	-104.776850	

RKB-15' WELL @ 4950.0ft (RKB-15')

WELLBORE TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
BHL 2140'FNL & 541'FEL, SEC.33	7396.0	-4634.1	122.3	Point



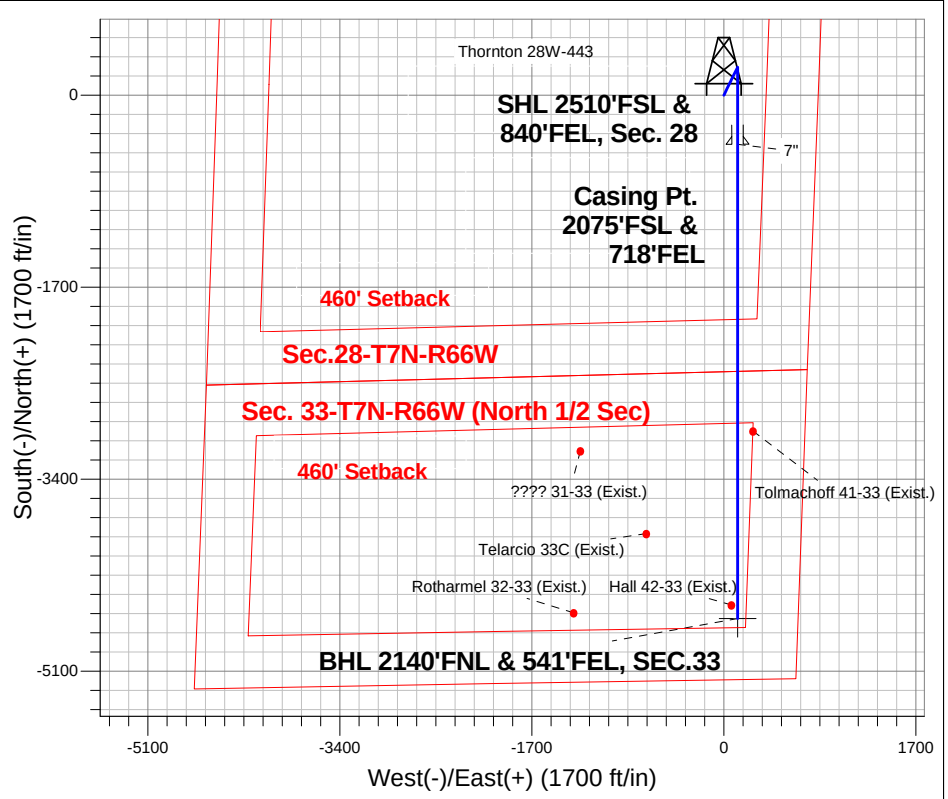
Azimuths to True North
Magnetic North: 8.62°

Magnetic Field
Strength: 52997.6snT
Dip Angle: 67.10°
Date: 6/4/2013
Model: IGRF2010

Thornton 28SW-HZ Pad Sec.28-T7N-R66W
Thornton 28W-443
Plan #1 (06-04-13)
11:42, June 11 2013

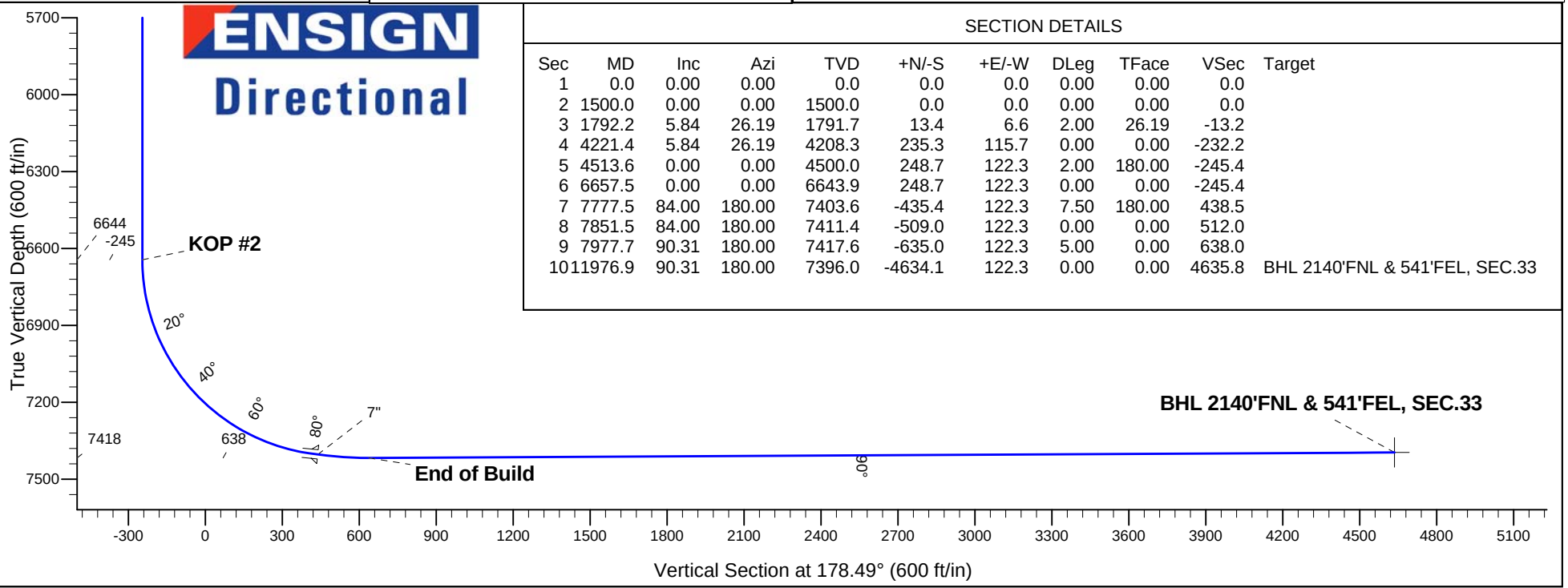
ANNOTATIONS

TVD	MD	Annotation
1500.0	1500.0	KOP #1
6643.9	6657.5	KOP #2
7417.6	7977.7	End of Build



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	DLeg	TFace	VSec	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	1500.0	0.00	0.00	1500.0	0.0	0.0	0.00	0.00	0.0	
3	1792.2	5.84	26.19	1791.7	13.4	6.6	2.00	26.19	-13.2	
4	4221.4	5.84	26.19	4208.3	235.3	115.7	0.00	0.00	-232.2	
5	4513.6	0.00	0.00	4500.0	248.7	122.3	2.00	180.00	-245.4	
6	6657.5	0.00	0.00	6643.9	248.7	122.3	0.00	0.00	-245.4	
7	7777.5	84.00	180.00	7403.6	-435.4	122.3	7.50	180.00	438.5	
8	7851.5	84.00	180.00	7411.4	-509.0	122.3	0.00	0.00	512.0	
9	7977.7	90.31	180.00	7417.6	-635.0	122.3	5.00	0.00	638.0	
10	11976.9	90.31	180.00	7396.0	-4634.1	122.3	0.00	0.00	4635.8	BHL 2140'FNL & 541'FEL, SEC.33



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.28-T7N-R66W
Thornton 28SW-HZ Pad Sec.28-T7N-R66W
Thornton 28W-443

Wellbore #1

Plan: Plan #1 (06-04-13)

Standard Planning Report

11 June, 2013

Database:	Landmark	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**North Reference:**	True
Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

Project SEC.28-T7N-R66W, Weld Country

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 Thornton 28SW-HZ Pad Sec.28-T7N-R66W

Site Position:		**Northing:**	1,442,374.80 ft	**Latitude:**	40.545470
From:	Lat/Long	**Easting:**	3,200,942.57 ft	**Longitude:**	-104.776950
Position Uncertainty:	0.0 ft	**Slot Radius:**	"	**Grid Convergence:**	0.47 °

Well Thornton 28W-443

Well Position	**+N/-S**	3.6 ft	**Northing:**	1,442,378.66 ft	**Latitude:**	40.545480
	+E/-W	27.8 ft	**Easting:**	3,200,970.33 ft	**Longitude:**	-104.776850
Position Uncertainty		0.0 ft	**Wellhead Elevation:**	ft	**Ground Level:**	4,935.0 ft

Wellbore Wellbore #1

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	6/4/2013	8.62	67.10	52,998

Design Plan #1 (06-04-13)

Audit Notes:

Version:		**Phase:**	PROTOTYPE	**Tie On Depth:**	0.0

Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	178.49

Plan Sections

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,792.2	5.84	26.19	1,791.7	13.4	6.6	2.00	2.00	0.00	26.19	
4,221.4	5.84	26.19	4,208.3	235.3	115.7	0.00	0.00	0.00	0.00	
4,513.6	0.00	0.00	4,500.0	248.7	122.3	2.00	-2.00	0.00	180.00	
6,657.5	0.00	0.00	6,643.9	248.7	122.3	0.00	0.00	0.00	0.00	
7,777.5	84.00	180.00	7,403.6	-435.4	122.3	7.50	7.50	0.00	180.00	
7,851.5	84.00	180.00	7,411.4	-509.0	122.3	0.00	0.00	0.00	0.00	
7,977.7	90.31	180.00	7,417.6	-635.0	122.3	5.00	5.00	0.00	0.00	
11,976.9	90.31	180.00	7,396.0	-4,634.1	122.3	0.00	0.00	0.00	0.00	BHL 2140'FNL & 5

Database:	Landmark	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**North Reference:**	True
Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
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
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP #1									
1,600.0	2.00	26.19	1,600.0	1.6	0.8	-1.5	2.00	2.00	0.00
1,700.0	4.00	26.19	1,699.8	6.3	3.1	-6.2	2.00	2.00	0.00
1,792.2	5.84	26.19	1,791.7	13.4	6.6	-13.2	2.00	2.00	0.00
1,800.0	5.84	26.19	1,799.5	14.1	6.9	-13.9	0.00	0.00	0.00
1,900.0	5.84	26.19	1,898.9	23.2	11.4	-22.9	0.00	0.00	0.00
2,000.0	5.84	26.19	1,998.4	32.3	15.9	-31.9	0.00	0.00	0.00
2,100.0	5.84	26.19	2,097.9	41.5	20.4	-40.9	0.00	0.00	0.00
2,200.0	5.84	26.19	2,197.4	50.6	24.9	-49.9	0.00	0.00	0.00
2,300.0	5.84	26.19	2,296.9	59.8	29.4	-59.0	0.00	0.00	0.00
2,400.0	5.84	26.19	2,396.3	68.9	33.9	-68.0	0.00	0.00	0.00
2,500.0	5.84	26.19	2,495.8	78.0	38.4	-77.0	0.00	0.00	0.00
2,600.0	5.84	26.19	2,595.3	87.2	42.9	-86.0	0.00	0.00	0.00
2,700.0	5.84	26.19	2,694.8	96.3	47.4	-95.0	0.00	0.00	0.00
2,800.0	5.84	26.19	2,794.3	105.4	51.9	-104.0	0.00	0.00	0.00
2,900.0	5.84	26.19	2,893.7	114.6	56.4	-113.1	0.00	0.00	0.00
3,000.0	5.84	26.19	2,993.2	123.7	60.8	-122.1	0.00	0.00	0.00
3,100.0	5.84	26.19	3,092.7	132.9	65.3	-131.1	0.00	0.00	0.00
3,200.0	5.84	26.19	3,192.2	142.0	69.8	-140.1	0.00	0.00	0.00
3,300.0	5.84	26.19	3,291.7	151.1	74.3	-149.1	0.00	0.00	0.00
3,400.0	5.84	26.19	3,391.1	160.3	78.8	-158.1	0.00	0.00	0.00
3,500.0	5.84	26.19	3,490.6	169.4	83.3	-167.1	0.00	0.00	0.00
3,600.0	5.84	26.19	3,590.1	178.5	87.8	-176.2	0.00	0.00	0.00
3,700.0	5.84	26.19	3,689.6	187.7	92.3	-185.2	0.00	0.00	0.00
3,800.0	5.84	26.19	3,789.1	196.8	96.8	-194.2	0.00	0.00	0.00
3,900.0	5.84	26.19	3,888.5	206.0	101.3	-203.2	0.00	0.00	0.00
4,000.0	5.84	26.19	3,988.0	215.1	105.8	-212.2	0.00	0.00	0.00
4,100.0	5.84	26.19	4,087.5	224.2	110.3	-221.2	0.00	0.00	0.00
4,200.0	5.84	26.19	4,187.0	233.4	114.8	-230.3	0.00	0.00	0.00
4,221.4	5.84	26.19	4,208.3	235.3	115.7	-232.2	0.00	0.00	0.00
4,300.0	4.27	26.19	4,286.6	241.5	118.8	-238.3	2.00	-2.00	0.00
4,400.0	2.27	26.19	4,386.4	246.7	121.3	-243.4	2.00	-2.00	0.00
4,500.0	0.27	26.19	4,486.4	248.7	122.3	-245.3	2.00	-2.00	0.00
4,513.6	0.00	0.00	4,500.0	248.7	122.3	-245.4	2.00	-2.00	0.00
4,600.0	0.00	0.00	4,586.4	248.7	122.3	-245.4	0.00	0.00	0.00
4,700.0	0.00	0.00	4,686.4	248.7	122.3	-245.4	0.00	0.00	0.00
4,800.0	0.00	0.00	4,786.4	248.7	122.3	-245.4	0.00	0.00	0.00

Database:	Landmark	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**North Reference:**	True
Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,900.0	0.00	0.00	4,886.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,000.0	0.00	0.00	4,986.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,100.0	0.00	0.00	5,086.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,200.0	0.00	0.00	5,186.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,300.0	0.00	0.00	5,286.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,400.0	0.00	0.00	5,386.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,500.0	0.00	0.00	5,486.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,600.0	0.00	0.00	5,586.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,700.0	0.00	0.00	5,686.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,800.0	0.00	0.00	5,786.4	248.7	122.3	-245.4	0.00	0.00	0.00
5,900.0	0.00	0.00	5,886.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,000.0	0.00	0.00	5,986.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,100.0	0.00	0.00	6,086.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,200.0	0.00	0.00	6,186.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,300.0	0.00	0.00	6,286.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,400.0	0.00	0.00	6,386.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,500.0	0.00	0.00	6,486.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,600.0	0.00	0.00	6,586.4	248.7	122.3	-245.4	0.00	0.00	0.00
6,657.5	0.00	0.00	6,643.9	248.7	122.3	-245.4	0.00	0.00	0.00
KOP #2									
6,700.0	3.19	180.00	6,686.3	247.5	122.3	-244.2	7.50	7.50	0.00
6,800.0	10.69	180.00	6,785.5	235.4	122.3	-232.1	7.50	7.50	0.00
6,900.0	18.19	180.00	6,882.3	210.5	122.3	-207.2	7.50	7.50	0.00
7,000.0	25.69	180.00	6,975.0	173.2	122.3	-169.9	7.50	7.50	0.00
7,100.0	33.19	180.00	7,062.0	124.1	122.3	-120.8	7.50	7.50	0.00
7,200.0	40.69	180.00	7,141.9	64.0	122.3	-60.8	7.50	7.50	0.00
7,300.0	48.19	180.00	7,213.3	-5.9	122.3	9.1	7.50	7.50	0.00
7,400.0	55.69	180.00	7,274.9	-84.6	122.3	87.8	7.50	7.50	0.00
7,500.0	63.19	180.00	7,325.7	-170.6	122.3	173.8	7.50	7.50	0.00
7,600.0	70.69	180.00	7,364.8	-262.6	122.3	265.7	7.50	7.50	0.00
7,700.0	78.19	180.00	7,391.6	-358.8	122.3	362.0	7.50	7.50	0.00
7,777.5	84.00	180.00	7,403.6	-435.4	122.3	438.5	7.50	7.50	0.00
7"									
7,800.0	84.00	180.00	7,406.0	-457.8	122.3	460.8	0.01	0.01	0.00
7,851.5	84.00	180.00	7,411.4	-509.0	122.3	512.0	0.00	0.00	0.00
7,900.0	86.42	180.00	7,415.4	-557.3	122.3	560.3	5.00	5.00	0.00
7,977.7	90.31	180.00	7,417.6	-635.0	122.3	638.0	5.00	5.00	0.00
End of Build									
8,000.0	90.31	180.00	7,417.5	-657.3	122.3	660.3	0.01	0.01	0.00
8,100.0	90.31	180.00	7,417.0	-757.3	122.3	760.2	0.00	0.00	0.00
8,200.0	90.31	180.00	7,416.4	-857.3	122.3	860.2	0.00	0.00	0.00
8,300.0	90.31	180.00	7,415.9	-957.3	122.3	960.1	0.00	0.00	0.00
8,400.0	90.31	180.00	7,415.4	-1,057.3	122.3	1,060.1	0.00	0.00	0.00
8,500.0	90.31	180.00	7,414.8	-1,157.2	122.3	1,160.1	0.00	0.00	0.00
8,600.0	90.31	180.00	7,414.3	-1,257.2	122.3	1,260.0	0.00	0.00	0.00
8,700.0	90.31	180.00	7,413.7	-1,357.2	122.3	1,360.0	0.00	0.00	0.00
8,800.0	90.31	180.00	7,413.2	-1,457.2	122.3	1,460.0	0.00	0.00	0.00
8,900.0	90.31	180.00	7,412.6	-1,557.2	122.3	1,559.9	0.00	0.00	0.00
9,000.0	90.31	180.00	7,412.1	-1,657.2	122.3	1,659.9	0.00	0.00	0.00
9,100.0	90.31	180.00	7,411.6	-1,757.2	122.3	1,759.9	0.00	0.00	0.00
9,200.0	90.31	180.00	7,411.0	-1,857.2	122.3	1,859.8	0.00	0.00	0.00
9,300.0	90.31	180.00	7,410.5	-1,957.2	122.3	1,959.8	0.00	0.00	0.00
9,400.0	90.31	180.00	7,409.9	-2,057.2	122.3	2,059.7	0.00	0.00	0.00

Database:	Landmark	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**North Reference:**	True
Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
9,500.0	90.31	180.00	7,409.4	-2,157.2	122.3	2,159.7	0.00	0.00	0.00
9,600.0	90.31	180.00	7,408.9	-2,257.2	122.3	2,259.7	0.00	0.00	0.00
9,700.0	90.31	180.00	7,408.3	-2,357.2	122.3	2,359.6	0.00	0.00	0.00
9,800.0	90.31	180.00	7,407.8	-2,457.2	122.3	2,459.6	0.00	0.00	0.00
9,900.0	90.31	180.00	7,407.2	-2,557.2	122.3	2,559.6	0.00	0.00	0.00
10,000.0	90.31	180.00	7,406.7	-2,657.2	122.3	2,659.5	0.00	0.00	0.00
10,100.0	90.31	180.00	7,406.2	-2,757.2	122.3	2,759.5	0.00	0.00	0.00
10,200.0	90.31	180.00	7,405.6	-2,857.2	122.3	2,859.5	0.00	0.00	0.00
10,300.0	90.31	180.00	7,405.1	-2,957.2	122.3	2,959.4	0.00	0.00	0.00
10,400.0	90.31	180.00	7,404.5	-3,057.2	122.3	3,059.4	0.00	0.00	0.00
10,500.0	90.31	180.00	7,404.0	-3,157.2	122.3	3,159.3	0.00	0.00	0.00
10,600.0	90.31	180.00	7,403.4	-3,257.2	122.3	3,259.3	0.00	0.00	0.00
10,700.0	90.31	180.00	7,402.9	-3,357.2	122.3	3,359.3	0.00	0.00	0.00
10,800.0	90.31	180.00	7,402.4	-3,457.2	122.3	3,459.2	0.00	0.00	0.00
10,900.0	90.31	180.00	7,401.8	-3,557.2	122.3	3,559.2	0.00	0.00	0.00
11,000.0	90.31	180.00	7,401.3	-3,657.2	122.3	3,659.2	0.00	0.00	0.00
11,100.0	90.31	180.00	7,400.7	-3,757.2	122.3	3,759.1	0.00	0.00	0.00
11,200.0	90.31	180.00	7,400.2	-3,857.2	122.3	3,859.1	0.00	0.00	0.00
11,300.0	90.31	180.00	7,399.7	-3,957.2	122.3	3,959.1	0.00	0.00	0.00
11,400.0	90.31	180.00	7,399.1	-4,057.2	122.3	4,059.0	0.00	0.00	0.00
11,500.0	90.31	180.00	7,398.6	-4,157.2	122.3	4,159.0	0.00	0.00	0.00
11,600.0	90.31	180.00	7,398.0	-4,257.2	122.3	4,258.9	0.00	0.00	0.00
11,700.0	90.31	180.00	7,397.5	-4,357.2	122.3	4,358.9	0.00	0.00	0.00
11,800.0	90.31	180.00	7,397.0	-4,457.2	122.3	4,458.9	0.00	0.00	0.00
11,900.0	90.31	180.00	7,396.4	-4,557.2	122.3	4,558.8	0.00	0.00	0.00
11,976.9	90.31	180.00	7,396.0	-4,634.1	122.3	4,635.8	0.00	0.00	0.00
BHL 2140'FNL & 541'FEL, SEC.33									

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,777.5	7,403.6	7"	7	7-1/2

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
1,500.0	1,500.0	0.0	0.0	KOP #1
6,657.5	6,643.9	248.7	122.3	KOP #2
7,977.7	7,417.6	-635.0	122.3	End of Build

ENSIGN Directional

PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.28-T7N-R66W
Thornton 28SW-HZ Pad Sec.28-T7N-R66W
Thornton 28W-443

Wellbore #1
Plan #1 (06-04-13)

Anticollision Report

11 June, 2013

PDC ENERGY
Growing E&P Value

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Reference Plan #1 (06-04-13)

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 1,000.0ft	**Error Surface:**	Elliptical Conic
Warning Levels Evaluated at:	2.00 **Sigma**		

Survey Tool Program **Date** 6/5/2013

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	11,976.9	Plan #1 (06-04-13) (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						
???? 31-33 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Hall 42-33 (Exist.) - Wellbore #1 - Wellbore #1	11,856.7	7,352.7	55.6	-180.6	0.235	Level 1, CC, ES, SF
Rotharmel 32-33 (Exist.) - Wellbore #1 - Wellbore #1						Out of range
Telarcio 33C (Exist.) - Wellbore #1 - Wellbore #1	11,222.8	7,353.1	808.9	584.7	3.608	CC, ES
Telarcio 33C (Exist.) - Wellbore #1 - Wellbore #1	11,300.0	7,352.7	812.6	586.9	3.601	SF
Tolmachoff 41-33 (Exist.) - Wellbore #1 - Wellbore #1	10,315.6	7,375.0	136.2	-71.5	0.656	Level 1, CC, ES, SF
Thornton 28SW-HZ Pad Sec.28-T7N-R66W						
Thornton 28S-223 - Wellbore #1 - Plan #1 (06-04-13)	1,500.0	1,500.0	28.0	21.5	4.300	CC, ES
Thornton 28S-223 - Wellbore #1 - Plan #1 (06-04-13)	11,976.9	11,879.0	328.6	172.2	2.100	SF
Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)	1,000.0	1,000.0	58.5	54.2	13.693	CC, ES
Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)	11,976.9	11,990.8	589.3	406.6	3.226	SF
Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)	1,000.0	1,000.0	30.6	26.3	7.159	CC, ES
Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)	11,976.9	11,760.7	461.5	316.8	3.189	SF

Offset Design Existing Wells - Hall 42-33 (Exist.) - Wellbore #1 - Wellbore #1 — **Offset Site Error:** 0.0 ft

Survey Program: 7500-UNKNOWN — **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
10,900.0	7,401.8	7,357.8	7,357.8	71.1	147.2	95.32	-4,513.9	66.7	958.3	740.9	217.40	4.408	
11,000.0	7,401.3	7,357.3	7,357.3	73.0	147.1	94.77	-4,513.9	66.7	858.5	639.1	219.43	3.912	
11,100.0	7,400.7	7,356.7	7,356.7	74.9	147.1	94.21	-4,513.9	66.7	758.8	537.3	221.45	3.426	
11,200.0	7,400.2	7,356.2	7,356.2	76.8	147.1	93.66	-4,513.9	66.7	659.1	435.6	223.45	2.949	
11,300.0	7,399.7	7,355.7	7,355.7	78.6	147.1	93.10	-4,513.9	66.7	559.5	334.1	225.44	2.482	
11,400.0	7,399.1	7,355.1	7,355.1	80.5	147.1	92.55	-4,513.9	66.7	460.1	232.7	227.41	2.023	
11,500.0	7,398.6	7,354.6	7,354.6	82.4	147.1	91.99	-4,513.9	66.7	361.0	131.7	229.36	1.574	
11,600.0	7,398.0	7,354.0	7,354.0	84.3	147.1	91.43	-4,513.9	66.7	262.7	31.4	231.29	1.136	Level 2
11,700.0	7,397.5	7,353.5	7,353.5	86.2	147.1	90.87	-4,513.9	66.7	166.3	-66.9	233.21	0.713	Level 1
11,800.0	7,397.0	7,353.0	7,353.0	88.1	147.1	90.32	-4,513.9	66.7	79.4	-155.7	235.11	0.338	Level 1
11,856.7	7,396.7	7,352.7	7,352.7	89.1	147.1	90.00	-4,513.9	66.7	55.6	-180.6	236.18	0.235	Level 1, CC, ES, SF
11,900.0	7,396.4	7,352.4	7,352.4	90.0	147.0	89.76	-4,513.9	66.7	70.4	-166.5	236.99	0.297	Level 1
11,976.9	7,396.0	7,352.0	7,352.0	91.4	147.0	89.33	-4,513.9	66.7	132.5	-106.0	238.42	0.556	Level 1

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

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Existing Wells - Telarcio 33C (Exist.) - Wellbore #1 - Wellbore #1

Offset Site Error: 0.0 ft

Survey Program: 7500-UNKNOWN

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
10,700.0	7,402.9	7,355.9	7,355.9	67.4	147.1	90.20	-3,880.0	-686.6	963.1	748.6	214.47	4.491	
10,800.0	7,402.4	7,355.4	7,355.4	69.2	147.1	90.16	-3,880.0	-686.6	912.7	696.4	216.33	4.219	
10,900.0	7,401.8	7,354.8	7,354.8	71.1	147.1	90.12	-3,880.0	-686.6	870.9	652.7	218.20	3.991	
11,000.0	7,401.3	7,354.3	7,354.3	73.0	147.1	90.09	-3,880.0	-686.6	839.0	618.9	220.06	3.813	
11,100.0	7,400.7	7,353.7	7,353.7	74.9	147.1	90.05	-3,880.0	-686.6	818.1	596.2	221.93	3.687	
11,200.0	7,400.2	7,353.2	7,353.2	76.8	147.1	90.01	-3,880.0	-686.6	809.2	585.4	223.80	3.616	
11,222.8	7,400.1	7,353.1	7,353.1	77.2	147.1	90.00	-3,880.0	-686.6	808.9	584.7	224.22	3.608	CC, ES
11,300.0	7,399.7	7,352.7	7,352.7	78.6	147.1	89.97	-3,880.0	-686.6	812.6	586.9	225.67	3.601	SF
11,400.0	7,399.1	7,352.1	7,352.1	80.5	147.0	89.93	-3,880.0	-686.6	828.1	600.5	227.54	3.639	
11,500.0	7,398.6	7,351.6	7,351.6	82.4	147.0	89.89	-3,880.0	-686.6	855.1	625.6	229.41	3.727	
11,600.0	7,398.0	7,351.0	7,351.0	84.3	147.0	89.86	-3,880.0	-686.6	892.5	661.2	231.29	3.859	
11,700.0	7,397.5	7,350.5	7,350.5	86.2	147.0	89.82	-3,880.0	-686.6	939.2	706.0	233.17	4.028	
11,800.0	7,397.0	7,350.0	7,350.0	88.1	147.0	89.78	-3,880.0	-686.6	993.7	758.7	235.05	4.228	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Existing Wells - Tolmachoff 41-33 (Exist.) - Wellbore #1 - Wellbore #1

Offset Site Error: 0.0 ft

Survey Program: 7500-UNKNOWN

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
9,400.0	7,409.9	7,379.9	7,379.9	43.5	147.6	-92.08	-2,972.9	258.5	925.7	734.7	190.95	4.848	
9,500.0	7,409.4	7,379.4	7,379.4	45.3	147.6	-91.86	-2,972.9	258.5	826.9	634.2	192.75	4.290	
9,600.0	7,408.9	7,378.9	7,378.9	47.1	147.6	-91.63	-2,972.9	258.5	728.5	533.9	194.57	3.744	
9,700.0	7,408.3	7,378.3	7,378.3	48.9	147.6	-91.40	-2,972.9	258.5	630.5	434.1	196.39	3.210	
9,800.0	7,407.8	7,377.8	7,377.8	50.7	147.6	-91.17	-2,972.9	258.5	533.3	335.1	198.22	2.690	
9,900.0	7,407.2	7,377.2	7,377.2	52.6	147.5	-90.95	-2,972.9	258.5	437.4	237.3	200.05	2.186	
10,000.0	7,406.7	7,376.7	7,376.7	54.4	147.5	-90.72	-2,972.9	258.5	343.8	141.9	201.89	1.703	
10,100.0	7,406.2	7,376.2	7,376.2	56.2	147.5	-90.49	-2,972.9	258.5	255.0	51.3	203.73	1.252	Level 3
10,200.0	7,405.6	7,375.6	7,375.6	58.1	147.5	-90.26	-2,972.9	258.5	178.7	-26.9	205.57	0.869	Level 1
10,300.0	7,405.1	7,375.1	7,375.1	59.9	147.5	-90.04	-2,972.9	258.5	137.1	-70.3	207.41	0.661	Level 1
10,315.6	7,405.0	7,375.0	7,375.0	60.2	147.5	-90.00	-2,972.9	258.5	136.2	-71.5	207.70	0.656	Level 1, CC, ES, SF
10,400.0	7,404.5	7,374.5	7,374.5	61.8	147.5	-89.81	-2,972.9	258.5	160.2	-49.1	209.26	0.766	Level 1
10,500.0	7,404.0	7,374.0	7,374.0	63.7	147.5	-89.58	-2,972.9	258.5	229.2	18.1	211.10	1.086	Level 2
10,600.0	7,403.4	7,373.4	7,373.4	65.5	147.5	-89.35	-2,972.9	258.5	315.3	102.3	212.95	1.481	Level 3
10,700.0	7,402.9	7,372.9	7,372.9	67.4	147.5	-89.13	-2,972.9	258.5	407.8	193.0	214.80	1.898	
10,800.0	7,402.4	7,372.4	7,372.4	69.2	147.4	-88.90	-2,972.9	258.5	503.1	286.5	216.64	2.322	
10,900.0	7,401.8	7,371.8	7,371.8	71.1	147.4	-88.67	-2,972.9	258.5	600.0	381.5	218.49	2.746	
11,000.0	7,401.3	7,371.3	7,371.3	73.0	147.4	-88.44	-2,972.9	258.5	697.8	477.4	220.33	3.167	
11,100.0	7,400.7	7,370.7	7,370.7	74.9	147.4	-88.22	-2,972.9	258.5	796.1	573.9	222.18	3.583	
11,200.0	7,400.2	7,370.2	7,370.2	76.8	147.4	-87.99	-2,972.9	258.5	894.8	670.8	224.02	3.994	
11,300.0	7,399.7	7,369.7	7,369.7	78.6	147.4	-87.76	-2,972.9	258.5	993.7	767.9	225.86	4.400	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-223 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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	-97.46	-3.6	-27.8	28.0				
100.0	100.0	100.0	100.0	0.1	0.1	-97.46	-3.6	-27.8	28.0	27.8	0.22	124.705	
200.0	200.0	200.0	200.0	0.3	0.3	-97.46	-3.6	-27.8	28.0	27.4	0.67	41.568	
300.0	300.0	300.0	300.0	0.6	0.6	-97.46	-3.6	-27.8	28.0	26.9	1.12	24.941	
400.0	400.0	400.0	400.0	0.8	0.8	-97.46	-3.6	-27.8	28.0	26.5	1.57	17.815	
500.0	500.0	500.0	500.0	1.0	1.0	-97.46	-3.6	-27.8	28.0	26.0	2.02	13.856	
600.0	600.0	600.0	600.0	1.2	1.2	-97.46	-3.6	-27.8	28.0	25.6	2.47	11.337	
700.0	700.0	700.0	700.0	1.5	1.5	-97.46	-3.6	-27.8	28.0	25.1	2.92	9.593	
800.0	800.0	800.0	800.0	1.7	1.7	-97.46	-3.6	-27.8	28.0	24.7	3.37	8.314	
900.0	900.0	900.0	900.0	1.9	1.9	-97.46	-3.6	-27.8	28.0	24.2	3.82	7.336	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-97.46	-3.6	-27.8	28.0	23.8	4.27	6.563	
1,100.0	1,100.0	1,100.0	1,100.0	2.4	2.4	-97.46	-3.6	-27.8	28.0	23.3	4.72	5.938	
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	-97.46	-3.6	-27.8	28.0	22.9	5.17	5.422	
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	-97.46	-3.6	-27.8	28.0	22.4	5.62	4.988	
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	-97.46	-3.6	-27.8	28.0	22.0	6.07	4.619	
1,500.0	1,500.0	1,500.0	1,500.0	3.3	3.3	-97.46	-3.6	-27.8	28.0	21.5	6.52	4.300	CC, ES
1,600.0	1,600.0	1,600.0	1,600.0	3.5	3.5	-126.50	-3.6	-27.8	29.0	22.1	6.96	4.169	
1,700.0	1,699.8	1,699.8	1,699.8	3.7	3.7	-133.90	-3.6	-27.8	32.4	25.0	7.40	4.378	
1,792.2	1,791.7	1,791.7	1,791.7	3.9	3.9	-142.37	-3.6	-27.8	38.3	30.5	7.80	4.912	
1,800.0	1,799.5	1,799.5	1,799.5	3.9	3.9	-143.08	-3.6	-27.8	39.0	31.1	7.84	4.971	
1,900.0	1,898.9	1,898.9	1,898.9	4.2	4.2	-150.46	-3.6	-27.8	47.5	39.2	8.28	5.737	
2,000.0	1,998.4	1,998.4	1,998.4	4.4	4.4	-155.55	-3.6	-27.8	56.6	47.9	8.73	6.485	
2,100.0	2,097.9	2,098.5	2,098.5	4.7	4.6	-157.80	-2.1	-28.5	65.5	56.4	9.18	7.141	
2,200.0	2,197.4	2,198.8	2,198.7	4.9	4.8	-156.90	2.6	-30.8	73.6	64.0	9.63	7.642	
2,300.0	2,296.9	2,299.1	2,298.6	5.2	5.1	-153.77	10.4	-34.6	80.9	70.8	10.09	8.014	
2,400.0	2,396.3	2,399.0	2,397.7	5.4	5.3	-148.99	21.2	-39.9	87.9	77.3	10.57	8.316	
2,500.0	2,495.8	2,498.4	2,496.3	5.7	5.5	-144.37	32.8	-45.6	95.4	84.3	11.06	8.623	
2,600.0	2,595.3	2,597.9	2,594.9	5.9	5.8	-140.44	44.4	-51.3	103.4	91.8	11.56	8.940	
2,700.0	2,694.8	2,697.3	2,693.5	6.2	6.0	-137.09	56.1	-56.9	111.8	99.7	12.08	9.257	
2,800.0	2,794.3	2,796.8	2,792.1	6.5	6.3	-134.21	67.7	-62.6	120.5	107.9	12.60	9.568	
2,900.0	2,893.7	2,896.2	2,890.7	6.7	6.6	-131.73	79.3	-68.3	129.5	116.4	13.13	9.869	
3,000.0	2,993.2	2,995.7	2,989.3	7.0	6.8	-129.58	91.0	-73.9	138.8	125.1	13.66	10.158	
3,100.0	3,092.7	3,095.1	3,087.9	7.3	7.1	-127.69	102.6	-79.6	148.2	134.0	14.20	10.433	
3,200.0	3,192.2	3,194.6	3,186.5	7.6	7.4	-126.03	114.2	-85.3	157.7	143.0	14.74	10.695	
3,300.0	3,291.7	3,294.0	3,285.1	7.8	7.7	-124.56	125.8	-91.0	167.3	152.1	15.29	10.944	
3,400.0	3,391.1	3,393.5	3,383.7	8.1	8.0	-123.25	137.5	-96.6	177.1	161.2	15.84	11.180	
3,500.0	3,490.6	3,492.9	3,482.3	8.4	8.3	-122.08	149.1	-102.3	186.9	170.5	16.39	11.403	
3,600.0	3,590.1	3,592.3	3,580.9	8.7	8.6	-121.02	160.7	-108.0	196.8	179.9	16.95	11.614	
3,700.0	3,689.6	3,691.8	3,679.5	9.0	8.9	-120.07	172.4	-113.7	206.8	189.3	17.50	11.814	
3,800.0	3,789.1	3,791.2	3,778.1	9.2	9.2	-119.20	184.0	-119.3	216.8	198.7	18.06	12.004	
3,900.0	3,888.5	3,890.7	3,876.7	9.5	9.5	-118.41	195.6	-125.0	226.8	208.2	18.62	12.183	
4,000.0	3,988.0	3,990.1	3,975.3	9.8	9.8	-117.69	207.2	-130.7	236.9	217.8	19.18	12.353	
4,100.0	4,087.5	4,089.6	4,073.9	10.1	10.1	-117.03	218.9	-136.3	247.1	227.3	19.74	12.515	
4,200.0	4,187.0	4,190.9	4,174.4	10.4	10.4	-116.48	230.4	-142.0	257.1	236.8	20.29	12.667	
4,221.4	4,208.3	4,213.1	4,196.5	10.4	10.4	-116.44	232.5	-143.0	259.0	238.6	20.40	12.696	
4,300.0	4,286.6	4,294.6	4,277.7	10.6	10.6	-116.49	239.3	-146.3	265.3	244.5	20.77	12.769	
4,400.0	4,386.4	4,398.7	4,381.6	10.8	10.8	-116.52	244.8	-149.0	270.4	249.2	21.18	12.767	
4,500.0	4,486.4	4,502.9	4,485.8	11.0	11.0	-116.53	247.0	-150.1	272.4	250.8	21.54	12.647	
4,513.6	4,500.0	4,517.2	4,500.0	11.0	11.0	-90.35	247.0	-150.1	272.4	250.8	21.58	12.622	
4,600.0	4,586.4	4,603.5	4,586.4	11.2	11.2	-90.35	247.0	-150.1	272.4	250.5	21.90	12.441	
4,700.0	4,686.4	4,703.5	4,686.4	11.4	11.4	-90.35	247.0	-150.1	272.4	250.1	22.30	12.216	

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

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-223 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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
4,800.0	4,786.4	4,803.5	4,786.4	11.6	11.6	-90.35	247.0	-150.1	272.4	249.7	22.70	11.999	
4,900.0	4,886.4	4,903.5	4,886.4	11.8	11.8	-90.35	247.0	-150.1	272.4	249.3	23.11	11.788	
5,000.0	4,986.4	5,003.5	4,986.4	12.0	12.0	-90.35	247.0	-150.1	272.4	248.9	23.52	11.583	
5,100.0	5,086.4	5,103.5	5,086.4	12.2	12.2	-90.35	247.0	-150.1	272.4	248.5	23.93	11.385	
5,200.0	5,186.4	5,203.5	5,186.4	12.4	12.4	-90.35	247.0	-150.1	272.4	248.1	24.34	11.193	
5,300.0	5,286.4	5,303.5	5,286.4	12.6	12.6	-90.35	247.0	-150.1	272.4	247.7	24.75	11.007	
5,400.0	5,386.4	5,403.5	5,386.4	12.8	12.8	-90.35	247.0	-150.1	272.4	247.2	25.16	10.826	
5,500.0	5,486.4	5,503.5	5,486.4	13.0	13.0	-90.35	247.0	-150.1	272.4	246.8	25.58	10.651	
5,600.0	5,586.4	5,603.5	5,586.4	13.2	13.2	-90.35	247.0	-150.1	272.4	246.4	25.99	10.480	
5,700.0	5,686.4	5,703.5	5,686.4	13.4	13.4	-90.35	247.0	-150.1	272.4	246.0	26.41	10.315	
5,800.0	5,786.4	5,803.5	5,786.4	13.6	13.6	-90.35	247.0	-150.1	272.4	245.6	26.83	10.154	
5,900.0	5,886.4	5,903.5	5,886.4	13.8	13.8	-90.35	247.0	-150.1	272.4	245.2	27.25	9.998	
6,000.0	5,986.4	6,003.5	5,986.4	14.0	14.0	-90.35	247.0	-150.1	272.4	244.7	27.67	9.846	
6,100.0	6,086.4	6,103.5	6,086.4	14.2	14.2	-90.35	247.0	-150.1	272.4	244.3	28.09	9.699	
6,200.0	6,186.4	6,203.5	6,186.4	14.4	14.4	-90.35	247.0	-150.1	272.4	243.9	28.51	9.555	
6,300.0	6,286.4	6,303.5	6,286.4	14.6	14.7	-90.35	247.0	-150.1	272.4	243.5	28.93	9.416	
6,400.0	6,386.4	6,403.5	6,386.4	14.8	14.9	-90.35	247.0	-150.1	272.4	243.1	29.35	9.280	
6,500.0	6,486.4	6,503.5	6,486.4	15.1	15.1	-90.35	247.0	-150.1	272.4	242.6	29.78	9.148	
6,551.4	6,537.8	6,554.9	6,537.8	15.2	15.2	-90.35	247.0	-150.1	272.4	242.4	30.00	9.081	
6,600.0	6,586.4	6,603.4	6,586.2	15.3	15.3	-90.55	246.1	-150.1	272.4	242.2	30.19	9.024	
6,657.5	6,643.9	6,660.3	6,642.9	15.4	15.3	-91.60	241.1	-150.1	272.5	242.1	30.38	8.970	
6,700.0	6,686.3	6,701.9	6,684.0	15.5	15.4	87.31	234.8	-150.1	272.7	242.2	30.49	8.943	
6,750.0	6,736.1	6,750.0	6,731.0	15.5	15.4	86.05	224.7	-150.1	273.1	242.5	30.59	8.927	
6,800.0	6,785.5	6,798.8	6,778.0	15.6	15.4	84.78	211.5	-150.1	273.6	242.9	30.65	8.924	
6,850.0	6,834.3	6,846.7	6,823.2	15.6	15.5	83.56	195.7	-150.1	274.2	243.5	30.69	8.932	
6,900.0	6,882.3	6,894.2	6,867.0	15.6	15.5	82.38	177.2	-150.1	274.9	244.1	30.72	8.949	
6,950.0	6,929.3	6,941.5	6,909.3	15.7	15.5	81.23	156.1	-150.1	275.7	244.9	30.72	8.973	
7,000.0	6,975.0	6,988.4	6,949.9	15.7	15.5	80.13	132.7	-150.1	276.5	245.8	30.72	9.003	
7,050.0	7,019.3	7,035.1	6,988.8	15.7	15.5	79.07	106.9	-150.1	277.5	246.8	30.71	9.035	
7,100.0	7,062.0	7,081.5	7,025.9	15.7	15.5	78.07	79.0	-150.1	278.5	247.8	30.71	9.067	
7,150.0	7,103.0	7,127.6	7,061.0	15.7	15.6	77.13	49.1	-150.1	279.5	248.8	30.72	9.097	
7,200.0	7,141.9	7,173.5	7,094.0	15.7	15.6	76.24	17.2	-150.1	280.5	249.8	30.76	9.121	
7,250.0	7,178.7	7,219.2	7,125.0	15.8	15.6	75.41	-16.4	-150.1	281.5	250.7	30.82	9.135	
7,300.0	7,213.3	7,264.7	7,153.7	15.8	15.7	74.64	-51.6	-150.1	282.5	251.6	30.92	9.138	
7,350.0	7,245.4	7,310.0	7,180.3	15.9	15.8	73.93	-88.4	-150.1	283.5	252.5	31.07	9.125	
7,400.0	7,274.9	7,355.2	7,204.5	16.0	16.0	73.29	-126.5	-150.1	284.5	253.2	31.28	9.094	
7,450.0	7,301.7	7,400.0	7,226.2	16.2	16.2	72.72	-165.6	-150.1	285.3	253.8	31.55	9.043	
7,500.0	7,325.7	7,445.0	7,245.7	16.5	16.4	72.21	-206.2	-150.1	286.1	254.2	31.90	8.969	
7,550.0	7,346.8	7,489.8	7,262.7	16.8	16.7	71.77	-247.6	-150.1	286.8	254.5	32.33	8.873	
7,600.0	7,364.8	7,534.4	7,277.2	17.1	17.0	71.40	-289.8	-150.1	287.4	254.6	32.83	8.754	
7,650.0	7,379.8	7,579.0	7,289.2	17.5	17.4	71.10	-332.8	-150.1	287.9	254.5	33.42	8.615	
7,700.0	7,391.6	7,623.5	7,298.7	17.9	17.8	70.86	-376.3	-150.1	288.3	254.2	34.10	8.456	
7,750.0	7,400.3	7,668.0	7,305.6	18.3	18.2	70.70	-420.2	-150.1	288.6	253.8	34.86	8.281	
7,777.5	7,403.6	7,692.5	7,308.3	18.6	18.4	70.63	-444.5	-150.1	288.7	253.4	35.31	8.178	
7,800.0	7,406.0	7,712.4	7,310.0	18.8	18.6	70.55	-464.4	-150.1	288.9	253.2	35.69	8.095	
7,851.5	7,411.4	7,758.0	7,311.7	19.3	19.1	69.99	-509.9	-150.1	290.1	253.5	36.55	7.936	
7,900.0	7,415.4	7,802.9	7,311.1	19.9	19.6	69.11	-554.8	-150.1	291.7	254.4	37.35	7.811	
7,977.7	7,417.6	7,880.5	7,309.2	20.8	20.5	68.29	-632.3	-150.1	293.2	254.3	38.89	7.538	
8,000.0	7,417.5	7,902.7	7,308.7	21.0	20.8	68.21	-654.6	-150.1	293.4	254.0	39.38	7.449	
8,100.0	7,417.0	8,002.7	7,306.2	22.3	22.0	67.87	-754.6	-150.1	294.1	252.4	41.71	7.050	
8,200.0	7,416.4	8,102.7	7,303.8	23.7	23.4	67.53	-854.5	-150.1	294.8	250.6	44.20	6.670	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-223 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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
8,300.0	7,415.9	8,202.7	7,301.4	25.1	24.9	67.20	-954.5	-150.1	295.5	248.7	46.80	6.314	
8,400.0	7,415.4	8,302.7	7,298.9	26.6	26.4	66.86	-1,054.4	-150.1	296.2	246.7	49.51	5.983	
8,500.0	7,414.8	8,402.6	7,296.5	28.2	27.9	66.53	-1,154.4	-150.1	297.0	244.7	52.30	5.678	
8,600.0	7,414.3	8,502.6	7,294.1	29.8	29.5	66.19	-1,254.3	-150.1	297.7	242.6	55.16	5.398	
8,700.0	7,413.7	8,602.6	7,291.7	31.4	31.2	65.86	-1,354.3	-150.1	298.5	240.4	58.07	5.140	
8,800.0	7,413.2	8,702.6	7,289.2	33.1	32.8	65.53	-1,454.2	-150.1	299.3	238.3	61.03	4.904	
8,900.0	7,412.6	8,802.6	7,286.8	34.8	34.5	65.20	-1,554.2	-150.1	300.1	236.1	64.02	4.687	
9,000.0	7,412.1	8,902.6	7,284.4	36.5	36.3	64.88	-1,654.1	-150.1	300.9	233.8	67.03	4.488	
9,100.0	7,411.6	9,002.5	7,282.0	38.2	38.0	64.56	-1,754.1	-150.1	301.7	231.6	70.07	4.305	
9,200.0	7,411.0	9,102.5	7,279.5	40.0	39.8	64.23	-1,854.0	-150.1	302.5	229.4	73.13	4.136	
9,300.0	7,410.5	9,202.5	7,277.1	41.7	41.5	63.91	-1,954.0	-150.1	303.3	227.1	76.20	3.981	
9,400.0	7,409.9	9,302.5	7,274.7	43.5	43.3	63.59	-2,054.0	-150.1	304.1	224.9	79.27	3.837	
9,500.0	7,409.4	9,402.5	7,272.3	45.3	45.1	63.28	-2,153.9	-150.1	305.0	222.6	82.36	3.703	
9,600.0	7,408.9	9,502.4	7,269.8	47.1	46.9	62.96	-2,253.9	-150.1	305.8	220.4	85.44	3.580	
9,700.0	7,408.3	9,602.4	7,267.4	48.9	48.7	62.65	-2,353.8	-150.1	306.7	218.2	88.53	3.465	
9,800.0	7,407.8	9,702.4	7,265.0	50.7	50.5	62.34	-2,453.8	-150.1	307.6	216.0	91.61	3.357	
9,900.0	7,407.2	9,802.4	7,262.6	52.6	52.4	62.03	-2,553.7	-150.1	308.5	213.8	94.69	3.258	
10,000.0	7,406.7	9,902.4	7,260.1	54.4	54.2	61.72	-2,653.7	-150.1	309.3	211.6	97.77	3.164	
10,100.0	7,406.2	10,002.4	7,257.7	56.2	56.0	61.41	-2,753.6	-150.1	310.2	209.4	100.84	3.077	
10,200.0	7,405.6	10,102.3	7,255.3	58.1	57.9	61.11	-2,853.6	-150.1	311.2	207.2	103.90	2.995	
10,300.0	7,405.1	10,202.3	7,252.9	59.9	59.7	60.80	-2,953.5	-150.1	312.1	205.1	106.96	2.918	
10,400.0	7,404.5	10,302.3	7,250.4	61.8	61.6	60.50	-3,053.5	-150.1	313.0	203.0	110.00	2.845	
10,500.0	7,404.0	10,402.3	7,248.0	63.7	63.5	60.20	-3,153.4	-150.1	313.9	200.9	113.04	2.777	
10,600.0	7,403.4	10,502.3	7,245.6	65.5	65.3	59.91	-3,253.4	-150.1	314.9	198.8	116.07	2.713	
10,700.0	7,402.9	10,602.3	7,243.2	67.4	67.2	59.61	-3,353.3	-150.1	315.8	196.7	119.09	2.652	
10,800.0	7,402.4	10,702.2	7,240.7	69.2	69.1	59.32	-3,453.3	-150.1	316.8	194.7	122.09	2.595	
10,900.0	7,401.8	10,802.2	7,238.3	71.1	70.9	59.02	-3,553.2	-150.1	317.7	192.7	125.08	2.540	
11,000.0	7,401.3	10,902.2	7,235.9	73.0	72.8	58.73	-3,653.2	-150.1	318.7	190.6	128.06	2.489	
11,100.0	7,400.7	11,002.2	7,233.5	74.9	74.7	58.44	-3,753.2	-150.1	319.7	188.7	131.03	2.440	
11,200.0	7,400.2	11,102.2	7,231.0	76.8	76.6	58.16	-3,853.1	-150.1	320.7	186.7	133.99	2.393	
11,300.0	7,399.7	11,202.1	7,228.6	78.6	78.4	57.87	-3,953.1	-150.1	321.7	184.8	136.93	2.349	
11,400.0	7,399.1	11,302.1	7,226.2	80.5	80.3	57.59	-4,053.0	-150.1	322.7	182.8	139.86	2.307	
11,500.0	7,398.6	11,402.1	7,223.8	82.4	82.2	57.31	-4,153.0	-150.1	323.7	180.9	142.78	2.267	
11,600.0	7,398.0	11,502.1	7,221.3	84.3	84.1	57.03	-4,252.9	-150.1	324.7	179.1	145.68	2.229	
11,700.0	7,397.5	11,602.1	7,218.9	86.2	86.0	56.75	-4,352.9	-150.1	325.8	177.2	148.56	2.193	
11,800.0	7,397.0	11,702.1	7,216.5	88.1	87.9	56.47	-4,452.8	-150.1	326.8	175.4	151.44	2.158	
11,900.0	7,396.4	11,802.0	7,214.1	90.0	89.8	56.20	-4,552.8	-150.1	327.8	173.5	154.30	2.125	
11,976.9	7,396.0	11,879.0	7,212.2	91.4	91.2	55.99	-4,629.7	-150.1	328.6	172.2	156.49	2.100	SF

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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	-93.58	-3.7	-58.4	58.5				
100.0	100.0	100.0	100.0	0.1	0.1	-93.58	-3.7	-58.4	58.5	58.3	0.22	260.172	
200.0	200.0	200.0	200.0	0.3	0.3	-93.58	-3.7	-58.4	58.5	57.8	0.67	86.724	
300.0	300.0	300.0	300.0	0.6	0.6	-93.58	-3.7	-58.4	58.5	57.4	1.12	52.034	
400.0	400.0	400.0	400.0	0.8	0.8	-93.58	-3.7	-58.4	58.5	56.9	1.57	37.167	
500.0	500.0	500.0	500.0	1.0	1.0	-93.58	-3.7	-58.4	58.5	56.5	2.02	28.908	
600.0	600.0	600.0	600.0	1.2	1.2	-93.58	-3.7	-58.4	58.5	56.0	2.47	23.652	
700.0	700.0	700.0	700.0	1.5	1.5	-93.58	-3.7	-58.4	58.5	55.6	2.92	20.013	
800.0	800.0	800.0	800.0	1.7	1.7	-93.58	-3.7	-58.4	58.5	55.1	3.37	17.345	
900.0	900.0	900.0	900.0	1.9	1.9	-93.58	-3.7	-58.4	58.5	54.7	3.82	15.304	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-93.58	-3.7	-58.4	58.5	54.2	4.27	13.693	CC, ES
1,100.0	1,100.0	1,098.3	1,098.3	2.4	2.4	-92.66	-2.8	-59.8	59.9	55.2	4.71	12.716	
1,200.0	1,200.0	1,196.4	1,196.3	2.6	2.6	-90.13	-0.1	-64.1	64.2	59.1	5.15	12.477	
1,300.0	1,300.0	1,294.0	1,293.5	2.8	2.8	-86.62	4.2	-71.2	71.6	66.1	5.59	12.819	
1,400.0	1,400.0	1,391.4	1,390.1	3.0	3.0	-82.79	10.3	-81.1	82.3	76.3	6.04	13.630	
1,500.0	1,500.0	1,490.5	1,488.4	3.3	3.3	-79.53	17.0	-92.2	94.5	88.0	6.50	14.528	
1,600.0	1,600.0	1,589.6	1,586.7	3.5	3.6	-103.87	23.8	-103.3	107.2	100.3	6.92	15.489	
1,700.0	1,699.8	1,688.7	1,684.9	3.7	3.8	-103.97	30.6	-114.3	120.8	113.5	7.37	16.398	
1,792.2	1,791.7	1,779.9	1,775.3	3.9	4.1	-105.27	36.8	-124.5	134.2	126.4	7.79	17.231	
1,800.0	1,799.5	1,787.6	1,782.9	3.9	4.1	-105.44	37.4	-125.4	135.4	127.5	7.82	17.301	
1,900.0	1,898.9	1,886.3	1,880.8	4.2	4.4	-107.38	44.1	-136.4	150.4	142.1	8.29	18.141	
2,000.0	1,998.4	1,985.0	1,978.7	4.4	4.7	-108.97	50.9	-147.5	165.6	156.8	8.77	18.886	
2,100.0	2,097.9	2,083.8	2,076.6	4.7	5.0	-110.29	57.6	-158.5	180.9	171.7	9.26	19.547	
2,200.0	2,197.4	2,182.5	2,174.5	4.9	5.3	-111.40	64.4	-169.6	196.3	186.5	9.75	20.136	
2,300.0	2,296.9	2,281.3	2,272.4	5.2	5.6	-112.35	71.1	-180.6	211.7	201.5	10.25	20.663	
2,400.0	2,396.3	2,380.0	2,370.3	5.4	6.0	-113.18	77.9	-191.6	227.2	216.5	10.75	21.135	
2,500.0	2,495.8	2,478.8	2,468.2	5.7	6.3	-113.89	84.6	-202.7	242.7	231.5	11.26	21.561	
2,600.0	2,595.3	2,577.5	2,566.1	5.9	6.6	-114.52	91.4	-213.7	258.3	246.5	11.77	21.946	
2,700.0	2,694.8	2,676.3	2,664.0	6.2	6.9	-115.08	98.2	-224.8	273.9	261.6	12.29	22.294	
2,800.0	2,794.3	2,775.0	2,761.8	6.5	7.2	-115.58	104.9	-235.8	289.5	276.7	12.80	22.612	
2,900.0	2,893.7	2,873.7	2,859.7	6.7	7.5	-116.03	111.7	-246.9	305.1	291.8	13.32	22.902	
3,000.0	2,993.2	2,972.5	2,957.6	7.0	7.8	-116.44	118.4	-257.9	320.8	306.9	13.85	23.168	
3,100.0	3,092.7	3,071.2	3,055.5	7.3	8.2	-116.80	125.2	-268.9	336.4	322.1	14.37	23.412	
3,200.0	3,192.2	3,170.0	3,153.4	7.6	8.5	-117.14	131.9	-280.0	352.1	337.2	14.90	23.637	
3,300.0	3,291.7	3,268.7	3,251.3	7.8	8.8	-117.44	138.7	-291.0	367.8	352.4	15.42	23.845	
3,400.0	3,391.1	3,367.5	3,349.2	8.1	9.1	-117.72	145.4	-302.1	383.5	367.5	15.95	24.037	
3,500.0	3,490.6	3,466.2	3,447.1	8.4	9.5	-117.98	152.2	-313.1	399.2	382.7	16.48	24.216	
3,600.0	3,590.1	3,565.0	3,545.0	8.7	9.8	-118.22	159.0	-324.1	414.9	397.9	17.02	24.383	
3,700.0	3,689.6	3,663.7	3,642.9	9.0	10.1	-118.44	165.7	-335.2	430.6	413.1	17.55	24.538	
3,800.0	3,789.1	3,762.4	3,740.8	9.2	10.4	-118.65	172.5	-346.2	446.3	428.2	18.08	24.684	
3,900.0	3,888.5	3,861.2	3,838.7	9.5	10.7	-118.84	179.2	-357.3	462.0	443.4	18.62	24.820	
4,000.0	3,988.0	3,959.9	3,936.6	9.8	11.1	-119.02	186.0	-368.3	477.8	458.6	19.15	24.947	
4,100.0	4,087.5	4,058.7	4,034.4	10.1	11.4	-119.19	192.7	-379.4	493.5	473.8	19.69	25.067	
4,200.0	4,187.0	4,157.4	4,132.3	10.4	11.7	-119.35	199.5	-390.4	509.2	489.0	20.22	25.180	
4,221.4	4,208.3	4,178.6	4,153.3	10.4	11.8	-119.38	200.9	-392.8	512.6	492.3	20.34	25.204	
4,300.0	4,286.6	4,256.2	4,230.3	10.6	12.0	-119.60	206.2	-401.4	524.5	503.7	20.75	25.272	
4,400.0	4,386.4	4,355.3	4,328.5	10.8	12.4	-119.56	213.0	-412.5	538.0	516.8	21.23	25.348	
4,500.0	4,486.4	4,454.4	4,426.8	11.0	12.7	-119.19	219.8	-423.6	549.9	528.2	21.67	25.381	
4,513.6	4,500.0	4,467.9	4,440.2	11.0	12.7	-92.92	220.7	-425.1	551.4	529.7	21.72	25.383	
4,600.0	4,586.4	4,553.6	4,525.1	11.2	13.0	-92.27	226.6	-434.7	560.8	538.7	22.09	25.386	
4,700.0	4,686.4	4,652.7	4,623.3	11.4	13.4	-91.54	233.4	-445.8	571.8	549.2	22.54	25.371	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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
4,800.0	4,786.4	4,772.2	4,742.1	11.6	13.7	-90.83	240.3	-457.1	581.1	558.1	22.98	25.292	
4,900.0	4,886.4	4,892.8	4,862.4	11.8	13.9	-90.40	244.6	-464.2	587.0	563.6	23.40	25.088	
5,000.0	4,986.4	5,013.9	4,983.5	12.0	14.1	-90.23	246.3	-467.0	589.3	565.5	23.81	24.754	
5,100.0	5,086.4	5,116.8	5,086.4	12.2	14.2	-90.23	246.3	-467.0	589.3	565.1	24.19	24.357	
5,200.0	5,186.4	5,216.8	5,186.4	12.4	14.4	-90.23	246.3	-467.0	589.3	564.7	24.59	23.962	
5,300.0	5,286.4	5,316.8	5,286.4	12.6	14.6	-90.23	246.3	-467.0	589.3	564.3	24.99	23.577	
5,400.0	5,386.4	5,416.8	5,386.4	12.8	14.8	-90.23	246.3	-467.0	589.3	563.9	25.40	23.203	
5,500.0	5,486.4	5,516.8	5,486.4	13.0	14.9	-90.23	246.3	-467.0	589.3	563.5	25.80	22.840	
5,600.0	5,586.4	5,616.8	5,586.4	13.2	15.1	-90.23	246.3	-467.0	589.3	563.1	26.21	22.486	
5,700.0	5,686.4	5,716.8	5,686.4	13.4	15.3	-90.23	246.3	-467.0	589.3	562.7	26.61	22.143	
5,800.0	5,786.4	5,816.8	5,786.4	13.6	15.5	-90.23	246.3	-467.0	589.3	562.3	27.02	21.808	
5,900.0	5,886.4	5,916.8	5,886.4	13.8	15.7	-90.23	246.3	-467.0	589.3	561.9	27.43	21.482	
6,000.0	5,986.4	6,016.8	5,986.4	14.0	15.8	-90.23	246.3	-467.0	589.3	561.5	27.84	21.165	
6,100.0	6,086.4	6,116.8	6,086.4	14.2	16.0	-90.23	246.3	-467.0	589.3	561.0	28.26	20.857	
6,200.0	6,186.4	6,216.8	6,186.4	14.4	16.2	-90.23	246.3	-467.0	589.3	560.6	28.67	20.556	
6,300.0	6,286.4	6,316.8	6,286.4	14.6	16.4	-90.23	246.3	-467.0	589.3	560.2	29.08	20.263	
6,400.0	6,386.4	6,416.8	6,386.4	14.8	16.6	-90.23	246.3	-467.0	589.3	559.8	29.50	19.978	
6,500.0	6,486.4	6,516.8	6,486.4	15.1	16.8	-90.23	246.3	-467.0	589.3	559.4	29.91	19.700	
6,600.0	6,586.4	6,616.8	6,586.4	15.3	16.9	-90.23	246.3	-467.0	589.3	559.0	30.33	19.429	
6,638.1	6,624.5	6,654.9	6,624.5	15.3	17.0	-90.23	246.3	-467.0	589.3	558.8	30.49	19.327	
6,657.5	6,643.9	6,674.3	6,643.9	15.4	17.1	-90.23	246.3	-467.0	589.3	558.7	30.57	19.276	
6,700.0	6,686.3	6,716.7	6,686.2	15.5	17.1	89.77	245.1	-467.0	589.3	558.6	30.72	19.186	
6,750.0	6,736.1	6,766.5	6,735.8	15.5	17.2	89.77	240.7	-467.0	589.3	558.5	30.84	19.108	
6,800.0	6,785.5	6,816.4	6,785.1	15.6	17.2	89.76	233.1	-467.0	589.3	558.4	30.94	19.049	
6,850.0	6,834.3	6,866.2	6,833.7	15.6	17.3	89.76	222.2	-467.0	589.3	558.3	31.01	19.007	
6,900.0	6,882.3	6,916.0	6,881.6	15.6	17.3	89.76	208.2	-467.0	589.3	558.3	31.05	18.977	
6,950.0	6,929.3	6,965.9	6,928.4	15.7	17.3	89.77	191.1	-467.0	589.3	558.2	31.09	18.957	
7,000.0	6,975.0	7,015.7	6,974.0	15.7	17.3	89.77	171.0	-467.0	589.3	558.2	31.11	18.943	
7,050.0	7,019.3	7,065.6	7,018.2	15.7	17.3	89.77	148.0	-467.0	589.3	558.2	31.13	18.928	
7,100.0	7,062.0	7,115.4	7,060.8	15.7	17.3	89.77	122.1	-467.0	589.3	558.1	31.17	18.908	
7,150.0	7,103.0	7,165.3	7,101.6	15.7	17.3	89.78	93.6	-467.0	589.3	558.1	31.22	18.875	
7,200.0	7,141.9	7,215.1	7,140.5	15.7	17.3	89.79	62.4	-467.0	589.3	558.0	31.30	18.826	
7,250.0	7,178.7	7,265.0	7,177.2	15.8	17.4	89.79	28.7	-467.0	589.3	557.9	31.43	18.752	
7,300.0	7,213.3	7,314.8	7,211.7	15.8	17.4	89.80	-7.3	-467.0	589.3	557.7	31.60	18.650	
7,350.0	7,245.4	7,364.7	7,243.8	15.9	17.4	89.81	-45.5	-467.0	589.3	557.5	31.83	18.514	
7,400.0	7,274.9	7,414.6	7,273.3	16.0	17.4	89.82	-85.7	-467.0	589.3	557.2	32.13	18.340	
7,450.0	7,301.7	7,464.5	7,300.2	16.2	17.5	89.83	-127.7	-467.0	589.3	556.8	32.51	18.128	
7,500.0	7,325.7	7,514.4	7,324.2	16.5	17.6	89.84	-171.4	-467.0	589.3	556.3	32.97	17.876	
7,550.0	7,346.8	7,564.3	7,345.4	16.8	17.8	89.85	-216.6	-467.0	589.3	555.8	33.51	17.586	
7,600.0	7,364.8	7,614.2	7,363.5	17.1	18.0	89.86	-263.1	-467.0	589.3	555.2	34.14	17.261	
7,650.0	7,379.8	7,664.1	7,378.6	17.5	18.3	89.88	-310.6	-467.0	589.3	554.4	34.86	16.907	
7,700.0	7,391.6	7,714.0	7,390.5	17.9	18.7	89.89	-359.1	-467.0	589.3	553.6	35.66	16.527	
7,750.0	7,400.3	7,763.9	7,399.3	18.3	19.1	89.90	-408.2	-467.0	589.3	552.8	36.53	16.130	
7,777.5	7,403.6	7,791.4	7,402.7	18.6	19.3	89.91	-435.5	-467.0	589.3	552.3	37.05	15.906	
7,800.0	7,406.0	7,813.9	7,405.1	18.8	19.5	89.91	-457.9	-467.0	589.3	551.8	37.49	15.719	
7,851.5	7,411.4	7,865.4	7,410.5	19.3	20.0	89.91	-509.1	-467.0	589.3	550.8	38.54	15.289	
7,900.0	7,415.4	7,913.9	7,414.6	19.9	20.5	89.92	-557.4	-467.0	589.3	549.7	39.61	14.879	
7,977.7	7,417.6	7,991.5	7,417.0	20.8	21.4	89.94	-635.0	-467.0	589.3	547.9	41.41	14.232	
8,000.0	7,417.5	8,013.8	7,416.9	21.0	21.7	89.94	-657.3	-467.0	589.3	547.3	41.95	14.046	
8,100.0	7,417.0	8,113.8	7,416.4	22.3	22.9	89.94	-757.3	-467.0	589.3	544.8	44.51	13.241	
8,200.0	7,416.4	8,213.8	7,415.8	23.7	24.2	89.94	-857.3	-467.0	589.3	542.1	47.23	12.477	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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
8,300.0	7,415.9	8,313.8	7,415.3	25.1	25.7	89.94	-957.3	-467.0	589.3	539.2	50.11	11.761	
8,400.0	7,415.4	8,413.8	7,414.8	26.6	27.1	89.94	-1,057.2	-467.0	589.3	536.2	53.11	11.097	
8,500.0	7,414.8	8,513.8	7,414.3	28.2	28.6	89.95	-1,157.2	-467.0	589.3	533.1	56.21	10.484	
8,600.0	7,414.3	8,613.8	7,413.7	29.8	30.2	89.95	-1,257.2	-467.0	589.3	529.9	59.40	9.921	
8,700.0	7,413.7	8,713.8	7,413.2	31.4	31.8	89.95	-1,357.2	-467.0	589.3	526.6	62.66	9.405	
8,800.0	7,413.2	8,813.8	7,412.7	33.1	33.5	89.95	-1,457.2	-467.0	589.3	523.3	65.99	8.931	
8,900.0	7,412.6	8,913.8	7,412.2	34.8	35.1	89.95	-1,557.2	-467.0	589.3	519.9	69.37	8.496	
9,000.0	7,412.1	9,013.8	7,411.6	36.5	36.8	89.96	-1,657.2	-467.0	589.3	516.5	72.79	8.096	
9,100.0	7,411.6	9,113.8	7,411.1	38.2	38.5	89.96	-1,757.2	-467.0	589.3	513.0	76.26	7.728	
9,200.0	7,411.0	9,213.8	7,410.6	40.0	40.3	89.96	-1,857.2	-467.0	589.3	509.5	79.76	7.388	
9,300.0	7,410.5	9,313.8	7,410.1	41.7	42.0	89.96	-1,957.2	-467.0	589.3	506.0	83.29	7.075	
9,400.0	7,409.9	9,413.8	7,409.6	43.5	43.8	89.96	-2,057.2	-467.0	589.3	502.4	86.85	6.785	
9,500.0	7,409.4	9,513.8	7,409.0	45.3	45.6	89.96	-2,157.2	-467.0	589.3	498.9	90.44	6.516	
9,600.0	7,408.9	9,613.8	7,408.5	47.1	47.3	89.97	-2,257.2	-467.0	589.3	495.3	94.04	6.266	
9,700.0	7,408.3	9,713.8	7,408.0	48.9	49.1	89.97	-2,357.2	-467.0	589.3	491.6	97.66	6.034	
9,800.0	7,407.8	9,813.8	7,407.5	50.7	50.9	89.97	-2,457.2	-467.0	589.3	488.0	101.30	5.817	
9,900.0	7,407.2	9,913.8	7,406.9	52.6	52.8	89.97	-2,557.2	-467.0	589.3	484.3	104.96	5.615	
10,000.0	7,406.7	10,013.8	7,406.4	54.4	54.6	89.97	-2,657.2	-467.0	589.3	480.7	108.62	5.425	
10,100.0	7,406.2	10,113.8	7,405.9	56.2	56.4	89.97	-2,757.2	-467.0	589.3	477.0	112.30	5.247	
10,200.0	7,405.6	10,213.8	7,405.4	58.1	58.2	89.98	-2,857.2	-467.0	589.3	473.3	115.99	5.080	
10,300.0	7,405.1	10,313.8	7,404.8	59.9	60.1	89.98	-2,957.2	-467.0	589.3	469.6	119.69	4.923	
10,400.0	7,404.5	10,413.8	7,404.3	61.8	61.9	89.98	-3,057.2	-467.0	589.3	465.9	123.40	4.775	
10,500.0	7,404.0	10,513.8	7,403.8	63.7	63.8	89.98	-3,157.2	-467.0	589.3	462.2	127.12	4.636	
10,600.0	7,403.4	10,613.8	7,403.3	65.5	65.6	89.98	-3,257.2	-467.0	589.3	458.5	130.84	4.504	
10,700.0	7,402.9	10,713.8	7,402.7	67.4	67.5	89.98	-3,357.2	-467.0	589.3	454.7	134.58	4.379	
10,800.0	7,402.4	10,813.8	7,402.2	69.2	69.4	89.99	-3,457.2	-467.0	589.3	451.0	138.31	4.261	
10,900.0	7,401.8	10,913.8	7,401.7	71.1	71.2	89.99	-3,557.2	-467.0	589.3	447.2	142.06	4.148	
11,000.0	7,401.3	11,013.8	7,401.2	73.0	73.1	89.99	-3,657.2	-467.0	589.3	443.5	145.81	4.042	
11,100.0	7,400.7	11,113.8	7,400.6	74.9	75.0	89.99	-3,757.2	-467.0	589.3	439.7	149.56	3.940	
11,200.0	7,400.2	11,213.8	7,400.1	76.8	76.8	89.99	-3,857.2	-467.0	589.3	436.0	153.32	3.843	
11,300.0	7,399.7	11,313.8	7,399.6	78.6	78.7	89.99	-3,957.2	-467.0	589.3	432.2	157.09	3.751	
11,400.0	7,399.1	11,413.8	7,399.1	80.5	80.6	90.00	-4,057.2	-467.0	589.3	428.4	160.85	3.664	
11,500.0	7,398.6	11,513.8	7,398.6	82.4	82.5	90.00	-4,157.2	-467.0	589.3	424.7	164.62	3.580	
11,600.0	7,398.0	11,613.8	7,398.0	84.3	84.3	90.00	-4,257.2	-467.0	589.3	420.9	168.40	3.499	
11,700.0	7,397.5	11,713.8	7,397.5	86.2	86.2	90.00	-4,357.2	-467.0	589.3	417.1	172.18	3.423	
11,800.0	7,397.0	11,813.8	7,397.0	88.1	88.1	90.00	-4,457.2	-467.0	589.3	413.3	175.96	3.349	
11,900.0	7,396.4	11,913.8	7,396.5	90.0	90.0	90.00	-4,557.2	-467.0	589.3	409.6	179.74	3.279	
11,976.9	7,396.0	11,990.8	7,396.1	91.4	91.5	90.01	-4,634.1	-467.0	589.3	406.6	182.66	3.226 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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	90.00	0.0	30.6	30.6				
100.0	100.0	100.0	100.0	0.1	0.1	90.00	0.0	30.6	30.6	30.3	0.22	136.014	
200.0	200.0	200.0	200.0	0.3	0.3	90.00	0.0	30.6	30.6	29.9	0.67	45.338	
300.0	300.0	300.0	300.0	0.6	0.6	90.00	0.0	30.6	30.6	29.4	1.12	27.203	
400.0	400.0	400.0	400.0	0.8	0.8	90.00	0.0	30.6	30.6	29.0	1.57	19.431	
500.0	500.0	500.0	500.0	1.0	1.0	90.00	0.0	30.6	30.6	28.5	2.02	15.113	
600.0	600.0	600.0	600.0	1.2	1.2	90.00	0.0	30.6	30.6	28.1	2.47	12.365	
700.0	700.0	700.0	700.0	1.5	1.5	90.00	0.0	30.6	30.6	27.6	2.92	10.463	
800.0	800.0	800.0	800.0	1.7	1.7	90.00	0.0	30.6	30.6	27.2	3.37	9.068	
900.0	900.0	900.0	900.0	1.9	1.9	90.00	0.0	30.6	30.6	26.8	3.82	8.001	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	90.00	0.0	30.6	30.6	26.3	4.27	7.159	CC, ES
1,100.0	1,100.0	1,099.0	1,099.0	2.4	2.4	88.47	0.9	32.1	32.1	27.4	4.71	6.809	
1,200.0	1,200.0	1,197.9	1,197.7	2.6	2.6	84.66	3.4	36.5	36.7	31.6	5.15	7.130	
1,300.0	1,300.0	1,296.2	1,295.7	2.8	2.8	80.11	7.6	43.8	44.7	39.1	5.59	7.993	
1,400.0	1,400.0	1,394.8	1,393.6	3.0	3.0	76.05	13.3	53.7	55.7	49.7	6.04	9.223	
1,500.0	1,500.0	1,494.1	1,492.2	3.3	3.3	73.24	19.3	64.0	67.3	60.8	6.49	10.372	
1,600.0	1,600.0	1,593.5	1,590.9	3.5	3.5	45.84	25.2	74.3	77.8	70.8	6.92	11.242	
1,700.0	1,699.8	1,693.2	1,689.8	3.7	3.8	46.56	31.2	84.6	85.8	78.5	7.36	11.666	
1,792.2	1,791.7	1,785.2	1,781.2	3.9	4.1	48.56	36.6	94.1	91.2	83.5	7.77	11.743	
1,800.0	1,799.5	1,792.9	1,788.9	3.9	4.1	48.78	37.1	94.9	91.6	83.8	7.80	11.738	
1,900.0	1,898.9	1,892.7	1,887.9	4.2	4.4	51.48	43.1	105.3	96.6	88.3	8.27	11.680	
2,000.0	1,998.4	1,992.5	1,987.0	4.4	4.7	53.92	49.0	115.6	101.7	93.0	8.74	11.636	
2,100.0	2,097.9	2,092.3	2,086.1	4.7	5.0	56.12	55.0	125.9	107.1	97.8	9.23	11.602	
2,200.0	2,197.4	2,192.0	2,185.1	4.9	5.3	58.10	60.9	136.3	112.5	102.8	9.72	11.575	
2,300.0	2,296.9	2,291.8	2,284.2	5.2	5.6	59.91	66.9	146.6	118.1	107.9	10.22	11.553	
2,400.0	2,396.3	2,391.6	2,383.3	5.4	5.9	61.54	72.9	156.9	123.8	113.1	10.73	11.535	
2,500.0	2,495.8	2,491.4	2,482.3	5.7	6.2	63.03	78.8	167.3	129.6	118.4	11.25	11.520	
2,600.0	2,595.3	2,591.2	2,581.4	5.9	6.5	64.40	84.8	177.6	135.5	123.7	11.77	11.507	
2,700.0	2,694.8	2,690.9	2,680.4	6.2	6.8	65.65	90.7	188.0	141.4	129.1	12.30	11.495	
2,800.0	2,794.3	2,790.7	2,779.5	6.5	7.1	66.80	96.7	198.3	147.4	134.6	12.84	11.485	
2,900.0	2,893.7	2,890.5	2,878.6	6.7	7.4	67.85	102.7	208.6	153.5	140.1	13.37	11.476	
3,000.0	2,993.2	2,990.3	2,977.6	7.0	7.7	68.83	108.6	219.0	159.6	145.7	13.92	11.467	
3,100.0	3,092.7	3,090.0	3,076.7	7.3	8.0	69.74	114.6	229.3	165.7	151.3	14.46	11.460	
3,200.0	3,192.2	3,189.8	3,175.8	7.6	8.3	70.58	120.5	239.6	171.9	156.9	15.01	11.453	
3,300.0	3,291.7	3,289.6	3,274.8	7.8	8.6	71.36	126.5	250.0	178.1	162.6	15.56	11.447	
3,400.0	3,391.1	3,389.4	3,373.9	8.1	8.9	72.09	132.5	260.3	184.4	168.3	16.12	11.441	
3,500.0	3,490.6	3,489.2	3,472.9	8.4	9.2	72.77	138.4	270.6	190.7	174.0	16.67	11.436	
3,600.0	3,590.1	3,588.9	3,572.0	8.7	9.5	73.41	144.4	281.0	197.0	179.8	17.23	11.431	
3,700.0	3,689.6	3,688.7	3,671.1	9.0	9.8	74.01	150.3	291.3	203.3	185.5	17.79	11.427	
3,800.0	3,789.1	3,788.5	3,770.1	9.2	10.1	74.57	156.3	301.6	209.7	191.3	18.35	11.423	
3,900.0	3,888.5	3,888.3	3,869.2	9.5	10.5	75.10	162.2	312.0	216.0	197.1	18.92	11.420	
4,000.0	3,988.0	3,988.0	3,968.3	9.8	10.8	75.60	168.2	322.3	222.4	202.9	19.48	11.416	
4,100.0	4,087.5	4,087.8	4,067.3	10.1	11.1	76.07	174.2	332.6	228.8	208.8	20.05	11.413	
4,200.0	4,187.0	4,187.6	4,166.4	10.4	11.4	76.51	180.1	343.0	235.2	214.6	20.62	11.410	
4,221.4	4,208.3	4,209.0	4,187.6	10.4	11.5	76.60	181.4	345.2	236.6	215.9	20.74	11.410	
4,300.0	4,286.6	4,287.4	4,265.4	10.6	11.7	76.79	186.1	353.3	241.9	220.8	21.15	11.439	
4,400.0	4,386.4	4,387.1	4,364.4	10.8	12.0	76.33	192.0	363.6	249.4	227.8	21.59	11.551	
4,500.0	4,486.4	4,486.5	4,463.2	11.0	12.3	75.18	198.0	373.9	257.7	235.8	21.97	11.729	
4,513.6	4,500.0	4,500.1	4,476.6	11.0	12.4	101.16	198.8	375.3	259.0	236.9	22.02	11.759	
4,600.0	4,586.4	4,585.8	4,561.7	11.2	12.6	99.70	203.9	384.2	266.8	244.5	22.34	11.945	
4,700.0	4,686.4	4,685.1	4,660.3	11.4	12.9	98.12	209.8	394.5	276.2	253.5	22.73	12.152	

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

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

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
4,800.0	4,786.4	4,784.4	4,758.9	11.6	13.2	96.65	215.8	404.8	285.7	262.6	23.12	12.359	
4,900.0	4,886.4	4,883.7	4,857.4	11.8	13.6	95.27	221.7	415.1	295.4	271.9	23.51	12.565	
5,000.0	4,986.4	4,982.9	4,956.0	12.0	13.9	93.98	227.6	425.4	305.3	281.4	23.91	12.770	
5,100.0	5,086.4	5,082.2	5,054.6	12.2	14.2	92.77	233.5	435.6	315.3	291.0	24.31	12.972	
5,200.0	5,186.4	5,181.5	5,153.2	12.4	14.5	91.63	239.5	445.9	325.4	300.7	24.71	13.172	
5,300.0	5,286.4	5,291.4	5,262.5	12.6	14.8	90.62	245.1	455.6	334.2	309.1	25.09	13.322	
5,400.0	5,386.4	5,402.5	5,373.3	12.8	15.0	90.01	248.6	461.7	339.7	314.2	25.47	13.337	
5,500.0	5,486.4	5,514.0	5,484.8	13.0	15.2	89.78	250.0	464.1	341.8	316.0	25.86	13.220	
5,600.0	5,586.4	5,615.6	5,586.4	13.2	15.3	89.78	250.0	464.2	341.9	315.6	26.25	13.024	
5,700.0	5,686.4	5,715.6	5,686.4	13.4	15.5	89.78	250.0	464.2	341.9	315.2	26.65	12.826	
5,800.0	5,786.4	5,815.6	5,786.4	13.6	15.7	89.78	250.0	464.2	341.9	314.8	27.06	12.634	
5,900.0	5,886.4	5,915.6	5,886.4	13.8	15.8	89.78	250.0	464.2	341.9	314.4	27.47	12.447	
6,000.0	5,986.4	6,015.6	5,986.4	14.0	16.0	89.78	250.0	464.2	341.9	314.0	27.87	12.264	
6,100.0	6,086.4	6,115.6	6,086.4	14.2	16.2	89.78	250.0	464.2	341.9	313.6	28.28	12.087	
6,200.0	6,186.4	6,215.6	6,186.4	14.4	16.4	89.78	250.0	464.2	341.9	313.2	28.69	11.914	
6,300.0	6,286.4	6,315.6	6,286.4	14.6	16.6	89.78	250.0	464.2	341.9	312.8	29.11	11.745	
6,400.0	6,386.4	6,415.6	6,386.4	14.8	16.7	89.78	250.0	464.2	341.9	312.3	29.52	11.581	
6,468.2	6,454.6	6,483.8	6,454.6	15.0	16.8	89.93	249.1	464.2	341.9	312.1	29.79	11.475	
6,500.0	6,486.4	6,515.5	6,486.2	15.1	16.9	90.30	246.9	464.2	341.9	311.9	29.92	11.426	
6,600.0	6,586.4	6,613.2	6,582.6	15.3	17.0	92.81	231.9	464.2	342.3	312.0	30.34	11.283	
6,657.5	6,643.9	6,667.1	6,634.9	15.4	17.0	95.06	218.4	464.2	343.3	312.7	30.59	11.225	
6,700.0	6,686.3	6,706.0	6,671.8	15.5	17.0	-83.02	206.4	464.2	344.6	313.9	30.76	11.205	
6,750.0	6,736.1	6,750.0	6,712.9	15.5	17.0	-80.87	190.6	464.2	346.7	315.7	30.91	11.214	
6,800.0	6,785.5	6,795.4	6,754.2	15.6	17.0	-78.69	171.7	464.2	349.2	318.1	31.04	11.250	
6,850.0	6,834.3	6,839.2	6,793.0	15.6	17.0	-76.63	151.3	464.2	352.1	320.9	31.12	11.314	
6,900.0	6,882.3	6,882.5	6,830.0	15.6	17.1	-74.66	129.0	464.2	355.3	324.2	31.16	11.404	
6,950.0	6,929.3	6,925.2	6,865.3	15.7	17.1	-72.78	105.0	464.2	358.9	327.7	31.16	11.518	
7,000.0	6,975.0	6,967.4	6,898.8	15.7	17.1	-71.00	79.3	464.2	362.6	331.5	31.12	11.653	
7,050.0	7,019.3	7,009.2	6,930.5	15.7	17.1	-69.33	52.1	464.2	366.6	335.5	31.05	11.807	
7,100.0	7,062.0	7,050.0	6,960.0	15.7	17.1	-67.77	23.9	464.2	370.6	339.6	30.95	11.975	
7,150.0	7,103.0	7,091.5	6,988.4	15.7	17.1	-66.28	-6.4	464.2	374.6	343.8	30.82	12.154	
7,200.0	7,141.9	7,132.2	7,014.6	15.7	17.1	-64.92	-37.5	464.2	378.7	348.0	30.72	12.328	
7,250.0	7,178.7	7,172.5	7,038.9	15.8	17.2	-63.66	-69.7	464.2	382.6	352.0	30.59	12.510	
7,300.0	7,213.3	7,212.6	7,061.4	15.8	17.2	-62.51	-102.9	464.2	386.5	356.0	30.48	12.679	
7,350.0	7,245.4	7,250.0	7,080.7	15.9	17.3	-61.51	-134.9	464.2	390.1	359.7	30.40	12.832	
7,400.0	7,274.9	7,292.0	7,100.5	16.0	17.4	-60.53	-171.9	464.2	393.6	363.2	30.39	12.952	
7,450.0	7,301.7	7,331.4	7,117.2	16.2	17.6	-59.69	-207.5	464.2	396.8	366.3	30.43	13.037	
7,500.0	7,325.7	7,370.6	7,132.0	16.5	17.8	-58.95	-243.8	464.2	399.7	369.1	30.56	13.080	
7,550.0	7,346.8	7,409.6	7,144.9	16.8	18.0	-58.31	-280.7	464.2	402.3	371.5	30.77	13.074	
7,600.0	7,364.8	7,450.0	7,156.2	17.1	18.2	-57.75	-319.5	464.2	404.5	373.4	31.09	13.012	
7,650.0	7,379.8	7,487.3	7,164.8	17.5	18.5	-57.32	-355.8	464.2	406.4	374.9	31.51	12.896	
7,700.0	7,391.6	7,526.0	7,171.9	17.9	18.8	-56.97	-393.8	464.2	407.9	375.9	32.06	12.725	
7,750.0	7,400.3	7,564.7	7,177.0	18.3	19.2	-56.71	-432.1	464.2	409.0	376.3	32.72	12.503	
7,777.5	7,403.6	7,585.9	7,179.0	18.6	19.4	-56.61	-453.3	464.2	409.5	376.4	33.13	12.361	
7,800.0	7,406.0	7,600.0	7,179.9	18.8	19.5	-56.55	-467.3	464.2	410.0	376.5	33.42	12.267	
7,851.5	7,411.4	7,642.8	7,181.4	19.3	19.9	-56.20	-510.1	464.2	412.0	377.9	34.17	12.060	
7,900.0	7,415.4	7,684.5	7,180.7	19.9	20.4	-55.62	-551.9	464.2	414.7	379.8	34.93	11.875	
7,977.7	7,417.6	7,762.1	7,178.9	20.8	21.2	-55.07	-629.4	464.2	417.0	380.5	36.48	11.433	
8,000.0	7,417.5	7,784.4	7,178.4	21.0	21.5	-55.02	-651.7	464.2	417.2	380.3	36.92	11.301	
8,100.0	7,417.0	7,884.4	7,176.1	22.3	22.8	-54.82	-751.7	464.2	418.3	379.2	39.04	10.714	
8,200.0	7,416.4	7,984.4	7,173.7	23.7	24.1	-54.63	-851.6	464.2	419.3	378.0	41.29	10.154	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)

Offset Site Error: 0.0 ft

Survey Program: 0-MWD

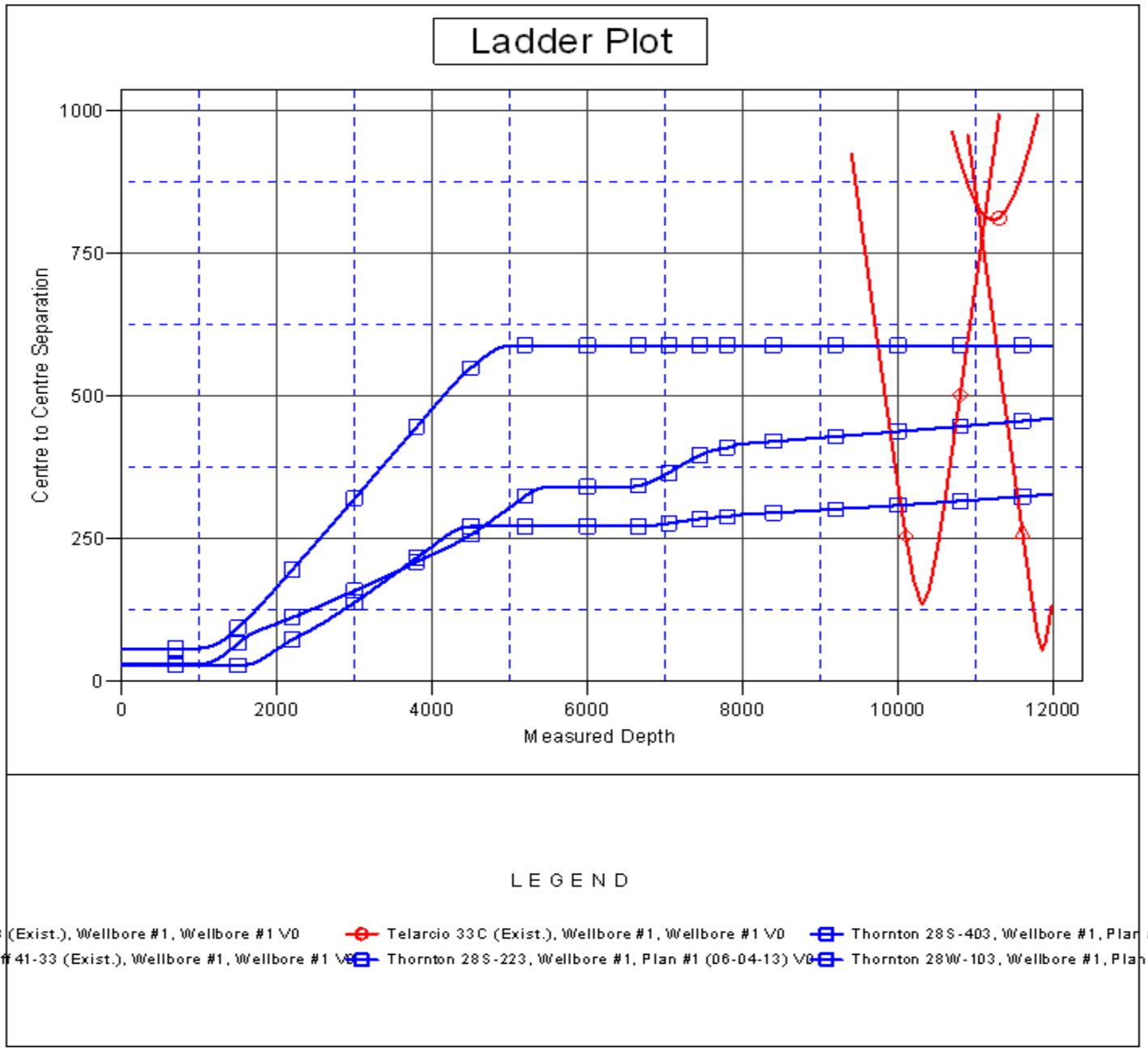
Offset Well Error: 0.0 ft

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
8,300.0	7,415.9	8,084.4	7,171.4	25.1	25.5	-54.43	-951.6	464.2	420.3	376.7	43.65	9.629	
8,400.0	7,415.4	8,184.4	7,169.1	26.6	27.0	-54.23	-1,051.5	464.2	421.4	375.3	46.11	9.139	
8,500.0	7,414.8	8,284.3	7,166.8	28.2	28.5	-54.04	-1,151.5	464.2	422.4	373.8	48.63	8.686	
8,600.0	7,414.3	8,384.3	7,164.5	29.8	30.1	-53.84	-1,251.4	464.2	423.5	372.2	51.22	8.268	
8,700.0	7,413.7	8,484.3	7,162.1	31.4	31.7	-53.65	-1,351.4	464.2	424.5	370.7	53.86	7.882	
8,800.0	7,413.2	8,584.3	7,159.8	33.1	33.3	-53.45	-1,451.4	464.2	425.6	369.0	56.53	7.528	
8,900.0	7,412.6	8,684.3	7,157.5	34.8	35.0	-53.26	-1,551.3	464.2	426.6	367.4	59.25	7.201	
9,000.0	7,412.1	8,784.3	7,155.2	36.5	36.7	-53.07	-1,651.3	464.2	427.7	365.7	61.98	6.900	
9,100.0	7,411.6	8,884.2	7,152.8	38.2	38.4	-52.88	-1,751.2	464.2	428.8	364.0	64.74	6.623	
9,200.0	7,411.0	8,984.2	7,150.5	40.0	40.2	-52.69	-1,851.2	464.2	429.9	362.3	67.52	6.366	
9,300.0	7,410.5	9,084.2	7,148.2	41.7	41.9	-52.50	-1,951.1	464.2	430.9	360.6	70.31	6.129	
9,400.0	7,409.9	9,184.2	7,145.9	43.5	43.7	-52.32	-2,051.1	464.2	432.0	358.9	73.12	5.909	
9,500.0	7,409.4	9,284.2	7,143.6	45.3	45.5	-52.13	-2,151.1	464.2	433.1	357.2	75.93	5.704	
9,600.0	7,408.9	9,384.2	7,141.2	47.1	47.3	-51.94	-2,251.0	464.2	434.2	355.5	78.74	5.514	
9,700.0	7,408.3	9,484.2	7,138.9	48.9	49.1	-51.76	-2,351.0	464.2	435.3	353.8	81.56	5.337	
9,800.0	7,407.8	9,584.1	7,136.6	50.7	50.9	-51.58	-2,450.9	464.2	436.4	352.0	84.38	5.172	
9,900.0	7,407.2	9,684.1	7,134.3	52.6	52.7	-51.39	-2,550.9	464.2	437.5	350.3	87.21	5.017	
10,000.0	7,406.7	9,784.1	7,132.0	54.4	54.5	-51.21	-2,650.8	464.2	438.6	348.6	90.03	4.872	
10,100.0	7,406.2	9,884.1	7,129.6	56.2	56.3	-51.03	-2,750.8	464.2	439.8	346.9	92.85	4.736	
10,200.0	7,405.6	9,984.1	7,127.3	58.1	58.2	-50.85	-2,850.8	464.2	440.9	345.2	95.67	4.608	
10,300.0	7,405.1	10,084.1	7,125.0	59.9	60.0	-50.67	-2,950.7	464.2	442.0	343.5	98.48	4.488	
10,400.0	7,404.5	10,184.0	7,122.7	61.8	61.9	-50.49	-3,050.7	464.2	443.1	341.8	101.29	4.375	
10,500.0	7,404.0	10,284.0	7,120.4	63.7	63.7	-50.32	-3,150.6	464.2	444.3	340.2	104.10	4.268	
10,600.0	7,403.4	10,384.0	7,118.0	65.5	65.6	-50.14	-3,250.6	464.2	445.4	338.5	106.90	4.167	
10,700.0	7,402.9	10,484.0	7,115.7	67.4	67.4	-49.97	-3,350.5	464.2	446.6	336.9	109.69	4.071	
10,800.0	7,402.4	10,584.0	7,113.4	69.2	69.3	-49.79	-3,450.5	464.2	447.7	335.2	112.48	3.980	
10,900.0	7,401.8	10,684.0	7,111.1	71.1	71.2	-49.62	-3,550.5	464.2	448.9	333.6	115.26	3.894	
11,000.0	7,401.3	10,783.9	7,108.8	73.0	73.0	-49.45	-3,650.4	464.2	450.0	332.0	118.04	3.813	
11,100.0	7,400.7	10,883.9	7,106.4	74.9	74.9	-49.27	-3,750.4	464.2	451.2	330.4	120.80	3.735	
11,200.0	7,400.2	10,983.9	7,104.1	76.8	76.8	-49.10	-3,850.3	464.2	452.3	328.8	123.56	3.661	
11,300.0	7,399.7	11,083.9	7,101.8	78.6	78.6	-48.93	-3,950.3	464.2	453.5	327.2	126.31	3.590	
11,400.0	7,399.1	11,183.9	7,099.5	80.5	80.5	-48.76	-4,050.2	464.2	454.7	325.6	129.06	3.523	
11,500.0	7,398.6	11,283.9	7,097.2	82.4	82.4	-48.60	-4,150.2	464.2	455.9	324.1	131.79	3.459	
11,600.0	7,398.0	11,383.9	7,094.8	84.3	84.3	-48.43	-4,250.2	464.2	457.0	322.5	134.52	3.398	
11,700.0	7,397.5	11,483.8	7,092.5	86.2	86.2	-48.26	-4,350.1	464.2	458.2	321.0	137.24	3.339	
11,800.0	7,397.0	11,583.8	7,090.2	88.1	88.1	-48.10	-4,450.1	464.2	459.4	319.5	139.95	3.283	
11,900.0	7,396.4	11,683.8	7,087.9	90.0	89.9	-47.93	-4,550.0	464.2	460.6	318.0	142.65	3.229	
11,976.9	7,396.0	11,760.7	7,086.1	91.4	91.4	-47.81	-4,626.9	464.2	461.5	316.8	144.72	3.189	SF

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Reference Depths are relative to WELL @ 4950.0ft (RKB-15')
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000 °

Coordinates are relative to: Thornton 28W-443
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.47°



Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	**Local Co-ordinate Reference:**	Well Thornton 28W-443
Project:	SEC.28-T7N-R66W	**TVD Reference:**	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	**MD Reference:**	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	**North Reference:**	True
Reference Well:	Thornton 28W-443	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0ft	**Output errors are at**	2.00 sigma
Reference Wellbore	Wellbore #1	**Database:**	Landmark
Reference Design:	Plan #1 (06-04-13)	**Offset TVD Reference:**	Offset Datum

Reference Depths are relative to WELL @ 4950.0ft (RKB-15')	Coordinates are relative to: Thornton 28W-443
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°