

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: Thornton 15Y-414

Surface Location: Thornton 15Y-414 Pad Sec.15-T7N-R66W

North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4921.0

+N/-S

+E/-W

Northing

Easting

Latitude

Longitude

Slot

0.0

0.0

1451734.68

3206719.85

40.571030

-104.755880

RKB - 15' WELL @ 4936.0ft (RKB - 15')

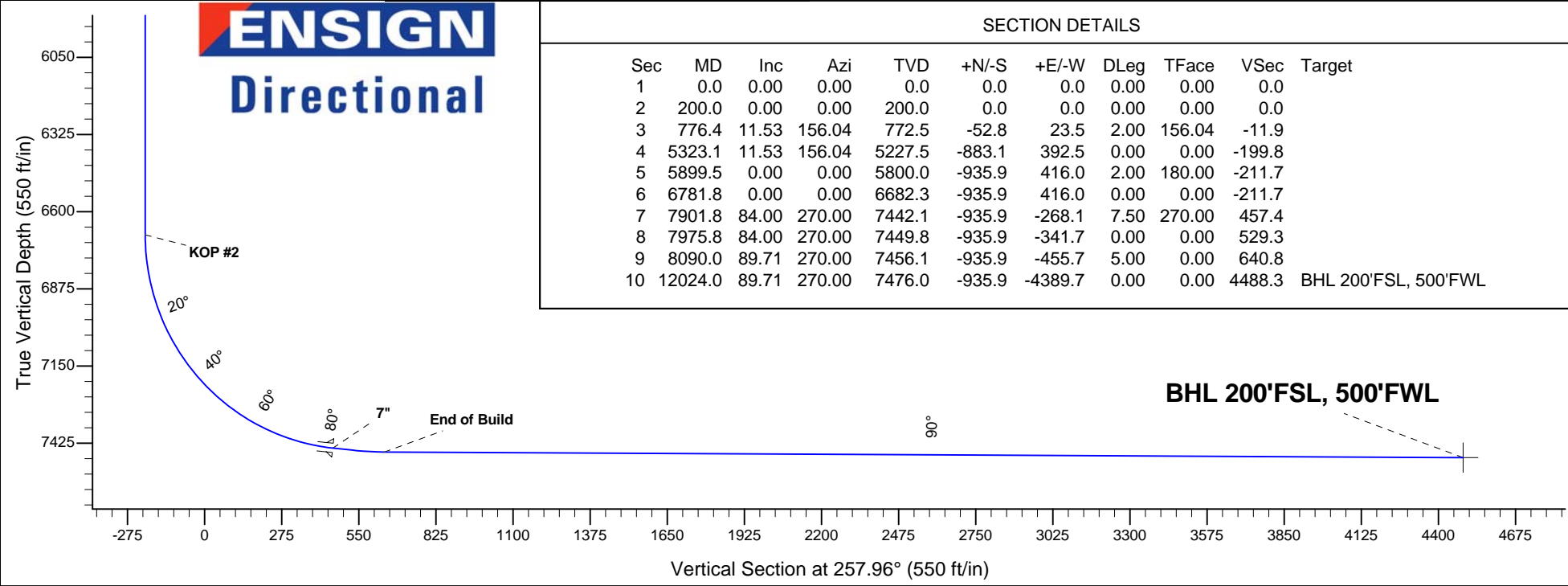
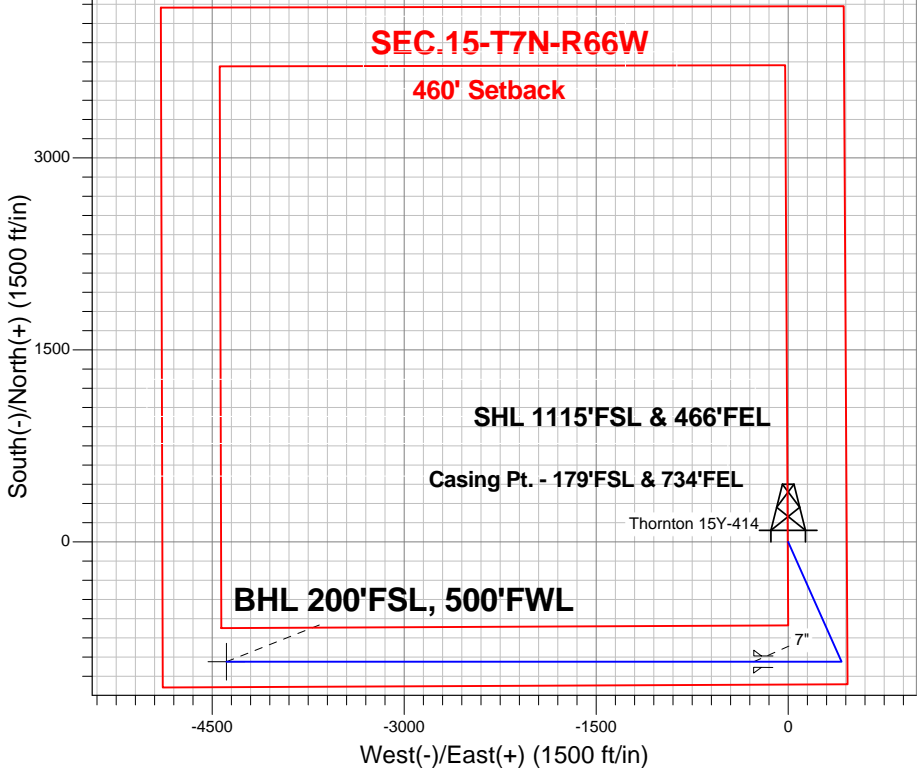
WELLBORE TARGET DETAILS				
Name	TVD	+N/-S	+E/-W	Shape
BHL 200'FSL, 500'FWL	7476.0	-935.9	-4389.7	Point

Azimuths to True North  
Magnetic North: 8.60°  
  
Magnetic Field  
Strength: 53002.8snT  
Dip Angle: 67.12°  
Date: 7/10/2013  
Model: IGRF2010

Thornton 15Y-414 Pad Sec.15-T7N-R66W  
Thornton 15Y-414  
Plan #1 (7-10-13)  
14:31, July 10 2013

ANNOTATIONS

TVD	MD	Annotation
200.0	200.0	KOP #1
6682.3	6781.8	KOP #2
7456.1	8090.0	End of Build





## **Directional**

# **PETROLEUM DEVELOPMENT CORP Weld County CO**

**SEC.15-T7N-R66W**

**Thornton 15Y-414 Pad Sec.15-T7N-R66W**

**Thornton 15Y-414**

**Wellbore #1**

**Plan: Plan #1 (7-10-13)**

## **Standard Planning Report**

**10 July, 2013**

<b>Database:</b>	Landmark	<b>Local Co-ordinate Reference:</b>	Well Thornton 15Y-414
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Site:</b>	Thornton 15Y-414 Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15Y-414	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #1 (7-10-13)		

<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

Site		Thornton 15Y-414 Pad Sec.15-T7N-R66W			
Site Position:		Northing:	1,451,734.70ft	Latitude:	40.571030
From:	Lat/Long	Easting:	3,206,719.85ft	Longitude:	-104.755880
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.48 °

Well	Thornton 15Y-414					
Well Position	+N/-S	0.0 ft	Northing:	1,451,734.68 ft	Latitude:	40.571030
	+E/-W	0.0 ft	Easting:	3,206,719.85 ft	Longitude:	-104.755880
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,921.0 ft

<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	7/10/2013	8.60	67.12	53,003

<b>Design</b>	Plan #1 (7-10-13)			
<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) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	257.96

<b>Plan Sections</b>										
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	
200.0	0.00	0.00	200.0	0.0	0.0	0.00	0.00	0.00	0.00	
776.4	11.53	156.04	772.5	-52.8	23.5	2.00	2.00	0.00	156.04	
5,323.1	11.53	156.04	5,227.5	-883.1	392.5	0.00	0.00	0.00	0.00	
5,899.5	0.00	0.00	5,800.0	-935.9	416.0	2.00	-2.00	0.00	180.00	
6,781.8	0.00	0.00	6,682.3	-935.9	416.0	0.00	0.00	0.00	0.00	
7,901.8	84.00	270.00	7,442.1	-935.9	-268.1	7.50	7.50	0.00	270.00	
7,975.8	84.00	270.00	7,449.8	-935.9	-341.7	0.00	0.00	0.00	0.00	
8,090.0	89.71	270.00	7,456.1	-935.9	-455.7	5.00	5.00	0.00	0.00	
12,024.0	89.71	270.00	7,476.0	-935.9	-4,389.7	0.00	0.00	0.00	0.00	BHL 200'FSL, 500'F

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<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Site:</b>	Thornton 15Y-414 Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15Y-414	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #1 (7-10-13)		

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
KOP #1									
300.0	2.00	156.04	300.0	-1.6	0.7	-0.4	2.00	2.00	0.00
400.0	4.00	156.04	399.8	-6.4	2.8	-1.4	2.00	2.00	0.00
500.0	6.00	156.04	499.5	-14.3	6.4	-3.2	2.00	2.00	0.00
600.0	8.00	156.04	598.7	-25.5	11.3	-5.8	2.00	2.00	0.00
700.0	10.00	156.04	697.5	-39.8	17.7	-9.0	2.00	2.00	0.00
776.4	11.53	156.04	772.5	-52.8	23.5	-11.9	2.00	2.00	0.00
800.0	11.53	156.04	795.6	-57.1	25.4	-12.9	0.00	0.00	0.00
900.0	11.53	156.04	893.6	-75.4	33.5	-17.1	0.00	0.00	0.00
1,000.0	11.53	156.04	991.6	-93.6	41.6	-21.2	0.00	0.00	0.00
1,100.0	11.53	156.04	1,089.6	-111.9	49.7	-25.3	0.00	0.00	0.00
1,200.0	11.53	156.04	1,187.6	-130.2	57.9	-29.4	0.00	0.00	0.00
1,300.0	11.53	156.04	1,285.6	-148.4	66.0	-33.6	0.00	0.00	0.00
1,400.0	11.53	156.04	1,383.5	-166.7	74.1	-37.7	0.00	0.00	0.00
1,500.0	11.53	156.04	1,481.5	-184.9	82.2	-41.8	0.00	0.00	0.00
1,600.0	11.53	156.04	1,579.5	-203.2	90.3	-46.0	0.00	0.00	0.00
1,700.0	11.53	156.04	1,677.5	-221.5	98.4	-50.1	0.00	0.00	0.00
1,800.0	11.53	156.04	1,775.5	-239.7	106.6	-54.2	0.00	0.00	0.00
1,900.0	11.53	156.04	1,873.5	-258.0	114.7	-58.4	0.00	0.00	0.00
2,000.0	11.53	156.04	1,971.4	-276.3	122.8	-62.5	0.00	0.00	0.00
2,100.0	11.53	156.04	2,069.4	-294.5	130.9	-66.6	0.00	0.00	0.00
2,200.0	11.53	156.04	2,167.4	-312.8	139.0	-70.8	0.00	0.00	0.00
2,300.0	11.53	156.04	2,265.4	-331.0	147.1	-74.9	0.00	0.00	0.00
2,400.0	11.53	156.04	2,363.4	-349.3	155.3	-79.0	0.00	0.00	0.00
2,500.0	11.53	156.04	2,461.4	-367.6	163.4	-83.1	0.00	0.00	0.00
2,600.0	11.53	156.04	2,559.3	-385.8	171.5	-87.3	0.00	0.00	0.00
2,700.0	11.53	156.04	2,657.3	-404.1	179.6	-91.4	0.00	0.00	0.00
2,800.0	11.53	156.04	2,755.3	-422.3	187.7	-95.5	0.00	0.00	0.00
2,900.0	11.53	156.04	2,853.3	-440.6	195.8	-99.7	0.00	0.00	0.00
3,000.0	11.53	156.04	2,951.3	-458.9	204.0	-103.8	0.00	0.00	0.00
3,100.0	11.53	156.04	3,049.2	-477.1	212.1	-107.9	0.00	0.00	0.00
3,200.0	11.53	156.04	3,147.2	-495.4	220.2	-112.1	0.00	0.00	0.00
3,300.0	11.53	156.04	3,245.2	-513.7	228.3	-116.2	0.00	0.00	0.00
3,400.0	11.53	156.04	3,343.2	-531.9	236.4	-120.3	0.00	0.00	0.00
3,500.0	11.53	156.04	3,441.2	-550.2	244.5	-124.5	0.00	0.00	0.00
3,600.0	11.53	156.04	3,539.2	-568.4	252.7	-128.6	0.00	0.00	0.00
3,700.0	11.53	156.04	3,637.1	-586.7	260.8	-132.7	0.00	0.00	0.00
3,800.0	11.53	156.04	3,735.1	-605.0	268.9	-136.8	0.00	0.00	0.00
3,900.0	11.53	156.04	3,833.1	-623.2	277.0	-141.0	0.00	0.00	0.00
4,000.0	11.53	156.04	3,931.1	-641.5	285.1	-145.1	0.00	0.00	0.00
4,100.0	11.53	156.04	4,029.1	-659.7	293.2	-149.2	0.00	0.00	0.00
4,200.0	11.53	156.04	4,127.1	-678.0	301.4	-153.4	0.00	0.00	0.00
4,300.0	11.53	156.04	4,225.0	-696.3	309.5	-157.5	0.00	0.00	0.00
4,400.0	11.53	156.04	4,323.0	-714.5	317.6	-161.6	0.00	0.00	0.00
4,500.0	11.53	156.04	4,421.0	-732.8	325.7	-165.8	0.00	0.00	0.00
4,600.0	11.53	156.04	4,519.0	-751.0	333.8	-169.9	0.00	0.00	0.00
4,700.0	11.53	156.04	4,617.0	-769.3	342.0	-174.0	0.00	0.00	0.00
4,800.0	11.53	156.04	4,715.0	-787.6	350.1	-178.2	0.00	0.00	0.00
4,900.0	11.53	156.04	4,812.9	-805.8	358.2	-182.3	0.00	0.00	0.00
5,000.0	11.53	156.04	4,910.9	-824.1	366.3	-186.4	0.00	0.00	0.00

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<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Site:</b>	Thornton 15Y-414 Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15Y-414	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #1 (7-10-13)		

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)
5,100.0	11.53	156.04	5,008.9	-842.4	374.4	-190.5	0.00	0.00	0.00
5,200.0	11.53	156.04	5,106.9	-860.6	382.5	-194.7	0.00	0.00	0.00
5,300.0	11.53	156.04	5,204.9	-878.9	390.7	-198.8	0.00	0.00	0.00
5,323.1	11.53	156.04	5,227.5	-883.1	392.5	-199.8	0.00	0.00	0.00
5,400.0	9.99	156.04	5,303.1	-896.2	398.4	-202.7	2.00	-2.00	0.00
5,500.0	7.99	156.04	5,401.8	-910.5	404.7	-206.0	2.00	-2.00	0.00
5,600.0	5.99	156.04	5,501.1	-921.6	409.6	-208.5	2.00	-2.00	0.00
5,700.0	3.99	156.04	5,600.7	-929.6	413.2	-210.3	2.00	-2.00	0.00
5,800.0	1.99	156.04	5,700.5	-934.3	415.3	-211.3	2.00	-2.00	0.00
5,899.5	0.00	0.00	5,800.0	-935.9	416.0	-211.7	2.00	-2.00	0.00
5,900.0	0.00	0.00	5,800.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,000.0	0.00	0.00	5,900.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,100.0	0.00	0.00	6,000.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,200.0	0.00	0.00	6,100.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,300.0	0.00	0.00	6,200.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,400.0	0.00	0.00	6,300.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,500.0	0.00	0.00	6,400.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,600.0	0.00	0.00	6,500.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,700.0	0.00	0.00	6,600.5	-935.9	416.0	-211.7	0.00	0.00	0.00
6,781.8	0.00	0.00	6,682.3	-935.9	416.0	-211.7	0.00	0.00	0.00
<b>KOP #2</b>									
6,800.0	1.36	270.00	6,700.5	-935.9	415.8	-211.5	7.50	7.50	0.00
6,900.0	8.86	270.00	6,800.1	-935.9	406.9	-202.8	7.50	7.50	0.00
7,000.0	16.36	270.00	6,897.6	-935.9	385.1	-181.4	7.50	7.50	0.00
7,100.0	23.86	270.00	6,991.4	-935.9	350.7	-147.8	7.50	7.50	0.00
7,200.0	31.36	270.00	7,079.9	-935.9	304.4	-102.5	7.50	7.50	0.00
7,300.0	38.86	270.00	7,161.7	-935.9	246.9	-46.3	7.50	7.50	0.00
7,400.0	46.36	270.00	7,235.2	-935.9	179.2	19.9	7.50	7.50	0.00
7,500.0	53.86	270.00	7,299.3	-935.9	102.6	94.9	7.50	7.50	0.00
7,600.0	61.36	270.00	7,352.8	-935.9	18.2	177.4	7.50	7.50	0.00
7,700.0	68.86	270.00	7,394.9	-935.9	-72.5	266.0	7.50	7.50	0.00
7,800.0	76.36	270.00	7,424.7	-935.9	-167.8	359.3	7.50	7.50	0.00
7,900.0	83.86	270.00	7,441.9	-935.9	-266.3	455.6	7.50	7.50	0.00
7,901.8	84.00	270.00	7,442.1	-935.9	-268.1	457.3	7.50	7.50	0.00
<b>7"</b>									
7,975.8	84.00	270.00	7,449.8	-935.9	-341.7	529.3	0.00	0.00	0.00
8,000.0	85.21	270.00	7,452.1	-935.9	-365.8	552.9	5.00	5.00	0.00
8,090.0	89.71	270.00	7,456.1	-935.9	-455.7	640.8	5.00	5.00	0.00
<b>End of Build</b>									
8,100.0	89.71	270.00	7,456.1	-935.9	-465.7	650.6	0.00	0.00	0.00
8,200.0	89.71	270.00	7,456.6	-935.9	-565.7	748.4	0.00	0.00	0.00
8,300.0	89.71	270.00	7,457.2	-935.9	-665.7	846.2	0.00	0.00	0.00
8,400.0	89.71	270.00	7,457.7	-935.9	-765.7	944.0	0.00	0.00	0.00
8,500.0	89.71	270.00	7,458.2	-935.9	-865.7	1,041.8	0.00	0.00	0.00
8,600.0	89.71	270.00	7,458.7	-935.9	-965.7	1,139.6	0.00	0.00	0.00
8,700.0	89.71	270.00	7,459.2	-935.9	-1,065.7	1,237.4	0.00	0.00	0.00
8,800.0	89.71	270.00	7,459.7	-935.9	-1,165.7	1,335.2	0.00	0.00	0.00
8,900.0	89.71	270.00	7,460.2	-935.9	-1,265.6	1,433.0	0.00	0.00	0.00
9,000.0	89.71	270.00	7,460.7	-935.9	-1,365.6	1,530.8	0.00	0.00	0.00
9,100.0	89.71	270.00	7,461.2	-935.9	-1,465.6	1,628.6	0.00	0.00	0.00
9,200.0	89.71	270.00	7,461.7	-935.9	-1,565.6	1,726.4	0.00	0.00	0.00
9,300.0	89.71	270.00	7,462.2	-935.9	-1,665.6	1,824.2	0.00	0.00	0.00
9,400.0	89.71	270.00	7,462.7	-935.9	-1,765.6	1,922.0	0.00	0.00	0.00

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<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Site:</b>	Thornton 15Y-414 Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15Y-414	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #1 (7-10-13)		

## 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	89.71	270.00	7,463.2	-935.9	-1,865.6	2,019.8	0.00	0.00	0.00
9,600.0	89.71	270.00	7,463.7	-935.9	-1,965.6	2,117.6	0.00	0.00	0.00
9,700.0	89.71	270.00	7,464.2	-935.9	-2,065.6	2,215.4	0.00	0.00	0.00
9,800.0	89.71	270.00	7,464.7	-935.9	-2,165.6	2,313.2	0.00	0.00	0.00
9,900.0	89.71	270.00	7,465.2	-935.9	-2,265.6	2,411.0	0.00	0.00	0.00
10,000.0	89.71	270.00	7,465.8	-935.9	-2,365.6	2,508.8	0.00	0.00	0.00
10,100.0	89.71	270.00	7,466.3	-935.9	-2,465.6	2,606.6	0.00	0.00	0.00
10,200.0	89.71	270.00	7,466.8	-935.9	-2,565.6	2,704.4	0.00	0.00	0.00
10,300.0	89.71	270.00	7,467.3	-935.9	-2,665.6	2,802.2	0.00	0.00	0.00
10,400.0	89.71	270.00	7,467.8	-935.9	-2,765.6	2,900.0	0.00	0.00	0.00
10,500.0	89.71	270.00	7,468.3	-935.9	-2,865.6	2,997.8	0.00	0.00	0.00
10,600.0	89.71	270.00	7,468.8	-935.9	-2,965.6	3,095.6	0.00	0.00	0.00
10,700.0	89.71	270.00	7,469.3	-935.9	-3,065.6	3,193.4	0.00	0.00	0.00
10,800.0	89.71	270.00	7,469.8	-935.9	-3,165.6	3,291.2	0.00	0.00	0.00
10,900.0	89.71	270.00	7,470.3	-935.9	-3,265.6	3,389.0	0.00	0.00	0.00
11,000.0	89.71	270.00	7,470.8	-935.9	-3,365.6	3,486.8	0.00	0.00	0.00
11,100.0	89.71	270.00	7,471.3	-935.9	-3,465.6	3,584.6	0.00	0.00	0.00
11,200.0	89.71	270.00	7,471.8	-935.9	-3,565.6	3,682.4	0.00	0.00	0.00
11,300.0	89.71	270.00	7,472.3	-935.9	-3,665.6	3,780.2	0.00	0.00	0.00
11,400.0	89.71	270.00	7,472.8	-935.9	-3,765.6	3,878.0	0.00	0.00	0.00
11,500.0	89.71	270.00	7,473.3	-935.9	-3,865.6	3,975.8	0.00	0.00	0.00
11,600.0	89.71	270.00	7,473.9	-935.9	-3,965.6	4,073.6	0.00	0.00	0.00
11,700.0	89.71	270.00	7,474.4	-935.9	-4,065.6	4,171.4	0.00	0.00	0.00
11,800.0	89.71	270.00	7,474.9	-935.9	-4,165.6	4,269.2	0.00	0.00	0.00
11,900.0	89.71	270.00	7,475.4	-935.9	-4,265.6	4,367.0	0.00	0.00	0.00
12,000.0	89.71	270.00	7,475.9	-935.9	-4,365.6	4,464.8	0.00	0.00	0.00
12,024.0	89.71	270.00	7,476.0	-935.9	-4,389.7	4,488.3	0.00	0.00	0.00
BHL 200'FSL, 500'FWL									

## Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
BHL 200'FSL, 500'FW	0.00	0.00	7,476.0	-935.9	-4,389.7	1,450,762.01	3,202,338.33	40.568460	-104.771680
- plan hits target center									
- Point									

## Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,901.8	7,442.1	7"	7	7-1/2

<b>Database:</b>	Landmark	<b>Local Co-ordinate Reference:</b>	Well Thornton 15Y-414
<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>TVD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Project:</b>	SEC.15-T7N-R66W	<b>MD Reference:</b>	WELL @ 4936.0ft (RKB - 15')
<b>Site:</b>	Thornton 15Y-414 Pad Sec.15-T7N-R66W	<b>North Reference:</b>	True
<b>Well:</b>	Thornton 15Y-414	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Wellbore #1		
<b>Design:</b>	Plan #1 (7-10-13)		

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
6,781.8	6,682.3	-935.9	416.0	KOP #2
8,090.0	7,456.1	-935.9	-455.7	End of Build