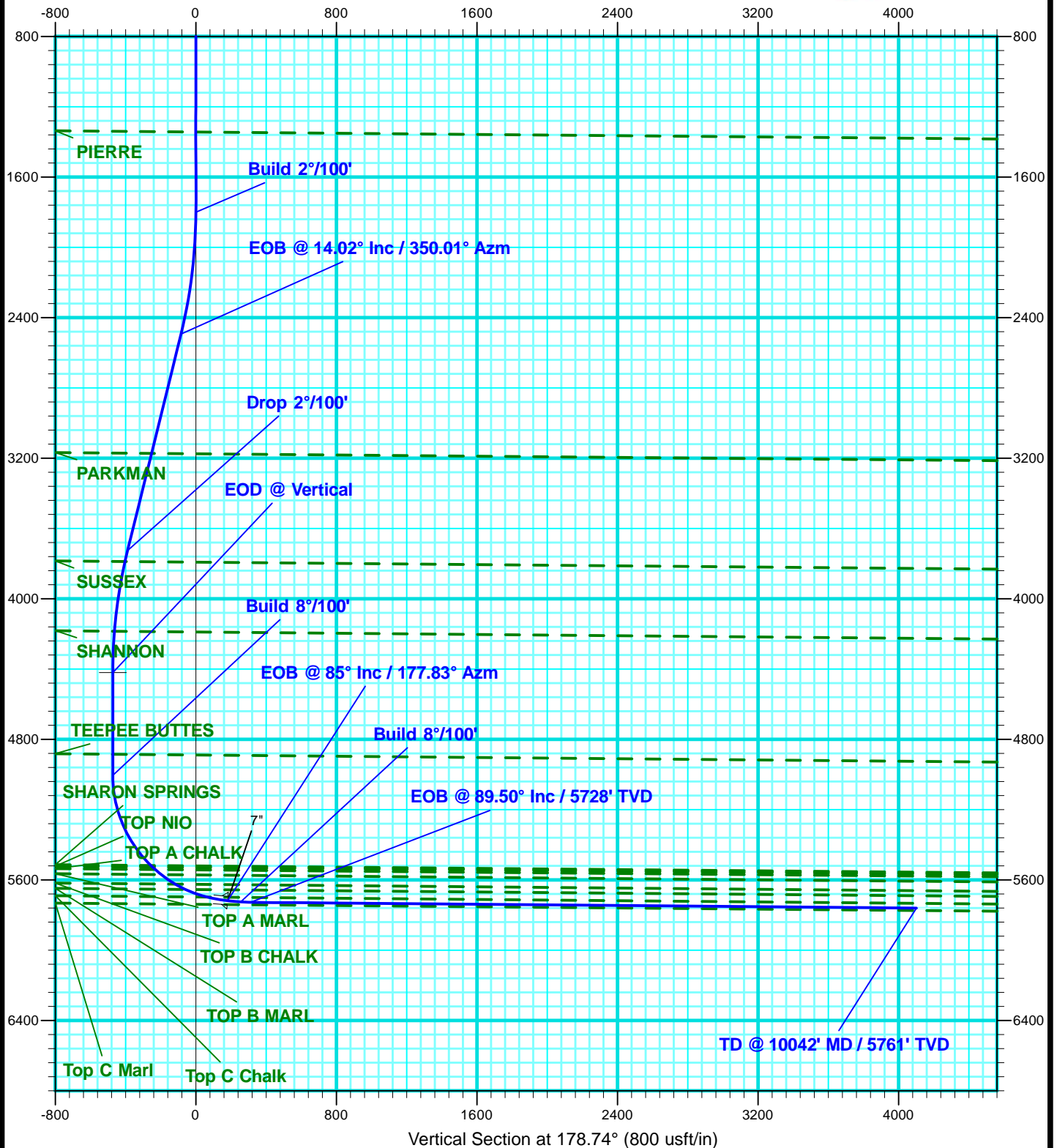




Weld County, CO
Castor Federal LD15-75-1HN
Quote 130941
Design #2





Noble Energy Inc.

**Weld County, CO
Sec 15, T9N, R58W, 6th PM
Castor Federal LD15-75-1HN**

Wellbore #1

Plan: Design #2

DDC Well Planning Report

18 December, 2013



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Castor Federal LD15-75-1HN
Company:	Noble Energy Inc.	TVD Reference:	WELL @ 4736.0usft (H&P #326)
Project:	Weld County, CO	MD Reference:	WELL @ 4736.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	North Reference:	Grid
Well:	Castor Federal LD15-75-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #2		

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	Sec 15, T9N, R58W, 6th PM		
Site Position:		Northing:	1,522,978.05 usft
From:	Lat/Long	Easting:	3,457,350.77 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	40° 45' 26.190 N
		Longitude:	103° 50' 56.660 W
		Grid Convergence:	1.07 °

Well	Castor Federal LD15-75-1HN		
Well Position	+N/-S	-51.9 usft	Northing: 1,522,926.11 usft
	+E/-W	48.7 usft	Easting: 3,457,399.46 usft
Position Uncertainty	0.0 usft	Wellhead Elevation:	Latitude: 40° 45' 25.668 N
			Longitude: 103° 50' 56.040 W
			Ground Level: 4,706.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/30/2013	8.07	67.40	53,161

Design	Design #2			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	178.74

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	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	
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,500.9	14.02	350.01	2,493.9	84.0	-14.8	2.00	2.00	0.00	350.01	
3,770.8	14.02	350.01	3,726.1	387.0	-68.2	0.00	0.00	0.00	0.00	
4,471.8	0.00	0.00	4,420.0	471.0	-83.0	2.00	-2.00	0.00	180.00	VP Castor Federal I
5,056.8	0.00	0.00	5,005.0	471.0	-83.0	0.00	0.00	0.00	0.00	
6,119.3	85.00	177.83	5,718.5	-182.3	-58.2	8.00	8.00	0.00	177.83	
6,194.3	85.00	177.83	5,725.0	-257.0	-55.4	0.00	0.00	0.00	0.00	
6,250.5	89.50	177.83	5,727.7	-313.1	-53.3	8.00	8.00	0.00	0.00	
10,041.7	89.50	177.83	5,760.8	-4,101.4	90.2	0.00	0.00	0.00	0.00	PBHL Castor Feder

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Project:	Weld County, CO	MD Reference:	WELL @ 4736.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	North Reference:	Grid
Well:	Castor Federal LD15-75-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #2		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	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
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
PIERRE									
1,344.0	0.00	0.00	1,344.0	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
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00
Build 2°/100'									
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00
1,900.0	2.00	350.01	1,900.0	1.7	-0.3	-1.7	2.00	2.00	0.00
2,000.0	4.00	350.01	1,999.8	6.9	-1.2	-6.9	2.00	2.00	0.00
2,100.0	6.00	350.01	2,099.5	15.5	-2.7	-15.5	2.00	2.00	0.00
2,200.0	8.00	350.01	2,198.7	27.5	-4.8	-27.6	2.00	2.00	0.00
2,300.0	10.00	350.01	2,297.5	42.9	-7.6	-43.0	2.00	2.00	0.00
2,400.0	12.00	350.01	2,395.6	61.7	-10.9	-61.9	2.00	2.00	0.00
2,500.0	14.00	350.01	2,493.1	83.8	-14.8	-84.1	2.00	2.00	0.00
EOB @ 14.02° Inc / 350.01° Azm									
2,500.9	14.02	350.01	2,493.9	84.0	-14.8	-84.3	2.00	2.00	0.00
2,600.0	14.02	350.01	2,590.1	107.7	-19.0	-108.1	0.00	0.00	0.00
2,700.0	14.02	350.01	2,687.1	131.5	-23.2	-132.0	0.00	0.00	0.00
2,800.0	14.02	350.01	2,784.1	155.4	-27.4	-155.9	0.00	0.00	0.00
2,900.0	14.02	350.01	2,881.1	179.2	-31.6	-179.9	0.00	0.00	0.00
3,000.0	14.02	350.01	2,978.2	203.1	-35.8	-203.8	0.00	0.00	0.00
3,100.0	14.02	350.01	3,075.2	226.9	-40.0	-227.8	0.00	0.00	0.00
3,200.0	14.02	350.01	3,172.2	250.8	-44.2	-251.7	0.00	0.00	0.00
PARKMAN									
3,200.6	14.02	350.01	3,172.8	250.9	-44.2	-251.9	0.00	0.00	0.00
3,300.0	14.02	350.01	3,269.2	274.7	-48.4	-275.6	0.00	0.00	0.00
3,400.0	14.02	350.01	3,366.3	298.5	-52.6	-299.6	0.00	0.00	0.00
3,500.0	14.02	350.01	3,463.3	322.4	-56.8	-323.5	0.00	0.00	0.00
3,600.0	14.02	350.01	3,560.3	346.2	-61.0	-347.5	0.00	0.00	0.00
3,700.0	14.02	350.01	3,657.3	370.1	-65.2	-371.4	0.00	0.00	0.00
Drop 2°/100'									
3,770.8	14.02	350.01	3,726.1	387.0	-68.2	-388.4	0.00	0.00	0.00
3,800.0	13.44	350.01	3,754.4	393.8	-69.4	-395.2	2.00	-2.00	0.00
SUSSEX									
3,835.0	12.73	350.01	3,788.5	401.6	-70.8	-403.1	2.00	-2.00	0.00
3,900.0	11.44	350.01	3,852.0	415.0	-73.1	-416.5	2.00	-2.00	0.00
4,000.0	9.44	350.01	3,950.4	432.8	-76.3	-434.4	2.00	-2.00	0.00
4,100.0	7.44	350.01	4,049.3	447.3	-78.8	-448.9	2.00	-2.00	0.00

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Project:	Weld County, CO	MD Reference:	WELL @ 4736.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	North Reference:	Grid
Well:	Castor Federal LD15-75-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #2		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,200.0	5.44	350.01	4,148.6	458.3	-80.8	-460.0	2.00	-2.00	0.00
SHANNON									
4,237.5	4.69	350.01	4,186.0	461.6	-81.3	-463.2	2.00	-2.00	0.00
4,300.0	3.44	350.01	4,248.3	465.9	-82.1	-467.6	2.00	-2.00	0.00
4,400.0	1.44	350.01	4,348.2	470.1	-82.8	-471.8	2.00	-2.00	0.00
EOD @ Vertical									
4,471.8	0.00	0.00	4,420.0	471.0	-83.0	-472.7	2.00	-2.00	0.00
4,500.0	0.00	0.00	4,448.2	471.0	-83.0	-472.7	0.00	0.00	0.00
4,600.0	0.00	0.00	4,548.2	471.0	-83.0	-472.7	0.00	0.00	0.00
4,700.0	0.00	0.00	4,648.2	471.0	-83.0	-472.7	0.00	0.00	0.00
4,800.0	0.00	0.00	4,748.2	471.0	-83.0	-472.7	0.00	0.00	0.00
4,900.0	0.00	0.00	4,848.2	471.0	-83.0	-472.7	0.00	0.00	0.00
TEEPEE BUTTES									
4,937.7	0.00	0.00	4,885.9	471.0	-83.0	-472.7	0.00	0.00	0.00
5,000.0	0.00	0.00	4,948.2	471.0	-83.0	-472.7	0.00	0.00	0.00
Build 8°/100'									
5,056.8	0.00	0.00	5,005.0	471.0	-83.0	-472.7	0.00	0.00	0.00
5,100.0	3.46	177.83	5,048.2	469.7	-83.0	-471.4	8.00	8.00	0.00
5,200.0	11.46	177.83	5,147.3	456.7	-82.5	-458.4	8.00	8.00	0.00
5,300.0	19.46	177.83	5,243.6	430.1	-81.5	-431.8	8.00	8.00	0.00
5,400.0	27.46	177.83	5,335.2	390.4	-79.9	-392.0	8.00	8.00	0.00
5,500.0	35.46	177.83	5,420.5	338.3	-78.0	-339.9	8.00	8.00	0.00
5,600.0	43.46	177.83	5,497.6	274.8	-75.6	-276.4	8.00	8.00	0.00
SHARON SPRINGS									
5,629.7	45.84	177.83	5,518.8	253.9	-74.8	-255.5	8.00	8.00	0.00
TOP NIO									
5,642.9	46.89	177.83	5,527.9	244.4	-74.4	-246.0	8.00	8.00	0.00
TOP A CHALK									
5,662.4	48.45	177.83	5,541.0	230.0	-73.9	-231.6	8.00	8.00	0.00
5,700.0	51.46	177.83	5,565.2	201.2	-72.8	-202.8	8.00	8.00	0.00
TOP A MARL									
5,708.3	52.12	177.83	5,570.3	194.7	-72.5	-196.3	8.00	8.00	0.00
5,800.0	59.46	177.83	5,621.8	119.0	-69.7	-120.5	8.00	8.00	0.00
TOP B CHALK									
5,806.3	59.96	177.83	5,625.0	113.6	-69.5	-115.1	8.00	8.00	0.00
TOP B MARL									
5,870.2	65.08	177.83	5,654.5	56.9	-67.3	-58.4	8.00	8.00	0.00
5,900.0	67.46	177.83	5,666.5	29.7	-66.3	-31.1	8.00	8.00	0.00
6,000.0	75.46	177.83	5,698.3	-65.0	-62.7	63.6	8.00	8.00	0.00
Top C Chalk									
6,001.3	75.56	177.83	5,698.6	-66.2	-62.6	64.8	8.00	8.00	0.00
6,100.0	83.46	177.83	5,716.5	-163.2	-59.0	161.8	8.00	8.00	0.00
EOB @ 85° Inc / 177.83° Azm - 7"									
6,119.3	85.00	177.83	5,718.5	-182.3	-58.2	181.0	7.99	7.99	0.00
Build 8°/100'									
6,194.3	85.00	177.83	5,725.0	-257.0	-55.4	255.7	0.00	0.00	0.00
6,200.0	85.46	177.83	5,725.5	-262.7	-55.2	261.4	8.00	8.00	0.00
EOB @ 89.50° Inc / 5728' TVD									
6,250.5	89.50	177.83	5,727.7	-313.1	-53.3	311.8	8.00	8.00	0.00
6,300.0	89.50	177.83	5,728.1	-362.5	-51.4	361.3	0.00	0.00	0.00
6,400.0	89.50	177.83	5,729.0	-462.5	-47.6	461.3	0.00	0.00	0.00
6,500.0	89.50	177.83	5,729.9	-562.4	-43.8	561.3	0.00	0.00	0.00

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Well:	Castor Federal LD15-75-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #2		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,600.0	89.50	177.83	5,730.8	-662.3	-40.1	661.3	0.00	0.00	0.00
6,700.0	89.50	177.83	5,731.6	-762.2	-36.3	761.3	0.00	0.00	0.00
6,800.0	89.50	177.83	5,732.5	-862.2	-32.5	861.2	0.00	0.00	0.00
6,900.0	89.50	177.83	5,733.4	-962.1	-28.7	961.2	0.00	0.00	0.00
7,000.0	89.50	177.83	5,734.2	-1,062.0	-24.9	1,061.2	0.00	0.00	0.00
7,100.0	89.50	177.83	5,735.1	-1,161.9	-21.1	1,161.2	0.00	0.00	0.00
7,200.0	89.50	177.83	5,736.0	-1,261.9	-17.3	1,261.2	0.00	0.00	0.00
7,300.0	89.50	177.83	5,736.9	-1,361.8	-13.6	1,361.2	0.00	0.00	0.00
7,400.0	89.50	177.83	5,737.7	-1,461.7	-9.8	1,461.1	0.00	0.00	0.00
7,500.0	89.50	177.83	5,738.6	-1,561.6	-6.0	1,561.1	0.00	0.00	0.00
7,600.0	89.50	177.83	5,739.5	-1,661.6	-2.2	1,661.1	0.00	0.00	0.00
7,700.0	89.50	177.83	5,740.4	-1,761.5	1.6	1,761.1	0.00	0.00	0.00
7,800.0	89.50	177.83	5,741.2	-1,861.4	5.4	1,861.1	0.00	0.00	0.00
7,900.0	89.50	177.83	5,742.1	-1,961.3	9.2	1,961.1	0.00	0.00	0.00
8,000.0	89.50	177.83	5,743.0	-2,061.3	12.9	2,061.0	0.00	0.00	0.00
8,100.0	89.50	177.83	5,743.9	-2,161.2	16.7	2,161.0	0.00	0.00	0.00
8,200.0	89.50	177.83	5,744.7	-2,261.1	20.5	2,261.0	0.00	0.00	0.00
8,300.0	89.50	177.83	5,745.6	-2,361.0	24.3	2,361.0	0.00	0.00	0.00
8,400.0	89.50	177.83	5,746.5	-2,461.0	28.1	2,461.0	0.00	0.00	0.00
8,500.0	89.50	177.83	5,747.3	-2,560.9	31.9	2,561.0	0.00	0.00	0.00
8,600.0	89.50	177.83	5,748.2	-2,660.8	35.7	2,661.0	0.00	0.00	0.00
8,700.0	89.50	177.83	5,749.1	-2,760.7	39.4	2,760.9	0.00	0.00	0.00
8,800.0	89.50	177.83	5,750.0	-2,860.7	43.2	2,860.9	0.00	0.00	0.00
8,900.0	89.50	177.83	5,750.8	-2,960.6	47.0	2,960.9	0.00	0.00	0.00
9,000.0	89.50	177.83	5,751.7	-3,060.5	50.8	3,060.9	0.00	0.00	0.00
9,100.0	89.50	177.83	5,752.6	-3,160.4	54.6	3,160.9	0.00	0.00	0.00
9,200.0	89.50	177.83	5,753.5	-3,260.4	58.4	3,260.9	0.00	0.00	0.00
9,300.0	89.50	177.83	5,754.3	-3,360.3	62.2	3,360.8	0.00	0.00	0.00
9,400.0	89.50	177.83	5,755.2	-3,460.2	65.9	3,460.8	0.00	0.00	0.00
9,500.0	89.50	177.83	5,756.1	-3,560.1	69.7	3,560.8	0.00	0.00	0.00
9,600.0	89.50	177.83	5,756.9	-3,660.1	73.5	3,660.8	0.00	0.00	0.00
9,700.0	89.50	177.83	5,757.8	-3,760.0	77.3	3,760.8	0.00	0.00	0.00
9,800.0	89.50	177.83	5,758.7	-3,859.9	81.1	3,860.8	0.00	0.00	0.00
9,900.0	89.50	177.83	5,759.6	-3,959.8	84.9	3,960.7	0.00	0.00	0.00
10,000.0	89.50	177.83	5,760.4	-4,059.8	88.7	4,060.7	0.00	0.00	0.00
TD @ 10042' MD / 5761' TVD									
10,041.7	89.50	177.83	5,760.8	-4,101.4	90.2	4,102.4	0.00	0.00	0.00

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Castor Federal LD15-75-1HN
Company:	Noble Energy Inc.	TVD Reference:	WELL @ 4736.0usft (H&P #326)
Project:	Weld County, CO	MD Reference:	WELL @ 4736.0usft (H&P #326)
Site:	Sec 15, T9N, R58W, 6th PM	North Reference:	Grid
Well:	Castor Federal LD15-75-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #2		

Design Targets

Target Name

- hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Bradbury 1 - plan misses target center by 2809.5usft at 0.0usft MD (0.0 TVD, 0.0 N, 0.0 E) - Circle (radius 300.0)	0.00	0.00	0.0	-2,784.3	376.1	1,520,141.86	3,457,775.54	40° 44' 58.092 N	103° 50' 51.828 W
VP Castor Federal LD - plan hits target center - Point	0.00	0.00	4,420.0	471.0	-83.0	1,523,397.11	3,457,316.46	40° 45' 30.336 N	103° 50' 57.004 W
PBHL Castor Federal - plan hits target center - Point	0.00	0.00	5,760.8	-4,101.4	90.2	1,518,824.71	3,457,489.69	40° 44' 45.132 N	103° 50' 55.860 W

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,119.3	5,718.5	7"	7	7-1/2

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,344.0	1,344.0	PIERRE		-0.50	
3,200.6	3,172.8	PARKMAN		-0.50	
3,835.0	3,788.5	SUSSEX		-0.50	
4,237.5	4,186.0	SHANNON		-0.50	
4,937.7	4,885.9	TEEPEE BUTTES		-0.50	
5,629.7	5,518.8	SHARON SPRINGS		-0.50	
5,642.9	5,527.9	TOP NIO		-0.50	
5,662.4	5,541.0	TOP A CHALK		-0.50	
5,708.3	5,570.3	TOP A MARL		-0.50	
5,806.3	5,625.0	TOP B CHALK		-0.50	
5,870.2	5,654.5	TOP B MARL		-0.50	
6,001.3	5,698.6	Top C Chalk		-0.50	

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,800.0	1,800.0	0.0	0.0	Build 2°/100'
2,500.9	2,493.9	84.0	-14.8	EOB @ 14.02° Inc / 350.01° Azm
3,770.8	3,726.1	387.0	-68.2	Drop 2°/100'
4,471.8	4,420.0	471.0	-83.0	EOD @ Vertical
5,056.8	5,005.0	471.0	-83.0	Build 8°/100'
6,119.3	5,718.5	-182.3	-58.2	EOB @ 85° Inc / 177.83° Azm
6,194.3	5,725.0	-257.0	-55.4	Build 8°/100'
6,250.5	5,727.7	-313.1	-53.3	EOB @ 89.50° Inc / 5728' TVD
10,041.7	5,760.8	-4,101.4	90.2	TD @ 10042' MD / 5761' TVD