Noble Energy

Weld County, CO (NAD 83)
Sec. 25-T9N-R59W
Castor LC25-72HN

Design: MWD Surveys

Sperry Drilling Services

Final Survey Report

14 April, 2013

Well Coordinates: 1,507,545.77 N, 3,438,463.11 E (40° 42' 57.13" N, 103° 55' 05.63" W)
Ground Level: 4,884.00 ft

Local Coordinate Origin:	Centered on Well Castor LC25-72HN
Viewing Datum:	KB=24' @ 4908.00ft (H&P 322)
TVDs to System:	N
North Reference:	Grid
Unit System:	API - US Survey Feet - Custom

Geodetic Scale Factor Applied
Version: 2003.16 Build: 43I

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Design Report for Castor LC25-72HN - MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1,445.00	0.00	0.00	1,445.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 1445.00 ft. MD							
1,663.00	0.59	323.25	1,663.00	0.90	-0.67	0.94	0.27
First Sperry MWD Survey @ 1663.00 ft. MD							
1,758.00	2.44	208.37	1,757.97	-0.49	-1.93	-0.36	2.89
1,853.00	6.24	210.98	1,852.68	-6.70	-5.55	-6.32	4.00
1,948.00	7.87	207.80	1,946.96	-16.88	-11.24	-16.11	1.76
2,044.00	9.42	187.02	2,041.89	-30.49	-15.26	-29.43	3.61
2,138.00	11.16	185.38	2,134.37	-47.19	-17.06	-45.97	1.88
2,233.00	13.35	182.62	2,227.20	-67.30	-18.42	-65.95	2.39
2,328.00	14.50	192.49	2,319.42	-89.87	-21.49	-88.28	2.77
2,423.00	15.96	190.01	2,411.08	-114.34	-26.34	-112.38	1.68
2,518.00	15.32	190.04	2,502.57	-139.56	-30.79	-137.26	0.67
2,613.00	15.07	191.63	2,594.24	-164.02	-35.47	-161.35	0.51
2,708.00	14.86	190.87	2,686.02	-188.08	-40.26	-185.05	0.30
2,803.00	16.10	190.78	2,777.57	-212.98	-45.02	-209.59	1.31
2,897.00	17.25	199.54	2,867.63	-238.93	-52.12	-235.02	2.94
2,992.00	14.83	199.42	2,958.93	-263.67	-60.88	-259.14	2.55
3,087.00	14.39	198.79	3,050.86	-286.31	-68.72	-281.22	0.49
3,182.00	14.81	198.98	3,142.79	-308.97	-76.47	-303.32	0.44
3,276.00	15.05	207.20	3,233.63	-331.19	-85.96	-324.87	2.27
3,371.00	16.37	208.02	3,325.08	-353.98	-97.89	-346.84	1.41
3,466.00	17.30	211.95	3,416.01	-377.78	-111.65	-369.69	1.55
3,561.00	15.98	209.43	3,507.03	-401.16	-125.55	-392.11	1.58
3,656.00	13.58	211.69	3,598.88	-422.04	-137.84	-412.15	2.60
3,751.00	10.22	210.73	3,691.82	-438.78	-148.01	-428.19	3.54
3,846.00	7.50	208.17	3,785.68	-451.49	-155.24	-440.40	2.89
3,941.00	3.34	197.09	3,880.24	-459.61	-158.98	-448.26	4.50
4,036.00	2.05	110.20	3,975.16	-462.84	-158.20	-451.53	4.02
4,131.00	0.62	20.84	4,070.14	-462.95	-156.42	-451.75	2.25
4,510.00	1.26	14.43	4,449.09	-456.99	-154.66	-445.93	0.17
4,795.00	1.30	125.20	4,734.05	-455.82	-151.23	-444.99	0.74
5,080.00	0.77	93.59	5,019.00	-457.81	-146.68	-447.26	0.27
5,206.00	0.74	61.85	5,144.99	-457.48	-145.12	-447.03	0.33
5,263.00	0.68	49.83	5,201.99	-457.08	-144.53	-446.68	0.28
5,358.00	3.31	335.70	5,296.93	-454.22	-145.23	-443.78	3.36
5,453.00	12.22	349.90	5,390.97	-441.80	-148.13	-431.19	9.52
5,547.00	18.19	354.38	5,481.64	-417.38	-151.32	-406.62	6.47
5,642.00	22.95	354.15	5,570.56	-384.18	-154.66	-373.27	5.01
5,737.00	27.97	358.26	5,656.31	-343.45	-157.22	-332.47	5.60
5,832.00	36.29	358.76	5,736.69	-292.99	-158.51	-282.03	8.76
5,927.00	45.96	356.97	5,808.17	-230.64	-160.93	-219.64	10.25
6,022.00	57.73	354.78	5,866.76	-156.27	-166.41	-145.08	12.52
6,069.00	61.20	354.54	5,890.64	-115.97	-170.18	-104.62	7.40
6,117.00	63.78	354.28	5,912.81	-73.61	-174.32	-62.08	5.40
6,211.00	69.63	355.95	5,949.97	12.38	-181.65	24.20	6.43
6,306.00	77.67	356.51	5,976.69	103.26	-187.62	115.28	8.48
6,359.00	80.99	357.47	5,986.50	155.27	-190.36	167.36	6.51
6,403.00	83.76	358.12	5,992.34	198.84	-192.03	210.95	6.46

Design Report for Castor LC25-72HN - MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
Estimated 7" Casing Point: 704' FSL, 687' FEL (Not a Survey Station)							
6,434.00	85.71	358.58	5,995.18	229.70	-192.92	241.79	6.46
6,609.00	90.68	1.46	6,000.69	404.54	-192.85	416.26	3.28
6,657.00	90.71	1.49	6,000.11	452.52	-191.62	464.05	0.09
6,752.00	87.13	359.62	6,001.90	547.48	-190.70	558.75	4.25
6,846.00	86.49	359.16	6,007.13	641.32	-191.70	652.46	0.84
6,942.00	88.86	358.16	6,011.03	737.21	-193.94	748.29	2.68
7,036.00	88.55	357.39	6,013.15	831.12	-197.59	842.24	0.88
7,131.00	89.69	356.67	6,014.61	925.97	-202.51	937.21	1.42
7,226.00	90.06	358.88	6,014.82	1,020.90	-206.20	1,032.17	2.36
7,321.00	89.32	358.26	6,015.33	1,115.86	-208.57	1,127.09	1.02
7,416.00	91.79	0.10	6,014.41	1,210.84	-209.93	1,221.96	3.24
7,511.00	91.20	359.68	6,011.93	1,305.81	-210.11	1,316.73	0.76
7,606.00	90.96	359.26	6,010.14	1,400.78	-210.99	1,411.57	0.51
7,701.00	90.31	357.70	6,009.09	1,495.74	-213.51	1,506.48	1.78
7,796.00	91.02	358.63	6,007.99	1,590.69	-216.55	1,601.42	1.23
7,890.00	91.57	359.56	6,005.86	1,684.65	-218.03	1,695.28	1.15
7,985.00	90.15	359.17	6,004.44	1,779.63	-219.09	1,790.13	1.55
8,080.00	89.35	358.96	6,004.85	1,874.61	-220.64	1,885.02	0.87
8,175.00	89.23	359.41	6,006.03	1,969.60	-221.99	1,979.88	0.49
8,270.00	89.01	359.04	6,007.49	2,064.58	-223.27	2,074.75	0.45
8,365.00	90.25	358.36	6,008.10	2,159.55	-225.43	2,169.65	1.49
8,460.00	89.60	357.37	6,008.23	2,254.48	-228.97	2,264.62	1.25
8,554.00	89.38	357.23	6,009.06	2,348.37	-233.40	2,358.60	0.28
8,649.00	89.82	358.03	6,009.73	2,443.29	-237.32	2,453.57	0.96
8,744.00	90.59	358.30	6,009.39	2,538.24	-240.37	2,548.51	0.86
8,839.00	91.33	359.20	6,007.79	2,633.20	-242.44	2,643.41	1.23
8,934.00	89.63	357.83	6,007.00	2,728.16	-244.90	2,738.32	2.30
9,029.00	89.97	357.02	6,007.33	2,823.06	-249.17	2,833.30	0.92
9,124.00	90.62	356.99	6,006.84	2,917.93	-254.13	2,928.29	0.68
9,219.00	91.88	356.40	6,004.77	3,012.75	-259.61	3,023.27	1.46
9,314.00	91.33	358.72	6,002.11	3,107.62	-263.65	3,118.20	2.51
9,408.00	89.48	359.18	6,001.44	3,201.59	-265.37	3,212.09	2.03
9,503.00	89.51	359.10	6,002.28	3,296.58	-266.80	3,306.96	0.09
9,598.00	90.15	358.71	6,002.56	3,391.56	-268.61	3,401.86	0.79
9,693.00	90.68	359.09	6,001.87	3,486.54	-270.44	3,496.76	0.69
9,788.00	88.28	0.04	6,002.74	3,581.53	-271.16	3,591.59	2.72
9,883.00	87.99	358.86	6,005.83	3,676.47	-272.07	3,686.39	1.28
9,978.00	88.06	358.75	6,009.10	3,771.39	-274.05	3,781.24	0.14
10,073.00	89.54	0.00	6,011.09	3,866.36	-275.09	3,876.07	2.04
10,168.00	90.77	0.01	6,010.83	3,961.36	-275.08	3,970.87	1.29
10,262.00	91.45	0.01	6,009.01	4,055.34	-275.06	4,064.65	0.72
Final Sperry MWD Survey @ 10262.00 ft. MD							
10,328.00	91.45	0.01	6,007.34	4,121.32	-275.05	4,130.48	0.00
Estimated BHL: 696' FNL, 664' FEL :: Straight Line Projection to TD @ 10328.00 ft. MD							

Design Report for Castor LC25-72HN - MWD Surveys

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
1,445.00	1,445.00	0.00	0.00	Surface Casing Assumed Vertical at 1445.00 ft. MD
1,663.00	1,663.00	0.90	-0.67	First Sperry MWD Survey @ 1663.00 ft. MD
6,403.00	5,992.34	198.84	-192.03	Estimated 7" Casing Point: 704' FSL, 687' FEL (Not a Survey Station)
10,262.00	6,009.01	4,055.34	-275.06	Final Sperry MWD Survey @ 10262.00 ft. MD
10,328.00	6,007.34	4,121.32	-275.05	Estimated BHL: 696' FNL, 664' FEL :: Straight Line Projection to TD @ 10328.00 ft. MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Castor LC25-72HN_PlanA - Rev0_BH	356.26	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
1,445.00	6,403.00	Sperry MWD Surveys	MWD
6,403.00	10,328.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
6,403.00	5,992.34	7" Casing PT	7	8-3/4

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Castor	0.00	0.00	0.00	0.00	0.00	1,507,545.77	3,438,463.11	40.715869	-103.918231
- actual wellpath hits target center									
- Polygon									
Point 1				-86.00	113.00	1,507,658.77	3,438,377.11		
Point 2				-4,167.00	-28.00	1,507,517.77	3,434,296.15		
Point 3				-4,306.00	4,091.00	1,511,636.73	3,434,157.15		
Point 4				-2,275.00	4,163.00	1,511,708.73	3,436,188.13		
Point 5				-230.00	4,235.00	1,511,780.73	3,438,233.11		
Point 6				-158.00	2,174.00	1,509,719.75	3,438,305.11		
Point 7				-86.00	113.00	1,507,658.77	3,438,377.11		
Castor	0.00	0.00	6,007.00	4,157.58	-271.82	1,511,703.31	3,438,191.29	40.727292	-103.918944
- actual wellpath misses target center by 36.40ft at 10328.00ft MD (6007.34 TVD, 4121.32 N, -275.05 E)									
- Point									
Castor	0.00	0.00	0.00	0.00	0.00	1,507,545.77	3,438,463.11	40.715869	-103.918231
- actual wellpath hits target center									
- Polygon									
Point 1				514.00	-487.00	1,507,058.78	3,438,977.10		
Point 2				-4,767.00	-628.00	1,506,917.78	3,433,696.16		
Point 3				-4,906.00	4,691.00	1,512,236.72	3,433,557.16		
Point 4				-2,275.00	4,763.00	1,512,308.72	3,436,188.13		
Point 5				370.00	4,835.00	1,512,380.72	3,438,833.11		
Point 6				442.00	2,174.00	1,509,719.75	3,438,905.10		
Point 7				514.00	-487.00	1,507,058.78	3,438,977.10		

North Reference Sheet for Sec. 25-T9N-R59W - Castor LC25-72HN

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB=24' @ 4908.00ft (H&P 322). Northing and Easting are relative to Castor LC25-72HN

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99998975

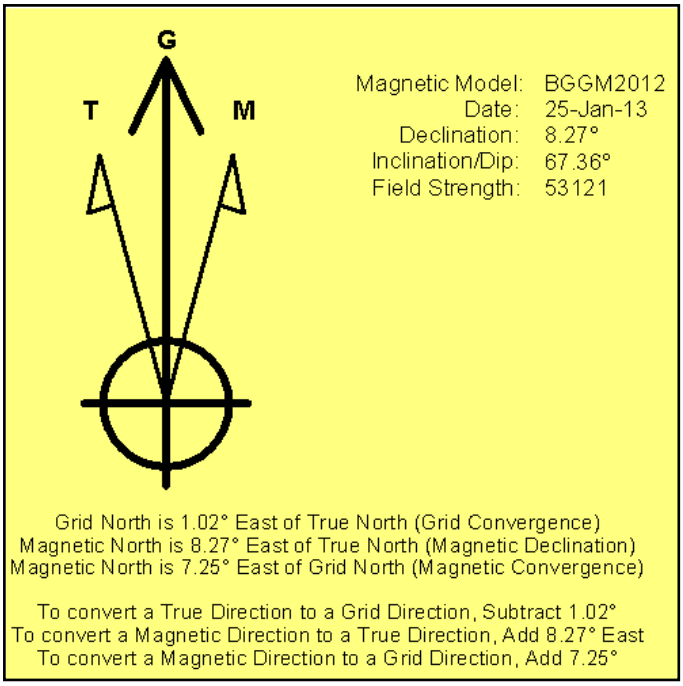
Grid Coordinates of Well: 1,507,545.77 ft N, 3,438,463.11 ft E

Geographical Coordinates of Well: 40° 42' 57.13" N, 103° 55' 05.63" W

Grid Convergence at Surface is: 1.02°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,328.00ft
the Bottom Hole Displacement is 4,130.49ft in the Direction of 356.18° (Grid).

Magnetic Convergence at surface is: -7.25° (25 January 2013, , BGGM2012)



Project: Weld County, CO (NAD 83)
Site: Sec. 25-T9N-R59W
Well: Castor LC25-72HN

Noble Energy

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Sperry Drilling

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Azimuths to Grid North
True North: -1.02°
Magnetic North: 7.25°

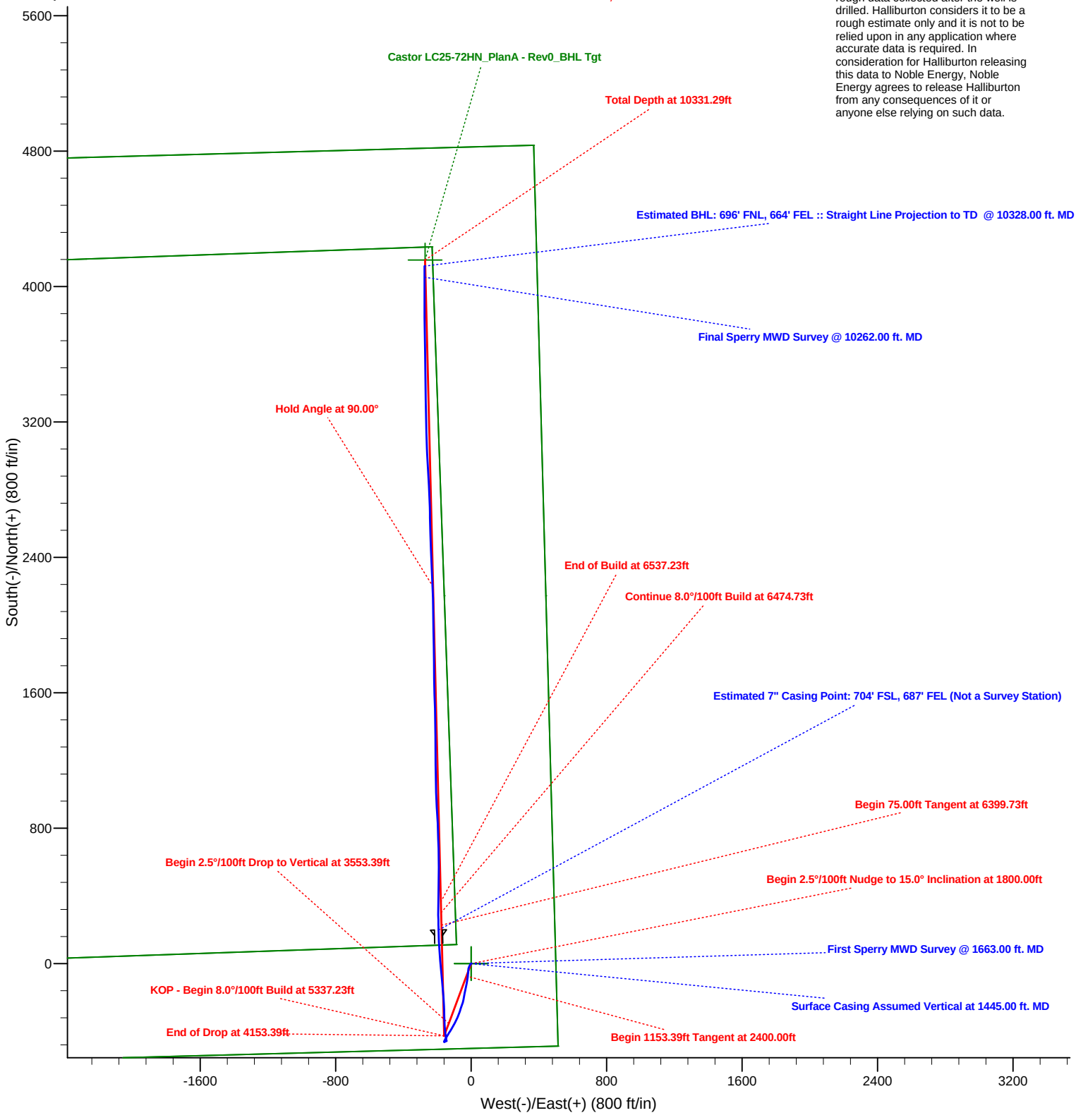
Magnetic Field
Strength: 53121.3snT
Dip Angle: 67.36°
Date: 1/25/2013
Model: BGGM2012

LEGEND

Castor LC25-72HN, Plan A, Plan A - Rev 0 Proposal V0
MWD Surveys

Permitted BHL: 660' FNL, 660' FEL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Castor LC25-72HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.



Project: Weld County, CO (NAD 83)
Site: Sec. 25-T9N-R59W
Well: Castor LC25-72HN

Noble Energy

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Sperry Drilling

Azimuths to Grid North
True North: -1.02°
Magnetic North: 7.25°

Magnetic Field
Strength: 53121.3snT
Dip Angle: 67.36°
Date: 1/25/2013
Model: BGGM2012

LEGEND

Castor LC25-72HN, Plan A, Plan A - Rev 0 Proposal V0
MWD Surveys

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Castor LC25-72HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.