

Noble Energy

Weld County, CO (NAD 83)

Sec. 36-T9N-R58W

Cook State LD36-78HN

Design: Actual Field Surveys

Sperry Drilling Services

Final Survey Report

09 June, 2013

Well Coordinates: 1,507,524.16 N, 3,465,984.86 E (40° 42' 51.91" N, 103° 49' 08.29" W)

Ground Level: 4,744.00 ft

Local Coordinate Origin:

Centered on Well Cook State LD36-78HN

Viewing Datum:

KB=24' @ 4768.00ft (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

HALLIBURTON

Design Report for Cook State LD36-78HN - Actual Field 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
338.00	0.10	12.60	338.00	0.29	0.06	-0.29	0.03
Surface Casing Assumed Vertical at 338.00 ft. MD							
620.00	0.10	33.20	620.00	0.73	0.25	-0.73	0.01
First Sperry MWD Survey @ 620.00 ft. MD							
728.00	0.26	321.12	728.00	1.00	0.15	-1.00	0.23
821.00	0.44	292.30	821.00	1.30	-0.31	-1.31	0.27
914.00	0.61	330.06	913.99	1.87	-0.89	-1.89	0.40
1,007.00	0.51	325.04	1,006.99	2.64	-1.37	-2.68	0.12
1,193.00	0.46	348.09	1,192.98	4.05	-2.00	-4.10	0.11
1,379.00	0.45	12.03	1,378.98	5.49	-2.00	-5.55	0.10
1,472.00	0.35	354.73	1,471.97	6.13	-1.95	-6.19	0.17
1,567.00	0.36	38.04	1,566.97	6.65	-1.80	-6.70	0.28
1,662.00	0.56	79.70	1,661.97	6.97	-1.16	-7.00	0.40
1,757.00	0.50	86.62	1,756.97	7.08	-0.29	-7.08	0.09
1,852.00	0.86	76.56	1,851.96	7.27	0.82	-7.24	0.40
1,946.00	0.31	14.04	1,945.95	7.68	1.57	-7.63	0.82
2,041.00	0.26	315.09	2,040.95	8.08	1.48	-8.03	0.30
2,136.00	0.43	253.19	2,135.95	8.13	0.99	-8.10	0.40
2,231.00	0.89	236.48	2,230.95	7.62	0.03	-7.62	0.52
2,326.00	0.71	223.94	2,325.94	6.79	-0.99	-6.82	0.26
2,421.00	0.48	190.81	2,420.93	5.98	-1.48	-6.02	0.43
2,516.00	1.78	21.84	2,515.92	6.95	-1.00	-6.98	2.37
2,611.00	3.57	359.21	2,610.81	11.28	-0.49	-11.29	2.15
2,706.00	5.11	354.14	2,705.54	18.45	-0.97	-18.47	1.67
2,801.00	7.58	355.80	2,799.95	28.91	-1.86	-28.95	2.61
2,896.00	7.61	356.08	2,894.12	41.43	-2.75	-41.50	0.05
2,990.00	9.56	3.58	2,987.06	55.43	-2.69	-55.49	2.39
3,085.00	11.08	0.40	3,080.52	72.44	-2.13	-72.47	1.71
3,180.00	12.36	3.74	3,173.54	91.71	-1.40	-91.71	1.52
3,275.00	13.15	6.19	3,266.20	112.60	0.43	-112.54	1.01
3,370.00	12.67	7.85	3,358.80	133.67	3.01	-133.52	0.64
3,465.00	11.26	6.10	3,451.73	153.21	5.42	-152.98	1.53
3,560.00	8.90	349.87	3,545.28	169.67	5.12	-169.44	3.86
3,655.00	5.01	340.70	3,639.56	180.83	2.45	-180.67	4.25
3,750.00	2.97	326.59	3,734.33	186.80	-0.27	-186.72	2.37
3,844.00	2.72	318.57	3,828.21	190.50	-3.09	-190.51	0.50
3,939.00	1.54	317.19	3,923.15	193.13	-5.45	-193.20	1.24
4,034.00	0.99	39.64	4,018.13	194.70	-5.79	-194.78	1.81
4,129.00	0.80	61.30	4,113.12	195.65	-4.69	-195.70	0.40
4,224.00	0.94	73.95	4,208.11	196.18	-3.36	-196.19	0.25
4,319.00	1.09	65.14	4,303.09	196.78	-1.79	-196.74	0.23
4,414.00	1.49	61.91	4,398.07	197.74	0.12	-197.65	0.43
4,508.00	1.13	176.43	4,492.05	197.39	1.26	-197.26	2.35
4,603.00	1.05	190.54	4,587.04	195.60	1.15	-195.48	0.29
4,698.00	0.74	221.98	4,682.03	194.29	0.59	-194.18	0.60
4,793.00	0.25	203.18	4,777.02	193.64	0.09	-193.55	0.54
4,888.00	0.60	229.76	4,872.02	193.13	-0.37	-193.05	0.41
4,976.00	0.34	260.01	4,960.02	192.78	-0.98	-192.73	0.40
5,023.00	1.32	148.20	5,007.01	192.30	-0.83	-192.24	3.15

Design Report for Cook State LD36-78HN - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,071.00	5.16	176.85	5,054.93	189.67	-0.42	-189.60	8.44
5,118.00	8.87	173.27	5,101.57	183.96	0.12	-183.88	7.94
5,166.00	13.02	175.21	5,148.69	174.90	1.01	-174.79	8.68
5,213.00	17.33	179.79	5,194.04	162.61	1.48	-162.50	9.51
5,261.00	21.47	180.79	5,239.30	146.67	1.38	-146.57	8.65
5,308.00	25.05	178.12	5,282.48	128.12	1.59	-128.02	7.94
5,356.00	27.85	176.17	5,325.45	106.77	2.67	-106.65	6.11
5,403.00	30.92	175.37	5,366.40	83.78	4.38	-83.61	6.58
5,451.00	33.82	175.76	5,406.93	58.16	6.36	-57.95	6.06
5,498.00	37.20	176.92	5,445.19	30.92	8.09	-30.67	7.33
5,545.00	41.84	179.22	5,481.44	1.04	9.07	-0.77	10.35
5,592.00	46.61	180.30	5,515.11	-31.73	9.20	31.99	10.27
5,640.00	51.81	179.48	5,546.45	-68.06	9.28	68.30	10.91
5,687.00	55.70	177.95	5,574.24	-105.94	10.14	106.20	8.68
5,735.00	59.65	177.17	5,599.90	-146.46	11.87	146.75	8.34
5,782.00	61.86	177.39	5,622.86	-187.42	13.82	187.75	4.72
5,830.00	64.70	178.16	5,644.44	-230.26	15.48	230.62	6.09
5,877.00	66.71	178.79	5,663.78	-273.08	16.61	273.45	4.45
5,925.00	69.70	179.36	5,681.60	-317.64	17.33	318.01	6.33
5,972.00	72.67	180.48	5,696.75	-362.12	17.39	362.48	6.71
6,020.00	75.80	180.59	5,709.79	-408.31	16.96	408.63	6.52
6,061.00	78.14	181.33	5,719.04	-448.24	16.29	448.53	5.97
6,106.00	80.59	181.89	5,727.34	-492.45	15.05	492.68	5.58
Estimated 7" Casing Point: 738' FNL, 660' FWL (Not a Survey Station)							
6,183.00	84.79	182.82	5,737.13	-568.74	11.91	568.84	5.58
6,277.00	85.68	183.26	5,744.94	-662.28	6.94	662.19	1.06
6,372.00	86.86	182.16	5,751.12	-756.97	2.46	756.71	1.70
6,467.00	88.55	179.56	5,754.93	-851.87	1.04	851.53	3.26
6,562.00	88.83	177.15	5,757.10	-946.80	3.76	946.49	2.55
6,657.00	89.72	177.06	5,758.30	-1,041.67	8.56	1,041.46	0.94
6,752.00	89.57	175.42	5,758.89	-1,136.46	14.79	1,136.40	1.73
6,847.00	90.03	173.17	5,759.22	-1,230.98	24.23	1,231.16	2.42
6,942.00	89.48	172.86	5,759.63	-1,325.28	35.78	1,325.76	0.66
7,037.00	89.97	174.80	5,760.08	-1,419.72	45.99	1,420.46	2.11
7,131.00	90.80	176.01	5,759.45	-1,513.41	53.52	1,514.34	1.56
7,226.00	91.26	177.57	5,757.74	-1,608.25	58.84	1,609.29	1.71
7,321.00	90.92	178.72	5,755.94	-1,703.18	61.92	1,704.27	1.26
7,416.00	88.46	179.23	5,756.45	-1,798.15	63.62	1,799.25	2.64
7,511.00	88.74	179.96	5,758.77	-1,893.12	64.29	1,894.20	0.82
7,606.00	90.03	180.06	5,759.79	-1,988.12	64.27	1,989.15	1.36
7,701.00	89.66	178.93	5,760.05	-2,083.11	65.11	2,084.12	1.25
7,795.00	89.82	177.23	5,760.48	-2,177.05	68.26	2,178.12	1.82
7,890.00	89.85	176.91	5,760.75	-2,271.93	73.11	2,273.10	0.34
7,985.00	90.89	178.28	5,760.14	-2,366.84	77.10	2,368.08	1.81
8,080.00	91.79	179.91	5,757.91	-2,461.80	78.60	2,463.05	1.96
8,175.00	89.85	177.91	5,756.55	-2,556.76	80.41	2,558.02	2.93
8,270.00	90.03	176.92	5,756.65	-2,651.66	84.69	2,653.01	1.06
8,364.00	91.48	179.25	5,755.42	-2,745.59	87.83	2,746.99	2.92
8,460.00	90.59	181.25	5,753.68	-2,841.57	87.41	2,842.91	2.28
8,555.00	88.77	180.43	5,754.21	-2,936.55	86.02	2,937.81	2.10
8,650.00	89.08	181.12	5,755.99	-3,031.53	84.74	3,032.71	0.80

Design Report for Cook State LD36-78HN - Actual Field Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,745.00	88.34	179.79	5,758.13	-3,126.50	83.98	3,127.61	1.60
8,839.00	89.63	180.37	5,759.80	-3,220.48	83.85	3,221.55	1.50
8,934.00	89.91	179.82	5,760.18	-3,315.48	83.69	3,316.50	0.65
9,030.00	90.56	179.38	5,759.79	-3,411.48	84.36	3,412.47	0.82
9,125.00	89.26	177.30	5,759.93	-3,506.43	87.12	3,507.47	2.58
9,220.00	88.64	177.37	5,761.68	-3,601.31	91.53	3,602.44	0.66
9,315.00	89.54	177.21	5,763.18	-3,696.19	96.02	3,697.41	0.96
9,410.00	88.92	177.01	5,764.46	-3,791.06	100.81	3,792.38	0.69
9,505.00	89.66	177.22	5,765.64	-3,885.93	105.59	3,887.35	0.81
Final Sperry MWD Survey @ 9505.00 ft. MD							
9,975.00	92.00	177.22	5,758.83	-4,355.30	128.39	4,357.19	0.50
Estimated BHL: 661' FSL, 657' FWL :: Straight Line Projection to TD @ 9975.00 ft. MD							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
338.00	338.00	0.29	0.06	Surface Casing Assumed Vertical at 338.00 ft. MD
620.00	620.00	0.73	0.25	First Sperry MWD Survey @ 620.00 ft. MD
6,106.00	5,727.34	-492.45	15.05	Estimated 7" Casing Point: 738' FNL, 660' FWL (Not a Survey Station)
9,505.00	5,765.64	-3,885.93	105.59	Final Sperry MWD Survey @ 9505.00 ft. MD
9,975.00	5,758.83	-4,355.30	128.39	Estimated BHL: 661' FSL, 657' FWL :: Straight Line Projection to TD @ 9975.00 ft. MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (ft)	+E/-W (ft)	Start TVD (ft)
Target	Cook State LD36-78HN_PlanA - Rev0_BH L Tgt	178.29	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
338.00	6,106.00	Sperry MWD Field Surveys	MWD
6,106.00	9,975.00	Sperry MWD Field Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
6,106.00	5,727.34	7" Casing PT	7	8-3/4

Design Report for Cook State LD36-78HN - Actual Field Surveys

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
Cook State	0.00	0.00	0.00	0.00	0.00	1,507,524.16	3,465,984.86	40.714420	-103.818970
- actual wellpath hits target center									
- Polygon									
Point 1				-67.00	-376.00	1,507,148.16	3,465,917.86		
Point 2				1,971.00	-282.00	1,507,242.16	3,467,955.84		
Point 3				4,009.00	-195.00	1,507,329.16	3,469,993.82		
Point 4				4,079.00	-2,239.00	1,505,285.18	3,470,063.82		
Point 5				4,149.00	-4,284.00	1,503,240.21	3,470,133.82		
Point 6				2,121.00	-4,359.00	1,503,165.21	3,468,105.84		
Point 7				91.00	-4,435.00	1,503,089.21	3,466,075.86		
Point 8				13.00	-2,405.00	1,505,119.19	3,465,997.86		
Point 9				-67.00	-376.00	1,507,148.16	3,465,917.86		
Cook State	0.00	0.00	0.00	0.00	0.00	1,507,524.16	3,465,984.86	40.714420	-103.818970
- actual wellpath hits target center									
- Polygon									
Point 1				-667.00	224.00	1,507,748.16	3,465,317.87		
Point 2				1,971.00	318.00	1,507,842.16	3,467,955.84		
Point 3				4,609.00	405.00	1,507,929.16	3,470,593.81		
Point 4				4,679.00	-2,239.00	1,505,285.18	3,470,663.81		
Point 5				4,749.00	-4,884.00	1,502,640.21	3,470,733.81		
Point 6				2,121.00	-4,959.00	1,502,565.21	3,468,105.84		
Point 7				-509.00	-5,035.00	1,502,489.21	3,465,475.87		
Point 8				-587.00	-2,405.00	1,505,119.19	3,465,397.87		
Point 9				-667.00	224.00	1,507,748.16	3,465,317.87		
Cook State	0.00	0.00	5,742.00	-4,355.72	129.73	1,503,168.49	3,466,114.59	40.702460	-103.818800
- actual wellpath misses target center by 16.89ft at 9975.00ft MD (5758.83 TVD, -4355.30 N, 128.39 E)									
- Point									

North Reference Sheet for Sec. 36-T9N-R58W - Cook State LD36-78HN

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' @ 4768.00ft (H&P 322). Northing and Easting are relative to Cook State LD36-78HN

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: 0.99998954

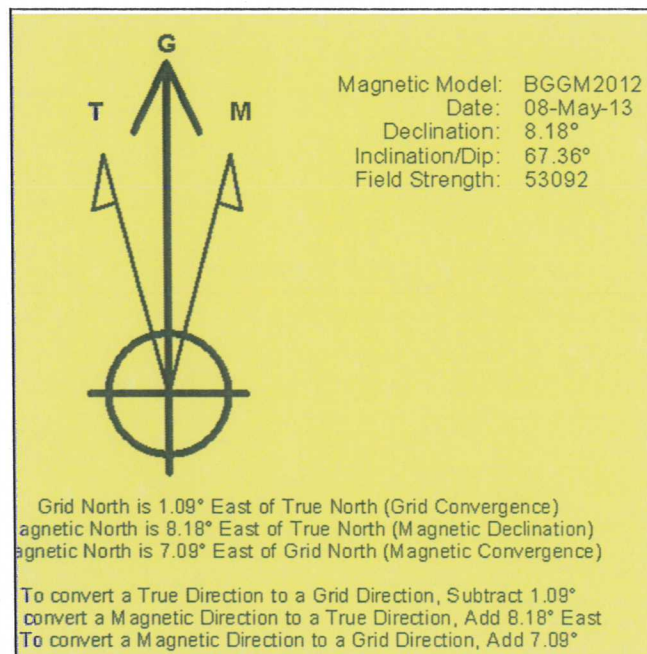
Grid Coordinates of Well: 1,507,524.16 ft N, 3,465,984.86 ft E

Geographical Coordinates of Well: 40° 42' 51.91" N, 103° 49' 08.29" W

Grid Convergence at Surface is: 1.09°

Based upon Minimum Curvature type calculations, at a Measured Depth of 9,975.00ft
the Bottom Hole Displacement is 4,357.19ft in the Direction of 178.31° (Grid).

Magnetic Convergence at surface is: -7.09° (8 May 2013, , BGGM2012)

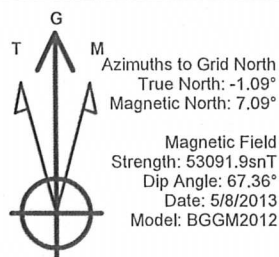


Project: Weld County, CO (NAD 83)
 Site: Sec. 36-T9N-R58W
 Well: Cook State LD36-78HN

Noble Energy

HALLIBURTON

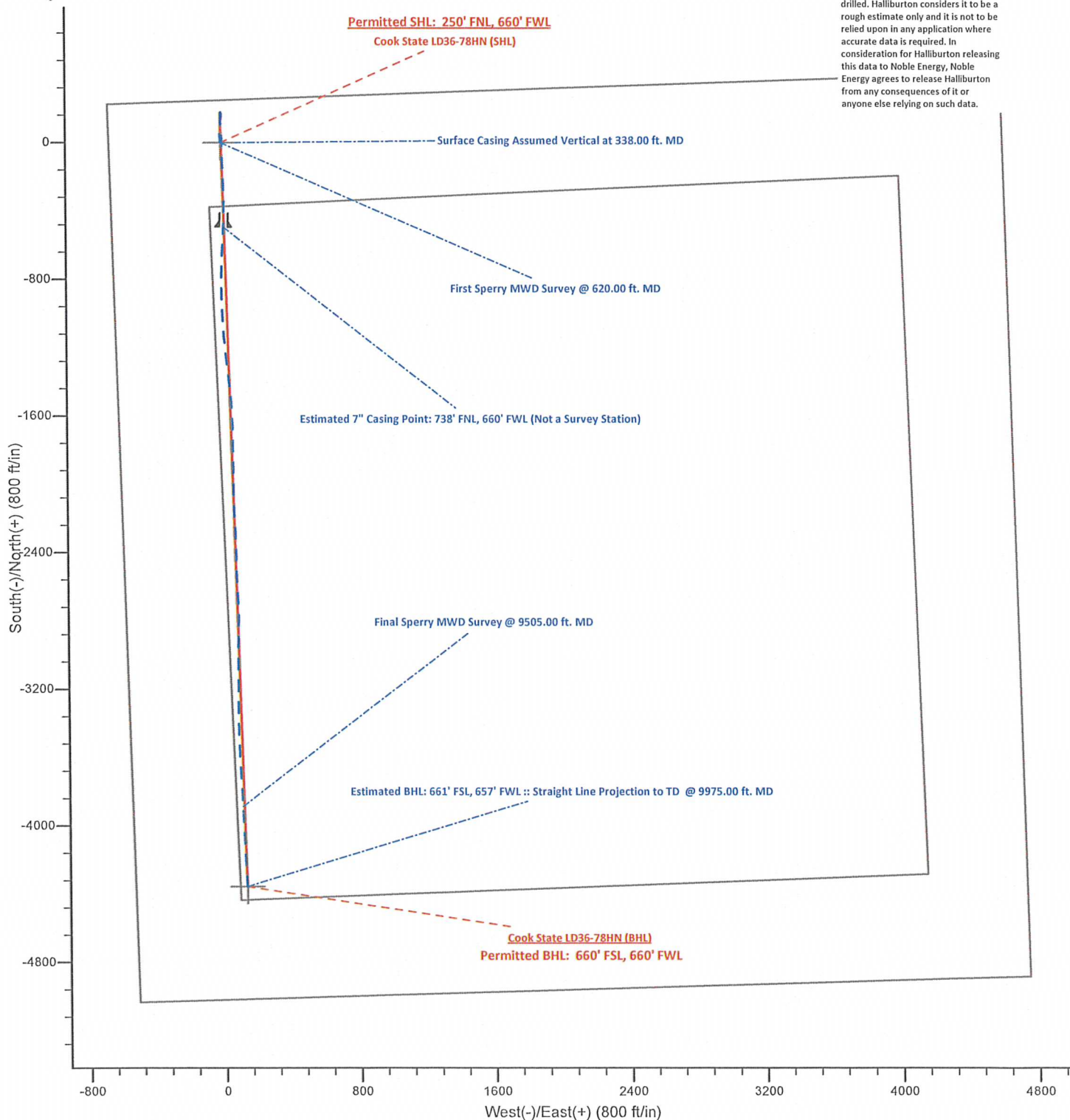
Sperry Drilling



LEGEND

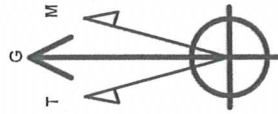
- Cook State LD36-78HN, Plan A Rev 0 Proposal
- - - Actual Field Surveys

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Cook State LD36-78HN 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. 36-T9N-R58W
Well: Cook State LD36-78HN

Noble Energy



Azimuths to Grid North
True North: -1.09°
Magnetic North: 7.09°
Magnetic Field
Strength: 53091.9snT
Dip Angle: 67.36°
Date: 5/8/2013
Model: BGGM2012

LEGEND

- Cook State LD36-78HN, Plan A Rev 0 Proposal
- - - Actual Field Surveys

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Cook State LD36-78HN 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.

