Noble Energy

Weld County, CO (NAD 83)
Sec. 20-T8N-R63W
Kern GW17-78HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

20 November, 2012

Well Coordinates: 1,482,326.56 N, 3,286,585.78 E (40° 39' 10.08" N, 104° 28' 01.67" W)
Ground Level: 4,977.00 ft

Local Coordinate Origin:	Centered on Well Kern GW17-78HN
Viewing Datum:	KB @ 5001.00ft (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 Kern GW17-78HN - MWD Survey

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
947.00	0.00	0.00	947.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 947.00ft							
1,017.00	0.43	112.48	1,017.00	-0.10	0.24	-0.08	0.61
First MWD Survey							
1,112.00	0.61	118.34	1,112.00	-0.48	1.02	-0.39	0.20
1,204.00	0.44	64.81	1,203.99	-0.56	1.77	-0.40	0.54
1,296.00	0.47	113.59	1,295.99	-0.56	2.43	-0.34	0.41
1,387.00	0.28	77.98	1,386.99	-0.66	2.99	-0.40	0.32
1,480.00	0.25	194.02	1,479.99	-0.81	3.17	-0.53	0.48
1,572.00	0.22	116.54	1,571.99	-1.09	3.28	-0.80	0.32
1,664.00	0.28	129.08	1,663.99	-1.31	3.61	-0.99	0.09
1,756.00	0.26	119.62	1,755.98	-1.55	3.96	-1.20	0.05
1,849.00	0.25	163.05	1,848.98	-1.85	4.21	-1.47	0.20
2,033.00	0.33	185.06	2,032.98	-2.76	4.28	-2.38	0.07
2,125.00	0.88	139.21	2,124.98	-3.56	4.71	-3.13	0.75
2,217.00	3.12	82.50	2,216.92	-3.77	7.66	-3.08	2.98
2,310.00	5.01	72.66	2,309.68	-2.23	14.05	-0.99	2.16
2,403.00	7.18	61.02	2,402.16	1.80	23.01	3.81	2.67
2,497.00	8.98	56.54	2,495.22	8.69	34.27	11.66	2.03
2,593.00	10.87	52.38	2,589.78	18.35	47.69	22.45	2.10
2,688.00	12.24	55.64	2,682.85	29.50	63.10	34.91	1.60
2,783.00	14.55	51.30	2,775.26	42.65	80.73	49.55	2.65
2,878.00	14.13	51.07	2,867.30	57.39	99.06	65.84	0.45
2,972.00	16.51	46.16	2,957.96	73.86	117.62	83.87	2.88
3,067.00	17.36	43.41	3,048.84	93.51	137.10	105.14	1.23
3,162.00	18.06	42.45	3,139.34	114.67	156.78	127.95	0.80
3,257.00	16.62	40.84	3,230.02	135.81	175.60	150.66	1.60
3,352.00	15.50	49.00	3,321.32	154.42	194.07	170.81	2.65
3,446.00	15.90	49.57	3,411.82	171.01	213.35	189.03	0.46
3,542.00	16.28	47.63	3,504.06	188.61	233.30	208.30	0.69
3,637.00	15.65	54.35	3,595.40	205.05	253.56	226.45	2.05
3,731.00	14.39	53.74	3,686.19	219.35	273.28	242.42	1.35
3,827.00	13.52	52.79	3,779.35	233.19	291.83	257.83	0.94
3,922.00	14.10	54.67	3,871.61	246.60	310.12	272.79	0.77
4,017.00	15.41	54.98	3,963.47	260.54	329.90	288.40	1.38
4,112.00	15.93	54.94	4,054.94	275.27	350.91	304.92	0.55
4,207.00	17.25	55.50	4,145.98	290.74	373.19	322.27	1.40
4,303.00	15.66	51.20	4,238.05	306.92	395.02	340.31	2.09
4,398.00	13.09	47.15	4,330.07	322.27	412.90	357.16	2.90
4,493.00	11.36	43.69	4,422.92	336.35	427.25	372.45	1.98
4,587.00	8.73	36.96	4,515.47	348.75	437.94	385.73	3.06
4,683.00	6.21	25.43	4,610.65	359.26	444.55	396.78	3.04
4,777.00	3.80	8.99	4,704.29	366.93	447.22	404.66	2.96
4,872.00	2.31	4.83	4,799.15	371.95	447.87	409.71	1.58
4,967.00	0.23	16.02	4,894.13	374.04	448.09	411.82	2.19
5,063.00	0.22	115.77	4,990.13	374.15	448.31	411.94	0.36
5,158.00	0.30	123.72	5,085.12	373.93	448.68	411.76	0.09
5,253.00	0.33	182.58	5,180.12	373.52	448.87	411.36	0.33
5,348.00	0.28	103.41	5,275.12	373.19	449.08	411.06	0.41

Design Report for Kern GW17-78HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,443.00	0.53	53.14	5,370.12	373.40	449.66	411.32	0.43
5,538.00	0.59	65.14	5,465.12	373.87	450.46	411.85	0.14
5,633.00	0.61	19.64	5,560.11	374.55	451.07	412.59	0.49
5,728.00	0.94	0.37	5,655.10	375.81	451.25	413.85	0.44
5,823.00	0.77	346.66	5,750.09	377.21	451.10	415.23	0.28
5,918.00	0.83	311.69	5,845.08	378.29	450.44	416.25	0.51
6,013.00	0.74	301.63	5,940.07	379.07	449.41	416.94	0.17
6,108.00	1.01	318.41	6,035.06	380.01	448.33	417.79	0.39
6,203.00	0.57	308.89	6,130.05	380.94	447.40	418.62	0.48
6,298.00	0.89	334.05	6,225.05	381.90	446.71	419.52	0.47
6,343.00	2.48	8.58	6,270.03	383.17	446.71	420.79	4.04
6,394.00	4.80	11.59	6,320.92	386.36	447.30	424.01	4.56
6,441.00	6.96	9.06	6,367.67	391.10	448.14	428.81	4.63
6,489.00	8.62	4.46	6,415.23	397.55	448.88	435.31	3.69
6,536.00	10.49	5.44	6,461.57	405.33	449.56	443.11	3.99
6,584.00	12.64	8.93	6,508.60	414.86	450.79	452.72	4.71
6,631.00	16.91	6.44	6,554.03	426.74	452.36	464.69	9.18
6,679.00	21.88	5.15	6,599.29	442.60	453.94	480.62	10.39
6,726.00	25.87	3.26	6,642.26	461.56	455.31	499.63	8.64
6,775.00	30.97	359.51	6,685.35	484.86	455.81	522.89	11.02
6,822.00	34.64	355.85	6,724.85	510.29	454.74	548.12	8.87
6,870.00	40.45	356.41	6,762.89	539.46	452.78	577.01	12.12
6,917.00	45.95	358.08	6,797.14	571.58	451.26	608.88	11.95
6,965.00	50.50	1.37	6,829.11	607.36	451.12	644.50	10.77
7,012.00	55.69	1.76	6,857.33	644.92	452.15	682.01	11.06
7,059.00	60.32	5.79	6,882.23	684.66	454.81	721.83	12.24
7,106.00	64.15	6.88	6,904.12	725.99	459.40	763.40	8.40
7,154.00	69.65	6.46	6,922.95	769.83	464.53	807.52	11.49
7,201.00	73.31	6.27	6,937.87	814.11	469.47	852.07	7.80
7,250.00	76.27	3.82	6,950.73	861.20	473.62	899.34	7.73
7,297.00	79.12	2.60	6,960.75	907.04	476.19	945.23	6.57
7,344.00	79.91	2.89	6,969.30	953.21	478.40	991.41	1.79
7,386.00	83.32	1.21	6,975.42	994.72	479.88	1,032.90	9.03
7,523.00	88.24	1.00	6,985.50	1,131.28	482.52	1,169.17	3.59
7,602.00	91.02	0.45	6,986.01	1,210.27	483.51	1,247.93	3.59
7,697.00	91.70	358.88	6,983.76	1,305.24	482.96	1,342.49	1.80
7,793.00	89.35	357.91	6,982.88	1,401.19	480.27	1,437.84	2.65
7,888.00	90.46	358.32	6,983.03	1,496.13	477.15	1,532.15	1.25
7,982.00	88.95	356.86	6,983.52	1,590.04	473.19	1,625.35	2.23
8,077.00	90.22	357.80	6,984.21	1,684.93	468.77	1,719.49	1.66
8,172.00	90.09	356.75	6,983.95	1,779.83	464.25	1,813.62	1.11
8,267.00	88.00	356.28	6,985.53	1,874.63	458.48	1,907.56	2.25
8,362.00	89.91	356.89	6,987.27	1,969.44	452.82	2,001.51	2.11
8,457.00	89.82	356.49	6,987.49	2,064.28	447.34	2,095.51	0.43
8,552.00	89.91	358.57	6,987.71	2,159.19	443.24	2,189.69	2.19
8,647.00	87.19	358.04	6,990.12	2,254.11	440.43	2,284.00	2.92
8,742.00	87.69	359.51	6,994.36	2,348.99	438.41	2,378.34	1.63
8,837.00	88.64	359.42	6,997.40	2,443.93	437.52	2,472.84	1.00
8,932.00	88.74	0.27	6,999.57	2,538.91	437.26	2,567.43	0.90
9,027.00	86.88	359.73	7,003.20	2,633.83	437.26	2,661.99	2.04
9,122.00	87.50	359.73	7,007.86	2,728.72	436.81	2,756.47	0.65

Design Report for Kern GW17-78HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,217.00	89.66	1.26	7,010.22	2,823.68	437.64	2,851.14	2.79
9,264.00	91.79	1.54	7,009.62	2,870.66	438.78	2,898.04	4.57
9,312.00	93.42	2.31	7,007.44	2,918.58	440.39	2,945.92	3.75
9,359.00	92.00	0.13	7,005.22	2,965.51	441.39	2,992.76	5.53
9,407.00	91.51	359.28	7,003.75	3,013.49	441.15	3,040.53	2.04
9,454.00	90.09	357.80	7,003.09	3,060.47	439.95	3,087.22	4.36
9,501.00	89.01	356.79	7,003.46	3,107.41	437.73	3,133.79	3.15
9,596.00	91.11	357.09	7,003.36	3,202.27	432.66	3,227.84	2.23
9,691.00	88.86	356.31	7,003.39	3,297.10	427.19	3,321.84	2.51
9,786.00	88.33	358.02	7,005.71	3,391.96	422.49	3,415.91	1.88
9,881.00	89.20	0.26	7,007.76	3,486.92	421.07	3,510.39	2.53
9,976.00	91.20	0.39	7,007.43	3,581.91	421.61	3,605.06	2.11
10,071.00	89.85	359.64	7,006.56	3,676.90	421.63	3,699.69	1.63
10,166.00	89.88	1.27	7,006.78	3,771.90	422.39	3,794.39	1.72
10,261.00	89.69	3.28	7,007.14	3,866.82	426.16	3,889.27	2.13
10,356.00	87.29	0.88	7,009.64	3,961.71	429.61	3,984.10	3.57
10,451.00	88.86	0.79	7,012.84	4,056.64	430.99	4,078.79	1.66
10,546.00	90.62	0.97	7,013.27	4,151.62	432.45	4,173.54	1.86
10,641.00	92.04	0.51	7,011.06	4,246.59	433.67	4,268.25	1.57
10,736.00	91.02	359.83	7,008.52	4,341.55	433.96	4,362.87	1.29
10,831.00	88.58	358.96	7,008.86	4,436.54	432.95	4,457.40	2.73
10,926.00	90.09	358.98	7,009.96	4,531.51	431.25	4,551.87	1.59
11,021.00	90.83	358.33	7,009.20	4,626.48	429.02	4,646.28	1.04
11,116.00	90.34	358.25	7,008.23	4,721.43	426.18	4,740.62	0.52
11,211.00	91.48	357.93	7,006.72	4,816.37	423.02	4,834.91	1.25
11,285.00	92.68	357.55	7,004.03	4,890.26	420.10	4,908.26	1.70
Final MWD Survey							
11,342.00	92.68	357.55	7,001.37	4,947.15	417.67	4,964.72	0.00
Survey Projection to TD - Estimated BHL: 691' FNL, 659' FWL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
947.00	947.00	0.00	0.00	Surface Casing Assumed Vertical at 947.00ft
1,017.00	1,017.00	-0.10	0.24	First MWD Survey
11,285.00	7,004.03	4,890.26	420.10	Final MWD Survey
11,342.00	7,001.37	4,947.15	417.67	Survey Projection to TD
11,342.00	7,001.37	4,947.15	417.67	Estimated BHL: 691' FNL, 659' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Kern GW17-78HN_PlanB - Rev0_B	5.02	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
947.00	11,342.00	Sperry MWD Surveys	MWD

Design Report for Kern GW17-78HN - MWD Survey

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
Kern	0.00	0.00	0.00	0.00	0.00	1,482,326.56	3,286,585.78	40.652800	-104.467130
- actual wellpath hits target center									
- Polygon									
Point 1				-250.00	278.00	1,482,604.56	3,286,335.78		
Point 2				-245.00	2,952.00	1,485,278.51	3,286,340.78		
Point 3				-238.00	5,630.00	1,487,956.46	3,286,347.78		
Point 4				2,395.00	5,668.00	1,487,994.46	3,288,980.74		
Point 5				5,008.00	5,695.00	1,488,021.46	3,291,593.69		
Point 6				5,006.00	3,036.00	1,485,362.51	3,291,591.69		
Point 7				5,002.00	376.00	1,482,702.56	3,291,587.69		
Point 8				2,374.00	327.00	1,482,653.56	3,288,959.74		
Point 9				-250.00	278.00	1,482,604.56	3,286,335.78		
Kern	0.00	0.00	6,981.00	4,963.93	436.02	1,487,290.40	3,287,021.79	40.666410	-104.465350
- actual wellpath misses target center by 32.15ft at 11342.00ft MD (7001.37 TVD, 4947.15 N, 417.67 E)									
- Point									
Kern	0.00	0.00	0.00	0.00	0.00	1,482,326.56	3,286,585.78	40.652800	-104.467130
- actual wellpath hits target center									
- Polygon									
Point 1				350.00	878.00	1,483,204.55	3,286,935.77		
Point 2				355.00	2,952.00	1,485,278.51	3,286,940.77		
Point 3				362.00	5,030.00	1,487,356.47	3,286,947.77		
Point 4				2,395.00	5,068.00	1,487,394.47	3,288,980.74		
Point 5				4,408.00	5,095.00	1,487,421.47	3,290,993.70		
Point 6				4,406.00	3,036.00	1,485,362.51	3,290,991.70		
Point 7				4,402.00	976.00	1,483,302.54	3,290,987.70		
Point 8				2,374.00	927.00	1,483,253.55	3,288,959.74		
Point 9				350.00	878.00	1,483,204.55	3,286,935.77		

North Reference Sheet for Sec. 20-T8N-R63W - Kern GW17-78HN

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

Vertical Depths are relative to KB @ 5001.00ft (H&P 322). Northing and Easting are relative to Kern GW17-78HN

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: 0.99998142

Grid Coordinates of Well: 1,482,326.56 ft N, 3,286,585.78 ft E

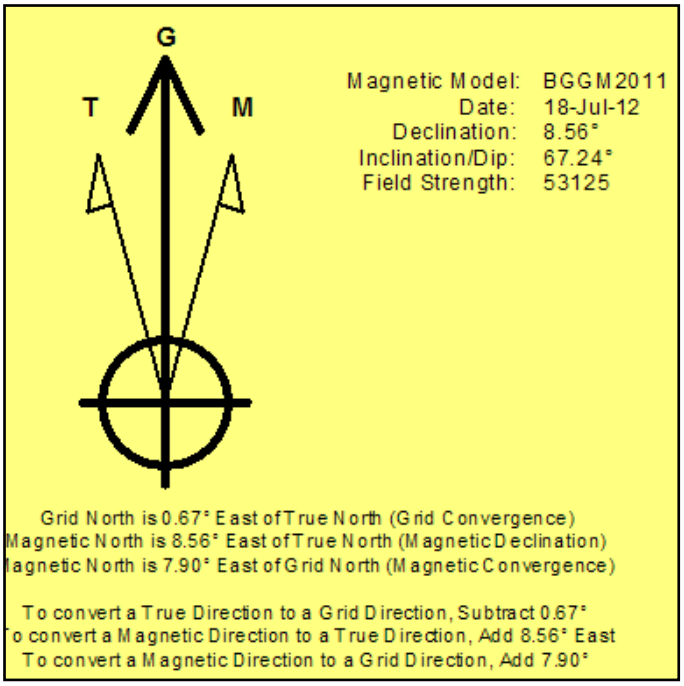
Geographical Coordinates of Well: 40° 39' 10.08" N, 104° 28' 01.67" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,342.00ft

the Bottom Hole Displacement is 4,964.75ft in the Direction of 4.83° (Grid).

Magnetic Convergence at surface is: -7.90° (18 July 2012, , BGGM2011)



Project: Weld County, CO (NAD 83)
Site: Sec. 20-T8N-R63W
Well: Kern GW17-78HN

Noble Energy

HALLIBURTON
Sperry Drilling

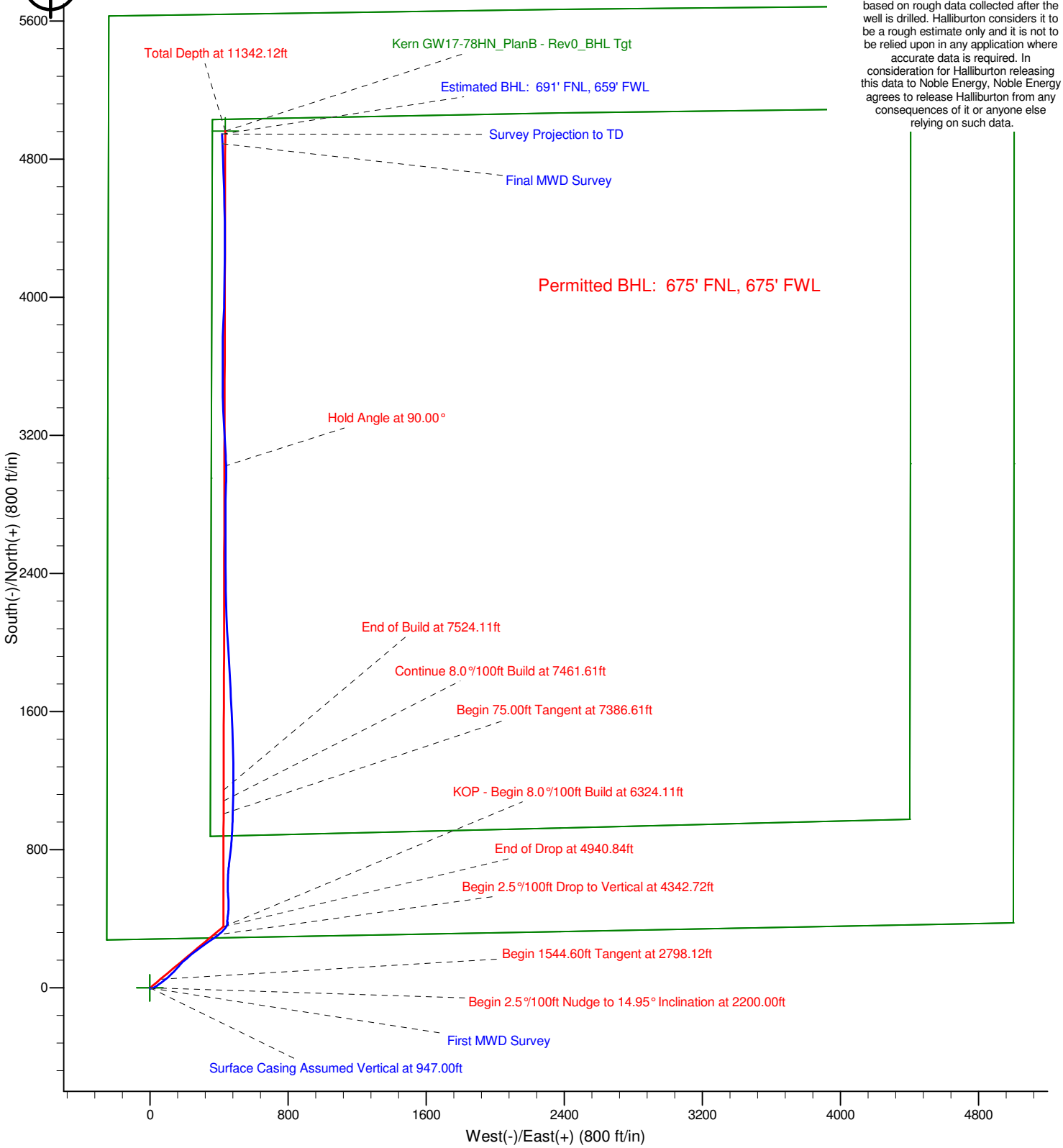
Azimuths to Grid North
True North: -0.67°
Magnetic North: 7.90°

Magnetic Field
Strength: 53125.4snT
Dip Angle: 67.24°
Date: 7/18/2012
Model: BGGM2011

LEGEND

Kern GW17-78HN, Plan B, Plan B - Rev 0 Proposal V0
MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Kern GW17-78HN 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. 20-T8N-R63W
Well: Kern GW17-78HN

Noble Energy

HALLIBURTON
Sperry Drilling

Azimuths to Grid North
True North: -0.67°
Magnetic North: 7.90°

Magnetic Field
Strength: 53125.4snT
Dip Angle: 67.24°
Date: 7/18/2012
Model: BGGM2011

LEGEND

Kern GW17-78HN, Plan B, Plan B - Rev 0 Proposal V0
MWD Survey

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