

# Noble Energy

Weld County, CO (NAD 83)

Sec. 11-T5N-R64W (Wacker 11 PAD)

Wacker B12-69HN - A1

Design: MWD Survey

## Sperry Drilling Services Final Survey Report

14 May, 2012

Well Coordinates: 1,397,610.16 N, 3,275,897.41 E (40° 25' 14.20" N, 104° 30' 32.62" W)

Ground Level: 4,595.00 ft

Local Coordinate Origin: Centered on Well Wacker B12-69HN - Slot A1

Viewing Datum: KB @ 4619.00ft (H&P 343)

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 Wacker B12-69HN - 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
719.00	0.00	0.00	719.00	0.00	0.00	0.00	0.00
<b>Surface Casing Assumed Vertical at 719.00ft</b>							
811.00	0.76	13.01	811.00	0.59	0.14	0.16	0.83
<b>First MWD Survey</b>							
903.00	0.58	27.89	902.99	1.60	0.49	0.56	0.27
995.00	1.56	75.53	994.98	2.33	1.92	2.02	1.35
1,090.00	3.10	59.85	1,089.89	3.94	5.40	5.57	1.74
1,185.00	4.05	59.00	1,184.71	6.96	10.49	10.79	1.00
1,279.00	5.48	68.29	1,278.38	10.33	17.51	17.95	1.72
1,374.00	7.39	65.17	1,372.78	14.57	27.27	27.89	2.04
1,469.00	8.41	62.44	1,466.88	20.35	38.97	39.84	1.14
1,563.00	8.40	57.41	1,559.87	27.23	50.85	52.02	0.78
1,658.00	9.86	63.19	1,653.67	34.64	63.96	65.44	1.81
1,753.00	10.69	72.55	1,747.15	40.95	79.63	81.38	1.96
1,847.00	11.35	77.65	1,839.42	45.54	96.98	98.92	1.25
1,942.00	8.65	73.55	1,932.97	49.56	112.97	115.07	2.94
2,037.00	10.58	74.27	2,026.63	53.95	128.21	130.50	2.04
2,135.00	9.72	68.25	2,123.09	59.46	144.56	147.07	1.39
2,231.00	8.91	70.19	2,217.83	64.98	159.08	161.82	0.90
2,326.00	10.19	67.56	2,311.51	70.68	173.77	176.75	1.42
2,422.00	9.31	60.59	2,406.13	77.74	188.38	191.67	1.53
2,517.00	10.01	65.56	2,499.78	84.92	202.59	206.19	1.15
2,613.00	11.21	63.87	2,594.14	92.49	218.57	222.48	1.29
2,708.00	12.20	61.91	2,687.16	101.28	235.71	240.00	1.12
2,804.00	10.99	61.50	2,781.20	110.42	252.71	257.39	1.26
2,899.00	9.29	59.51	2,874.71	118.64	267.27	272.31	1.83
2,995.00	6.83	48.94	2,969.76	126.32	278.26	283.62	2.98
3,090.00	5.14	45.05	3,064.24	133.04	285.53	291.19	1.83
3,186.00	3.01	48.34	3,159.99	137.75	290.46	296.32	2.23
3,281.00	1.46	291.43	3,254.95	139.85	291.19	297.15	4.10
3,377.00	1.47	294.84	3,350.92	140.81	288.94	294.94	0.09
3,472.00	1.59	258.57	3,445.89	141.07	286.54	292.55	1.01
3,568.00	1.40	273.49	3,541.85	140.87	284.06	290.07	0.45
3,663.00	1.81	270.58	3,636.82	140.96	281.40	287.42	0.44
3,759.00	2.15	276.48	3,732.76	141.18	278.10	284.13	0.41
3,854.00	1.47	241.09	3,827.71	140.79	275.26	281.28	1.34
3,950.00	0.68	228.83	3,923.70	139.82	273.75	279.73	0.85
4,045.00	0.48	191.28	4,018.69	139.06	273.25	279.19	0.44
4,332.00	1.28	168.65	4,305.66	134.74	273.65	279.39	0.30
4,618.00	2.42	201.99	4,591.51	126.00	272.02	277.37	0.53
4,713.00	0.59	290.67	4,686.48	124.32	270.81	276.09	2.61
4,904.00	0.74	272.33	4,877.47	124.71	268.65	273.96	0.14
5,191.00	0.92	235.88	5,164.44	123.50	264.90	270.15	0.19
5,286.00	1.67	208.01	5,259.41	121.85	263.61	268.79	1.01
5,381.00	1.80	211.00	5,354.37	119.35	262.20	267.26	0.17
5,477.00	1.63	208.61	5,450.33	116.86	260.76	265.72	0.19
5,763.00	1.07	218.22	5,736.25	111.19	257.16	261.88	0.21
5,794.00	1.22	246.67	5,767.24	110.83	256.68	261.38	1.87
5,842.00	1.70	122.89	5,815.23	110.24	256.81	261.48	5.39

**Design Report for Wacker B12-69HN - MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,889.00	6.17	108.21	5,862.11	109.07	259.80	264.41	9.67
5,937.00	10.59	102.89	5,909.59	107.28	266.55	271.08	9.34
5,984.00	14.01	97.09	5,955.50	105.61	276.41	280.85	7.73
6,032.00	16.98	89.28	6,001.76	104.98	289.19	293.59	7.55
6,080.00	20.64	84.24	6,047.19	105.92	304.62	309.05	8.34
6,128.00	23.29	88.07	6,091.71	107.09	322.53	326.99	6.27
6,175.00	25.77	88.77	6,134.46	107.62	342.03	346.50	5.31
6,223.00	29.07	89.07	6,177.06	108.04	364.13	368.59	6.88
6,271.00	32.22	87.70	6,218.35	108.74	388.58	393.05	6.72
6,319.00	36.63	86.22	6,257.94	110.20	415.67	420.17	9.35
6,366.00	38.97	85.28	6,295.07	112.34	444.39	448.97	5.13
6,462.00	47.74	90.34	6,364.83	114.62	510.15	514.76	9.82
6,510.00	53.89	91.88	6,395.14	113.87	547.33	551.87	13.05
6,557.00	57.74	89.90	6,421.55	113.29	586.19	590.67	8.90
6,605.00	61.06	86.37	6,445.98	114.65	627.47	631.96	9.37
6,653.00	62.61	85.60	6,468.64	117.62	669.68	674.27	3.53
6,701.00	65.56	86.08	6,489.62	120.75	712.73	717.42	6.21
6,748.00	68.81	85.69	6,507.84	123.86	755.94	760.72	6.96
6,796.00	71.79	85.94	6,524.02	127.15	801.00	805.89	6.23
6,843.00	75.02	86.00	6,537.44	130.32	845.93	850.91	6.87
6,891.00	77.56	87.47	6,548.81	132.97	892.48	897.53	6.07
6,939.00	80.52	89.26	6,557.94	134.31	939.58	944.64	7.17
6,965.00	82.72	89.64	6,561.73	134.56	965.30	970.35	8.58
7,115.00	85.80	89.85	6,576.73	135.22	1,114.53	1,119.46	2.06
7,211.00	87.69	89.26	6,582.18	135.97	1,210.36	1,215.23	2.06
7,306.00	88.86	88.56	6,585.04	137.77	1,305.30	1,310.15	1.43
7,402.00	93.24	88.73	6,583.28	140.04	1,401.24	1,406.09	4.57
7,497.00	92.65	88.98	6,578.40	141.94	1,496.09	1,500.94	0.67
7,593.00	90.59	87.58	6,575.69	144.82	1,592.00	1,596.88	2.59
7,688.00	89.85	86.75	6,575.32	149.52	1,686.88	1,691.88	1.17
7,783.00	90.37	85.32	6,575.14	156.09	1,781.65	1,786.85	1.60
7,879.00	89.78	84.75	6,575.01	164.39	1,877.29	1,882.76	0.85
7,975.00	91.76	84.96	6,573.72	173.00	1,972.89	1,978.65	2.07
8,070.00	91.79	87.74	6,570.78	179.05	2,067.64	2,073.58	2.93
8,166.00	90.40	89.96	6,568.95	180.97	2,163.60	2,169.52	2.73
8,261.00	90.03	91.89	6,568.59	179.44	2,258.58	2,264.34	2.07
8,356.00	90.52	93.97	6,568.13	174.58	2,353.45	2,358.90	2.25
8,452.00	89.75	92.73	6,567.91	168.97	2,449.28	2,454.39	1.52
8,547.00	90.31	90.70	6,567.86	166.13	2,544.24	2,549.12	2.22
8,643.00	90.22	90.09	6,567.41	165.47	2,640.23	2,644.99	0.64
8,739.00	89.69	90.33	6,567.49	165.12	2,736.23	2,740.88	0.61
8,834.00	91.72	89.06	6,566.32	165.62	2,831.22	2,835.79	2.52
8,930.00	92.03	89.62	6,563.18	166.73	2,927.16	2,931.68	0.67
9,025.00	90.55	88.51	6,561.04	168.28	3,022.12	3,026.62	1.95
9,120.00	92.47	88.63	6,558.54	170.65	3,117.05	3,121.56	2.02
9,216.00	92.06	86.99	6,554.74	174.31	3,212.90	3,217.48	1.76
9,311.00	90.12	87.14	6,552.94	179.18	3,307.75	3,312.46	2.05
9,407.00	91.76	84.99	6,551.36	185.76	3,403.51	3,408.41	2.82
9,502.00	91.60	83.79	6,548.57	195.04	3,498.01	3,503.23	1.27
9,598.00	89.72	85.61	6,547.47	203.91	3,593.58	3,599.11	2.73
9,694.00	87.97	87.33	6,549.40	209.82	3,689.37	3,695.06	2.56



**Design Report for Wacker B12-69HN - MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,789.00	87.90	87.63	6,552.83	213.99	3,784.22	3,790.00	0.32
9,884.00	88.55	87.75	6,555.77	217.82	3,879.10	3,884.96	0.70
9,980.00	88.86	87.68	6,557.94	221.65	3,975.00	3,980.93	0.33
10,075.00	88.46	87.94	6,560.16	225.28	4,069.90	4,075.90	0.50
10,170.00	87.93	88.42	6,563.15	228.29	4,164.81	4,170.85	0.75
10,266.00	86.76	88.96	6,567.60	230.49	4,260.68	4,266.72	1.34
10,361.00	87.19	89.56	6,572.61	231.71	4,355.53	4,361.54	0.78
10,457.00	88.86	90.53	6,575.92	231.63	4,451.47	4,457.38	2.01
10,552.00	89.72	90.44	6,577.10	230.83	4,546.46	4,552.23	0.91
10,648.00	89.91	90.58	6,577.41	229.98	4,642.46	4,648.10	0.25
10,743.00	89.85	90.79	6,577.61	228.84	4,737.45	4,742.94	0.23
10,839.00	90.25	90.42	6,577.52	227.83	4,833.44	4,838.80	0.57
10,934.00	90.55	90.08	6,576.86	227.41	4,928.44	4,933.68	0.48
11,030.00	91.36	89.90	6,575.26	227.43	5,024.43	5,029.57	0.86
11,060.00	90.89	90.53	6,574.67	227.32	5,054.42	5,059.53	2.62

**Final MWD Survey**

11,124.00	90.89	90.53	6,573.68	226.72	5,118.41	5,123.43	0.00
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Survey Projection to TD - Estimated BHL: 77' FNL, 537' FEL

**Design Annotations**

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
719.00	719.00	0.00	0.00	Surface Casing Assumed Vertical at 719.00ft
811.00	811.00	0.59	0.14	First MWD Survey
11,060.00	6,574.67	227.32	5,054.42	Final MWD Survey
11,124.00	6,573.68	226.72	5,118.41	Survey Projection to TD
11,124.00	6,573.68	226.72	5,118.41	Estimated BHL: 77' FNL, 537' FEL

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (ft)	+E/-W (ft)	Start TVD (ft)
Target	Wacker B12-69HN_Plan A - Rev 1_BHL Tgt	87.44	Slot	0.00	0.00	0.00

**Survey tool program**

From (ft)	To (ft)	Survey/Plan	Survey Tool
719.00	11,124.00	Sperry MWD Surveys	MWD



## Design Report for Wacker B12-69HN - 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
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				728.00	-253.00	1,397,357.17	3,276,625.38		
Point 2				5,195.00	-145.00	1,397,465.16	3,281,092.21		
Point 3				5,146.00	-4,745.00	1,392,865.34	3,281,043.21		
Point 4				776.00	-4,674.00	1,392,936.34	3,276,673.38		
Point 5				749.00	-2,460.00	1,395,150.25	3,276,646.38		
Point 6				728.00	-253.00	1,397,357.17	3,276,625.38		
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				268.00	207.00	1,397,817.15	3,276,165.40		
Point 2				5,655.00	315.00	1,397,925.15	3,281,552.19		
Point 3				5,606.00	-5,205.00	1,392,405.36	3,281,503.19		
Point 4				316.00	-5,134.00	1,392,476.36	3,276,213.39		
Point 5				289.00	-2,460.00	1,395,150.25	3,276,186.40		
Point 6				268.00	207.00	1,397,817.15	3,276,165.40		
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				-192.00	667.00	1,398,277.13	3,275,705.41		
Point 2				-2,369.00	612.00	1,398,222.13	3,273,528.50		
Point 3				-4,545.00	576.00	1,398,186.14	3,271,352.58		
Point 4				-4,538.00	2,765.00	1,400,375.05	3,271,359.58		
Point 5				-4,531.00	4,953.00	1,402,562.97	3,271,366.58		
Point 6				-2,355.00	4,990.00	1,402,599.96	3,273,542.50		
Point 7				-176.00	5,026.00	1,402,635.96	3,275,721.41		
Point 8				-177.00	2,841.00	1,400,451.05	3,275,720.41		
Point 9				-192.00	667.00	1,398,277.13	3,275,705.41		
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				-192.00	-253.00	1,397,357.17	3,275,705.41		
Point 2				-171.00	-2,460.00	1,395,150.25	3,275,726.41		
Point 3				-144.00	-4,674.00	1,392,936.34	3,275,753.41		
Point 4				-2,326.00	-4,707.00	1,392,903.34	3,273,571.50		
Point 5				-4,492.00	-4,750.00	1,392,860.34	3,271,405.58		
Point 6				-4,521.00	-2,558.00	1,395,052.26	3,271,376.58		
Point 7				-4,545.00	-344.00	1,397,266.17	3,271,352.58		
Point 8				-2,369.00	-308.00	1,397,302.17	3,273,528.50		
Point 9				-192.00	-253.00	1,397,357.17	3,275,705.41		
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				268.00	207.00	1,397,817.15	3,276,165.40		
Point 2				289.00	-2,460.00	1,395,150.25	3,276,186.40		
Point 3				316.00	-5,134.00	1,392,476.36	3,276,213.39		
Point 4				-2,326.00	-5,167.00	1,392,443.36	3,273,571.50		
Point 5				-4,952.00	-5,210.00	1,392,400.36	3,270,945.60		
Point 6				-4,981.00	-2,558.00	1,395,052.26	3,270,916.60		
Point 7				-5,005.00	116.00	1,397,726.15	3,270,892.60		
Point 8				-2,369.00	152.00	1,397,762.15	3,273,528.50		
Point 9				268.00	207.00	1,397,817.15	3,276,165.40		
Wacker	0.00	0.00	6,553.94	228.99	5,120.96	1,397,839.14	3,281,018.16	40° 25' 15.888 N	104° 29' 26.376 W
- actual wellpath misses target center by 20.03ft at 11124.00ft MD (6573.68 TVD, 226.72 N, 5118.41 E)									
- Point									
Wacker	0.00	0.00	0.00	0.00	0.00	1,397,610.16	3,275,897.41	40° 25' 14.196 N	104° 30' 32.616 W
- actual wellpath hits target center									
- Polygon									
Point 1				268.00	207.00	1,397,817.15	3,276,165.40		
Point 2				-2,369.00	152.00	1,397,762.15	3,273,528.50		

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Design Report for Wacker B12-69HN - MWD Survey

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Point 3	-5,005.00	116.00	1,397,726.15	3,270,892.60
Point 4	-4,998.00	2,765.00	1,400,375.05	3,270,899.60
Point 5	-4,991.00	5,413.00	1,403,022.95	3,270,906.60
Point 6	-2,355.00	5,450.00	1,403,059.95	3,273,542.50
Point 7	284.00	5,486.00	1,403,095.95	3,276,181.40
Point 8	283.00	2,841.00	1,400,451.05	3,276,180.40
Point 9	268.00	207.00	1,397,817.15	3,276,165.40

**North Reference Sheet for Sec. 11-T5N-R64W (Wacker 11 PAD) - Wacker B12-69HN**

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

Vertical Depths are relative to KB @ 4619.00ft (H&P 343). Northing and Easting are relative to Wacker B12-69HN - Slot A1

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° 30' 0.000 W°, Longitude Origin: 0° 0' 0.000 E°, Latitude Origin: 40° 47' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996123

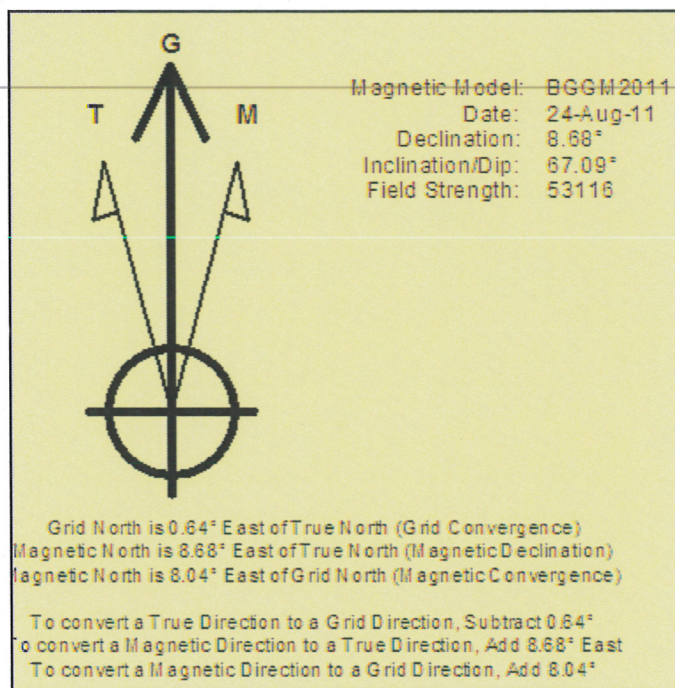
Grid Coordinates of Well: 1,397,610.16 ft N, 3,275,897.41 ft E

Geographical Coordinates of Well: 40° 25' 14.20" N, 104° 30' 32.62" W

Grid Convergence at Surface is: 0.64°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,124.00ft  
the Bottom Hole Displacement is 5,123.43ft in the Direction of 87.46° (Grid).

Magnetic Convergence at surface is: -8.04° (24 August 2011, , BGGM2011)



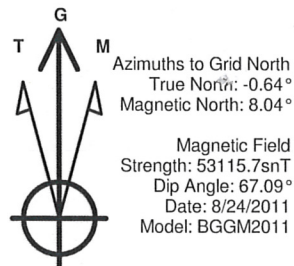


Project: Weld County, CO (NAD 83)  
 Site: Sec. 11-T5N-R64W (Wacker 11 PAD)  
 Well: Wacker B12-69HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling

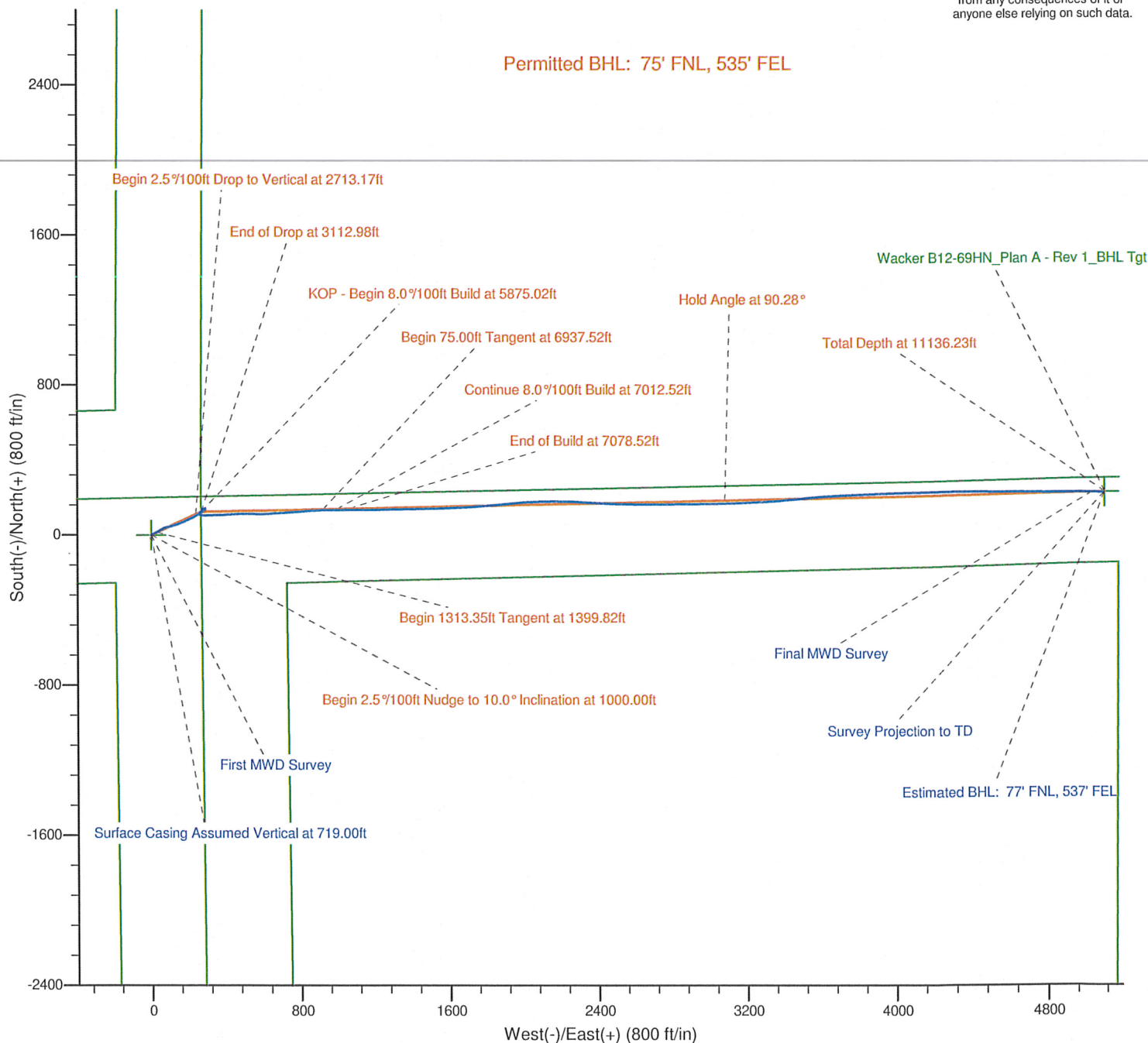


## LEGEND

- Wacker B12-69HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

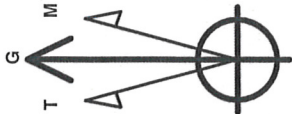
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wacker B12-69HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them 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.

Permitted BHL: 75' FNL, 535' FEL



Project: Weld County, CO (NAD 83)  
Site: Sec. 11-T5N-R64W (Wacker 11 PAD)  
Well: Wacker B12-69HN

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Azimuths to Grid North  
True North: -0.64°  
Magnetic North: 8.04°  
  
Magnetic Field  
Strength: 53115.7nT  
Dip Angle: 67.09°  
Date: 8/24/2011  
Model: BGGM2011

## LEGEND

- Wacker B12-69HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

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