

# **Noble Energy**

**Weld County, CO (NAD 83)**

**Sec. 18-T5N-R63W (SLW State 18 PAD)**

**SLW State PC BB18-65HN**

**MWD Survey**

## **Sperry Drilling Services**

### **Final Survey Report**

**08 January, 2013**

Well Coordinates: 1,390,667.79 N, 3,282,163.75 E (40° 24' 04.90" N, 104° 29' 12.62" W)

Ground Level: 4,590.00 ft

Local Coordinate Origin: Centered on Well SLW State PC BB18-65HN - Slot A

Viewing Datum: KB @ 4614.00ft (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: 431

**HALLIBURTON**

## Design Report for SLW State PC BB18-65HN - 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
585.00	0.00	0.00	585.00	0.00	0.00	0.00	0.00
Tie On To Surface Casing Assumed Vertical							
630.00	4.48	125.92	629.95	-1.03	1.42	1.60	9.96
First MWD Survey							
724.00	2.38	105.03	723.78	-3.69	6.28	6.88	2.56
819.00	0.79	24.00	818.75	-3.61	8.45	8.99	2.51
914.00	0.64	42.58	913.74	-2.62	9.08	9.41	0.29
1,008.00	0.65	42.09	1,007.74	-1.83	9.79	9.96	0.01
1,103.00	0.63	25.59	1,102.73	-0.96	10.38	10.37	0.19
1,195.00	1.34	227.46	1,194.73	-1.23	9.81	9.86	2.11
1,287.00	3.70	222.21	1,286.63	-4.16	7.02	7.69	2.57
1,379.00	6.09	225.72	1,378.29	-9.77	1.53	3.39	2.62
1,471.00	7.85	235.51	1,469.61	-16.73	-7.14	-3.78	2.30
1,564.00	10.04	227.83	1,561.48	-25.77	-18.39	-13.06	2.68
1,656.00	12.44	214.56	1,651.72	-39.32	-29.96	-21.79	3.82
1,748.00	13.75	214.34	1,741.32	-56.51	-41.75	-30.04	1.42
1,840.00	13.96	220.48	1,830.65	-73.98	-55.12	-39.78	1.61
1,932.00	14.51	219.12	1,919.83	-91.36	-69.60	-50.62	0.70
2,025.00	13.60	217.82	2,010.04	-109.04	-83.65	-61.00	1.04
2,124.00	14.70	217.33	2,106.04	-128.22	-98.41	-71.76	1.12
2,219.00	13.34	212.81	2,198.21	-147.02	-111.65	-81.13	1.84
2,315.00	14.41	213.77	2,291.41	-166.26	-124.30	-89.81	1.14
2,410.00	17.57	220.46	2,382.73	-187.00	-140.18	-101.39	3.85
2,506.00	16.73	217.38	2,474.46	-209.01	-157.97	-114.59	1.29
2,601.00	16.34	215.26	2,565.53	-230.78	-173.98	-126.09	0.76
2,697.00	15.30	214.96	2,657.89	-252.19	-189.04	-136.72	1.09
2,792.00	13.45	217.71	2,749.92	-271.21	-202.98	-146.73	2.08
2,888.00	13.19	217.00	2,843.33	-288.79	-216.40	-156.50	0.32
2,983.00	13.04	214.10	2,935.86	-306.32	-228.93	-165.40	0.71
3,079.00	11.95	213.85	3,029.58	-323.54	-240.54	-173.46	1.14
3,174.00	13.05	216.03	3,122.33	-340.38	-252.33	-181.77	1.26
3,269.00	12.92	219.62	3,214.90	-357.24	-265.41	-191.35	0.86
3,365.00	14.55	222.61	3,308.15	-374.38	-280.42	-202.76	1.85
3,460.00	13.83	221.59	3,400.26	-391.66	-296.04	-214.74	0.80
3,556.00	15.50	225.36	3,493.13	-409.25	-312.78	-227.77	2.00
3,651.00	16.26	224.97	3,584.50	-427.58	-331.21	-242.31	0.81
3,746.00	17.14	224.56	3,675.49	-446.97	-350.43	-257.43	0.93
3,841.00	17.51	224.68	3,766.18	-467.10	-370.31	-273.03	0.39
3,937.00	15.81	218.67	3,858.16	-487.58	-388.63	-287.05	2.52
4,032.00	15.72	217.62	3,949.58	-507.88	-404.58	-298.77	0.31
4,127.00	14.89	220.44	4,041.21	-527.37	-420.35	-310.48	1.17
4,223.00	14.38	219.72	4,134.10	-545.92	-435.97	-322.22	0.56
4,318.00	13.96	222.52	4,226.21	-563.44	-451.25	-333.83	0.85
4,413.00	13.87	221.91	4,318.42	-580.36	-466.60	-345.62	0.18
4,509.00	12.52	220.23	4,411.89	-596.87	-481.01	-356.56	1.46
4,604.00	12.53	218.86	4,504.63	-612.76	-494.13	-366.36	0.31
4,700.00	12.25	221.51	4,598.39	-628.49	-507.41	-376.35	0.66
4,795.00	11.21	224.00	4,691.41	-642.68	-520.50	-386.46	1.22
4,891.00	10.89	227.09	4,785.63	-655.57	-533.63	-396.84	0.70



## Design Report for SLW State PC BB18-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,986.00	9.34	217.30	4,879.15	-667.81	-544.87	-405.51	2.43
5,082.00	6.10	208.84	4,974.27	-678.48	-552.06	-410.49	3.57
5,177.00	5.27	212.85	5,068.81	-686.57	-556.86	-413.64	0.97
5,272.00	2.47	198.82	5,163.58	-692.17	-559.89	-415.53	3.09
5,367.00	0.73	179.41	5,258.54	-694.71	-560.54	-415.68	1.89
5,463.00	0.81	148.75	5,354.53	-695.91	-560.18	-415.10	0.43
5,559.00	0.62	148.64	5,450.53	-696.93	-559.56	-414.29	0.20
5,654.00	1.00	148.52	5,545.52	-698.08	-558.86	-413.38	0.40
5,749.00	1.10	146.89	5,640.50	-699.55	-557.93	-412.18	0.11
5,794.00	1.15	142.13	5,685.49	-700.26	-557.42	-411.54	0.24
5,846.00	1.54	118.79	5,737.48	-701.01	-556.48	-410.48	1.28
5,893.00	3.10	101.93	5,784.44	-701.58	-554.69	-408.61	3.59
5,941.00	6.72	85.69	5,832.26	-701.64	-550.61	-404.60	8.00
5,989.00	9.25	82.55	5,879.79	-700.93	-543.99	-398.24	5.35
6,036.00	11.35	92.47	5,926.03	-700.64	-535.62	-390.08	5.83
6,084.00	14.33	98.15	5,972.83	-701.68	-525.02	-379.48	6.74
6,132.00	18.01	97.30	6,018.92	-703.47	-511.77	-366.14	7.68
6,180.00	21.26	96.98	6,064.12	-705.47	-495.77	-350.05	6.77
6,228.00	24.42	95.32	6,108.35	-707.45	-477.25	-331.50	6.72
6,276.00	27.91	92.54	6,151.43	-708.86	-456.14	-310.51	7.70
6,323.00	31.29	93.12	6,192.29	-710.02	-432.95	-287.54	7.22
6,371.00	35.70	94.09	6,232.31	-711.69	-406.53	-261.29	9.25
6,418.00	40.33	95.34	6,269.33	-714.09	-377.69	-232.53	9.99
6,466.00	45.16	94.23	6,304.57	-716.79	-345.23	-200.16	10.18
6,514.00	50.94	93.12	6,336.64	-719.06	-309.62	-164.79	12.16
6,562.00	56.45	93.04	6,365.05	-721.14	-271.01	-126.50	11.48
6,609.00	60.95	90.05	6,389.47	-722.20	-230.88	-86.93	11.01
6,657.00	64.24	90.31	6,411.56	-722.33	-188.27	-45.10	6.87
6,705.00	67.60	91.00	6,431.14	-722.84	-144.46	-2.01	7.12
6,753.00	70.90	91.68	6,448.14	-723.89	-99.59	42.21	7.00
6,800.00	73.29	92.23	6,462.59	-725.42	-54.90	86.36	5.21
6,848.00	77.26	91.85	6,474.79	-727.07	-8.51	132.19	8.31
6,896.00	81.48	92.55	6,483.64	-728.88	38.62	178.78	8.91
6,901.00	81.94	92.91	6,484.37	-729.12	43.56	183.67	11.64
6,984.00	84.97	95.22	6,493.83	-734.96	125.79	265.49	4.58
7,079.00	85.51	94.64	6,501.71	-743.10	220.11	359.61	0.83
7,174.00	87.04	92.08	6,507.88	-748.65	314.74	453.52	3.13
7,270.00	88.40	91.58	6,511.70	-751.72	410.61	548.18	1.51
7,365.00	92.06	91.77	6,511.32	-754.49	505.56	641.86	3.86
7,461.00	92.50	89.76	6,507.50	-755.77	601.47	736.21	2.14
7,556.00	91.97	91.40	6,503.80	-756.74	696.39	829.53	1.81
7,652.00	93.24	85.75	6,499.43	-754.35	792.22	923.09	6.03
7,747.00	92.47	88.86	6,494.70	-749.89	886.98	1,015.21	3.37
7,843.00	91.70	89.00	6,491.20	-748.10	982.90	1,108.97	0.82
7,938.00	92.34	88.56	6,487.85	-746.08	1,077.82	1,201.71	0.82
8,033.00	91.36	88.18	6,484.79	-743.38	1,172.73	1,294.31	1.11
8,129.00	91.29	87.72	6,482.57	-739.95	1,268.64	1,387.75	0.48
8,224.00	90.86	88.53	6,480.79	-736.84	1,363.57	1,480.29	0.97
8,320.00	89.38	88.76	6,480.58	-734.57	1,459.54	1,574.01	1.56
8,415.00	88.12	89.85	6,482.66	-733.42	1,554.51	1,666.96	1.75
8,510.00	89.54	89.25	6,484.60	-732.67	1,649.48	1,760.00	1.62

## Design Report for SLW State PC BB18-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,606.00	90.71	90.54	6,484.39	-732.49	1,745.48	1,854.15	1.81
8,701.00	89.85	91.67	6,483.92	-734.33	1,840.46	1,947.69	1.49
8,797.00	90.99	89.97	6,483.22	-735.70	1,936.44	2,042.13	2.13
8,892.00	91.57	91.46	6,481.10	-736.89	2,031.41	2,135.53	1.68
8,988.00	91.17	91.50	6,478.80	-739.36	2,127.35	2,230.14	0.42
9,083.00	91.05	91.53	6,476.96	-741.88	2,222.30	2,323.79	0.13
9,179.00	91.91	93.96	6,474.48	-746.47	2,318.15	2,418.72	2.68
9,274.00	91.70	93.48	6,471.49	-752.63	2,412.90	2,512.87	0.55
9,370.00	89.91	93.28	6,470.14	-758.29	2,508.72	2,607.98	1.88
9,465.00	91.79	91.86	6,468.73	-762.55	2,603.61	2,701.90	2.48
9,561.00	90.15	92.92	6,467.11	-766.55	2,699.50	2,796.77	2.03
9,656.00	89.66	93.01	6,467.26	-771.47	2,794.38	2,890.80	0.52
9,752.00	90.99	93.31	6,466.72	-776.76	2,890.23	2,985.86	1.42
9,847.00	91.48	92.23	6,464.67	-781.35	2,985.09	3,079.83	1.25
9,942.00	90.86	90.66	6,462.73	-783.74	3,080.04	3,173.45	1.78
10,038.00	90.25	90.41	6,461.80	-784.64	3,176.03	3,267.80	0.69
10,133.00	88.80	90.58	6,462.59	-785.46	3,271.02	3,361.16	1.54
10,227.00	88.30	89.57	6,464.97	-785.58	3,364.99	3,453.38	1.20
10,275.00	90.00	90.56	6,465.68	-785.64	3,412.98	3,500.47	4.10
10,323.00	90.86	91.40	6,465.32	-786.46	3,460.97	3,547.72	2.50
10,390.00	92.43	92.36	6,463.40	-788.66	3,527.90	3,613.81	2.75
10,418.00	93.12	93.31	6,462.04	-790.04	3,555.84	3,641.49	4.19
10,514.00	91.14	92.74	6,458.47	-795.10	3,651.63	3,736.45	2.15
10,609.00	90.12	92.63	6,457.43	-799.55	3,746.52	3,830.41	1.08
10,705.00	88.98	92.44	6,458.18	-803.80	3,842.42	3,925.33	1.20
10,800.00	88.12	91.20	6,460.59	-806.81	3,937.34	4,019.04	1.59
10,896.00	87.81	90.37	6,464.00	-808.13	4,033.27	4,113.41	0.92
10,926.00	87.44	90.15	6,465.24	-808.26	4,063.24	4,142.85	1.43
Final MWD Survey							
10,986.00	87.44	90.15	6,467.92	-808.42	4,123.18	4,201.69	0.00
Bit Projection - Estimated BHL 2488'FNL 535'FEL							

### Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
585.00	585.00	0.00	0.00	Tie On To Surface Casing Assumed Vertical
630.00	629.95	-1.03	1.42	First MWD Survey
10,926.00	6,465.24	-808.26	4,063.24	Final MWD Survey
10,986.00	6,467.92	-808.42	4,123.18	Bit Projection
10,986.00	6,467.92	-808.42	4,123.18	Estimated BHL 2488'FNL 535'FEL

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	SLW State PC BB18-65HN_PlanA - Rev1_BH L Tgt	101.15	Slot	0.00	0.00	0.00



## Design Report for SLW State PC BB18-65HN - MWD Survey

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
585.00	10,986.00	Sperry MWD Surveys	MWD

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
SLW State PC	0.00	0.00	0.00	0.00	0.00	1,390,667.79	3,282,163.75	40° 24' 4.896 N	104° 29' 12.624 W
- actual wellpath hits target center									
- Polygon									
Point 1				-620.00	-849.00	1,389,818.83	3,281,543.78		
Point 2				-660.00	1,738.00	1,392,405.72	3,281,503.78		
Point 3				1,949.00	1,706.00	1,392,373.73	3,284,112.68		
Point 4				4,624.00	1,675.00	1,392,342.73	3,286,787.57		
Point 5				4,659.00	-850.00	1,389,817.83	3,286,822.57		
Point 6				4,694.00	-3,374.00	1,387,293.93	3,286,857.57		
Point 7				2,050.00	-3,401.00	1,387,266.93	3,284,213.67		
Point 8				-551.00	-3,427.00	1,387,240.93	3,281,612.77		
Point 9				-620.00	-849.00	1,389,818.83	3,281,543.78		
SLW State PC	0.00	0.00	0.00	0.00	0.00	1,390,667.79	3,282,163.75	40° 24' 4.896 N	104° 29' 12.624 W
- actual wellpath hits target center									
- Polygon									
Point 1				-160.00	-849.00	1,389,818.83	3,282,003.76		
Point 2				-200.00	1,278.00	1,391,945.74	3,281,963.76		
Point 3				1,949.00	1,246.00	1,391,913.74	3,284,112.68		
Point 4				4,164.00	1,215.00	1,391,882.74	3,286,327.59		
Point 5				4,199.00	-850.00	1,389,817.83	3,286,362.59		
Point 6				4,234.00	-2,914.00	1,387,753.91	3,286,397.58		
Point 7				2,050.00	-2,941.00	1,387,726.91	3,284,213.67		
Point 8				-91.00	-2,967.00	1,387,700.91	3,282,072.76		
Point 9				-160.00	-849.00	1,389,818.83	3,282,003.76		
SLW State PC	0.00	0.00	6,472.26	-812.37	4,123.37	1,389,855.45	3,286,286.96	40° 23' 56.400 N	104° 28' 19.452 W
- actual wellpath misses target center by 5.88ft at 10986.00ft MD (6467.92 TVD, -808.42 N, 4123.18 E)									
- Point									

**North Reference Sheet for Sec. 18-T5N-R63W (SLW State 18 PAD) - SLW State PC BB18-65HN**

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

Vertical Depths are relative to KB @ 4614.00ft (H&P 343). Northing and Easting are relative to SLW State PC BB18-65HN - 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: 0.99996029

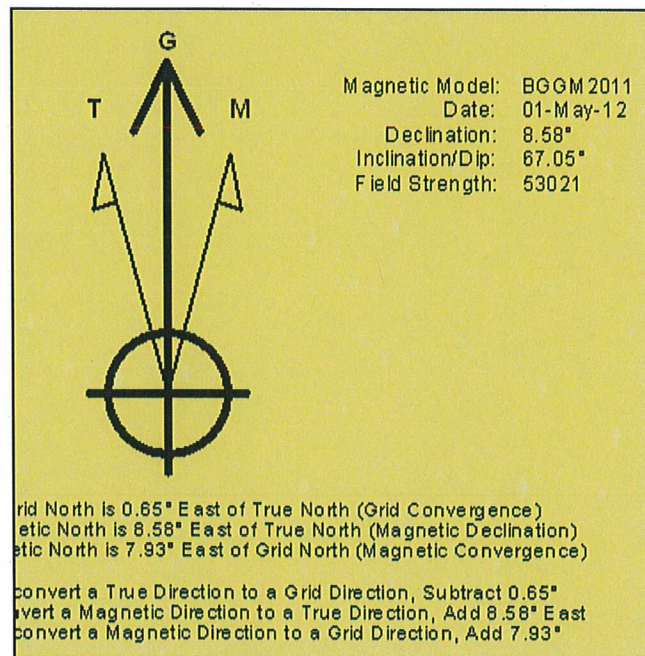
Grid Coordinates of Well: 1,390,667.79 ft N, 3,282,163.75 ft E

Geographical Coordinates of Well: 40° 24' 04.90" N, 104° 29' 12.62" W

Grid Convergence at Surface is: 0.65°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,986.00ft  
the Bottom Hole Displacement is 4,201.69ft in the Direction of 101.09° (Grid).

Magnetic Convergence at surface is: -7.93° ( 1 May 2012, , BGGM2011)

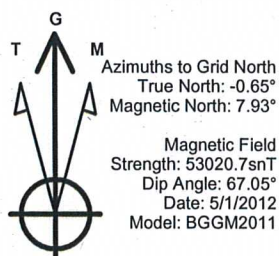


Project: Weld County, CO (NAD 83)  
 Site: Sec. 18-T5N-R63W (SLW State 18 PAD)  
 Well: SLW State PC BB18-65HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling

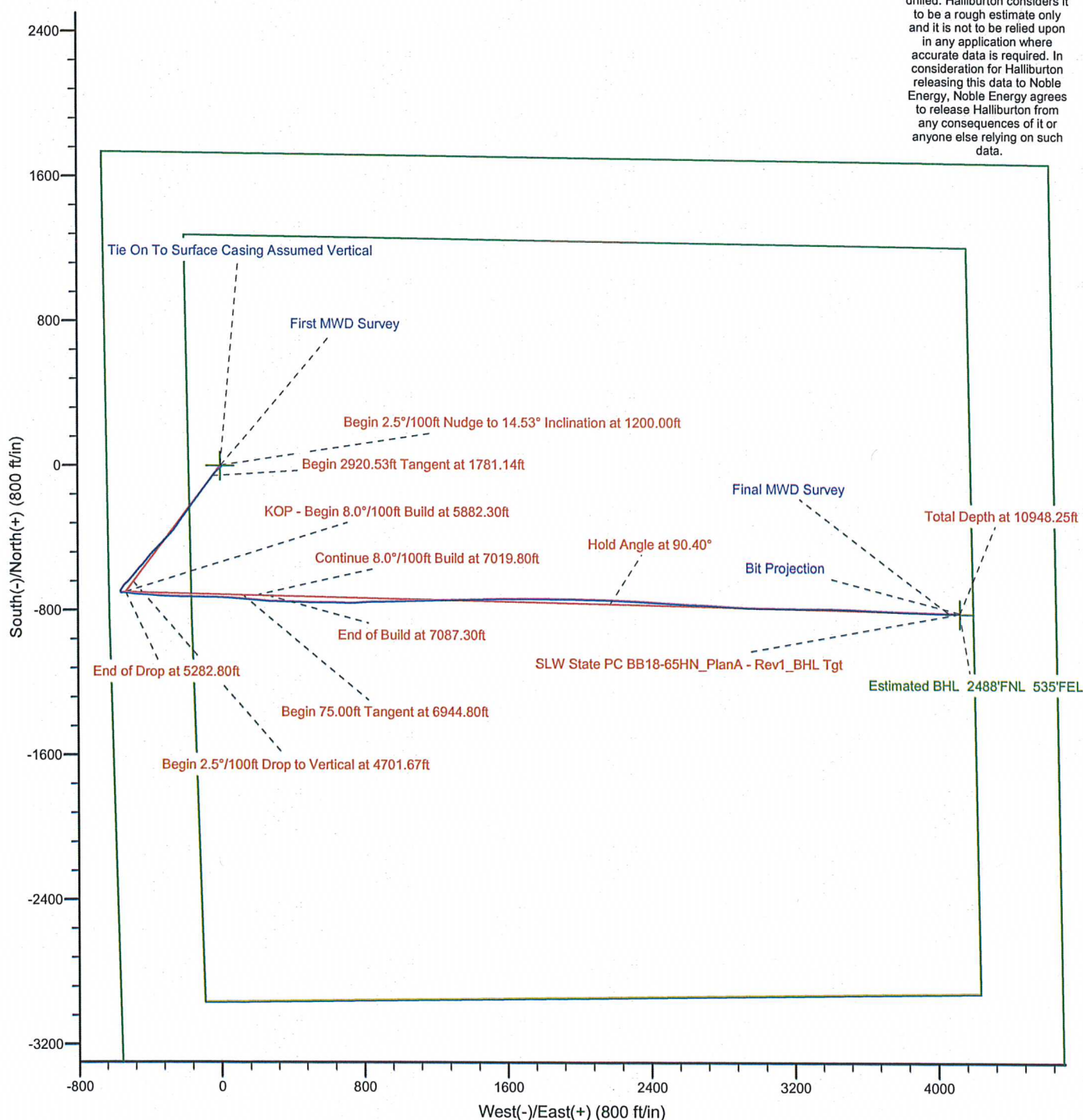


## LEGEND

- SLW State PC BB18-65HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Permitted BHL: 2491' FNL,  
 535' FEL

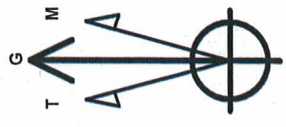
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the SLW State BB18-65HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them 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.





# Noble Energy

Project: Weld County, CO (NAD 83)  
Site: Sec. 18-T5N-R63W (SLW State 18 PAD)  
Well: SLW State PC BB18-65HN



Azimuths to Grid North  
True North: -0.65°  
Magnetic North: 7.93°  
  
Magnetic Field  
Strength: 53020.7snT  
Dip Angle: 67.05°  
Date: 5/1/2012  
Model: BGGM2011

## LEGEND

- SLW State PC BB18-65HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the SLW State PC BB18-65HN 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.

