

Noble Energy

Weld County, CO (NAD 83)
Sec. 23-T4N-R64W (Sater 23 PAD)
Sater C24-79HN - A1

Design: MWD Survey

Sperry Drilling Services Final Survey Report

10 April, 2012

Well Coordinates: 1,350,663.00 N, 3,276,427.64 E (40° 17' 30.23" N, 104° 30' 32.54" W)
Ground Level: 4,675.00 ft

Local Coordinate Origin:	Centered on Well Sater C24-79HN - Slot A1
Viewing Datum:	KB @ 4699.00ft (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 Sater C24-79HN - 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
700.00	0.40	88.21	699.99	0.08	2.44	0.17	0.06
First MWD Survey							
791.00	0.28	29.79	790.99	0.28	2.87	0.39	0.38
882.00	0.97	102.01	881.99	0.31	3.73	0.46	1.02
973.00	1.11	77.66	972.97	0.34	5.35	0.55	0.50
1,067.00	0.75	88.79	1,066.96	0.55	6.85	0.82	0.43
1,162.00	0.44	92.93	1,161.96	0.54	7.84	0.85	0.33
1,256.00	1.77	93.60	1,255.94	0.43	9.65	0.81	1.41
1,350.00	3.77	81.70	1,349.82	0.79	14.16	1.34	2.20
1,444.00	5.35	96.64	1,443.52	0.73	21.57	1.57	2.09
1,538.00	6.55	88.00	1,537.02	0.41	31.28	1.63	1.59
1,633.00	8.55	85.71	1,631.19	1.12	43.74	2.84	2.13
1,728.00	7.70	93.82	1,725.24	1.23	57.13	3.47	1.50
1,823.00	8.33	92.22	1,819.31	0.54	70.36	3.30	0.70
1,918.00	6.80	92.87	1,913.48	-0.01	82.85	3.24	1.61
2,013.00	7.79	89.69	2,007.71	-0.26	94.91	3.47	1.13
2,108.00	7.34	91.54	2,101.88	-0.38	107.41	3.83	0.54
2,204.00	8.17	93.89	2,197.01	-1.01	120.35	3.71	0.93
2,299.00	7.83	91.51	2,291.08	-1.64	133.55	3.60	0.50
2,395.00	8.19	84.04	2,386.15	-1.10	146.89	4.66	1.15
2,490.00	8.26	82.18	2,480.17	0.53	160.38	6.82	0.29
2,584.00	8.33	89.84	2,573.19	1.47	173.88	8.29	1.18
2,679.00	7.80	89.03	2,667.25	1.59	187.21	8.94	0.57
2,774.00	8.90	90.79	2,761.24	1.60	201.00	9.49	1.19
2,869.00	8.40	90.87	2,855.16	1.40	215.29	9.85	0.53
2,964.00	7.49	86.71	2,949.25	1.65	228.41	10.61	1.13
3,058.00	5.72	90.14	3,042.62	1.99	239.21	11.37	1.93
3,153.00	1.79	72.39	3,137.40	2.42	245.36	12.05	4.27
3,248.00	1.03	16.49	3,232.38	3.69	247.02	13.38	1.56
3,343.00	0.61	279.92	3,327.37	4.60	246.76	14.28	1.32
3,438.00	0.65	295.18	3,422.36	4.91	245.77	14.56	0.18
3,629.00	0.65	298.08	3,613.35	5.88	243.84	15.45	0.02
3,819.00	0.66	289.82	3,803.34	6.76	241.86	16.25	0.05
4,010.00	1.49	227.30	3,994.31	5.45	239.00	14.83	0.69
4,200.00	1.57	224.95	4,184.24	1.93	235.34	11.17	0.05
4,390.00	1.46	241.41	4,374.18	-1.07	231.38	8.02	0.24
4,581.00	1.20	285.32	4,565.13	-1.70	227.31	7.22	0.54
4,771.00	1.08	229.88	4,755.10	-2.33	224.03	6.47	0.56
4,961.00	1.01	149.58	4,945.07	-4.93	223.50	3.85	0.71
5,151.00	0.61	93.91	5,135.06	-6.44	225.36	2.41	0.44
5,340.00	0.25	48.85	5,324.05	-6.24	226.68	2.66	0.25
5,530.00	0.19	300.07	5,514.05	-5.81	226.71	3.10	0.19
5,625.00	0.46	23.28	5,609.05	-5.38	226.73	3.53	0.50
5,720.00	0.69	28.38	5,704.04	-4.53	227.15	4.39	0.25
5,773.00	0.59	41.41	5,757.04	-4.04	227.48	4.89	0.33
5,814.00	0.76	35.47	5,798.04	-3.66	227.78	5.28	0.45
5,861.00	2.38	0.53	5,845.02	-2.43	227.97	6.52	3.85
5,910.00	6.28	353.00	5,893.87	1.25	227.65	10.18	8.03
5,957.00	11.80	353.35	5,940.27	8.58	226.78	17.47	11.75

Design Report for Sater C24-79HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,005.00	16.75	355.47	5,986.77	20.36	225.67	29.20	10.37
6,052.00	21.31	357.06	6,031.19	35.64	224.69	44.44	9.76
6,100.00	25.48	358.25	6,075.24	54.68	223.93	63.43	8.74
6,147.00	29.63	0.17	6,116.90	76.42	223.66	85.14	9.03
6,195.00	33.82	0.52	6,157.72	101.65	223.81	110.36	8.74
6,242.00	37.68	2.13	6,195.85	129.10	224.47	137.81	8.45
6,289.00	39.90	3.39	6,232.49	158.50	225.89	167.25	5.01
6,336.00	43.48	3.51	6,267.58	189.70	227.77	198.49	7.62
6,384.00	48.03	1.26	6,301.06	224.04	229.18	232.87	10.06
6,431.00	51.66	359.16	6,331.37	259.96	229.29	268.76	8.44
6,478.00	54.91	358.04	6,359.46	297.61	228.36	306.35	7.17
6,525.00	58.36	357.26	6,385.31	336.83	226.75	345.47	7.47
6,574.00	61.67	356.82	6,409.79	379.21	224.56	387.73	6.80
6,621.00	63.69	357.17	6,431.36	420.90	222.37	429.31	4.35
6,669.00	65.39	356.83	6,452.00	464.18	220.10	472.46	3.60
6,716.00	67.11	357.54	6,470.93	507.15	217.99	515.31	3.91
6,764.00	68.90	357.81	6,488.90	551.62	216.18	559.68	3.77
6,811.00	70.04	358.20	6,505.38	595.60	214.65	603.57	2.55
6,859.00	71.09	358.80	6,521.36	640.85	213.47	648.74	2.48
6,906.00	72.80	359.14	6,535.92	685.53	212.66	693.35	3.70
6,954.00	74.33	359.24	6,549.50	731.56	212.01	739.32	3.19
7,001.00	75.81	358.85	6,561.61	776.97	211.26	784.66	3.25
7,049.00	77.81	0.28	6,572.56	823.70	210.90	831.34	5.08
7,096.00	80.78	359.54	6,581.29	869.87	210.83	877.48	6.51
7,119.00	82.62	359.37	6,584.61	892.63	210.61	900.21	8.03
7,251.00	86.48	359.05	6,597.15	1,023.99	208.80	1,031.40	2.93
7,344.00	88.77	359.15	6,601.00	1,116.90	207.34	1,124.18	2.46
7,437.00	90.52	358.91	6,601.58	1,209.88	205.77	1,217.02	1.90
7,532.00	92.28	358.87	6,599.26	1,304.83	203.93	1,311.83	1.85
7,627.00	91.11	358.85	6,596.45	1,399.77	202.04	1,406.62	1.23
7,722.00	91.20	359.12	6,594.53	1,494.73	200.36	1,501.45	0.30
7,818.00	89.81	358.42	6,593.69	1,590.70	198.30	1,597.26	1.62
7,913.00	89.69	357.43	6,594.10	1,685.64	194.86	1,691.99	1.05
8,007.00	91.54	357.53	6,593.09	1,779.54	190.72	1,785.65	1.97
8,102.00	91.92	358.62	6,590.22	1,874.44	187.53	1,880.36	1.21
8,197.00	91.02	358.72	6,587.79	1,969.38	185.33	1,975.14	0.95
8,293.00	90.68	0.70	6,586.36	2,065.37	184.84	2,071.03	2.09
8,387.00	91.97	0.56	6,584.19	2,159.33	185.88	2,164.97	1.38
8,483.00	90.31	2.33	6,582.28	2,255.28	188.30	2,260.93	2.53
8,578.00	90.80	2.40	6,581.36	2,350.19	192.22	2,355.92	0.52
8,673.00	91.85	2.30	6,579.16	2,445.08	196.11	2,450.90	1.11
8,768.00	89.97	1.00	6,577.65	2,540.03	198.85	2,545.87	2.41
8,863.00	90.59	0.74	6,577.19	2,635.01	200.29	2,640.84	0.71
8,957.00	91.33	0.79	6,575.61	2,728.99	201.54	2,734.80	0.79
9,053.00	89.48	0.07	6,574.93	2,824.98	202.26	2,830.74	2.07
9,148.00	90.40	0.05	6,575.03	2,919.98	202.36	2,925.67	0.97
9,243.00	89.48	359.54	6,575.13	3,014.98	202.02	3,020.58	1.11
9,338.00	89.41	0.00	6,576.05	3,109.97	201.64	3,115.49	0.49
9,433.00	90.15	359.81	6,576.42	3,204.97	201.48	3,210.41	0.80
9,528.00	88.24	0.39	6,577.75	3,299.96	201.65	3,305.33	2.10
9,623.00	88.80	359.82	6,580.21	3,394.92	201.82	3,400.23	0.84

Design Report for Sater C24-79HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,718.00	90.49	0.27	6,580.80	3,489.92	201.90	3,495.15	1.84
9,813.00	91.42	0.02	6,579.21	3,584.90	202.14	3,590.08	1.01
9,908.00	89.63	359.92	6,578.34	3,679.90	202.09	3,684.99	1.89
10,003.00	91.33	0.64	6,577.55	3,774.89	202.55	3,779.93	1.94
10,098.00	89.20	359.72	6,577.11	3,869.88	202.85	3,874.86	2.44
10,193.00	89.54	359.25	6,578.15	3,964.87	202.00	3,969.74	0.61
10,288.00	89.69	358.85	6,578.79	4,059.85	200.42	4,064.59	0.45
10,382.00	90.43	359.15	6,578.69	4,153.84	198.78	4,158.44	0.85
10,477.00	91.02	358.51	6,577.49	4,248.81	196.84	4,253.26	0.92
10,572.00	89.07	359.27	6,577.41	4,343.79	195.00	4,348.09	2.20
10,667.00	89.20	358.82	6,578.85	4,438.76	193.42	4,442.93	0.49
10,762.00	90.00	359.31	6,579.51	4,533.75	191.87	4,537.78	0.99
10,857.00	91.02	359.33	6,578.67	4,628.74	190.74	4,632.66	1.07
10,952.00	91.20	358.36	6,576.83	4,723.70	188.83	4,727.47	1.04
11,046.00	90.83	357.57	6,575.16	4,817.62	185.49	4,821.19	0.93
11,141.00	90.37	357.62	6,574.17	4,912.53	181.50	4,915.87	0.49
11,200.00	90.31	357.08	6,573.82	4,971.47	178.78	4,974.65	0.92
Final MWD Survey							
11,256.00	90.31	357.08	6,573.51	5,027.40	175.92	5,030.43	0.00

Survey Projection to TD - Estimated BHL: 147' FSL, 53' FWL

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
700.00	699.99	0.08	2.44	First MWD Survey
11,200.00	6,573.82	4,971.47	178.78	Final MWD Survey
11,256.00	6,573.51	5,027.40	175.92	Survey Projection to TD
11,256.00	6,573.51	5,027.40	175.92	Estimated BHL: 147' FSL, 53' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Sater C24-79HN _Plan A - Rev 1_BHL Tgt	2.25	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
700.00	11,256.00	Sperry MWD Surveys	MWD

Design Report for Sater C24-79HN - 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
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				-302.00	86.00	1,350,748.99	3,276,125.65		
Point 2				-2,487.00	61.00	1,350,723.99	3,273,940.75		
Point 3				-4,671.00	35.00	1,350,697.99	3,271,756.84		
Point 4				-4,689.00	2,216.00	1,352,878.90	3,271,738.84		
Point 5				-4,704.00	4,398.00	1,355,060.81	3,271,723.84		
Point 6				-2,526.00	4,430.00	1,355,092.81	3,273,901.75		
Point 7				-336.00	4,420.00	1,355,082.81	3,276,091.66		
Point 8				-302.00	86.00	1,350,748.99	3,276,125.65		
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				618.00	86.00	1,350,748.99	3,277,045.62		
Point 2				584.00	4,420.00	1,355,082.81	3,277,011.62		
Point 3				4,886.00	4,402.00	1,355,064.81	3,281,313.43		
Point 4				4,926.00	76.00	1,350,738.99	3,281,353.43		
Point 5				618.00	86.00	1,350,748.99	3,277,045.62		
Sater C24-79HN	0.00	0.00	6,579.26	5,029.93	197.61	1,355,692.71	3,276,625.24	40° 18' 19.908 N	104° 30' 29.268 W
- actual wellpath misses target center by 22.58ft at 11256.00ft MD (6573.51 TVD, 5027.40 N, 175.92 E)									
- Point									
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				584.00	5,340.00	1,356,002.77	3,277,011.62		
Point 2				563.00	7,546.00	1,358,208.67	3,276,990.62		
Point 3				541.00	9,724.00	1,360,386.58	3,276,968.62		
Point 4				2,686.00	9,746.00	1,360,408.58	3,279,113.53		
Point 5				4,830.00	9,768.00	1,360,430.58	3,281,257.43		
Point 6				4,886.00	5,322.00	1,355,984.77	3,281,313.43		
Point 7				584.00	5,340.00	1,356,002.77	3,277,011.62		
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				124.00	4,880.00	1,355,542.79	3,276,551.64		
Point 2				158.00	-374.00	1,350,289.01	3,276,585.63		
Point 3				-2,487.00	-399.00	1,350,264.01	3,273,940.75		
Point 4				-5,131.00	-425.00	1,350,238.01	3,271,296.86		
Point 5				-5,149.00	2,216.00	1,352,878.90	3,271,278.86		
Point 6				-5,164.00	4,858.00	1,355,520.79	3,271,263.86		
Point 7				-2,526.00	4,890.00	1,355,552.79	3,273,901.75		
Point 8				124.00	4,880.00	1,355,542.79	3,276,551.64		
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				158.00	-374.00	1,350,289.01	3,276,585.63		
Point 2				124.00	4,880.00	1,355,542.79	3,276,551.64		
Point 3				5,346.00	4,862.00	1,355,524.79	3,281,773.41		
Point 4				5,386.00	-384.00	1,350,279.01	3,281,813.41		
Point 5				158.00	-374.00	1,350,289.01	3,276,585.63		
Sater 23 PAD_Sec.	0.00	0.00	0.00	0.00	0.00	1,350,663.00	3,276,427.64	40° 17' 30.228 N	104° 30' 32.544 W
- actual wellpath hits target center									
- Polygon									
Point 1				124.00	4,880.00	1,355,542.79	3,276,551.64		
Point 2				103.00	7,546.00	1,358,208.67	3,276,530.64		
Point 3				81.00	10,184.00	1,360,846.56	3,276,508.64		
Point 4				2,686.00	10,206.00	1,360,868.56	3,279,113.53		
Point 5				5,290.00	10,228.00	1,360,890.56	3,281,717.41		
Point 6				5,346.00	4,862.00	1,355,524.79	3,281,773.41		
Point 7				124.00	4,880.00	1,355,542.79	3,276,551.64		

North Reference Sheet for Sec. 23-T4N-R64W (Sater 23 PAD) - Sater C24-79HN

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

Vertical Depths are relative to KB @ 4699.00ft (H&P 322). Northing and Easting are relative to Sater C24-79HN - 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: 0.99995710

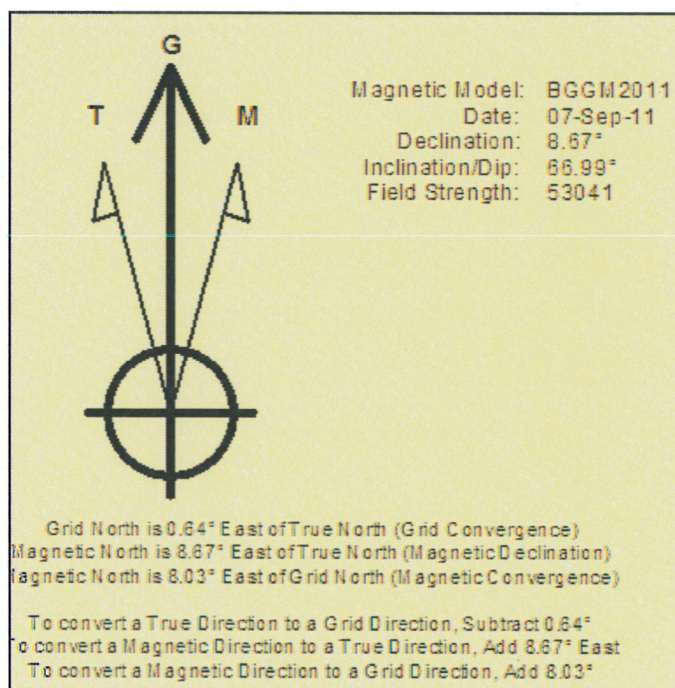
Grid Coordinates of Well: 1,350,663.00 ft N, 3,276,427.64 ft E

Geographical Coordinates of Well: 40° 17' 30.23" N, 104° 30' 32.54" W

Grid Convergence at Surface is: 0.64°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,256.00ft
the Bottom Hole Displacement is 5,030.47ft in the Direction of 2.00° (Grid).

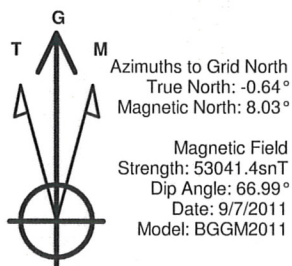
Magnetic Convergence at surface is: -8.03° (7 September 2011, , BGGM2011)



Noble Energy

HALLIBURTON

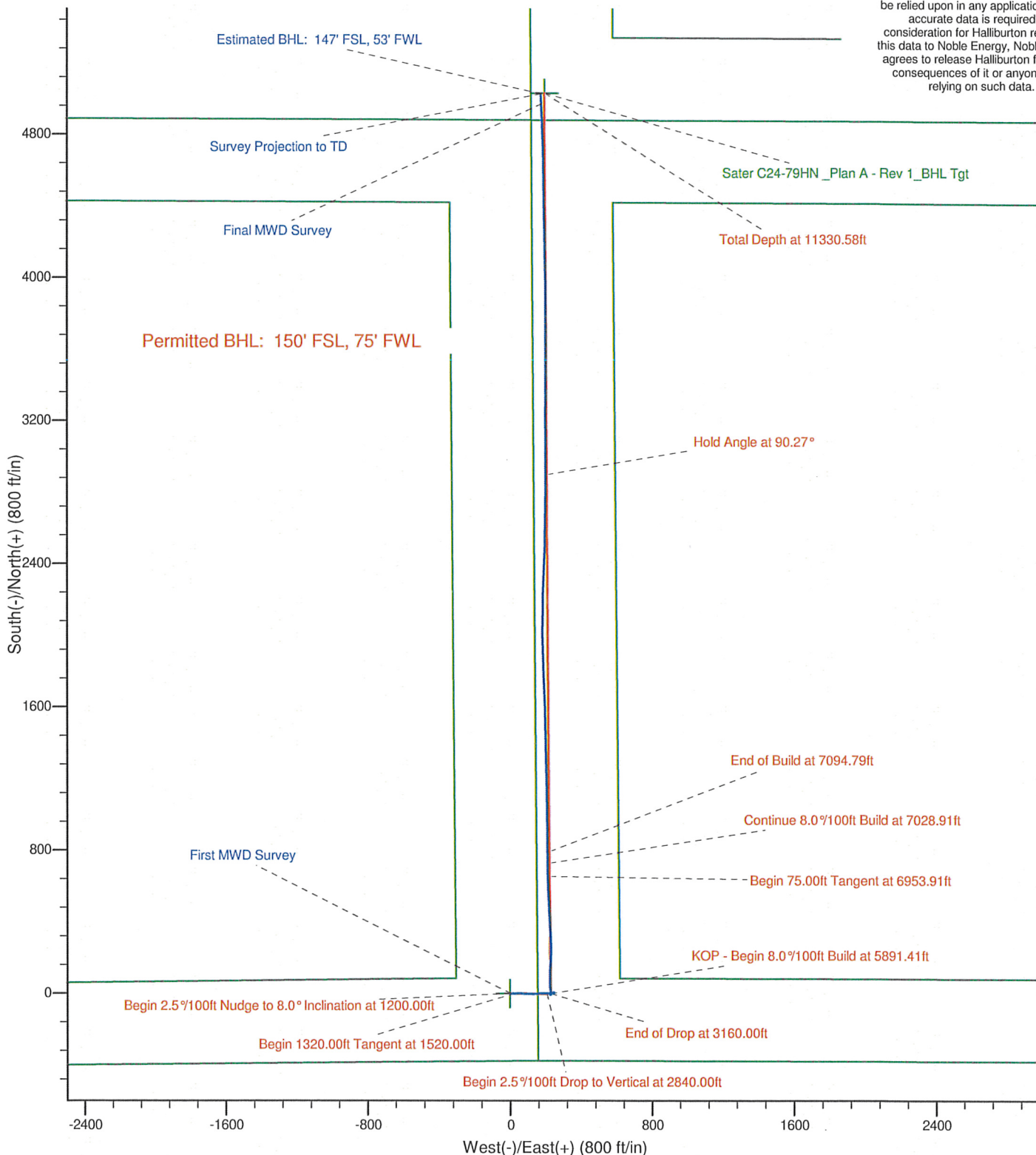
Sperry Drilling



LEGEND

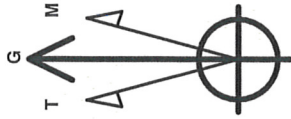
- Sater C24-79HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Sater C24-79HN 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. 23-T4N-R64W (Sater 23 PAD)
Well: Sater C24-79HN



Azimuths to Grid North
True North: -0.64°
Magnetic North: 8.03°

Magnetic Field
Strength: 53041.4snT
Dip Angle: 66.99°
Date: 9/7/2011
Model: BGGM2011

LEGEND

- Sater C24-79HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

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