

Noble Energy

Weld County, CO (NAD 83)
Sec. 11-T6N-R63W (Wells Ranch PAD)
Wells Ranch AA11-690
05-123-41211
Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

09 June, 2015

Surface UWI : 05-123-41211

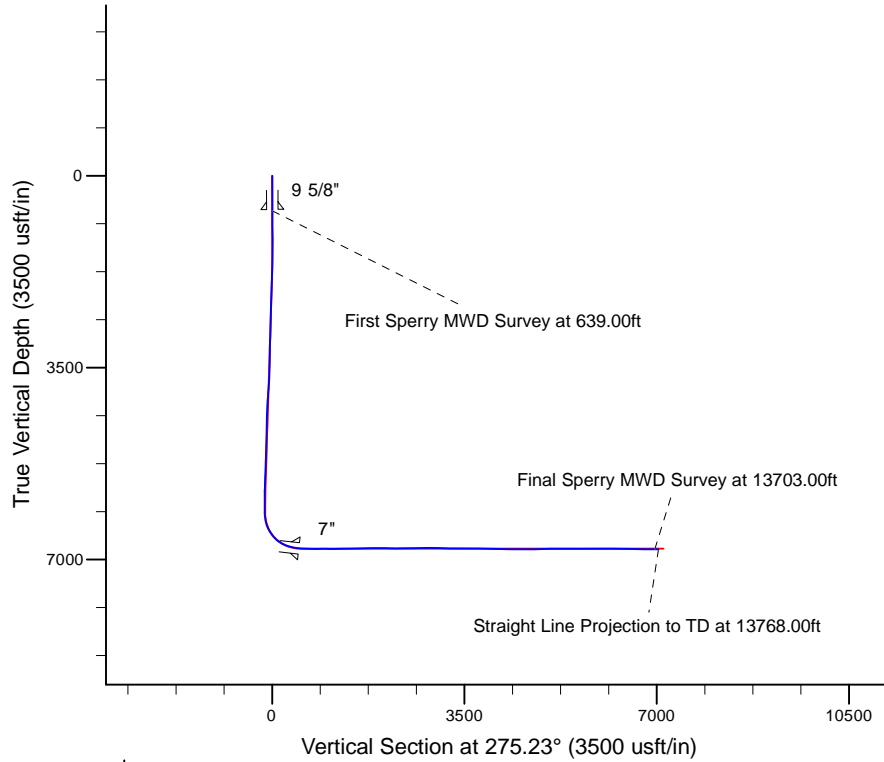
Well Coordinates: 1,429,315.64 N, 3,307,181.34 E (40° 30' 23.83" N, 104° 23' 43.04" W)
Ground Level: 4,855.00 usft

Local Coordinate Origin:	Centered on Well Wells Ranch AA11-690
Viewing Datum:	KB @ 4885.00usft (HP 321)
TVDs to System:	N
North Reference:	Grid
Unit System:	Dec-Deg - API - US Survey Feet - Custom
Geodetic Scale Factor Applied	
Version: 5000.1 Build: 73	

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 11-T6N-R63W (Wells Ranch PAD)
 Well: Wells Ranch AA11-690
 Wellbore: Original Wellbore
 Design: Actual Surveys

Noble Energy



Platted SHL: 650' FNL, 215' FEL
 Platted Lat/Long: 40.506620 N, 104.395290 W
 Location: Sec. 11-T6N-R63W

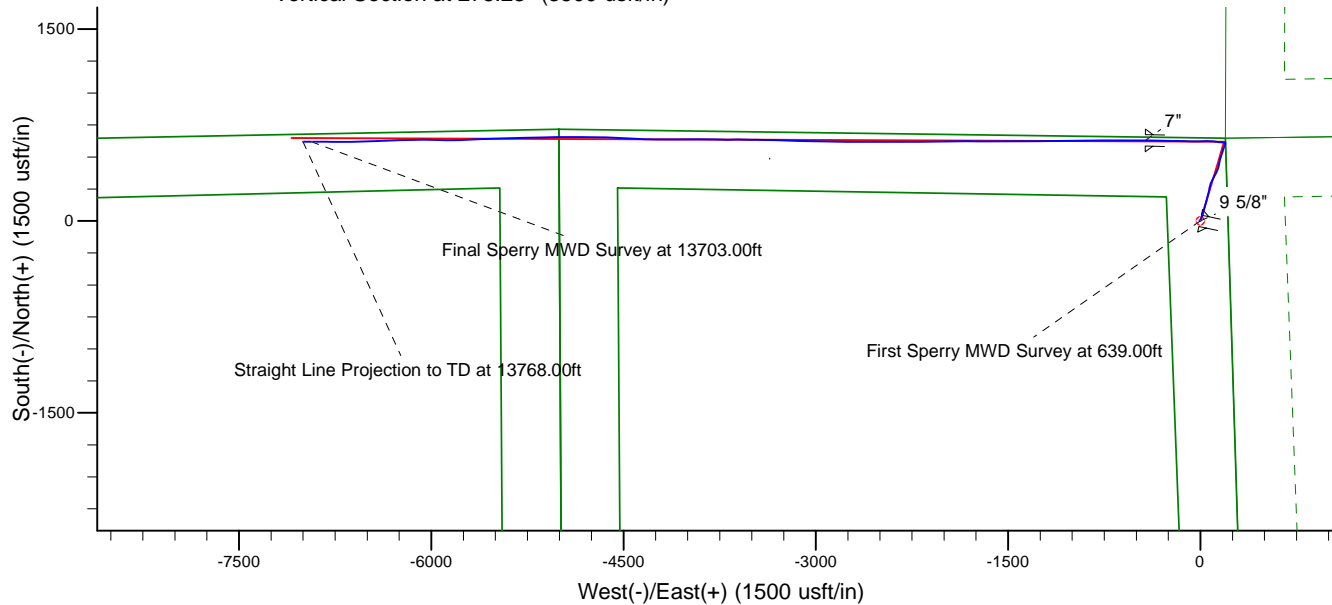
~7" Casing: 31' FNL, 587' FEL
 Lat/Long: 40.508362 N, 104.396802 W
 State Planes - CO Northern: 1429944.87 N, 3306752.93 E
 Location: Sec. 11-T6N-R63W

Platted BHL: 30' FNL, 2085' FEL
 Lat/Long: 40.508640 N, 104.420760 W
 State Planes - CO Northern: 1429964.29 N, 3300090.42 E
 Location: Sec. 10-T6N-R63W

LEGEND

—+— Wells Ranch AA11-690, Original Wellbore, Rev B0 V0

—□— Actual Surveys



WELL DETAILS: Wells Ranch AA11-690	
Ground Level:	4855.00
KB @ 4885.00usft (HP 321)	
Created By:	Tatiana Gomez
Created On:	10/21/2015



Design Report for Wells Ranch AA11-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
614.00	0.34	281.95	614.00	0.37	-1.76	1.79	0.05
9 5/8"							
639.00	0.35	281.95	639.00	0.40	-1.91	1.94	0.05
First Sperry MWD Survey at 639.00ft							
731.00	0.33	277.10	730.99	0.50	-2.45	2.48	0.04
823.00	0.40	295.41	822.99	0.67	-3.00	3.05	0.15
916.00	0.56	293.95	915.99	0.99	-3.71	3.78	0.17
1,008.00	0.52	269.91	1,007.99	1.17	-4.54	4.62	0.25
1,100.00	0.59	283.75	1,099.98	1.28	-5.41	5.51	0.16
1,210.00	0.31	105.19	1,209.98	1.34	-5.68	5.78	0.82
1,301.00	0.28	117.27	1,300.98	1.17	-5.24	5.33	0.08
1,394.00	0.34	77.61	1,393.98	1.13	-4.77	4.85	0.23
1,486.00	0.44	68.06	1,485.97	1.32	-4.18	4.28	0.13
1,579.00	1.58	38.47	1,578.96	2.46	-3.05	3.26	1.31
1,671.00	3.10	29.48	1,670.88	5.62	-1.03	1.54	1.69
1,763.00	4.61	23.29	1,762.67	11.18	1.65	-0.63	1.70
1,946.00	8.31	23.45	1,944.48	30.07	9.82	-7.04	2.02
2,038.00	9.07	21.88	2,035.42	42.90	15.17	-11.20	0.87
2,129.00	9.22	17.83	2,125.26	56.50	20.08	-14.85	0.73
2,221.00	8.98	14.87	2,216.11	70.45	24.18	-17.66	0.57
2,313.00	10.08	12.07	2,306.84	85.26	27.70	-19.82	1.30
2,405.00	9.39	11.05	2,397.51	100.50	30.83	-21.54	0.77
2,497.00	8.58	17.19	2,488.38	114.43	34.29	-23.73	1.36
2,588.00	9.57	19.08	2,578.24	128.06	38.77	-26.94	1.14
2,680.00	9.79	15.00	2,668.93	142.84	43.30	-30.10	0.78
2,772.00	9.08	13.10	2,759.69	157.47	46.97	-32.43	0.84
2,866.00	8.52	12.42	2,852.58	171.49	50.14	-34.31	0.61
2,961.00	9.38	18.58	2,946.43	185.71	54.13	-36.98	1.35
3,056.00	9.05	13.35	3,040.20	200.31	58.32	-39.83	0.95
3,150.00	9.27	13.21	3,133.00	214.88	61.75	-41.92	0.24
3,245.00	8.81	12.57	3,226.82	229.43	65.09	-43.92	0.50
3,340.00	8.52	12.06	3,320.74	243.41	68.14	-45.68	0.32
3,434.00	7.79	11.86	3,413.79	256.45	70.90	-47.25	0.78
3,529.00	8.46	13.38	3,507.83	269.55	73.84	-48.98	0.74
3,623.00	8.78	12.94	3,600.77	283.27	77.05	-50.93	0.35
3,718.00	9.42	25.68	3,694.59	297.35	82.04	-54.62	2.22
3,813.00	10.47	28.17	3,788.16	311.96	89.49	-60.70	1.19
3,907.00	11.73	26.67	3,880.40	328.03	97.81	-67.52	1.38
4,001.00	10.95	25.00	3,972.56	344.66	105.87	-74.03	0.90
4,095.00	8.87	26.51	4,065.15	359.24	112.88	-79.69	2.23
4,190.00	8.76	28.89	4,159.03	372.13	119.64	-85.25	0.40
4,284.00	8.15	29.47	4,252.01	384.20	126.38	-90.86	0.66
4,378.00	8.13	23.95	4,345.06	396.07	132.36	-95.73	0.83
4,473.00	8.56	19.73	4,439.06	408.87	137.47	-99.65	0.79
4,567.00	9.31	11.22	4,531.92	422.91	141.31	-102.20	1.61
4,662.00	8.62	7.62	4,625.76	437.50	143.75	-103.30	0.94
4,757.00	8.64	13.85	4,719.69	451.49	146.40	-104.67	0.98
4,851.00	8.08	13.13	4,812.69	464.78	149.59	-106.63	0.61
4,946.00	8.88	15.38	4,906.65	478.35	153.06	-108.84	0.91

Design Report for Wells Ranch AA11-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,040.00	7.70	15.22	4,999.67	491.42	156.63	-111.22	1.26
5,135.00	8.97	19.61	5,093.66	504.54	160.79	-114.16	1.49
5,229.00	8.63	17.93	5,186.56	518.15	165.42	-117.53	0.45
5,324.00	7.22	16.94	5,280.65	530.65	169.35	-120.31	1.49
5,418.00	8.28	17.28	5,373.79	542.76	173.09	-122.92	1.13
5,512.00	8.16	20.62	5,466.82	555.47	177.45	-126.11	0.52
5,607.00	8.55	18.04	5,560.81	568.49	182.01	-129.46	0.57
5,701.00	10.73	21.72	5,653.48	583.27	187.41	-133.50	2.41
5,796.00	6.19	13.89	5,747.42	596.46	191.92	-136.78	4.92
5,890.00	3.73	15.25	5,841.07	604.33	193.94	-138.08	2.62
5,985.00	2.21	0.20	5,935.94	609.15	194.76	-138.46	1.78
6,080.00	0.80	2.40	6,030.90	611.64	194.79	-138.26	1.49
6,175.00	0.80	83.02	6,125.89	612.38	195.48	-138.88	1.09
6,223.00	2.12	297.24	6,173.89	612.83	195.02	-138.38	5.87
6,269.00	6.51	283.94	6,219.74	613.85	191.73	-135.01	9.72
6,364.00	15.35	267.70	6,312.95	614.64	173.90	-117.19	9.76
6,459.00	20.83	275.75	6,403.23	615.83	144.50	-87.80	6.33
6,553.00	30.46	278.20	6,487.87	620.92	104.20	-47.20	10.30
6,648.00	40.55	269.24	6,565.16	623.95	49.31	7.74	11.93
6,743.00	48.24	267.38	6,633.00	621.92	-17.07	73.65	8.21
6,837.00	58.03	273.04	6,689.35	622.43	-92.13	148.45	11.47
6,932.00	68.61	270.98	6,731.95	625.34	-176.84	233.07	11.30
6,980.00	71.99	271.40	6,748.13	626.28	-222.01	278.14	7.09
7,027.00	73.25	270.37	6,762.17	626.97	-266.86	322.86	3.40
7,075.00	75.96	270.52	6,774.91	627.33	-313.13	368.97	5.65
7,122.00	79.94	271.28	6,784.72	628.05	-359.08	414.80	8.61
7,146.00	82.15	270.96	6,788.45	628.51	-382.78	438.44	9.30
7,192.00	83.79	270.91	6,794.08	629.26	-428.43	483.97	3.57
7"							
7,295.00	87.47	270.80	6,801.93	630.79	-531.10	586.35	3.57
7,390.00	88.24	269.49	6,805.48	631.03	-626.03	680.91	1.60
7,485.00	91.20	269.25	6,805.95	629.99	-721.01	775.40	3.13
7,579.00	90.49	269.47	6,804.56	628.94	-815.00	868.90	0.79
7,671.00	90.12	269.57	6,804.07	628.17	-906.99	960.44	0.42
7,763.00	89.38	268.43	6,804.47	626.56	-998.97	1,051.90	1.48
7,855.00	90.56	269.71	6,804.52	625.07	-1,090.96	1,143.36	1.89
7,947.00	90.71	269.88	6,803.50	624.74	-1,182.95	1,234.94	0.25
8,040.00	91.36	269.64	6,801.82	624.35	-1,275.93	1,327.51	0.75
8,132.00	90.65	269.82	6,800.21	623.92	-1,367.92	1,419.07	0.80
8,224.00	92.04	268.91	6,798.05	622.90	-1,459.88	1,510.56	1.81
8,316.00	92.62	269.46	6,794.31	621.59	-1,551.80	1,601.97	0.87
8,407.00	91.60	269.85	6,790.96	621.04	-1,642.73	1,692.48	1.20
8,499.00	91.20	270.61	6,788.71	621.41	-1,734.70	1,784.10	0.93
8,590.00	88.46	270.71	6,788.98	622.46	-1,825.69	1,874.80	3.01
8,682.00	89.08	269.85	6,790.95	622.91	-1,917.67	1,966.44	1.15
8,774.00	89.11	269.56	6,792.41	622.43	-2,009.65	2,058.00	0.32
8,866.00	89.35	269.17	6,793.64	621.41	-2,101.64	2,149.51	0.50
8,958.00	90.34	268.91	6,793.89	619.87	-2,193.62	2,240.97	1.11
9,080.00	90.03	269.49	6,793.50	618.17	-2,315.61	2,362.30	0.54
9,141.00	91.11	268.85	6,792.89	617.29	-2,376.60	2,422.95	2.06
9,233.00	91.11	269.86	6,791.11	616.25	-2,468.58	2,514.45	1.10



Design Report for Wells Ranch AA11-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,327.00	90.09	270.56	6,790.13	616.60	-2,562.57	2,608.08	1.32
9,422.00	91.45	270.01	6,788.85	617.07	-2,657.56	2,702.72	1.54
9,517.00	88.95	271.27	6,788.52	618.13	-2,752.54	2,797.40	2.95
9,611.00	90.09	270.75	6,789.30	619.79	-2,846.52	2,891.15	1.33
9,706.00	90.46	271.18	6,788.85	621.39	-2,941.51	2,985.88	0.60
9,801.00	89.48	272.34	6,788.90	624.30	-3,036.46	3,080.70	1.60
9,895.00	87.10	271.90	6,791.70	627.78	-3,130.35	3,174.52	2.57
9,990.00	88.70	271.22	6,795.18	630.36	-3,225.24	3,269.26	1.83
10,085.00	89.75	270.94	6,796.47	632.15	-3,320.22	3,364.00	1.14
10,179.00	89.11	271.38	6,797.40	634.06	-3,414.19	3,457.75	0.83
10,274.00	89.48	270.11	6,798.57	635.29	-3,509.17	3,552.46	1.39
10,369.00	91.70	270.71	6,797.60	635.97	-3,604.16	3,647.11	2.42
10,463.00	87.25	268.88	6,798.46	635.64	-3,698.13	3,740.65	5.12
10,558.00	89.20	271.24	6,801.40	635.74	-3,793.07	3,835.21	3.22
10,653.00	90.28	270.83	6,801.83	637.45	-3,888.05	3,929.96	1.22
10,747.00	89.01	269.62	6,802.41	637.82	-3,982.05	4,023.59	1.87
10,842.00	88.64	269.18	6,804.36	636.83	-4,077.02	4,118.08	0.61
10,937.00	88.64	269.82	6,806.62	636.00	-4,171.99	4,212.58	0.67
11,032.00	88.89	270.95	6,808.66	636.64	-4,266.96	4,307.22	1.22
11,126.00	89.45	272.91	6,810.03	639.80	-4,360.90	4,401.05	2.17
11,221.00	89.54	273.95	6,810.86	645.48	-4,455.72	4,496.00	1.10
11,316.00	89.97	271.74	6,811.27	650.20	-4,550.60	4,590.91	2.37
11,410.00	90.06	271.42	6,811.24	652.79	-4,644.56	4,684.72	0.35
11,504.00	90.56	270.60	6,810.74	654.45	-4,738.54	4,778.46	1.02
11,599.00	91.63	270.67	6,808.92	655.50	-4,833.52	4,873.14	1.13
11,693.00	91.29	270.13	6,806.53	656.16	-4,927.49	4,966.77	0.68
11,788.00	92.25	269.16	6,803.59	655.57	-5,022.44	5,061.27	1.44
11,882.00	90.25	268.04	6,801.54	653.27	-5,116.38	5,154.62	2.44
11,976.00	91.20	268.56	6,800.35	650.48	-5,210.33	5,247.92	1.15
12,071.00	90.52	269.27	6,798.92	648.69	-5,305.30	5,342.33	1.03
12,165.00	89.54	269.53	6,798.88	647.70	-5,399.29	5,435.85	1.08
12,260.00	89.23	267.06	6,799.90	644.88	-5,494.24	5,530.14	2.62
12,354.00	88.18	265.69	6,802.02	638.93	-5,588.02	5,622.99	1.84
12,449.00	90.15	269.74	6,803.40	635.15	-5,682.91	5,717.14	4.74
12,543.00	89.08	266.38	6,804.04	631.97	-5,776.84	5,810.39	3.75
12,638.00	90.65	271.90	6,804.26	630.54	-5,871.79	5,904.82	6.04
12,732.00	91.60	272.05	6,802.42	633.78	-5,965.72	5,998.65	1.02
12,827.00	92.72	271.07	6,798.83	636.37	-6,060.61	6,093.38	1.57
12,921.00	88.74	267.32	6,797.64	635.04	-6,154.56	6,186.82	5.82
13,016.00	88.12	267.00	6,800.24	630.34	-6,249.41	6,280.84	0.73
13,110.00	88.83	268.18	6,802.74	626.39	-6,343.29	6,373.97	1.46
13,205.00	89.38	268.88	6,804.23	623.95	-6,438.24	6,468.31	0.94
13,299.00	89.23	268.31	6,805.37	621.65	-6,532.21	6,561.68	0.63
13,394.00	88.86	268.80	6,806.95	619.25	-6,627.16	6,656.02	0.65
13,489.00	89.32	270.33	6,808.46	618.53	-6,722.15	6,750.54	1.68
13,583.00	89.29	271.38	6,809.60	619.93	-6,816.13	6,844.26	1.12
13,678.00	89.88	268.78	6,810.29	620.07	-6,911.12	6,938.87	2.81
13,703.00	90.46	269.04	6,810.21	619.59	-6,936.11	6,963.71	2.54
Final Sperry MWD Survey at 13703.00ft							
13,768.00	91.70	270.28	6,808.99	619.20	-7,001.10	7,028.39	2.70
Straight Line Projection to TD at 13768.00ft - Wells Ranch AA11-690_BHL							

Design Report for Wells Ranch AA11-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
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Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
639.00	639.00	0.40	-1.91	First Sperry MWD Survey at 639.00ft
13,703.00	6,810.21	619.59	-6,936.11	Final Sperry MWD Survey at 13703.00ft
13,768.00	6,808.99	619.20	-7,001.10	Straight Line Projection to TD at 13768.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AA11-690_BHL	275.23	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
639.00	7,146.00	Intermediate Surveys	MWD
7,295.00	13,768.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
614.00	614.00	9 5/8"	9-5/8	13-3/4
7,192.00	6,794.08	7"	7	8-3/4

Wellbore Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Wells Ranch AA11-690 - hit/miss target - Shape	0.00	0.00	0.00	648.67	-7,091.16	1,429,964.29	3,300,090.42	40.508640	-104.420760
- actual wellpath misses target center by 6809.65usft at 13768.00usft MD (6808.99 TVD, 619.20 N, -7001.10 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.88 °/100usft	Maximum Dogleg over Survey:	11.93 °/100usft at 6,648.00 usft
Net Tortosity applicable to Plans:	1.09 °/100usft	Directional Difficulty Index:	6.613

Audit Info

**North Reference Sheet for Sec. 11-T6N-R63W (Wells Ranch PAD) - Wells Ranch
AA11-690 - Original Wellbore**

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

Vertical Depths are relative to KB @ 4885.00usft (HP 321). Northing and Easting are relative to Wells Ranch AA11-690

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996679

Grid Coordinates of Well: 1,429,315.64 usft N, 3,307,181.34 usft E

Geographical Coordinates of Well: 40° 30' 23.83" N, 104° 23' 43.04" W

Grid Convergence at Surface is: 0.71°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,768.00usft
the Bottom Hole Displacement is 7,028.43usft in the Direction of 275.05° (Grid).

Magnetic Convergence at surface is: -7.65° (18 May 2015, , BGGM2015)

