

Project: Weld County, CO (NAD 83)

Site: Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD)

Well: Wells Ranch AE20-67HN

Wellbore: Plan A

Design: Final Surveys

Noble Energy

HALLIBURTON
Sperry Drilling

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE20-63-1HN 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.

Platted SHL: 1320' FNL, 535' FWL
Platted Lat/Long: 40.40, 47620 N, 104.35519 W
Location: Sec. 20-T6N-R62W

7" Casing: ~1313.35' FNL, ~745.69' FWL
Lat/Long: 40.475937 N, 104.353289 W
State Planes - CO Northern: 1,418,286.78' N, 3,319,004.39' E
Location: Sec. 20-T6N-R62W

BHL: ~1312.58' FNL, ~537.76' FEL
Lat/Long: 40.476113 N, 104.339313 W
State Planes - CO Northern: 1,418,401.64' N, 3,322,891.24' E
Location: Sec. 20-T6N-R62W

LEGEND

- Wells Ranch AE20-67HN, Plan A, Rev A0 Proposal V0
- Final Surveys

Tie-On to Surface Gyros @ 966.00ft

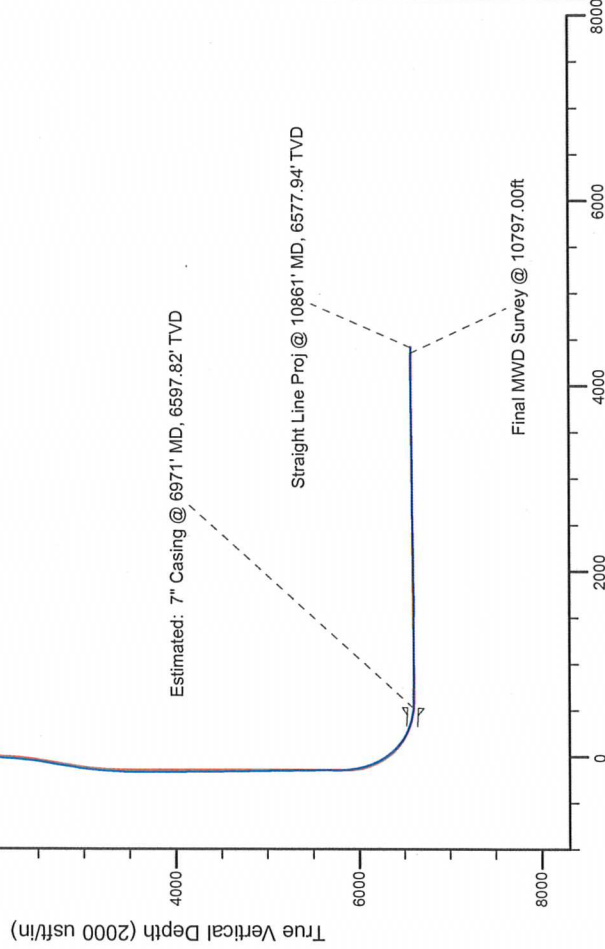
First MWD Survey @ 998.00ft

Estimated: 7" Casing @ 6971' MD, 6597.82' TVD

Straight Line Proj @ 10861' MD, 6577.94' TVD

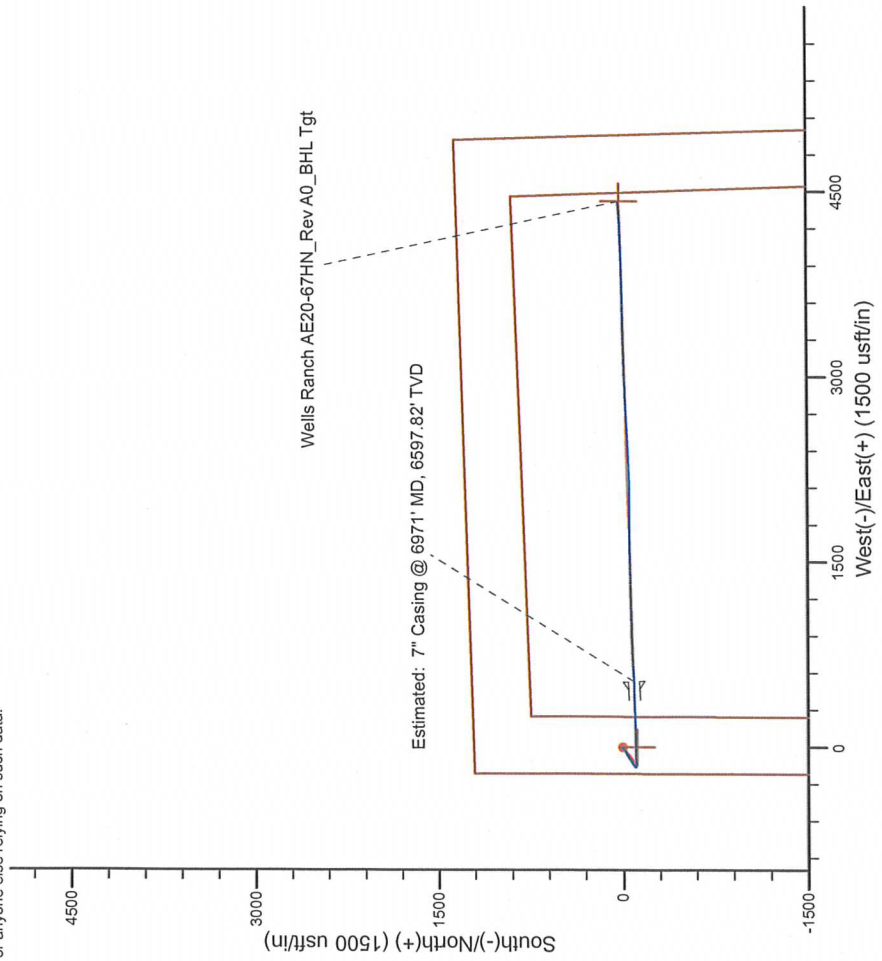
Final MWD Survey @ 10797.00ft

Vertical Section at 89.77° (2000 usft/in)



Wells Ranch AE20-67HN_Rev A0_BHL Tgt

Estimated: 7" Casing @ 6971' MD, 6597.82' TVD



WELL DETAILS: Wells Ranch AE20-67HN

Ground Level: 4841.00
KB=30' @ 4871.00usft (H&P 321)

Design: Final Surveys (Wells Ranch AE20-67HN/Plan A)

Created By: Fred Hartmann

Date: 10/14/2013

Noble Energy

Weld County, CO (NAD 83)

Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD)

Wells Ranch AE20-67HN - A4

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

14 October, 2013

Well Coordinates: 1,418,375.87 N, 3,318,474.21 E (40° 28' 34.32" N, 104° 21' 18.68" W)

Ground Level: 4,841.00 usft

Local Coordinate Origin: Centered on Well Wells Ranch AE20-67HN - Slot A4

Viewing Datum: KB=30' @ 4871.00usft (H&P 321)

TVDs to System: N

North Reference: Grid

Unit System: Custom API - US Survey Feet

Geodetic Scale Factor Applied

Version: 5000.1 Build: 58

HALLIBURTON

Design Report for Wells Ranch AE20-67HN - Final 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
356.00	0.80	324.63	355.99	2.03	-1.44	-1.43	0.22
663.00	0.60	302.03	662.97	4.63	-4.04	-4.02	0.11
966.00	0.60	65.73	965.96	6.12	-3.94	-3.92	0.35
Tie-On to Surface Gyros @ 966.00ft							
998.00	0.21	92.76	997.96	6.19	-3.73	-3.71	1.32
First MWD Survey @ 998.00ft							
1,090.00	0.38	64.89	1,089.96	6.31	-3.28	-3.26	0.24
1,183.00	0.52	88.82	1,182.95	6.45	-2.58	-2.56	0.25
1,275.00	0.80	52.78	1,274.95	6.84	-1.65	-1.63	0.53
1,368.00	0.72	57.40	1,367.94	7.55	-0.65	-0.62	0.11
1,460.00	1.18	32.66	1,459.93	8.66	0.35	0.39	0.66
1,555.00	1.37	325.86	1,554.91	10.42	0.24	0.28	1.49
1,649.00	0.75	279.95	1,648.89	11.46	-0.99	-0.95	1.07
1,744.00	0.98	237.69	1,743.88	11.13	-2.29	-2.25	0.69
1,839.00	1.10	236.16	1,838.87	10.19	-3.74	-3.70	0.13
1,933.00	1.26	230.41	1,932.85	9.03	-5.28	-5.25	0.21
2,028.00	2.99	223.32	2,027.78	6.56	-7.79	-7.76	1.84
2,123.00	4.16	218.23	2,122.59	2.05	-11.62	-11.61	1.27
2,218.00	5.50	232.25	2,217.26	-3.44	-17.35	-17.37	1.87
2,313.00	6.45	235.77	2,311.74	-9.23	-25.36	-25.40	1.07
2,408.00	7.07	239.73	2,406.08	-15.18	-34.82	-34.88	0.82
2,503.00	9.24	240.02	2,500.11	-21.94	-46.48	-46.57	2.28
2,597.00	12.28	238.19	2,592.45	-30.98	-61.52	-61.64	3.25
2,692.00	10.88	236.79	2,685.51	-41.22	-77.61	-77.77	1.50
2,787.00	9.87	238.85	2,778.96	-50.34	-92.08	-92.27	1.13
2,882.00	9.56	242.28	2,872.60	-58.22	-106.03	-106.25	0.69
2,976.00	9.71	242.10	2,965.27	-65.56	-119.94	-120.20	0.16
3,071.00	9.09	230.84	3,059.00	-74.05	-132.84	-133.13	2.04
3,166.00	5.82	224.52	3,153.19	-82.23	-142.04	-142.36	3.54
3,261.00	4.93	234.59	3,247.77	-88.02	-148.75	-149.09	1.36
3,356.00	5.89	234.80	3,342.35	-93.20	-156.06	-156.42	1.01
3,450.00	2.92	213.39	3,436.07	-97.98	-161.32	-161.70	3.56
3,545.00	1.75	149.99	3,531.00	-101.26	-161.92	-162.32	2.79
3,640.00	0.16	253.93	3,625.98	-102.55	-161.32	-161.73	1.89
3,735.00	1.01	347.18	3,720.98	-101.77	-161.64	-162.04	1.09
3,830.00	1.97	342.81	3,815.95	-99.39	-162.31	-162.70	1.02
3,925.00	0.94	350.58	3,910.91	-97.07	-162.92	-163.30	1.10
4,019.00	0.55	52.68	4,004.91	-96.03	-162.68	-163.06	0.89
4,114.00	1.03	113.36	4,099.90	-96.09	-161.54	-161.91	0.95
4,209.00	0.06	66.07	4,194.89	-96.41	-160.71	-161.09	1.04
4,304.00	0.74	80.32	4,289.89	-96.29	-160.06	-160.43	0.72
4,399.00	1.07	153.64	4,384.88	-96.98	-159.06	-159.44	1.17
4,494.00	1.38	152.39	4,479.86	-98.79	-158.14	-158.52	0.33
4,589.00	1.70	125.27	4,574.83	-100.62	-156.45	-156.85	0.83
4,684.00	1.52	134.23	4,669.79	-102.31	-154.40	-154.80	0.33
4,779.00	0.77	99.41	4,764.77	-103.29	-152.87	-153.27	1.04
4,873.00	0.49	142.39	4,858.77	-103.71	-152.00	-152.41	0.56
4,968.00	1.23	106.19	4,953.75	-104.32	-150.77	-151.18	0.93
5,063.00	0.71	101.66	5,048.74	-104.72	-149.22	-149.63	0.55

Design Report for Wells Ranch AE20-67HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,158.00	0.76	112.35	5,143.73	-105.08	-148.06	-148.47	0.15
5,253.00	1.18	79.78	5,238.72	-105.15	-146.51	-146.92	0.71
5,347.00	0.18	57.60	5,332.71	-104.90	-145.44	-145.85	1.08
5,442.00	1.08	108.39	5,427.71	-105.10	-144.46	-144.87	1.03
5,537.00	0.68	126.14	5,522.69	-105.71	-143.16	-143.57	0.50
5,632.00	0.34	117.32	5,617.69	-106.18	-142.45	-142.87	0.37
5,726.00	0.67	108.13	5,711.69	-106.48	-141.68	-142.10	0.36
5,783.00	0.80	76.46	5,768.68	-106.49	-140.98	-141.39	0.74
5,847.00	0.46	70.05	5,832.68	-106.29	-140.30	-140.72	0.54
5,915.00	3.91	71.34	5,900.62	-105.46	-137.85	-138.26	5.07
5,963.00	11.20	75.54	5,948.17	-103.77	-131.77	-132.18	15.22
6,010.00	13.38	80.35	5,994.09	-101.72	-121.99	-122.39	5.12
6,058.00	14.64	85.07	6,040.66	-100.26	-110.47	-110.86	3.54
6,105.00	17.77	85.64	6,085.79	-99.21	-97.40	-97.79	6.67
6,153.00	19.50	88.48	6,131.27	-98.44	-82.09	-82.47	4.07
6,199.00	21.74	87.00	6,174.32	-97.79	-65.90	-66.28	5.00
6,247.00	25.48	85.15	6,218.30	-96.45	-46.73	-47.11	7.94
6,294.00	30.15	88.14	6,259.86	-95.21	-24.85	-25.22	10.37
6,342.00	34.94	91.24	6,300.31	-95.12	0.96	0.59	10.56
6,389.00	38.46	93.02	6,337.99	-96.18	29.02	28.64	7.82
6,437.00	43.44	92.70	6,374.23	-97.74	60.43	60.05	10.38
6,484.00	46.75	90.72	6,407.41	-98.72	93.70	93.31	7.65
6,532.00	49.48	89.03	6,439.45	-98.63	129.43	129.04	6.26
6,579.00	52.96	89.09	6,468.89	-98.03	166.06	165.67	7.40
6,627.00	57.98	88.49	6,496.09	-97.19	205.58	205.20	10.51
6,674.00	62.45	87.67	6,519.43	-95.82	246.34	245.96	9.63
6,722.00	65.25	87.58	6,540.58	-94.03	289.38	289.01	5.84
6,768.00	71.09	88.42	6,557.68	-92.55	332.04	331.67	12.81
6,816.00	73.74	89.82	6,572.18	-91.85	377.79	377.42	6.18
6,863.00	77.20	89.58	6,583.97	-91.61	423.27	422.91	7.38
6,926.00	83.85	88.55	6,594.34	-90.59	485.37	485.01	10.68
6,971.00	87.26	87.62	6,597.82	-89.09	530.20	529.85	7.86
Estimated: 7" Casing @ 6971' MD, 6597.82' TVD							
7,003.00	89.69	86.96	6,598.67	-87.58	562.15	561.81	7.86
7,088.00	89.23	85.66	6,599.47	-82.11	646.97	646.64	1.62
7,183.00	87.97	86.94	6,601.80	-75.98	741.74	741.44	1.89
7,278.00	88.58	88.65	6,604.66	-72.33	836.62	836.33	1.91
7,373.00	90.71	89.03	6,605.24	-70.40	931.60	931.31	2.28
7,467.00	91.45	88.68	6,603.47	-68.53	1,025.56	1,025.28	0.87
7,562.00	91.14	88.21	6,601.33	-65.95	1,120.50	1,120.23	0.59
7,657.00	90.15	88.65	6,600.26	-63.35	1,215.46	1,215.20	1.14
7,751.00	88.80	89.07	6,601.12	-61.48	1,309.43	1,309.18	1.50
7,846.00	89.17	88.49	6,602.80	-59.45	1,404.40	1,404.15	0.72
7,941.00	89.38	88.64	6,604.00	-57.08	1,499.36	1,499.12	0.27
8,036.00	88.98	89.45	6,605.36	-55.49	1,594.34	1,594.10	0.95
8,131.00	91.48	90.66	6,604.98	-55.58	1,689.32	1,689.09	2.92
8,225.00	91.61	90.31	6,602.45	-56.38	1,783.29	1,783.05	0.40
8,320.00	91.27	89.55	6,600.06	-56.26	1,878.26	1,878.02	0.88
8,415.00	91.54	89.51	6,597.73	-55.48	1,973.22	1,972.99	0.29
8,510.00	89.48	90.07	6,596.88	-55.14	2,068.21	2,067.98	2.25
8,605.00	89.32	88.67	6,597.88	-54.09	2,163.20	2,162.97	1.48

Design Report for Wells Ranch AE20-67HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,700.00	89.44	88.83	6,598.91	-52.02	2,258.17	2,257.95	0.21
8,794.00	91.33	87.01	6,598.27	-48.61	2,352.10	2,351.89	2.79
8,889.00	91.85	87.05	6,595.64	-43.69	2,446.94	2,446.75	0.55
8,984.00	91.39	87.58	6,592.95	-39.24	2,541.79	2,541.62	0.74
9,079.00	90.62	86.38	6,591.29	-34.23	2,636.64	2,636.49	1.50
9,174.00	90.99	86.11	6,589.95	-28.01	2,731.43	2,731.30	0.48
9,269.00	91.60	88.16	6,587.80	-23.27	2,826.28	2,826.17	2.25
9,364.00	90.22	87.89	6,586.30	-19.99	2,921.21	2,921.11	1.48
9,458.00	89.85	86.87	6,586.24	-15.70	3,015.11	3,015.03	1.15
9,553.00	89.35	88.31	6,586.90	-11.70	3,110.02	3,109.95	1.60
9,648.00	90.56	88.88	6,586.98	-9.37	3,204.99	3,204.93	1.41
9,742.00	91.02	88.51	6,585.68	-7.23	3,298.96	3,298.90	0.63
9,837.00	90.74	89.11	6,584.22	-5.26	3,393.93	3,393.88	0.70
9,932.00	89.75	88.22	6,583.82	-3.05	3,488.90	3,488.86	1.40
10,027.00	90.55	89.96	6,583.57	-1.54	3,583.88	3,583.85	2.02
10,122.00	90.34	89.31	6,582.83	-0.93	3,678.88	3,678.84	0.72
10,216.00	91.67	89.69	6,581.18	-0.11	3,772.85	3,772.83	1.47
10,311.00	90.22	87.92	6,579.61	1.87	3,867.82	3,867.79	2.41
10,406.00	89.81	87.80	6,579.59	5.42	3,962.75	3,962.74	0.45
10,500.00	90.83	88.11	6,579.06	8.77	4,056.69	4,056.69	1.13
10,595.00	91.97	88.45	6,576.74	11.62	4,151.61	4,151.63	1.25
10,690.00	89.51	86.98	6,575.52	15.41	4,246.52	4,246.55	3.02
10,797.00	89.04	86.32	6,576.87	21.66	4,353.33	4,353.38	0.76
Final MWD Survey @ 10797.00ft							
10,861.00	89.04	86.32	6,577.94	25.77	4,417.19	4,417.25	0.00
Straight Line Proj @ 10861' MD, 6577.94' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
966.00	965.96	6.12	-3.94	Tie-On to Surface Gyros @ 966.00ft
998.00	997.96	6.19	-3.73	First MWD Survey @ 998.00ft
10,797.00	6,576.87	21.66	4,353.33	Final MWD Survey @ 10797.00ft
10,861.00	6,577.94	25.77	4,417.19	Straight Line Proj @ 10861' MD, 6577.94' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Wells Ranch AE20-67HN_Rev A0_BHL Tgt	89.77	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
356.00	966.00	Surface Gyros	Flexi-Shot
998.00	6,926.00	MWD Surveys - Vert/Build	MWD+IFR1+MS_WY
7,003.00	10,797.00	MWD Surveys - Lateral	MWD+IFR1+MS_WY

Design Report for Wells Ranch AE20-67HN - Final Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,971.00	6,597.82	Estimated: 7" Casing @ 6971' MD, 6597.82' TVD	7	8-3/4

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Wells Ranch AE20-66-	0.00	0.00	1.00	-112.97	-1.32	1,418,262.91	3,318,472.89	40.475890	-104.355200
- actual wellpath misses target center by 112.98usft at 0.36usft MD (0.36 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			248.00	856.00		1,419,118.85	3,318,720.95		
Point 2			4,457.00	1,007.00		1,419,269.48	3,322,929.82		
Point 3			4,615.00	-3,383.00		1,414,879.62	3,323,087.43		
Point 4			239.00	-3,525.00		1,414,738.01	3,318,711.57		
Point 5			248.00	856.00		1,419,118.85	3,318,720.95		
Wells Ranch AE20-66-	0.00	0.00	1.00	-112.97	-1.32	1,418,262.91	3,318,472.89	40.475890	-104.355200
- actual wellpath misses target center by 112.98usft at 0.36usft MD (0.36 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-212.00	1,316.00		1,419,578.88	3,318,261.01		
Point 2			4,917.00	1,467.00		1,419,729.42	3,323,389.84		
Point 3			5,075.00	-3,843.00		1,414,419.60	3,323,547.37		
Point 4			-221.00	-3,985.00		1,414,278.07	3,318,251.55		
Point 5			-212.00	1,316.00		1,419,578.88	3,318,261.01		
Wells Ranch AE20-67H	0.00	0.00	6,576.43	17.35	4,418.08	1,418,393.22	3,322,892.14	40.476090	-104.339310
- actual wellpath misses target center by 8.60usft at 10861.00usft MD (6577.94 TVD, 25.77 N, 4417.19 E)									
- Point									

North Reference Sheet for Sec. 20-T6N-R62W (Wells Ranch AE20 North PAD) - Wells Ranch AE20-67HN

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

Vertical Depths are relative to KB=30' @ 4871.00usft (H&P 321). Northing and Easting are relative to Wells Ranch AE20-67HN - Slot A4

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: 0.99996457

Grid Coordinates of Well: 1,418,375.87 usft N, 3,318,474.21 usft E

Geographical Coordinates of Well: 40° 28' 34.32" N, 104° 21' 18.68" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,861.00usft

the Bottom Hole Displacement is 4,417.26usft in the Direction of 89.67° (Grid).

Magnetic Convergence at surface is: -7.63° (12 September 2013, , BGGM2013)

