

Noble Energy

Weld County, CO (NAD 83)

Sec. 32-T6N-R62W (Wells Ranch AE32)

Wells Ranch AE32-670

05-123-41722

Plan A

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

07 October, 2015

Surface UWI : 05-123-41722

Well Coordinates: 1,407,020.98 N, 3,318,862.98 E (40° 26' 42.07" N, 104° 21' 15.55" W)

Ground Level: 4,729.00 usft

Local Coordinate Origin:

Centered on Well Wells Ranch AE32-670

Viewing Datum:

KB = 30' @ 4759.00usft (H&P 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

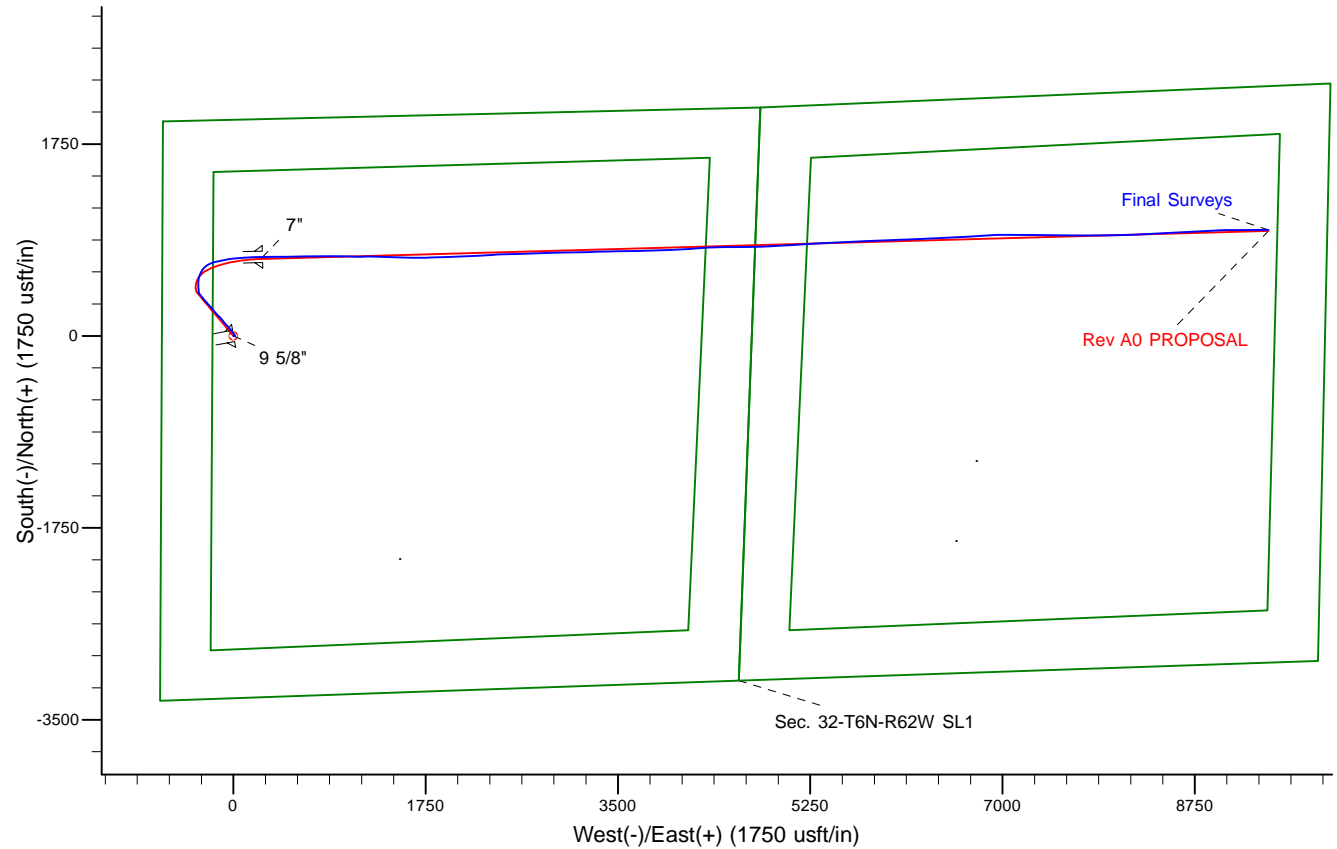
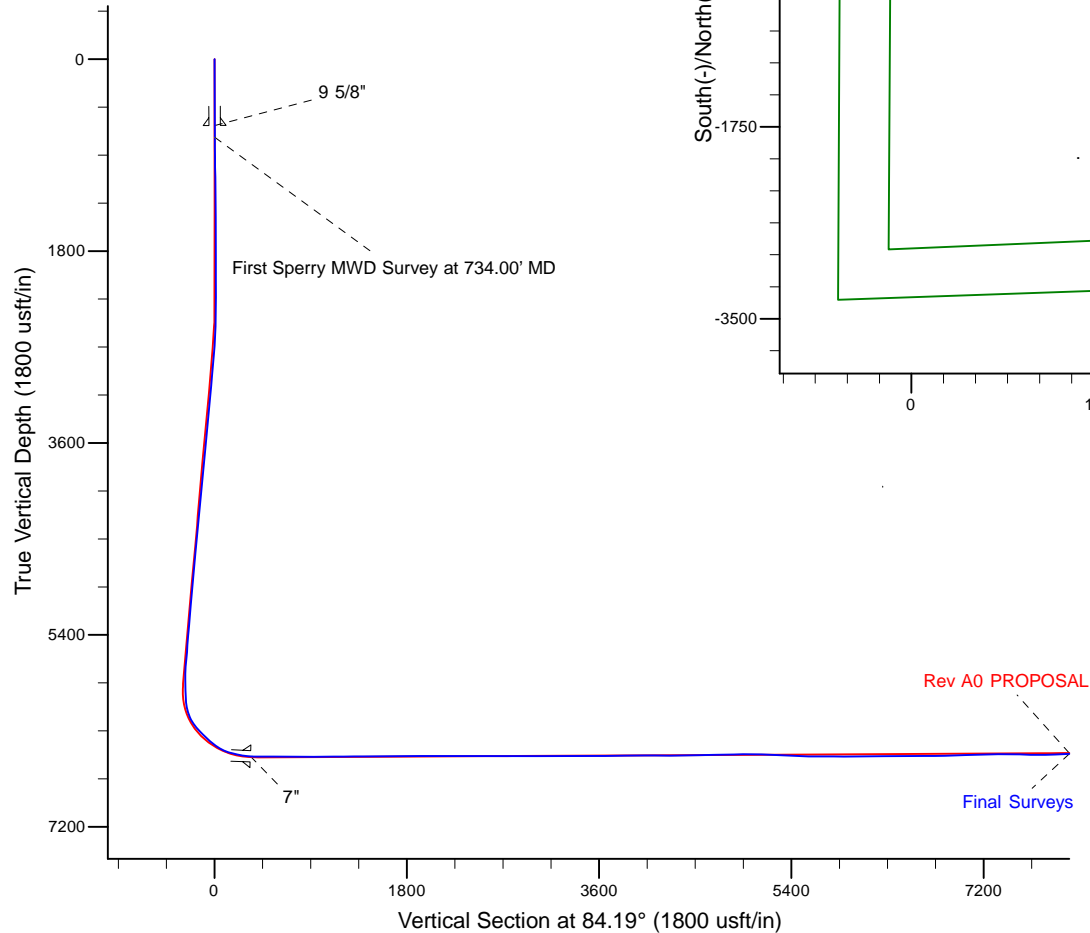
Project: Weld County, CO (NAD 83)
 Site: Sec. 32-T6N-R62W (Wells Ranch AE32)
 Well: Wells Ranch AE32-670
 Wellbore: Plan A
 Design: Final Surveys



Platted SHL: 1972' FNL, 650' FWL
 Platted Lat/Long: 40.445020, -104.354320
 Location: Sec. 32-T6N-R62W

~7" Casing: 1255' FNL, 900' FWL
 Lat/Long: 40.446987 N, -104.353333 W
 State Planes - CO Northern: 1,407,741.00 N, 3,319,128.44 E
 Sec. 32-T6N-R62W

Platted BHL: 1320' FNL, 535' FEL
 Platted Lat/Long: 40.447335 N, -104.320438 W
 State Planes - CO Northern: 1,407,987.81 N, 3,328,281.34 E
 Location: Sec. 33-T6N-R62W



LEGEND

- Wells Ranch AE32-670, Plan A, Rev A0 PROPOSAL V0
- Final Surveys

WELL DETAILS: Wells Ranch AE32-670

Ground Level: 4729.00

KB = 30' @ 4759.00usft (H&P 321)

Created By: Tatiana Gomez
 Created On: 10/7/2015

Design Report for Wells Ranch AE32-670 - 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
623.00	0.45	79.66	622.99	0.44	2.41	2.44	0.07
9 5/8"							
734.00	0.53	79.66	733.99	0.61	3.34	3.38	0.07
First Sperry MWD Survey at 734.00' MD							
828.00	0.57	91.25	827.99	0.68	4.23	4.28	0.13
919.00	0.59	90.43	918.98	0.66	5.16	5.20	0.02
1,011.00	0.62	91.46	1,010.98	0.65	6.13	6.16	0.03
1,105.00	0.51	89.69	1,104.97	0.64	7.05	7.08	0.12
1,210.00	0.65	93.00	1,209.97	0.61	8.12	8.14	0.14
1,304.00	0.74	112.77	1,303.96	0.35	9.21	9.20	0.27
1,397.00	0.58	113.77	1,396.95	-0.08	10.19	10.13	0.17
1,491.00	0.62	127.09	1,490.95	-0.58	11.03	10.92	0.15
1,582.00	0.33	126.34	1,581.94	-1.03	11.64	11.47	0.32
1,674.00	0.28	114.84	1,673.94	-1.28	12.05	11.86	0.09
1,767.00	0.06	227.25	1,766.94	-1.41	12.23	12.02	0.33
1,861.00	0.28	126.04	1,860.94	-1.58	12.38	12.15	0.32
1,954.00	0.33	129.18	1,953.94	-1.88	12.77	12.51	0.06
2,046.00	0.38	159.21	2,045.94	-2.33	13.08	12.78	0.21
2,138.00	0.56	156.04	2,137.94	-3.03	13.37	13.00	0.20
2,232.00	0.50	154.78	2,231.93	-3.82	13.73	13.28	0.07
2,324.00	3.02	348.72	2,323.90	-1.80	13.43	13.18	3.81
2,418.00	4.69	335.01	2,417.68	4.11	11.32	11.68	2.02
2,509.00	5.94	332.03	2,508.29	11.64	7.54	8.68	1.41
2,602.00	6.11	328.54	2,600.77	20.11	2.70	4.72	0.43
2,695.00	7.37	321.98	2,693.13	29.03	-3.56	-0.60	1.59
2,786.00	9.03	321.61	2,783.20	39.23	-11.59	-7.56	1.83
2,976.00	9.01	321.57	2,970.85	62.57	-30.09	-23.61	0.01
3,070.00	8.62	319.48	3,063.74	73.69	-39.25	-31.59	0.54
3,165.00	8.89	318.14	3,157.63	84.57	-48.77	-39.96	0.36
3,260.00	8.41	316.12	3,251.55	95.04	-58.48	-48.57	0.60
3,355.00	8.81	318.32	3,345.48	105.49	-68.14	-57.12	0.55
3,449.00	8.31	314.67	3,438.43	115.64	-77.75	-65.66	0.79
3,544.00	9.06	320.99	3,532.35	126.28	-87.35	-74.12	1.28
3,639.00	9.89	321.42	3,626.05	138.47	-97.14	-82.64	0.88
3,734.00	10.43	321.01	3,719.56	151.53	-107.64	-91.76	0.57
3,828.00	9.79	317.34	3,812.10	164.02	-118.41	-101.21	0.97
3,923.00	9.64	316.78	3,905.74	175.75	-129.33	-110.89	0.19
4,017.00	9.57	315.57	3,998.42	187.07	-140.19	-120.55	0.23
4,112.00	8.95	313.95	4,092.18	197.84	-151.04	-130.25	0.71
4,207.00	8.77	320.67	4,186.05	208.57	-160.95	-139.02	1.11
4,302.00	9.53	321.66	4,279.84	220.34	-170.42	-147.25	0.82
4,396.00	9.31	320.90	4,372.57	232.34	-180.04	-155.61	0.27
4,491.00	8.91	320.49	4,466.37	243.98	-189.57	-163.91	0.43
4,586.00	7.92	318.94	4,560.35	254.59	-198.55	-171.77	1.07
4,680.00	9.60	320.06	4,653.25	265.49	-207.83	-179.91	1.80
4,775.00	9.06	316.47	4,746.99	276.98	-218.07	-188.93	0.84
4,869.00	8.28	315.69	4,839.92	287.19	-227.89	-197.67	0.84
4,964.00	9.27	320.77	4,933.81	298.02	-237.51	-206.15	1.32
5,059.00	8.63	320.28	5,027.65	309.43	-246.91	-214.34	0.68

Design Report for Wells Ranch AE32-670 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,154.00	7.94	311.02	5,121.66	319.22	-256.41	-222.81	1.58
5,248.00	8.73	322.92	5,214.68	329.17	-265.61	-230.95	2.01
5,343.00	9.31	324.09	5,308.50	341.14	-274.47	-238.55	0.64
5,438.00	8.27	321.80	5,402.38	352.74	-283.20	-246.06	1.15
5,532.00	8.95	320.39	5,495.32	363.68	-292.04	-253.75	0.76
5,627.00	8.14	318.57	5,589.27	374.42	-301.20	-261.78	0.90
5,722.00	8.83	324.56	5,683.23	385.40	-309.88	-269.31	1.18
5,769.00	10.39	336.67	5,729.57	392.23	-313.65	-272.37	5.42
5,816.00	12.79	350.57	5,775.62	401.26	-316.18	-273.97	7.80
5,863.00	14.54	356.97	5,821.29	412.29	-317.35	-274.02	4.92
5,911.00	16.46	358.48	5,867.54	425.10	-317.85	-273.22	4.09
5,958.00	19.09	358.61	5,912.30	439.44	-318.21	-272.13	5.60
6,006.00	23.09	357.40	5,957.07	456.70	-318.83	-271.00	8.38
6,053.00	27.16	359.02	5,999.62	476.64	-319.43	-269.58	8.78
6,100.00	31.88	3.84	6,040.51	499.77	-318.78	-266.59	11.24
6,147.00	35.67	11.84	6,079.59	525.59	-315.14	-260.35	12.42
6,195.00	36.69	18.76	6,118.35	552.87	-307.65	-250.15	8.77
6,242.00	36.75	26.86	6,156.05	578.73	-296.78	-236.71	10.30
6,290.00	37.95	35.62	6,194.23	603.55	-281.68	-219.18	11.34
6,337.00	40.20	46.10	6,230.76	625.85	-262.31	-197.66	14.83
6,385.00	42.41	56.16	6,266.85	645.63	-237.67	-171.14	14.57
6,432.00	45.16	66.62	6,300.83	661.09	-209.17	-141.22	16.46
6,480.00	46.17	75.49	6,334.40	672.19	-176.75	-107.85	13.38
6,574.00	48.36	78.09	6,398.20	687.94	-109.55	-39.40	3.09
6,669.00	56.97	81.53	6,455.77	701.16	-35.27	35.84	9.51
6,763.00	70.39	85.68	6,497.36	710.34	48.26	119.87	14.81
6,810.00	76.69	86.97	6,510.68	713.22	93.22	164.89	13.66
6,858.00	78.15	87.25	6,521.13	715.58	140.01	211.68	3.09
6,905.00	79.09	87.25	6,530.40	717.79	186.03	257.69	2.00
6,939.00	84.04	88.71	6,535.39	718.98	219.63	291.23	15.17
6,985.00	87.19	88.63	6,538.91	720.04	265.48	336.95	6.84
7"							
7,014.00	89.17	88.58	6,539.83	720.75	294.45	365.85	6.84
7,108.00	89.41	89.53	6,540.99	722.30	388.43	459.50	1.04
7,203.00	89.60	89.58	6,541.81	723.03	483.43	554.09	0.21
7,297.00	91.26	90.06	6,541.11	723.33	577.42	647.63	1.84
7,391.00	89.04	89.04	6,540.86	724.07	671.41	741.21	2.60
7,486.00	88.77	88.44	6,542.68	726.16	766.37	835.89	0.69
7,580.00	90.28	90.07	6,543.46	727.38	860.35	929.52	2.36
7,674.00	91.17	91.72	6,542.27	725.91	954.33	1,022.86	1.99
7,768.00	90.65	91.48	6,540.78	723.29	1,048.28	1,116.07	0.61
7,862.00	90.09	89.05	6,540.17	722.85	1,142.27	1,209.53	2.65
7,956.00	90.74	89.89	6,539.49	723.72	1,236.26	1,303.13	1.13
8,051.00	90.52	90.81	6,538.44	723.14	1,331.25	1,397.57	1.00
8,145.00	90.71	93.44	6,537.43	719.65	1,425.17	1,490.66	2.81
8,239.00	90.00	90.91	6,536.85	716.09	1,519.10	1,583.74	2.80
8,333.00	90.31	91.15	6,536.60	714.40	1,613.08	1,677.07	0.42
8,427.00	89.94	89.88	6,536.39	713.55	1,707.07	1,770.50	1.41
8,522.00	90.03	88.86	6,536.42	714.60	1,802.07	1,865.11	1.08
8,616.00	89.63	87.36	6,536.70	717.70	1,896.01	1,958.89	1.65
8,710.00	90.12	87.71	6,536.90	721.74	1,989.93	2,052.73	0.64

Design Report for Wells Ranch AE32-670 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,804.00	90.86	89.01	6,536.10	724.43	2,083.88	2,146.47	1.59
8,899.00	89.60	86.34	6,535.72	728.28	2,178.79	2,241.29	3.11
8,993.00	89.78	86.30	6,536.22	734.32	2,272.60	2,335.22	0.20
9,088.00	89.78	86.00	6,536.59	740.70	2,367.38	2,430.16	0.32
9,183.00	90.55	89.05	6,536.32	744.80	2,462.28	2,524.99	3.31
9,278.00	89.29	87.74	6,536.45	747.46	2,557.24	2,619.73	1.91
9,467.00	90.40	88.88	6,536.96	753.03	2,746.15	2,808.24	0.84
9,562.00	89.54	87.86	6,537.01	755.73	2,841.11	2,902.98	1.40
9,656.00	89.97	88.19	6,537.41	758.97	2,935.05	2,996.77	0.58
9,751.00	90.62	88.90	6,536.92	761.39	3,030.02	3,091.50	1.01
9,846.00	90.49	89.11	6,536.00	763.04	3,125.00	3,186.16	0.26
9,940.00	90.43	88.71	6,535.25	764.82	3,218.98	3,279.83	0.43
10,035.00	89.54	88.23	6,535.27	767.36	3,313.94	3,374.57	1.06
10,130.00	89.72	88.34	6,535.89	770.20	3,408.90	3,469.33	0.22
10,224.00	90.28	88.86	6,535.89	772.50	3,502.87	3,563.05	0.81
10,319.00	91.20	89.63	6,534.66	773.75	3,597.85	3,657.67	1.26
10,412.00	90.52	88.03	6,533.26	775.65	3,690.82	3,750.35	1.87
10,506.00	90.59	88.14	6,532.35	778.79	3,784.76	3,844.13	0.14
10,691.00	90.62	88.23	6,530.40	784.65	3,969.66	4,028.67	0.05
10,783.00	90.37	87.75	6,529.60	787.88	4,061.60	4,120.46	0.59
10,876.00	88.37	84.85	6,530.63	793.88	4,154.39	4,213.38	3.79
10,969.00	89.14	86.18	6,532.65	801.15	4,247.08	4,306.33	1.65
11,062.00	92.19	87.29	6,531.57	806.44	4,339.91	4,399.22	3.49
11,155.00	91.54	88.19	6,528.54	810.11	4,432.78	4,491.99	1.19
11,247.00	91.94	90.12	6,525.75	811.47	4,524.73	4,583.60	2.14
11,340.00	90.18	89.29	6,524.03	811.94	4,617.70	4,676.15	2.09
11,433.00	91.33	90.24	6,522.80	812.33	4,710.69	4,768.70	1.60
11,526.00	91.36	88.38	6,520.62	813.45	4,803.66	4,861.30	2.00
11,618.00	89.91	85.91	6,519.60	818.03	4,895.53	4,953.16	3.11
11,803.00	89.04	87.08	6,521.29	829.34	5,080.17	5,138.00	0.79
11,895.00	87.50	86.66	6,524.07	834.36	5,171.99	5,229.86	1.73
12,085.00	86.64	86.31	6,533.78	845.99	5,361.38	5,419.46	0.49
12,179.00	88.43	87.74	6,537.83	850.86	5,455.16	5,513.25	2.44
12,274.00	90.00	87.73	6,539.13	854.62	5,550.07	5,608.05	1.65
12,369.00	89.88	87.34	6,539.23	858.70	5,644.99	5,702.89	0.43
12,463.00	89.57	87.62	6,539.68	862.84	5,738.89	5,796.74	0.44
12,557.00	88.80	86.85	6,541.02	867.37	5,832.77	5,890.59	1.16
12,652.00	90.31	87.28	6,541.75	872.23	5,927.64	5,985.47	1.65
12,746.00	91.60	87.95	6,540.19	876.15	6,021.55	6,079.29	1.55
12,841.00	91.94	87.32	6,537.25	880.06	6,116.42	6,174.07	0.75
12,935.00	89.51	87.29	6,536.06	884.48	6,210.30	6,267.92	2.59
13,030.00	89.26	88.80	6,537.08	887.72	6,305.24	6,362.69	1.61
13,125.00	90.40	87.97	6,537.36	890.40	6,400.20	6,457.44	1.48
13,220.00	90.77	87.72	6,536.39	893.97	6,495.12	6,552.24	0.47
13,315.00	90.37	86.24	6,535.45	898.98	6,589.98	6,647.12	1.61
13,409.00	90.74	86.41	6,534.54	905.00	6,683.79	6,741.05	0.43
13,504.00	90.65	85.47	6,533.39	911.73	6,778.54	6,836.00	0.99
13,598.00	91.57	86.60	6,531.57	918.23	6,872.29	6,929.93	1.55
13,693.00	92.44	89.59	6,528.24	921.38	6,967.17	7,024.64	3.28
13,788.00	92.87	89.99	6,523.84	921.73	7,062.07	7,119.08	0.62
13,883.00	91.82	90.61	6,519.95	921.23	7,156.99	7,213.46	1.28

Design Report for Wells Ranch AE32-670 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
13,977.00	89.57	90.78	6,518.81	920.09	7,250.97	7,306.85	2.40
14,072.00	89.17	90.40	6,519.86	919.12	7,345.96	7,401.25	0.58
14,167.00	89.23	90.58	6,521.18	918.30	7,440.94	7,495.67	0.20
14,262.00	88.37	90.25	6,523.17	917.61	7,535.92	7,590.09	0.97
14,357.00	89.85	90.28	6,524.65	917.18	7,630.90	7,684.54	1.56
14,451.00	91.14	89.99	6,523.84	916.95	7,724.90	7,778.03	1.41
14,546.00	92.10	89.67	6,521.15	917.24	7,819.86	7,872.53	1.07
14,641.00	91.73	89.86	6,517.98	917.63	7,914.80	7,967.03	0.44
14,735.00	91.97	89.07	6,514.94	918.50	8,008.75	8,060.58	0.88
14,830.00	92.43	88.23	6,511.30	920.74	8,103.65	8,155.22	1.01
14,925.00	92.44	87.88	6,507.26	923.96	8,198.51	8,249.92	0.37
15,114.00	93.85	86.49	6,496.89	933.23	8,386.99	8,438.37	1.05
15,209.00	92.96	87.68	6,491.25	938.05	8,481.70	8,533.08	1.56
15,303.00	92.62	87.24	6,486.67	942.21	8,575.49	8,626.82	0.59
15,493.00	93.95	86.65	6,475.78	952.32	8,764.91	8,816.28	0.77
15,587.00	92.47	86.62	6,470.52	957.83	8,858.59	8,910.04	1.57
15,681.00	92.84	87.06	6,466.17	963.00	8,952.35	9,003.84	0.61
15,775.00	91.45	89.77	6,462.65	965.60	9,046.24	9,097.51	3.24
15,870.00	91.94	89.79	6,459.84	965.96	9,141.19	9,192.02	0.52
16,064.00	92.50	89.78	6,452.32	966.69	9,335.05	9,384.95	0.29
16,083.00	92.37	89.90	6,451.52	966.74	9,354.03	9,403.84	0.93
First Sperry MWD Survey at 16083.00ft							
16,147.74	92.37	89.90	6,448.84	966.86	9,418.72	9,468.21	0.00
Wells Ranch AE32-670_Rev A0_BHL							
16,149.00	92.37	89.90	6,448.79	966.86	9,419.97	9,469.46	0.00
Straight Line Projection to TD at 16149.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
734.00	733.99	0.61	3.34	First Sperry MWD Survey at 734.00' MD
16,083.00	6,451.52	966.74	9,354.03	First Sperry MWD Survey at 16083.00ft
16,149.00	6,448.79	966.86	9,419.97	Straight Line Projection to TD at 16149.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AE32-670_Rev A0_BHL	84.19	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
734.00	6,939.00	Intermediate Surveys	MWD
6,939.00	16,149.00	Production Surveys	MWD+IFR1+MS_WY

Design Report for Wells Ranch AE32-670 - Final Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
623.00	9 5/8"		9-5/8	13-3/4
6,985.00	6,538.91 7"		7	8-3/4

Wellbore 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 AE32-670	0.00	0.00	0.00	0.02	0.00	1,407,021.01	3,318,862.98	40.445020	-104.354320
- actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Wells Ranch AE32-670	0.00	0.00	6,501.00	957.90	9,420.89	1,407,978.85	3,328,283.52	40.447310	-104.320430
- actual wellpath misses target center by 52.97usft at 16147.74usft MD (6448.84 TVD, 966.86 N, 9418.72 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.69 °/100usft	Maximum Dogleg over Survey:	16.46 °/100usft at 6,432.00 usft
Net Tortosity applicable to Plans:	0.97 °/100usft	Directional Difficulty Index:	6.849

Audit Info