

# Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AE32-650

05-123-41729

Plan A

Design: Final Surveys

## Sperry Drilling Services

### Final Survey Report

07 October, 2015

Surface UWI : 05-123-41729

Well Coordinates: 1,405,840.50 N, 3,318,858.74 E (40° 26' 30.41" N, 104° 21' 15.80" W)

Ground Level: 4,722.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Wells Ranch AE32-650

KB = 24' @ 4746.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

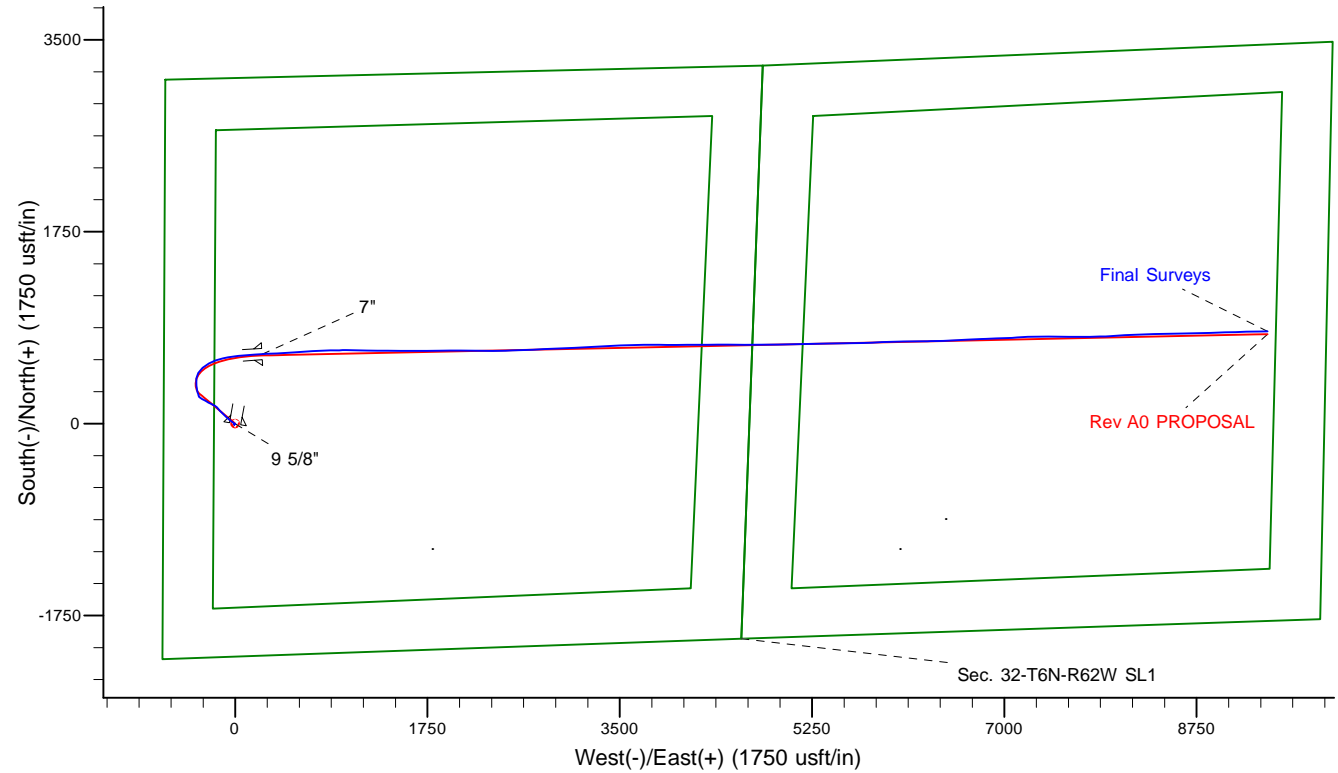
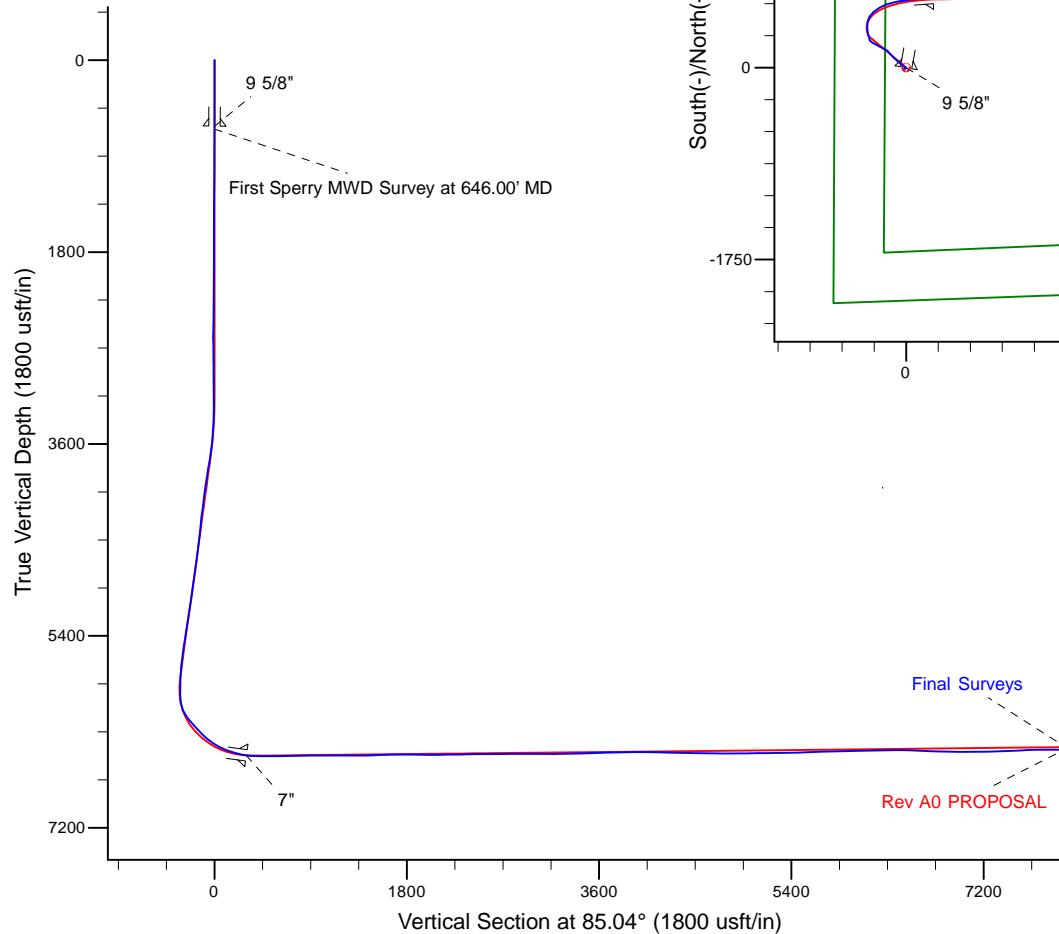
Project: Weld County, CO (NAD 83)  
 Site: Sec. 32-T6N-R62W (Wells Ranch AE32)  
 Well: Wells Ranch AE32-650  
 Wellbore: Plan A  
 Design: Final Surveys



Platted SHL: 2122' FSL, 650' FWL  
 Platted Lat/Long: 40.441780, -104.354390  
 Location: Sec. 32-T6N-R62W

~7" Casing: 2524' FNL, 900' FWL  
 Lat/Long: 40.443511 N, -104.353484 W  
 State Planes - CO Northern: 1,406,474.39 N, 3,319,102.68 E  
 Sec. 32-T6N-R62W

Platted BHL: 2313' FSL, 535' FEL  
 Platted Lat/Long: 40.443751 N, -104.320842 W  
 State Planes - CO Northern: 1,406,680.75 N, 3,328,186.13 E  
 Location: Sec. 33-T6N-R62W



# LEGEND

- Wells Ranch AE32-650, Plan A, Rev A0 PROPOSAL V0
- Final Surveys

WELL DETAILS: Wells Ranch AE32-650

Ground Level: 4722.00

KB = 24' @ 4746.00usft (H&P 343)

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

## Design Report for Wells Ranch AE32-650 - 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
618.00	0.36	190.56	618.00	-1.93	-0.36	-0.52	0.06
<b>9 5/8"</b>							
646.00	0.38	190.56	646.00	-2.11	-0.39	-0.57	0.06
<b>First Sperry MWD Survey at 646.00' MD</b>							
836.00	0.44	207.16	835.99	-3.37	-0.84	-1.13	0.07
931.00	0.44	202.60	930.99	-4.04	-1.15	-1.49	0.04
1,025.00	0.59	230.07	1,024.98	-4.68	-1.66	-2.06	0.30
1,118.00	0.48	215.38	1,117.98	-5.30	-2.25	-2.70	0.19
1,212.00	0.25	240.41	1,211.98	-5.73	-2.66	-3.14	0.29
1,304.00	0.26	231.35	1,303.98	-5.96	-2.99	-3.50	0.05
1,491.00	0.51	261.49	1,490.97	-6.34	-4.15	-4.68	0.17
1,584.00	0.39	281.61	1,583.97	-6.34	-4.87	-5.40	0.21
1,676.00	0.47	304.25	1,675.97	-6.07	-5.49	-5.99	0.20
1,768.00	0.30	5.46	1,767.97	-5.61	-5.78	-6.24	0.45
1,861.00	0.25	47.30	1,860.96	-5.23	-5.60	-6.03	0.22
1,953.00	0.15	29.67	1,952.96	-4.99	-5.40	-5.81	0.13
2,048.00	0.32	248.25	2,047.96	-4.98	-5.58	-5.99	0.47
2,141.00	0.47	265.53	2,140.96	-5.11	-6.20	-6.62	0.20
2,234.00	0.65	253.13	2,233.96	-5.29	-7.09	-7.52	0.23
2,327.00	0.86	244.47	2,326.95	-5.75	-8.22	-8.69	0.26
2,420.00	0.70	235.20	2,419.94	-6.37	-9.32	-9.83	0.22
2,511.00	0.79	233.30	2,510.93	-7.06	-10.28	-10.85	0.10
2,603.00	0.77	231.02	2,602.92	-7.83	-11.27	-11.90	0.04
2,695.00	1.00	52.63	2,694.92	-7.73	-11.11	-11.74	1.92
2,788.00	0.65	69.74	2,787.91	-7.06	-9.97	-10.54	0.46
2,881.00	0.54	72.21	2,880.91	-6.74	-9.06	-9.61	0.12
2,975.00	0.62	94.29	2,974.90	-6.64	-8.13	-8.67	0.25
3,070.00	0.93	78.56	3,069.89	-6.53	-6.86	-7.40	0.39
3,164.00	1.75	354.73	3,163.87	-4.95	-6.24	-6.65	2.01
3,259.00	2.13	328.52	3,258.82	-2.00	-7.30	-7.45	1.00
3,353.00	1.92	329.00	3,352.76	0.84	-9.02	-8.92	0.22
3,448.00	4.56	306.64	3,447.60	4.46	-12.87	-12.44	3.03
3,543.00	6.47	305.35	3,542.16	9.81	-20.27	-19.35	2.01
3,637.00	9.66	308.67	3,635.22	17.80	-30.75	-29.10	3.43
3,732.00	12.44	307.75	3,728.45	29.05	-45.07	-42.39	2.93
3,827.00	13.26	307.62	3,821.07	41.97	-61.79	-57.93	0.86
3,921.00	12.62	314.45	3,912.69	55.74	-77.66	-72.55	1.76
4,016.00	12.12	315.15	4,005.48	70.08	-92.10	-85.70	0.55
4,110.00	12.02	315.62	4,097.40	84.07	-105.91	-98.24	0.15
4,205.00	11.27	315.50	4,190.45	97.76	-119.33	-110.43	0.79
4,300.00	10.32	315.43	4,283.76	110.44	-131.81	-121.77	1.00
4,394.00	9.75	315.46	4,376.33	122.12	-143.30	-132.21	0.61
4,489.00	10.72	320.26	4,469.81	134.64	-154.59	-142.37	1.36
4,583.00	9.13	315.55	4,562.41	146.69	-165.40	-152.10	1.90
4,678.00	9.30	306.55	4,656.19	156.64	-176.85	-162.64	1.53
4,772.00	9.72	298.21	4,748.90	164.92	-189.94	-174.97	1.53
4,867.00	9.16	296.21	4,842.61	172.05	-203.80	-188.16	0.68
4,962.00	11.05	300.60	4,936.13	180.02	-218.42	-202.03	2.15
5,056.00	9.15	295.73	5,028.68	187.85	-232.91	-215.79	2.21

## Design Report for Wells Ranch AE32-650 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,151.00	9.53	297.50	5,122.42	194.76	-246.69	-228.92	0.50
5,246.00	10.57	297.25	5,215.96	202.39	-261.41	-242.93	1.10
5,340.00	11.55	302.38	5,308.21	211.37	-277.02	-257.71	1.48
5,435.00	10.16	294.02	5,401.52	219.88	-292.71	-272.60	2.21
5,530.00	10.78	305.49	5,494.94	228.45	-307.60	-286.69	2.28
5,624.00	12.12	310.94	5,587.07	240.02	-322.21	-300.25	1.83
5,719.00	20.44	340.67	5,678.33	262.28	-335.28	-311.34	12.14
5,813.00	21.83	347.59	5,766.02	294.85	-344.47	-317.69	3.04
5,908.00	22.50	351.24	5,854.00	330.06	-351.03	-321.18	1.61
6,002.00	25.91	357.44	5,939.74	368.37	-354.69	-321.51	4.52
6,097.00	30.39	6.15	6,023.52	413.04	-353.04	-316.01	6.39
6,191.00	37.54	29.06	6,101.75	461.98	-336.50	-295.29	15.48
6,286.00	45.86	51.38	6,173.01	508.89	-295.51	-250.40	17.81
<b>Wells Ranch AE32-650_Rev A0_SHL</b>							
6,381.00	45.53	60.19	6,239.43	547.06	-239.41	-191.21	6.64
6,475.00	44.01	68.34	6,306.22	575.81	-179.90	-129.44	6.31
6,570.00	50.48	77.90	6,370.76	595.72	-113.25	-61.31	10.04
6,665.00	59.60	82.40	6,425.16	608.85	-36.62	16.16	10.35
6,759.00	68.58	84.62	6,466.19	618.34	47.30	100.59	9.79
6,854.00	73.61	85.32	6,496.96	626.20	136.80	190.43	5.34
6,964.00	82.02	86.43	6,520.16	633.92	243.95	297.85	7.71
<b>7"</b>							
7,068.00	89.97	87.43	6,527.42	639.47	347.46	401.45	7.71
7,163.00	90.25	87.29	6,527.24	643.85	442.36	496.37	0.33
7,258.00	90.40	86.12	6,526.70	649.31	537.20	591.33	1.24
7,352.00	90.28	85.43	6,526.14	656.23	630.94	685.32	0.75
7,447.00	90.89	86.62	6,525.17	662.82	725.70	780.30	1.41
7,542.00	91.76	89.17	6,522.98	666.30	820.61	875.15	2.84
7,636.00	90.86	88.47	6,520.83	668.24	914.56	968.92	1.21
7,731.00	89.69	90.28	6,520.37	669.28	1,009.55	1,063.64	2.27
7,920.00	90.00	91.36	6,520.88	666.57	1,198.52	1,251.67	0.59
8,015.00	89.51	90.25	6,521.29	665.24	1,293.51	1,346.19	1.28
8,109.00	91.79	90.58	6,520.22	664.56	1,387.50	1,439.76	2.45
8,204.00	92.53	90.33	6,516.64	663.80	1,482.43	1,534.27	0.82
8,299.00	90.71	90.09	6,513.96	663.45	1,577.38	1,628.84	1.93
8,394.00	90.77	90.77	6,512.73	662.74	1,672.37	1,723.41	0.72
8,488.00	89.17	89.17	6,512.78	662.79	1,766.37	1,817.06	2.41
8,583.00	88.67	88.53	6,514.57	664.70	1,861.33	1,911.83	0.85
8,677.00	89.63	88.72	6,515.97	666.95	1,955.29	2,005.64	1.04
8,771.00	91.63	90.84	6,514.93	667.31	2,049.27	2,099.30	3.10
8,865.00	90.99	90.60	6,512.78	666.13	2,143.24	2,192.81	0.73
8,960.00	90.96	92.66	6,511.17	663.43	2,238.18	2,287.17	2.17
9,054.00	90.83	89.07	6,509.70	662.01	2,332.15	2,380.65	3.82
9,149.00	90.55	87.82	6,508.55	664.59	2,427.10	2,475.48	1.35
9,244.00	90.25	88.32	6,507.89	667.79	2,522.05	2,570.34	0.61
9,338.00	90.28	88.54	6,507.46	670.36	2,616.01	2,664.18	0.24
9,433.00	90.22	87.62	6,507.04	673.55	2,710.95	2,759.04	0.97
9,527.00	89.97	86.69	6,506.88	678.21	2,804.84	2,852.98	1.02
9,621.00	90.25	88.16	6,506.70	682.44	2,898.74	2,946.89	1.59
9,716.00	90.00	87.44	6,506.50	686.08	2,993.67	3,041.78	0.80
9,810.00	89.88	86.72	6,506.60	690.87	3,087.55	3,135.72	0.78

## Design Report for Wells Ranch AE32-650 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,905.00	90.49	86.73	6,506.29	696.30	3,182.39	3,230.68	0.64
10,000.00	91.67	86.50	6,504.50	701.91	3,277.21	3,325.62	1.27
10,094.00	91.76	87.67	6,501.68	706.68	3,371.04	3,419.52	1.25
10,187.00	89.94	86.92	6,500.31	711.07	3,463.92	3,512.43	2.12
10,281.00	91.91	88.48	6,498.79	714.84	3,557.83	3,606.31	2.67
10,373.00	93.21	89.15	6,494.68	716.75	3,649.71	3,698.02	1.59
10,467.00	92.31	89.75	6,490.15	717.65	3,743.60	3,791.63	1.15
10,560.00	89.32	90.16	6,488.83	717.72	3,836.58	3,884.27	3.25
10,653.00	89.11	89.83	6,490.10	717.73	3,929.57	3,976.91	0.42
10,745.00	89.57	89.85	6,491.16	717.98	4,021.56	4,068.58	0.50
10,838.00	89.01	89.56	6,492.32	718.46	4,114.55	4,161.27	0.68
10,930.00	89.01	89.61	6,493.91	719.13	4,206.54	4,252.96	0.05
11,023.00	88.00	89.65	6,496.33	719.73	4,299.50	4,345.63	1.09
11,117.00	89.29	89.97	6,498.55	720.04	4,393.47	4,439.28	1.41
11,210.00	88.80	89.70	6,500.10	720.31	4,486.46	4,531.94	0.60
11,303.00	89.94	90.45	6,501.13	720.19	4,579.45	4,624.57	1.47
11,396.00	89.45	91.08	6,501.62	718.95	4,672.44	4,717.11	0.86
11,489.00	89.54	89.56	6,502.44	718.43	4,765.43	4,809.71	1.64
11,580.00	90.34	89.35	6,502.54	719.29	4,856.43	4,900.43	0.91
11,672.00	91.26	89.02	6,501.25	720.60	4,948.41	4,992.18	1.06
11,764.00	90.71	88.68	6,499.67	722.45	5,040.38	5,083.97	0.70
11,857.00	90.80	88.61	6,498.45	724.65	5,133.34	5,176.77	0.12
11,950.00	90.34	88.17	6,497.52	727.26	5,226.30	5,269.61	0.68
12,045.00	91.48	90.01	6,496.01	728.77	5,321.27	5,364.36	2.28
12,139.00	91.36	89.11	6,493.68	729.49	5,415.24	5,458.03	0.97
12,234.00	92.37	89.04	6,490.59	731.02	5,510.17	5,552.75	1.07
12,329.00	92.87	88.73	6,486.25	732.87	5,605.06	5,647.43	0.62
12,423.00	91.57	88.73	6,482.61	734.95	5,698.96	5,741.17	1.38
12,518.00	90.09	87.47	6,481.23	738.10	5,793.89	5,836.02	2.05
12,613.00	90.15	86.81	6,481.03	742.84	5,888.77	5,930.95	0.70
12,707.00	91.85	88.47	6,479.39	746.71	5,982.67	6,024.83	2.53
12,802.00	92.62	88.81	6,475.69	748.96	6,077.57	6,119.57	0.89
12,897.00	91.76	89.48	6,472.06	750.38	6,172.49	6,214.26	1.15
12,991.00	90.65	89.73	6,470.08	751.03	6,266.47	6,307.94	1.21
13,086.00	88.74	88.21	6,470.58	752.73	6,361.44	6,402.71	2.57
13,180.00	88.61	87.94	6,472.76	755.89	6,455.37	6,496.55	0.32
13,275.00	88.24	87.41	6,475.37	759.74	6,550.25	6,591.41	0.68
13,370.00	88.24	87.30	6,478.29	764.13	6,645.11	6,686.29	0.12
13,464.00	87.84	86.58	6,481.50	769.14	6,738.92	6,780.18	0.88
13,559.00	88.30	88.15	6,484.70	773.50	6,833.76	6,875.05	1.72
13,654.00	88.55	87.72	6,487.31	776.93	6,928.66	6,969.89	0.52
13,748.00	90.59	87.69	6,488.02	780.69	7,022.58	7,063.78	2.17
13,843.00	89.51	86.02	6,487.94	785.90	7,117.43	7,158.73	2.09
13,938.00	92.59	88.94	6,486.19	790.08	7,212.30	7,253.60	4.47
14,032.00	93.15	88.17	6,481.49	792.45	7,306.15	7,347.31	1.01
14,127.00	93.21	89.24	6,476.22	794.59	7,400.98	7,441.97	1.13
14,221.00	91.60	91.39	6,472.27	794.07	7,494.89	7,535.48	2.86
14,316.00	92.03	91.09	6,469.26	792.02	7,589.82	7,629.87	0.55
14,411.00	90.80	90.55	6,466.92	790.66	7,684.78	7,724.36	1.41
14,505.00	89.85	88.73	6,466.38	791.25	7,778.77	7,818.05	2.18
14,600.00	90.25	88.48	6,466.30	793.56	7,873.74	7,912.87	0.50

## Design Report for Wells Ranch AE32-650 - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
14,694.00	90.37	87.28	6,465.79	797.04	7,967.67	8,006.75	1.28
14,788.00	90.56	85.80	6,465.03	802.71	8,061.49	8,100.71	1.59
14,883.00	90.15	86.23	6,464.44	809.31	8,156.26	8,195.69	0.63
14,978.00	89.69	88.77	6,464.57	813.46	8,251.16	8,290.60	2.72
15,072.00	89.35	88.48	6,465.36	815.71	8,345.13	8,384.41	0.48
15,167.00	90.40	88.72	6,465.57	818.03	8,440.10	8,479.23	1.13
15,262.00	89.72	88.70	6,465.47	820.17	8,535.08	8,574.03	0.72
15,357.00	90.31	89.61	6,465.44	821.57	8,630.07	8,668.78	1.14
15,451.00	90.25	88.58	6,464.99	823.06	8,724.05	8,762.55	1.10
15,546.00	90.40	87.87	6,464.45	826.00	8,819.00	8,857.40	0.76
15,641.00	90.89	87.46	6,463.38	829.87	8,913.92	8,952.29	0.67
15,735.00	89.75	88.72	6,462.85	833.00	9,007.86	9,046.15	1.81
15,833.00	89.69	88.56	6,463.33	835.33	9,105.83	9,143.96	0.17
15,930.00	90.92	89.00	6,462.81	837.39	9,202.81	9,240.75	1.35
16,055.00	91.91	88.35	6,459.73	840.28	9,327.73	9,365.46	0.95
Final Sperry MWD Survey at 16055.00ft							
16,122.00	91.91	88.35	6,457.50	842.21	9,394.67	9,432.31	0.00
Straight Line Projection to TD at 16122.00ft - Wells Ranch AE32-650_Rev A0_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
646.00	646.00	-2.11	-0.39	First Sperry MWD Survey at 646.00' MD
16,055.00	6,459.73	840.28	9,327.73	Final Sperry MWD Survey at 16055.00ft
16,122.00	6,457.50	842.21	9,394.67	Straight Line Projection to TD at 16122.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AE32-650_Rev A0_BHL	85.04	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
646.00	6,854.00	Intermediate Surveys	MWD
6,854.00	16,122.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
618.00	618.00	9 5/8"	9-5/8	13-3/4
6,964.00	6,520.16	7"	7	8-3/4

## Design Report for Wells Ranch AE32-650 - Final Surveys

### 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 AE32-650 - actual wellpath misses target center by 37186245.07usft at 6286.00usft MD (6173.01 TVD, 508.89 N, -295.51 E) - Point	0.00	0.00	0.00	17,694,586.87	14,816,718.08	29,099,385.77	-21,496,925.97	40.441780	104.354390
Wells Ranch AE32-650 - actual wellpath misses target center by 39.83usft at 16122.00usft MD (6457.50 TVD, 842.21 N, 9394.67 E) - Point	0.00	0.00	6,428.00	815.46	9,395.40	1,406,655.92	3,328,253.79	40.443680	-104.320600

### Directional Difficulty Index

Average Dogleg over Survey:	1.75 °/100usft	Maximum Dogleg over Survey:	17.81 °/100usft at 6,286.00 usft
Net Tortosity applicable to Plans:	0.99 °/100usft	Directional Difficulty Index:	6.862

### Audit Info