

Noble Energy

Weld County, CO (NAD 83)

Sec. 8-T4N-R66W (Five Rivers K09-25-A)

Five Rivers K09-65-1HN

Job# 901434368:: API:05-123-39476

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

22 October, 2014

Surface UWI : Job# 901434368:: API:05-123-39476

Well Coordinates: 1,362,021.02 N, 3,197,186.73 E (40° 19' 29.96" N, 104° 47' 33.97" W)

Ground Level: 4,700.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Five Rivers K09-65-1HN

RKB=24ft @ 4724.00usft (H&P 315)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 8-T4N-R66W (Five Rivers K09-25-A)
 Well: Five Rivers K09-65-1HN
 Wellbore: Plan A
 Design: Actual Surveys

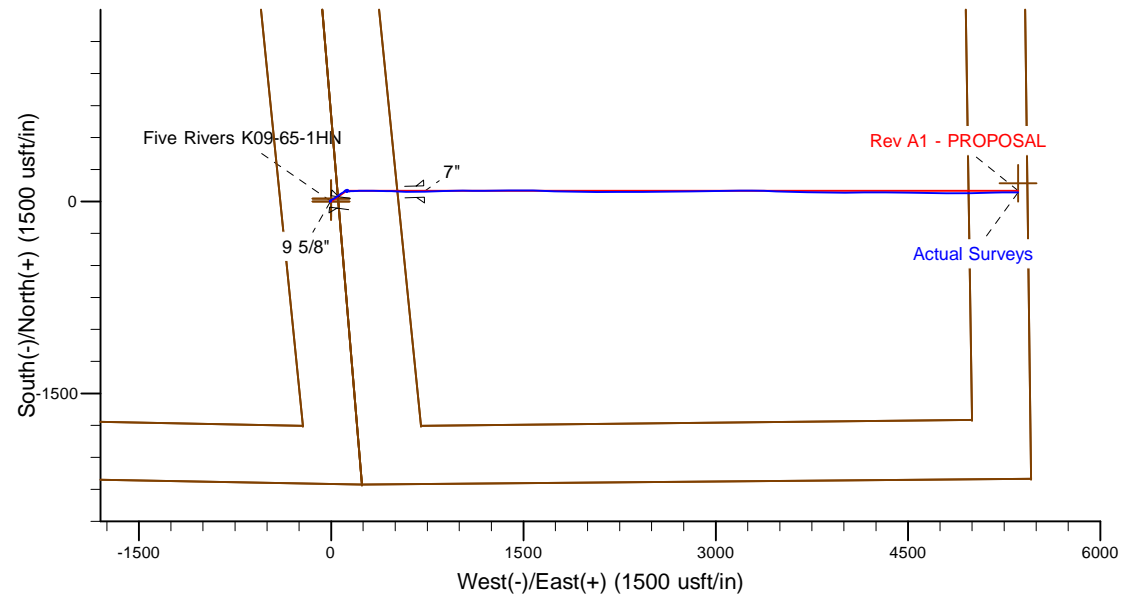
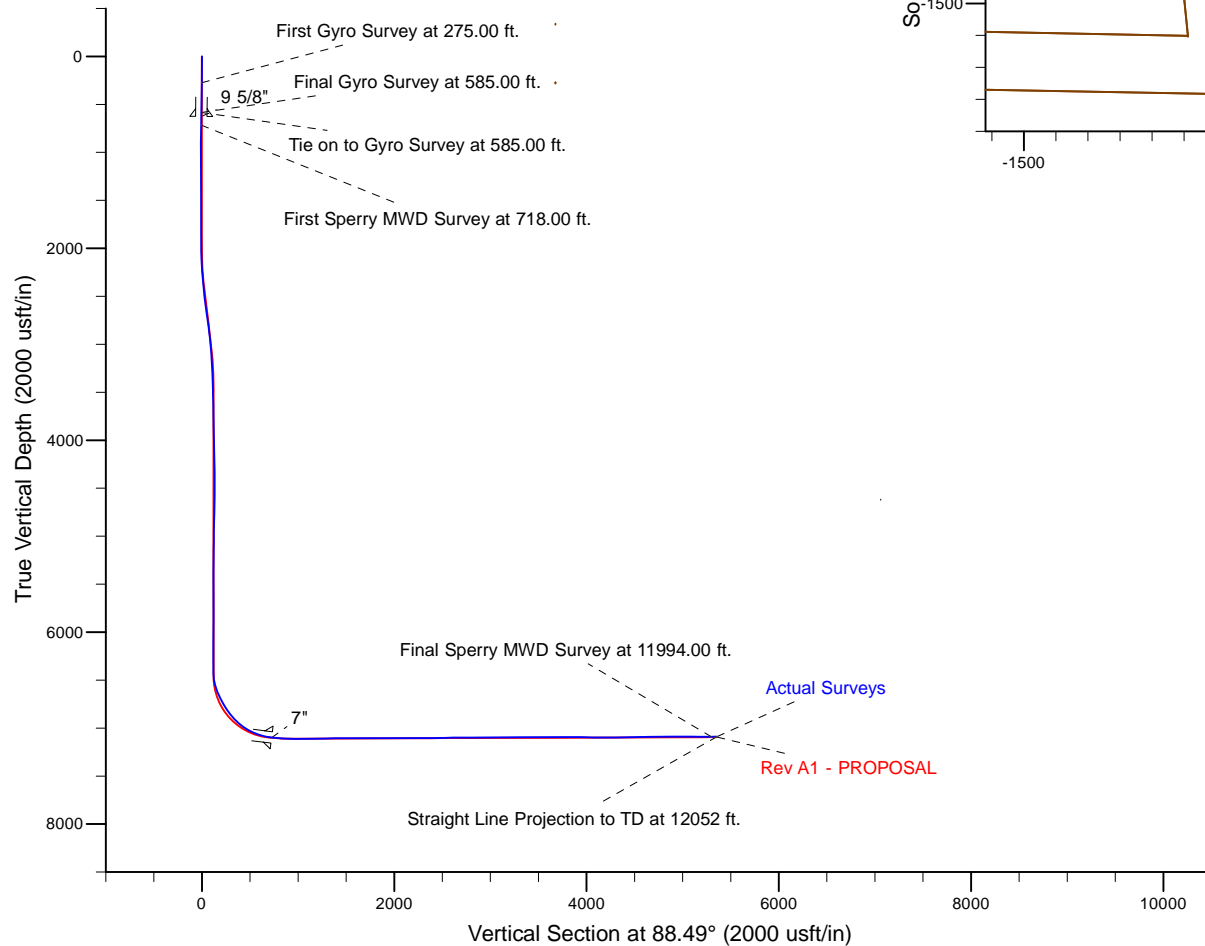
Noble Energy

HALLIBURTON
 Sperry Drilling

Platted SHL: 2211' FSL, 56' FEL
 Platted Lat/Long: 40.32499 N, 104.79277 W
 Location: Sec. 8-T4N-R66W

~7" Casing: 2295' FSL, 686' FWL
 Lat/Long: 40.325187° N, 104.790164°W
 State Planes - CO Northern: 1362098.70N, 3197912.61E
 Location: Sec. 9-T4N-R66W

Platted BHL: 2310' FSL, 75' FEL
 Lat/Long: 40.32526N, 104.77355 W
 State Planes - CO Northern: 1362162.71 N, 3202544.64 E
 Location: Sec. 9-T4N-R66W



LEGEND

- Five Rivers K09-65-1HN, Plan A, Rev A1 - PROPOSAL V0
- Actual Surveys

WELL DETAILS: Five Rivers K09-65-1HN

Ground Level: 4700.00
 RKB=24ft @ 4724.00usft (H&P 315)

Created By: Gordy Roth
 Created On: 10/22/2014

Design Report for Five Rivers K09-65-1HN - 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
275.00	0.80	259.74	274.99	-0.34	-1.89	-1.90	0.29
First Gyro Survey at 275.00 ft.							
585.00	0.60	294.24	584.97	-0.06	-5.50	-5.50	0.15
Final Gyro Survey at 585.00 ft. - Tie on to Gyro Survey at 585.00 ft.							
718.00	1.29	260.57	717.95	-0.02	-7.61	-7.61	0.64
First Sperry MWD Survey at 718.00 ft.							
811.00	1.08	264.97	810.93	-0.27	-9.52	-9.52	0.25
903.00	0.22	244.89	902.92	-0.42	-10.54	-10.55	0.95
996.00	0.37	41.21	995.92	-0.27	-10.50	-10.51	0.62
1,183.00	0.53	24.36	1,182.92	0.97	-9.75	-9.72	0.11
1,275.00	0.45	9.60	1,274.91	1.72	-9.51	-9.46	0.16
1,368.00	0.53	13.33	1,367.91	2.49	-9.35	-9.28	0.09
1,460.00	1.16	50.76	1,459.90	3.50	-8.53	-8.44	0.88
1,553.00	0.90	38.18	1,552.89	4.67	-7.35	-7.23	0.37
1,647.00	0.60	7.84	1,646.88	5.74	-6.83	-6.68	0.52
1,742.00	0.17	272.84	1,741.88	6.24	-6.90	-6.74	0.67
1,837.00	0.22	329.68	1,836.88	6.40	-7.14	-6.96	0.20
1,932.00	0.48	338.11	1,931.87	6.93	-7.38	-7.19	0.28
2,027.00	1.46	44.89	2,026.86	8.15	-6.67	-6.45	1.42
2,122.00	2.51	59.88	2,121.80	10.05	-4.02	-3.75	1.22
2,217.00	4.09	68.53	2,216.64	12.34	0.94	1.26	1.74
2,311.00	5.12	62.84	2,310.34	15.48	7.79	8.19	1.20
2,406.00	6.50	62.66	2,404.85	19.89	16.34	16.86	1.45
2,501.00	7.56	59.21	2,499.13	25.55	26.48	27.15	1.20
2,596.00	8.60	56.84	2,593.19	32.64	37.80	38.65	1.15
2,691.00	9.60	53.34	2,686.99	41.25	50.10	51.17	1.20
2,786.00	9.69	52.87	2,780.65	50.81	62.83	64.15	0.13
2,881.00	8.16	58.44	2,874.50	59.16	74.95	76.48	1.85
2,976.00	7.04	55.47	2,968.66	65.99	85.49	87.20	1.25
3,071.00	5.87	53.04	3,063.06	72.21	94.17	96.04	1.26
3,166.00	4.54	47.08	3,157.67	77.70	100.80	102.82	1.51
3,261.00	3.61	45.58	3,252.43	82.35	105.69	107.83	0.99
3,356.00	2.26	57.79	3,347.30	85.44	109.41	111.63	1.56
3,451.00	1.93	49.30	3,442.24	87.48	112.21	114.48	0.48
3,546.00	1.37	77.48	3,537.20	88.77	114.53	116.84	1.02
3,640.00	1.21	76.12	3,631.18	89.25	116.59	118.91	0.17
3,735.00	1.07	72.68	3,726.16	89.76	118.41	120.74	0.16
3,830.00	1.14	74.99	3,821.14	90.27	120.17	122.52	0.09
3,925.00	0.92	81.56	3,916.12	90.62	121.84	124.19	0.26
4,020.00	1.08	84.05	4,011.11	90.83	123.48	125.84	0.17
4,115.00	1.52	92.71	4,106.08	90.86	125.63	127.99	0.51
4,210.00	1.91	96.93	4,201.04	90.61	128.46	130.81	0.43
4,304.00	1.26	126.31	4,295.01	89.81	130.85	133.18	1.09
4,399.00	0.79	189.53	4,389.99	88.55	131.58	133.88	1.21
4,494.00	0.98	197.39	4,484.98	87.13	131.23	133.49	0.24
4,589.00	1.02	210.87	4,579.97	85.62	130.56	132.77	0.25
4,684.00	1.52	227.78	4,674.94	84.05	129.19	131.37	0.65
4,779.00	1.39	230.29	4,769.91	82.47	127.37	129.51	0.15
4,874.00	1.40	233.80	4,864.89	81.05	125.55	127.65	0.09

Design Report for Five Rivers K09-65-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,969.00	1.23	232.74	4,959.86	79.74	123.80	125.86	0.18
5,063.00	1.12	230.12	5,053.84	78.54	122.29	124.32	0.13
5,158.00	0.85	235.06	5,148.83	77.55	121.00	123.01	0.30
5,253.00	0.99	237.33	5,243.81	76.70	119.73	121.72	0.15
5,348.00	0.74	214.10	5,338.80	75.75	118.70	120.66	0.45
5,443.00	0.44	187.12	5,433.80	74.88	118.31	120.25	0.42
5,538.00	0.48	158.27	5,528.80	74.15	118.41	120.33	0.24
5,633.00	0.34	44.47	5,623.79	73.98	118.76	120.67	0.73
5,727.00	0.29	41.62	5,717.79	74.36	119.11	121.03	0.06
5,822.00	0.29	356.30	5,812.79	74.77	119.25	121.19	0.24
5,917.00	0.41	300.46	5,907.79	75.19	118.94	120.89	0.36
6,012.00	0.48	319.95	6,002.79	75.66	118.40	120.35	0.17
6,106.00	0.25	321.67	6,096.79	76.13	118.01	119.99	0.24
6,201.00	0.28	335.87	6,191.78	76.50	117.79	119.77	0.08
6,297.00	0.10	352.23	6,287.78	76.80	117.68	119.67	0.19
6,392.00	0.12	36.67	6,382.78	76.96	117.73	119.73	0.09
6,421.00	0.19	9.30	6,411.78	77.03	117.76	119.75	0.34
6,578.00	16.15	84.49	6,566.71	79.40	139.68	141.73	10.26
6,673.00	25.25	87.70	6,655.48	81.49	173.15	175.24	9.65
6,721.00	27.47	86.93	6,698.49	82.49	194.43	196.55	4.68
6,767.00	28.60	88.59	6,739.09	83.33	216.04	218.16	2.98
6,815.00	31.26	89.41	6,780.69	83.74	239.98	242.11	5.61
6,862.00	35.41	89.70	6,819.95	83.94	265.80	267.93	8.84
6,910.00	38.22	90.32	6,858.37	83.93	294.56	296.68	5.91
6,957.00	42.38	91.78	6,894.21	83.35	324.95	327.04	9.08
7,005.00	45.76	91.55	6,928.69	82.39	358.31	360.37	7.05
7,052.00	49.48	90.50	6,960.37	81.77	393.02	395.04	8.08
7,100.00	54.86	90.51	6,989.79	81.44	430.92	432.92	11.21
7,146.00	60.26	92.06	7,014.46	80.55	469.71	471.68	12.08
7,194.00	63.34	92.27	7,037.14	78.96	511.98	513.89	6.43
7,241.00	67.84	93.56	7,056.56	76.77	554.71	556.54	9.90
7,289.00	72.38	91.47	7,072.89	74.80	599.79	601.56	10.31
7,337.00	77.00	88.40	7,085.56	74.87	646.07	647.82	11.43
7,371.00	81.02	87.75	7,092.04	75.99	679.42	681.19	11.97
7,509.00	85.93	88.72	7,107.72	80.21	816.41	818.25	3.63
7,604.00	88.80	88.83	7,112.09	82.24	911.28	913.14	3.02
7,698.00	90.25	89.24	7,112.87	83.82	1,005.26	1,007.13	1.60
7,793.00	89.97	90.47	7,112.68	84.06	1,100.26	1,102.10	1.33
7,888.00	91.05	89.16	7,111.84	84.37	1,195.25	1,197.06	1.79
7,983.00	91.76	88.93	7,109.51	85.95	1,290.21	1,292.03	0.79
8,078.00	90.52	89.71	7,107.62	87.08	1,385.18	1,387.00	1.54
8,173.00	90.68	90.14	7,106.62	87.20	1,480.18	1,481.96	0.48
8,268.00	89.85	91.30	7,106.18	86.01	1,575.17	1,576.89	1.50
8,363.00	89.88	92.12	7,106.41	83.17	1,670.12	1,671.74	0.86
8,457.00	89.82	92.28	7,106.65	79.56	1,764.05	1,765.54	0.18
8,552.00	90.22	90.88	7,106.62	76.94	1,859.01	1,860.40	1.53
8,647.00	90.43	90.90	7,106.08	75.47	1,954.00	1,955.31	0.22
8,742.00	89.94	90.28	7,105.77	74.49	2,048.99	2,050.25	0.83
8,837.00	89.94	90.11	7,105.87	74.17	2,143.99	2,145.20	0.18
8,932.00	90.06	90.09	7,105.87	74.00	2,238.99	2,240.17	0.13
9,027.00	90.18	89.26	7,105.68	74.54	2,333.99	2,335.15	0.88

Design Report for Five Rivers K09-65-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,122.00	91.05	89.89	7,104.66	75.24	2,428.98	2,430.12	1.13
9,216.00	92.16	89.68	7,102.02	75.60	2,522.94	2,524.06	1.20
9,311.00	90.46	89.60	7,099.85	76.19	2,617.91	2,619.01	1.79
9,406.00	90.19	89.35	7,099.31	77.06	2,712.91	2,714.00	0.39
9,501.00	90.03	88.83	7,099.13	78.57	2,807.89	2,808.99	0.57
9,596.00	90.37	89.06	7,098.80	80.32	2,902.88	2,903.99	0.43
9,691.00	90.55	88.47	7,098.04	82.37	2,997.85	2,998.98	0.65
9,786.00	90.49	89.09	7,097.17	84.39	3,092.83	3,093.98	0.66
9,881.00	90.52	89.72	7,096.34	85.38	3,187.82	3,188.96	0.66
9,975.00	89.51	90.79	7,096.31	84.96	3,281.81	3,282.91	1.57
10,070.00	89.35	91.24	7,097.26	83.28	3,376.79	3,377.81	0.50
10,165.00	90.86	92.73	7,097.08	79.99	3,471.73	3,472.63	2.23
10,260.00	90.62	91.36	7,095.86	76.60	3,566.66	3,567.44	1.46
10,355.00	89.48	90.85	7,095.77	74.77	3,661.64	3,662.34	1.31
10,450.00	90.31	92.33	7,095.95	72.13	3,756.60	3,757.19	1.79
10,545.00	90.25	90.54	7,095.48	69.75	3,851.56	3,852.06	1.89
10,640.00	89.63	89.77	7,095.58	69.49	3,946.56	3,947.02	1.04
10,734.00	88.43	89.49	7,097.17	70.10	4,040.55	4,040.99	1.31
10,829.00	88.61	88.57	7,099.63	71.71	4,135.50	4,135.95	0.99
10,924.00	90.96	90.63	7,099.98	72.37	4,230.48	4,230.92	3.29
11,019.00	91.20	90.78	7,098.19	71.20	4,325.46	4,325.83	0.30
11,114.00	91.02	90.84	7,096.35	69.86	4,420.43	4,420.74	0.20
11,209.00	91.02	90.79	7,094.66	68.51	4,515.41	4,515.64	0.05
11,304.00	90.99	90.59	7,092.99	67.36	4,610.39	4,610.56	0.21
11,399.00	90.62	90.93	7,091.66	66.10	4,705.37	4,705.47	0.53
11,494.00	90.77	90.72	7,090.51	64.74	4,800.35	4,800.39	0.27
11,589.00	90.12	89.34	7,089.77	64.69	4,895.35	4,895.35	1.61
11,683.00	90.22	89.02	7,089.49	66.03	4,989.34	4,989.34	0.36
11,778.00	89.82	88.65	7,089.46	67.96	5,084.32	5,084.34	0.57
11,873.00	89.41	88.49	7,090.10	70.33	5,179.28	5,179.33	0.46
11,994.00	90.37	89.82	7,090.33	72.12	5,300.27	5,300.32	1.36
Final Sperry MWD Survey at 11994.00 ft.							
12,052.00	90.37	89.82	7,089.95	72.30	5,358.27	5,358.30	0.00
Straight Line Projection to TD at 12052 ft.							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
275.00	274.99	-0.34	-1.89	First Gyro Survey at 275.00 ft.
585.00	584.97	-0.06	-5.50	Final Gyro Survey at 585.00 ft.
585.00	584.97	-0.06	-5.50	Tie on to Gyro Survey at 585.00 ft.
718.00	717.95	-0.02	-7.61	First Sperry MWD Survey at 718.00 ft.
11,994.00	7,090.33	72.12	5,300.27	Final Sperry MWD Survey at 11994.00 ft.
12,052.00	7,089.95	72.30	5,358.27	Straight Line Projection to TD at 12052 ft.

Design Report for Five Rivers K09-65-1HN - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/_W (usft)	Start TVD (usft)
Target	Five Rivers K09-65-1HN BHL	88.49	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
275.00	585.00	Surface Surveys	Flexi-Shot
718.00	7,371.00	MWD Surveys - Intermediate	MWD+IFR1+MS_WY
7,509.00	12,052.00	MWD Surveys - Production	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
627.00	626.97	9 5/8"	9-5/8	13-3/4
7,418.00	7,098.70	7"	7	8-3/4

Design Report for Five Rivers K09-65-1HN - Actual 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
Five Rivers K09-65-1H	0.00	0.00	0.00	0.01	0.00	1,362,021.03	3,197,186.73	40.324990	-104.792770
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Five Rivers K09-65-1H	0.00	0.00	0.00	0.01	0.00	1,362,021.03	3,197,186.73	40.324990	-104.792770
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	2,693.34	253.64	1,364,714.26	3,197,440.36	
Point 2				0.00	-1,753.11	700.76	1,360,268.00	3,197,887.46	
Point 3				0.00	-1,707.24	5,000.70	1,360,313.87	3,202,187.21	
Point 4				0.00	2,698.53	4,934.74	1,364,719.45	3,202,121.26	
Five Rivers K07-65-1B	0.00	0.00	0.00	21.87	-0.17	1,362,042.89	3,197,186.55	40.325050	-104.792770
- actual wellpath misses target center by 21.87usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	3,114.73	-10,343.34	1,365,157.49	3,186,843.65	
Point 2				0.00	-2,211.12	-10,283.57	1,359,831.86	3,186,903.42	
Point 3				0.00	-2,139.05	-5,155.84	1,359,903.93	3,192,030.93	
Point 4				0.00	3,280.07	-5,404.24	1,365,322.82	3,191,782.54	
Point 5				0.00	-2,139.05	-5,155.84	1,359,903.93	3,192,030.93	
Point 6				0.00	-2,234.99	240.92	1,359,808.00	3,197,427.46	
Point 7				0.00	3,131.50	-206.20	1,365,174.26	3,196,980.36	
Point 8				0.00	3,280.07	-5,404.24	1,365,322.82	3,191,782.54	
Point 9				0.00	3,114.73	-10,343.34	1,365,157.49	3,186,843.65	
Five Rivers K07-65-1B	0.00	0.00	0.00	21.87	-0.17	1,362,042.89	3,197,186.55	40.325050	-104.792770
- actual wellpath misses target center by 21.87usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	2,654.71	-9,883.32	1,364,697.49	3,187,303.65	
Point 2				0.00	-1,751.11	-9,823.55	1,360,291.86	3,187,363.42	
Point 3				0.00	-1,679.03	-5,155.84	1,360,363.93	3,192,030.93	
Point 4				0.00	-1,774.97	-219.10	1,360,268.00	3,196,967.46	
Point 5				0.00	2,671.48	-666.22	1,364,714.26	3,196,520.36	
Point 6				0.00	2,820.05	-5,404.24	1,364,862.82	3,191,782.54	
Point 7				0.00	2,654.71	-9,883.32	1,364,697.49	3,187,303.65	
Five Rivers K09-65-1H	0.00	0.00	0.00	0.01	0.00	1,362,021.03	3,197,186.73	40.324990	-104.792770
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	3,153.36	-206.38	1,365,174.26	3,196,980.36	
Point 2				0.00	-2,213.13	240.74	1,359,808.00	3,197,427.46	
Point 3				0.00	-2,167.26	5,460.71	1,359,853.87	3,202,647.21	
Point 4				0.00	3,158.55	5,394.76	1,365,179.45	3,202,581.26	
UPRR PAN AM #01-61	0.00	0.00	-3.00	-279.70	740.61	1,361,741.33	3,197,927.30	40.324206	-104.790122
- actual wellpath misses target center by 791.67usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Circle (radius 300.00)									
Five Rivers K09-65-1H	0.00	0.00	7,095.29	141.70	5,358.14	1,362,162.71	3,202,544.64	40.325260	-104.773550
- actual wellpath misses target center by 69.60usft at 12052.00usft MD (7089.95 TVD, 72.30 N, 5358.27 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.41 °/100usft	Maximum Dogleg over Survey:	12.08 °/100usft at 7,146.00 usft
Net Tortousity applicable to Plans:	0.52 °/100usft	Directional Difficulty Index:	6.195

Audit Info

North Reference Sheet for Sec. 8-T4N-R66W (Five Rivers K09-25-A) - Five Rivers
K09-65-1HN - Plan A

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

Vertical Depths are relative to RKB=24ft @ 4724.00usft (H&P 315). Northing and Easting are relative to Five Rivers K09-65-1HN

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: 0.99995768

Grid Coordinates of Well: 1,362,021.02 usft N, 3,197,186.73 usft E

Geographical Coordinates of Well: 40° 19' 29.96" N, 104° 47' 33.97" W

Grid Convergence at Surface is: 0.46°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,052.00usft
the Bottom Hole Displacement is 5,358.75usft in the Direction of 89.23° (Grid).

Magnetic Convergence at surface is: -8.07° (7 September 2014, , BGGM2014)

