

30-015-41382

RKI Exploration & Production

Eddy County (NM83E)

Sec 17-T26S-R30E

RDX 17-12H

Wellbore #1

Survey: MWD Surveys

Standard Survey Report

20 September, 2013

Wolverine Directional, LLC

Survey Report

Company:	RKI Exploration & Production	Local Co-ordinate Reference:	Well RDX 17-12H
Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0ft (Original Well Elev)
Site:	Sec 17-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDX 17-12H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Design:	Wellbore #1
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Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth: 0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	180.08

Survey Program		Date: 2013/09/20		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
100.0	12,028.0	MWD Surveys (Wellbore #1)	MWD	MWD - Standard

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
100.0	0.49	303.15	100.0	0.2	-0.4	-0.2	0.49	0.49	0.00
200.0	0.35	293.92	200.0	0.6	-1.0	-0.6	0.16	-0.14	-9.23
300.0	0.27	296.21	300.0	0.8	-1.5	-0.8	0.08	-0.08	2.29
400.0	0.49	310.01	400.0	1.2	-2.0	-1.2	0.24	0.22	13.80
500.0	0.49	320.88	500.0	1.8	-2.6	-1.8	0.09	0.00	10.87
600.0	0.56	319.18	600.0	2.5	-3.2	-2.5	0.07	0.07	-1.70
700.0	0.53	316.80	700.0	3.2	-3.8	-3.2	0.04	-0.03	-2.38
800.0	0.41	328.09	800.0	3.9	-4.4	-3.8	0.15	-0.12	11.29
900.0	0.22	341.96	900.0	4.3	-4.6	-4.3	0.20	-0.19	13.87
1,000.0	0.19	253.87	1,000.0	4.5	-4.8	-4.5	0.29	-0.03	-88.09
1,100.0	0.25	272.35	1,100.0	4.4	-5.2	-4.4	0.09	0.06	18.48
1,200.0	0.06	257.14	1,200.0	4.4	-5.5	-4.4	0.19	-0.19	-15.21
1,300.0	0.16	226.21	1,300.0	4.3	-5.6	-4.3	0.11	0.10	-30.93
1,400.0	0.23	219.79	1,400.0	4.1	-5.8	-4.1	0.07	0.07	-6.42
1,500.0	0.12	235.52	1,500.0	3.9	-6.1	-3.9	0.12	-0.11	15.73
1,600.0	0.24	274.76	1,600.0	3.8	-6.4	-3.8	0.17	0.12	39.24
1,700.0	0.26	263.48	1,700.0	3.8	-6.8	-3.8	0.05	0.02	-11.28
1,800.0	0.16	252.77	1,800.0	3.7	-7.2	-3.7	0.11	-0.10	-10.71
1,900.0	0.34	239.34	1,900.0	3.6	-7.5	-3.5	0.19	0.18	-13.43
2,000.0	0.45	219.89	2,000.0	3.1	-8.0	-3.1	0.17	0.11	-19.45
2,100.0	0.43	238.46	2,100.0	2.6	-8.6	-2.6	0.14	-0.02	18.57
2,200.0	0.56	206.98	2,200.0	2.0	-9.2	-2.0	0.30	0.13	-31.48
2,300.0	0.82	183.95	2,300.0	0.8	-9.4	-0.8	0.38	0.26	-23.03
2,400.0	1.04	179.35	2,399.9	-0.8	-9.5	0.8	0.23	0.22	-4.60
2,500.0	1.05	176.69	2,499.9	-2.6	-9.4	2.6	0.05	0.01	-2.66
2,600.0	0.86	181.16	2,599.9	-4.3	-9.4	4.3	0.20	-0.19	4.47
2,700.0	0.74	175.17	2,699.9	-5.7	-9.3	5.7	0.15	-0.12	-5.99
2,800.0	1.04	145.04	2,799.9	-7.1	-8.8	7.1	0.55	0.30	-30.13
2,900.0	1.71	136.20	2,899.9	-8.9	-7.2	8.9	0.70	0.67	-8.84
3,000.0	1.99	138.38	2,999.8	-11.3	-5.0	11.3	0.29	0.28	2.18
3,100.0	2.62	127.83	3,099.7	-14.0	-2.1	14.0	0.76	0.63	-10.55
3,200.0	3.09	124.96	3,199.6	-16.9	2.0	16.9	0.49	0.47	-2.87
3,300.0	2.80	123.54	3,299.5	-19.8	6.2	19.8	0.30	-0.29	-1.42
3,400.0	1.84	116.77	3,399.4	-21.9	9.7	21.9	1.00	-0.96	-6.77
3,500.0	1.45	121.05	3,499.3	-23.3	12.2	23.2	0.41	-0.39	4.28
3,600.0	1.47	126.12	3,599.3	-24.7	14.3	24.6	0.13	0.02	5.07
3,700.0	1.19	129.32	3,699.3	-26.1	16.1	26.1	0.29	-0.28	3.20
3,800.0	0.94	123.78	3,799.3	-27.2	17.6	27.2	0.27	-0.25	-5.54

Wolverine Directional, LLC

Survey Report

Company:	RKI Exploration & Production	Local Co-ordinate Reference:	Well RDX 17-12H
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Site:	Sec 17-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDX 17-12H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
3,900.0	0.87	120.22	3,899.3	-28.0	19.0	28.0	0.09	-0.07	-3.56	
4,000.0	0.69	118.19	3,999.2	-28.7	20.2	28.7	0.18	-0.18	-2.03	
4,100.0	0.87	119.27	4,099.2	-29.3	21.3	29.3	0.18	0.18	1.08	
4,200.0	0.60	118.79	4,199.2	-30.0	22.5	29.9	0.27	-0.27	-0.48	
4,300.0	0.36	119.49	4,299.2	-30.4	23.2	30.3	0.24	-0.24	0.70	
4,400.0	0.20	124.97	4,399.2	-30.6	23.6	30.6	0.16	-0.16	5.48	
4,500.0	0.32	122.56	4,499.2	-30.9	24.0	30.9	0.12	0.12	-2.41	
4,600.0	0.28	116.32	4,599.2	-31.1	24.5	31.1	0.05	-0.04	-6.24	
4,700.0	0.32	121.08	4,699.2	-31.4	24.9	31.4	0.05	0.04	4.76	
4,800.0	0.35	120.27	4,799.2	-31.7	25.4	31.7	0.03	0.03	-0.81	
4,900.0	0.25	122.70	4,899.2	-32.0	25.9	31.9	0.10	-0.10	2.43	
5,000.0	0.23	111.39	4,999.2	-32.2	26.2	32.1	0.05	-0.02	-11.31	
5,100.0	0.12	105.41	5,099.2	-32.3	26.5	32.2	0.11	-0.11	-5.98	
5,200.0	0.27	196.80	5,199.2	-32.5	26.6	32.5	0.30	0.15	91.39	
5,300.0	0.55	179.47	5,299.2	-33.2	26.5	33.2	0.30	0.28	-17.33	
5,400.0	0.56	169.62	5,399.2	-34.2	26.6	34.1	0.10	0.01	-9.85	
5,500.0	0.48	143.73	5,499.2	-35.0	26.9	35.0	0.25	-0.08	-25.89	
5,600.0	0.46	152.26	5,599.2	-35.7	27.4	35.6	0.07	-0.02	8.53	
5,700.0	0.39	160.54	5,699.2	-36.4	27.7	36.3	0.09	-0.07	8.28	
5,800.0	0.48	188.14	5,799.2	-37.1	27.7	37.1	0.23	0.09	27.60	
5,900.0	0.53	198.18	5,899.2	-38.0	27.5	37.9	0.10	0.05	10.04	
6,000.0	0.65	204.97	5,999.2	-38.9	27.1	38.9	0.14	0.12	6.79	
6,100.0	0.69	213.69	6,099.2	-39.9	26.5	39.9	0.11	0.04	8.72	
6,200.0	0.70	201.34	6,199.2	-41.0	26.0	41.0	0.15	0.01	-12.35	
6,300.0	0.91	203.92	6,299.2	-42.3	25.4	42.3	0.21	0.21	2.58	
6,400.0	0.75	205.20	6,399.2	-43.6	24.8	43.6	0.16	-0.16	1.28	
6,500.0	0.70	201.35	6,499.1	-44.8	24.3	44.7	0.07	-0.05	-3.85	
6,600.0	0.72	196.41	6,599.1	-45.9	23.9	45.9	0.06	0.02	-4.94	
6,700.0	0.68	185.80	6,699.1	-47.1	23.7	47.1	0.14	-0.04	-10.61	
6,800.0	0.76	181.81	6,799.1	-48.4	23.6	48.4	0.09	0.08	-3.99	
6,900.0	0.63	174.40	6,899.1	-49.6	23.7	49.6	0.16	-0.13	-7.41	
7,000.0	0.56	171.83	6,999.1	-50.6	23.8	50.6	0.07	-0.07	-2.57	
7,025.0	0.59	172.56	7,024.1	-50.9	23.8	50.8	0.12	0.12	2.92	
Last GYRO Survey										
7,060.0	1.00	195.10	7,059.1	-51.3	23.8	51.3	1.45	1.17	64.40	
First MWD Survey										
7,092.0	3.10	190.70	7,091.1	-52.5	23.5	52.4	6.58	6.56	-13.75	
7,124.0	7.10	191.40	7,122.9	-55.3	23.0	55.2	12.50	12.50	2.19	
7,155.0	9.40	194.60	7,153.6	-59.6	22.0	59.6	7.56	7.42	10.32	
7,186.0	12.00	195.40	7,184.1	-65.1	20.5	65.1	8.40	8.39	2.58	
7,218.0	14.90	195.00	7,215.2	-72.3	18.5	72.3	9.07	9.06	-1.25	
7,250.0	18.10	193.10	7,245.9	-81.1	16.3	81.1	10.14	10.00	-5.94	
7,282.0	21.90	194.10	7,275.9	-91.8	13.7	91.8	11.92	11.88	3.13	
7,313.0	24.70	195.50	7,304.4	-103.6	10.6	103.6	9.21	9.03	4.52	
7,344.0	26.40	196.30	7,332.4	-116.5	6.9	116.5	5.60	5.48	2.58	
7,374.0	27.90	193.60	7,359.1	-129.7	3.4	129.7	6.47	5.00	-9.00	
7,406.0	29.90	189.20	7,387.1	-144.9	0.4	144.9	9.12	6.25	-13.75	
7,437.0	32.30	184.30	7,413.6	-160.8	-1.5	160.8	11.25	7.74	-15.81	
7,469.0	35.10	180.40	7,440.3	-178.5	-2.2	178.5	11.05	8.75	-12.19	
7,501.0	37.30	180.10	7,466.1	-197.4	-2.3	197.4	6.90	6.88	-0.94	
7,533.0	39.10	180.20	7,491.2	-217.2	-2.3	217.2	5.63	5.63	0.31	
7,564.0	41.90	179.10	7,514.8	-237.3	-2.2	237.3	9.32	9.03	-3.55	
7,594.0	45.80	178.50	7,536.4	-258.1	-1.8	258.1	13.07	13.00	-2.00	
7,626.0	49.80	177.80	7,557.9	-281.8	-1.0	281.8	12.60	12.50	-2.19	

Wolverine Directional, LLC

Survey Report

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7,657.0	53.90	178.20	7,577.1	-306.1	-0.1	306.1	13.26	13.23	1.29
7,689.0	57.60	178.80	7,595.1	-332.6	0.6	332.6	11.67	11.56	1.88
7,721.0	60.70	179.60	7,611.5	-360.0	0.9	360.0	9.92	9.69	2.50
7,752.0	64.20	179.80	7,625.8	-387.5	1.1	387.5	11.30	11.29	0.65
7,783.0	67.40	180.10	7,638.5	-415.8	1.1	415.8	10.36	10.32	0.97
7,815.0	71.70	179.40	7,649.7	-445.8	1.2	445.8	13.59	13.44	-2.19
7,846.0	75.80	177.80	7,658.4	-475.5	2.0	475.5	14.12	13.23	-5.16
7,878.0	80.60	176.60	7,664.9	-506.8	3.5	506.8	15.44	15.00	-3.75
7,910.0	83.70	176.30	7,669.3	-538.4	5.5	538.4	9.73	9.69	-0.94
7,934.0	85.10	177.00	7,671.6	-562.3	6.9	562.2	6.52	5.83	2.92
7,966.0	87.30	177.40	7,673.8	-594.1	8.4	594.1	6.99	6.88	1.25
7,997.0	89.80	177.30	7,674.5	-625.1	9.8	625.1	8.07	8.06	-0.32
8,029.0	90.80	177.00	7,674.4	-657.1	11.4	657.0	3.26	3.13	-0.94
8,062.0	91.00	177.20	7,673.8	-690.0	13.1	690.0	0.86	0.61	0.61
8,125.0	90.50	178.50	7,673.0	-753.0	15.5	752.9	2.21	-0.79	2.06
8,220.0	89.10	180.10	7,673.4	-847.9	16.6	847.9	2.24	-1.47	1.68
8,315.0	89.80	181.80	7,674.3	-942.9	15.1	942.9	1.94	0.74	1.79
8,410.0	90.30	181.40	7,674.2	-1,037.9	12.4	1,037.9	0.67	0.53	-0.42
8,505.0	89.80	180.90	7,674.1	-1,132.9	10.5	1,132.9	0.74	-0.53	-0.53
8,599.0	89.60	181.80	7,674.6	-1,226.8	8.3	1,226.8	0.98	-0.21	0.96
8,694.0	89.60	182.50	7,675.3	-1,321.8	4.7	1,321.8	0.74	0.00	0.74
8,789.0	89.50	181.30	7,676.0	-1,416.7	1.6	1,416.7	1.27	-0.11	-1.26
8,883.0	90.80	180.80	7,675.8	-1,510.7	-0.2	1,510.7	1.48	1.38	-0.53
8,977.0	91.60	179.50	7,673.8	-1,604.7	-0.4	1,604.7	1.62	0.85	-1.38
9,072.0	91.30	177.90	7,671.4	-1,699.6	1.8	1,699.6	1.71	-0.32	-1.68
9,167.0	90.90	178.70	7,669.6	-1,794.6	4.6	1,794.5	0.94	-0.42	0.84
9,262.0	90.50	178.80	7,668.4	-1,889.5	6.6	1,889.5	0.43	-0.42	0.11
9,357.0	89.80	177.40	7,668.2	-1,984.5	9.8	1,984.5	1.65	-0.74	-1.47
9,453.0	90.70	180.20	7,667.7	-2,080.4	11.8	2,080.4	3.06	0.94	2.92
9,548.0	93.50	180.80	7,664.3	-2,175.4	11.0	2,175.3	3.01	2.95	0.63
9,644.0	92.80	180.30	7,659.0	-2,271.2	10.1	2,271.2	0.90	-0.73	-0.52
9,741.0	92.20	181.40	7,654.7	-2,368.1	8.6	2,368.1	1.29	-0.62	1.13
9,835.0	93.10	181.10	7,650.4	-2,462.0	6.6	2,462.0	1.01	0.96	-0.32
9,929.0	91.30	181.00	7,646.8	-2,555.9	4.9	2,555.9	1.92	-1.91	-0.11
10,023.0	90.60	180.50	7,645.2	-2,649.9	3.6	2,649.9	0.92	-0.74	-0.53
10,115.0	89.00	178.80	7,645.6	-2,741.9	4.2	2,741.8	2.54	-1.74	-1.85
10,209.0	91.20	179.80	7,645.4	-2,835.8	5.3	2,835.8	2.57	2.34	1.06
10,304.0	88.80	178.10	7,645.4	-2,930.8	7.1	2,930.8	3.10	-2.53	-1.79
10,399.0	88.60	177.60	7,647.5	-3,025.7	10.6	3,025.7	0.57	-0.21	-0.53
10,494.0	90.40	180.30	7,648.4	-3,120.7	12.4	3,120.7	3.42	1.89	2.84
10,589.0	91.30	178.80	7,647.0	-3,215.7	13.1	3,215.7	1.84	0.95	-1.58
10,685.0	89.70	179.70	7,646.1	-3,311.7	14.4	3,311.6	1.91	-1.67	0.94
10,780.0	89.50	179.40	7,646.8	-3,406.7	15.1	3,406.6	0.38	-0.21	-0.32
10,874.0	92.00	179.90	7,645.6	-3,500.6	15.7	3,500.6	2.71	2.66	0.53
10,969.0	90.30	180.90	7,643.7	-3,595.6	15.0	3,595.6	2.08	-1.79	1.05
11,065.0	90.30	183.10	7,643.2	-3,691.5	11.7	3,691.5	2.29	0.00	2.29
11,160.0	89.90	182.40	7,643.0	-3,786.4	7.1	3,786.4	0.85	-0.42	-0.74
11,256.0	90.30	181.80	7,642.8	-3,882.4	3.6	3,882.4	0.75	0.42	-0.63
11,351.0	90.20	181.00	7,642.4	-3,977.3	1.3	3,977.3	0.85	-0.11	-0.84
11,446.0	93.10	181.80	7,639.7	-4,072.3	-1.0	4,072.3	3.17	3.05	0.84
11,540.0	93.60	180.30	7,634.2	-4,166.1	-2.8	4,166.1	1.68	0.53	-1.60
11,635.0	90.80	180.10	7,630.5	-4,261.0	-3.1	4,261.0	2.95	-2.95	-0.21
11,730.0	91.10	180.50	7,629.0	-4,356.0	-3.6	4,356.0	0.53	0.32	0.42
11,826.0	92.10	182.20	7,626.3	-4,451.9	-5.8	4,451.9	2.05	1.04	1.77

Wolverine Directional, LLC

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Project:	Eddy County (NM83E)	TVD Reference:	WELL @ 0.0ft (Original Well Elev)
Site:	Sec 17-T26S-R30E	MD Reference:	WELL @ 0.0ft (Original Well Elev)
Well:	RDX 17-12H	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	EDM 2003.21 Single User Db

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,921.0	89.70	180.40	7,624.8	-4,546.9	-8.0	4,546.9	3.16	-2.53	-1.89
11,969.0	89.70	180.40	7,625.0	-4,594.9	-8.3	4,594.9	0.00	0.00	0.00
Last MWD Survey									
12,028.0	89.70	180.40	7,625.3	-4,653.9	-8.7	4,653.9	0.00	0.00	0.00
Proj to TD - RDX 17-12 PBHL									

Survey Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
7,025.0	7,024.1	-50.9	23.8	Last GYRO Survey
7,060.0	7,059.1	-51.3	23.8	First MWD Survey
11,969.0	7,625.0	-4,594.9	-8.3	Last MWD Survey
12,028.0	7,625.3	-4,653.9	-8.7	Proj to TD

Checked By: _____ Approved By: _____ Date: _____