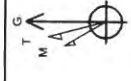




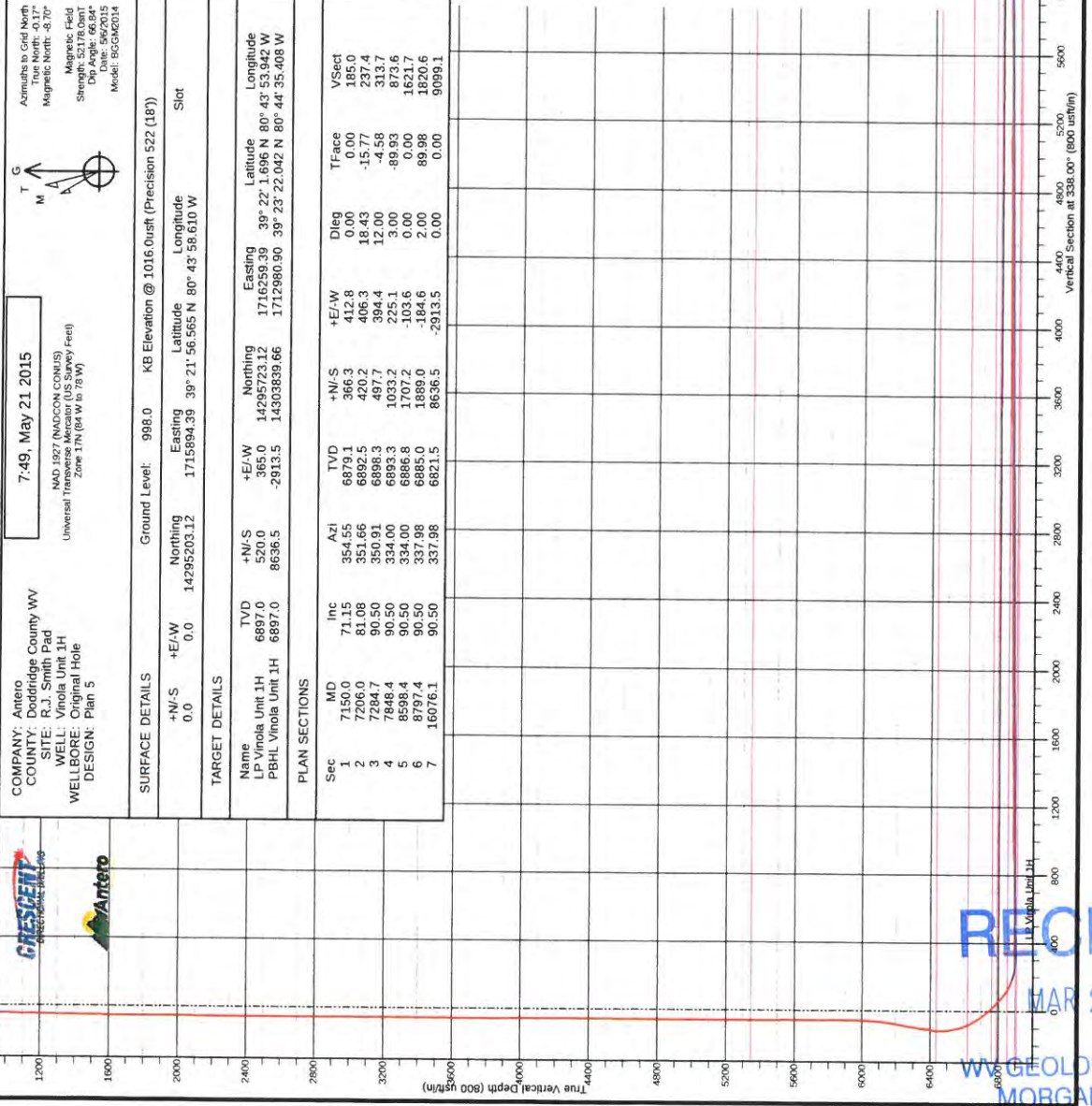
COMPANY: Antero
 COUNTY: Doddridge County WV
 SITE: R.J. Smith Pad
 WELL: Vinola Unit 1H
 WELLBORE: Original Hole
 DESIGN: Plan 5

7:49, May 21 2015
 NAD 1983 (NADCON CONUS)
 Universal Transverse Mercator (US Survey Feet)
 Zone 17N (64 W to 78 W)

Anterms to Grid North
 True North: -8.70°
 Magnetic North: -8.70°
 Magnetic Field
 Strength: 50.74 Gauss
 Date: 5/6/2015
 Model: BCGM2014



SURFACE DETAILS		Ground Level: 998.0		KB Elevation @ 1016.0usft (Precision 522 (187))					
+N/S	+E/W	Northing	Easting	Latitude	Longitude				
0.0	0.0	14295203.12	1715894.39	39° 21' 56.565 N	80° 43' 58.610 W				
TARGET DETAILS		+N/S	Northing	Easting	Latitude	Longitude			
Name	TVD	+N/S	Northing	Easting	Latitude	Longitude			
Vinola Unit 1H	6897.0	365.0	14295723.12	1716259.39	39° 22' 1.696 N	80° 43' 53.942 W			
PBHL Vinola Unit 1H	6897.0	-2913.5	14303839.66	1712890.90	39° 23' 22.042 N	80° 44' 35.408 W			
PLAN SECTIONS									
Sec	MD	Inc	Azi	TVD	+N/S	+E/W	Dleg	TFace	VSecl
1	7150.0	71.15	354.55	6879.1	365.3	412.8	0.00	0.00	185.0
2	7206.0	81.08	351.66	6892.5	420.2	412.8	18.43	-15.77	237.4
3	7284.7	90.50	350.91	6898.3	467.7	394.4	12.00	-4.58	313.7
4	7848.4	90.50	334.00	6933.3	1033.2	225.1	0.00	-69.53	1673.6
5	8598.4	90.50	334.00	6886.8	1707.2	-103.6	0.00	89.90	1821.7
6	8797.4	90.50	337.98	6885.0	1889.0	-184.6	2.00	89.98	1821.6
7	16076.1	90.50	337.98	6821.5	8636.5	-2913.5	0.00	0.00	9099.1



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 WV GEOLOGICAL SURVEY
 MORGANTOWN, WV

Antero

Doddridge County WV

**R.J. Smith Pad: Costlow/Duff/Gibson/Mishka/Vinola
Vinola Unit 1H**

Original Hole

Design: Surveys

Standard Survey Report

21 May, 2015

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WV GEOLOGICAL SURVEY
MORGANTOWN, WV

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WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Survey Report

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Project	Doddridge County WV, McClellan District		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	R.J. Smith Pad: Costlow/Duff/Gibson/Mishka/Vinola		
Site Position:		Northing:	14,295,223.06 usft
From:	Map	Easting:	1,715,891.05 usft
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "
		Latitude:	39° 21' 56.762 N
		Longitude:	80° 43' 58.652 W
		Grid Convergence:	0.17 °

Well	Vinola Unit 1H, Marcellus		
Well Position	+N/-S	0.0 usft	Latitude:
	+E/-W	0.0 usft	39° 21' 56.565 N
Position Uncertainty	2.0 usft	Wellhead Elevation:	1,009.0 usft
		Ground Level:	998.0 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	User Defined	5/6/2015	-8.53	66.84	52,178

Design	Surveys			
Audit Notes:				
Version:	1.0	Phase:	ACTUAL	Tie On Depth:
				0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	338.00

Survey Program	Date 5/21/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
106.7	5,899.4	Gyro (Original Hole)	Standard Keeper 104	Standard Wireline Keeper ver 1.0.4
5,953.0	16,063.0	Crescent MWD (Original Hole)	MWD	MWD - Standard

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
106.7	0.12	104.64	106.7	0.0	0.1	-0.1	0.11	0.11	0.00
107.0	0.12	105.14	107.0	0.0	0.1	-0.1	0.39	0.00	185.19
132.0	0.10	192.78	132.0	-0.1	0.1	-0.1	0.61	-0.08	350.56
157.0	0.04	19.31	157.0	-0.1	0.1	-0.1	0.56	-0.24	-693.88
182.0	0.03	296.70	182.0	-0.1	0.1	-0.1	0.19	-0.04	-330.44
207.0	0.16	291.97	207.0	0.0	0.1	-0.1	0.52	0.52	-18.92
232.0	0.04	270.05	232.0	0.0	0.0	0.0	0.50	-0.48	-87.68
257.0	0.05	81.26	257.0	0.0	0.0	0.0	0.36	0.04	684.84

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Survey Report

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Company: Antero
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Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
282.0	0.11	221.43	282.0	0.0	0.0	-0.1	0.61	0.24	560.68
307.0	0.14	270.65	307.0	-0.1	0.0	-0.1	0.43	0.12	196.88
332.0	0.18	111.37	332.0	-0.1	0.0	-0.1	1.26	0.16	-637.12
357.0	0.37	114.03	357.0	-0.1	0.1	-0.2	0.76	0.76	10.64
382.0	0.77	123.85	382.0	-0.2	0.3	-0.4	1.64	1.60	39.28
407.0	1.42	127.35	407.0	-0.5	0.7	-0.8	2.61	2.60	14.00
432.0	2.04	130.10	432.0	-1.0	1.3	-1.4	2.50	2.48	11.00
457.0	2.53	132.70	457.0	-1.7	2.0	-2.3	2.00	1.96	10.40
482.0	3.18	136.55	481.9	-2.5	2.9	-3.5	2.71	2.60	15.40
507.0	3.76	138.11	506.9	-3.7	3.9	-4.9	2.35	2.32	6.24
532.0	4.37	137.39	531.8	-5.0	5.1	-6.5	2.45	2.44	-2.88
557.0	4.61	138.96	556.7	-6.4	6.4	-8.4	1.08	0.96	6.28
582.0	5.31	143.35	581.7	-8.1	7.8	-10.4	3.18	2.80	17.56
607.0	5.60	144.43	606.5	-10.0	9.2	-12.7	1.23	1.16	4.32
632.0	5.67	145.53	631.4	-12.0	10.6	-15.1	0.51	0.28	4.40
657.0	5.71	145.25	656.3	-14.1	12.0	-17.6	0.19	0.16	-1.12
682.0	5.76	145.20	681.2	-16.1	13.4	-20.0	0.20	0.20	-0.20
707.0	5.83	145.99	706.0	-18.2	14.9	-22.5	0.42	0.28	3.16
732.0	5.89	144.66	730.9	-20.3	16.3	-25.0	0.59	0.24	-5.32
757.0	5.79	145.54	755.8	-22.4	17.8	-27.4	0.54	-0.40	3.52
782.0	5.74	143.61	780.7	-24.4	19.2	-29.9	0.80	-0.20	-7.72
807.0	4.92	142.99	805.5	-26.3	20.6	-32.1	3.29	-3.28	-2.48
832.0	4.84	142.06	830.5	-28.0	21.9	-34.2	0.45	-0.32	-3.72
857.0	4.65	142.67	855.4	-29.6	23.2	-36.2	0.79	-0.76	2.44
882.0	4.37	143.67	880.3	-31.2	24.3	-38.1	1.16	-1.12	4.00
907.0	4.05	143.88	905.2	-32.7	25.4	-39.8	1.28	-1.28	0.84
932.0	3.80	144.47	930.2	-34.1	26.4	-41.5	1.01	-1.00	2.36
957.0	3.35	144.69	955.1	-35.3	27.3	-43.0	1.80	-1.80	0.88
982.0	2.97	143.52	980.1	-36.5	28.1	-44.4	1.54	-1.52	-4.68
1,007.0	2.61	144.79	1,005.0	-37.5	28.9	-45.5	1.46	-1.44	5.08
1,032.0	2.35	145.10	1,030.0	-38.3	29.5	-46.6	1.04	-1.04	1.24
1,057.0	2.13	142.86	1,055.0	-39.1	30.1	-47.5	0.95	-0.88	-8.96
1,082.0	1.86	143.98	1,080.0	-39.8	30.6	-48.4	1.09	-1.08	4.48
1,107.0	1.64	144.79	1,105.0	-40.4	31.0	-49.1	0.89	-0.88	3.24
1,132.0	1.48	145.09	1,130.0	-41.0	31.4	-49.8	0.64	-0.64	1.20
1,157.0	1.39	144.97	1,155.0	-41.5	31.8	-50.4	0.36	-0.36	-0.48
1,182.0	1.12	141.54	1,180.0	-42.0	32.1	-50.9	1.12	-1.08	-13.72
1,207.0	1.02	139.44	1,205.0	-42.3	32.4	-51.4	0.43	-0.40	-8.40
1,232.0	0.81	142.24	1,229.9	-42.6	32.6	-51.8	0.86	-0.84	11.20
1,257.0	0.68	139.81	1,254.9	-42.9	32.8	-52.1	0.54	-0.52	-9.72
1,282.0	0.55	136.48	1,279.9	-43.1	33.0	-52.3	0.54	-0.52	-13.32
1,307.0	0.59	134.01	1,304.9	-43.3	33.2	-52.5	0.19	0.16	-9.88

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Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,332.0	0.63	140.07	1,329.9	-43.4	33.4	-52.8	0.30	0.16	24.24
1,357.0	0.60	137.82	1,354.9	-43.7	33.6	-53.0	0.15	-0.12	-9.00
1,382.0	0.55	136.30	1,379.9	-43.8	33.7	-53.3	0.21	-0.20	-6.08
1,407.0	0.45	138.73	1,404.9	-44.0	33.9	-53.5	0.41	-0.40	9.72
1,432.0	0.48	143.53	1,429.9	-44.2	34.0	-53.7	0.20	0.12	19.20
1,457.0	0.41	141.61	1,454.9	-44.3	34.1	-53.9	0.29	-0.28	-7.68
1,482.0	0.46	139.25	1,479.9	-44.5	34.2	-54.0	0.21	0.20	-9.44
1,507.0	0.52	141.19	1,504.9	-44.6	34.4	-54.2	0.25	0.24	7.76
1,532.0	0.39	139.90	1,529.9	-44.8	34.5	-54.4	0.52	-0.52	-5.16
1,557.0	0.39	145.08	1,554.9	-44.9	34.6	-54.6	0.14	0.00	20.72
1,582.0	0.42	143.75	1,579.9	-45.1	34.7	-54.8	0.13	0.12	-5.32
1,607.0	0.37	140.32	1,604.9	-45.2	34.8	-54.9	0.22	-0.20	-13.72
1,632.0	0.34	133.93	1,629.9	-45.3	34.9	-55.1	0.20	-0.12	-25.56
1,657.0	0.29	126.78	1,654.9	-45.4	35.0	-55.2	0.25	-0.20	-28.60
1,682.0	0.33	146.95	1,679.9	-45.5	35.1	-55.3	0.46	0.16	80.68
1,707.0	0.26	152.97	1,704.9	-45.6	35.2	-55.5	0.31	-0.28	24.08
1,732.0	0.30	148.27	1,729.9	-45.7	35.2	-55.6	0.18	0.16	-18.80
1,757.0	0.28	149.46	1,754.9	-45.8	35.3	-55.7	0.08	-0.08	4.76
1,782.0	0.24	166.10	1,779.9	-45.9	35.4	-55.8	0.34	-0.16	66.56
1,807.0	0.25	177.62	1,804.9	-46.0	35.4	-55.9	0.20	0.04	46.08
1,832.0	0.22	166.84	1,829.9	-46.1	35.4	-56.0	0.21	-0.12	-43.12
1,857.0	0.26	147.35	1,854.9	-46.2	35.4	-56.1	0.36	0.16	-77.96
1,882.0	0.15	143.42	1,879.9	-46.3	35.5	-56.2	0.44	-0.44	-15.72
1,907.0	0.12	150.97	1,904.9	-46.3	35.5	-56.3	0.14	-0.12	30.20
1,932.0	0.11	169.40	1,929.9	-46.4	35.5	-56.3	0.15	-0.04	73.72
1,957.0	0.14	181.94	1,954.9	-46.4	35.5	-56.4	0.16	0.12	50.16
1,982.0	0.16	121.16	1,979.9	-46.5	35.6	-56.4	0.61	0.08	-243.12
2,007.0	0.12	161.72	2,004.9	-46.5	35.6	-56.5	0.42	-0.16	162.24
2,032.0	0.14	154.66	2,029.9	-46.6	35.6	-56.5	0.10	0.08	-28.24
2,057.0	0.05	142.90	2,054.9	-46.6	35.6	-56.6	0.37	-0.36	-47.04
2,082.0	0.18	151.07	2,079.9	-46.7	35.7	-56.6	0.52	0.52	32.68
2,107.0	0.06	175.14	2,104.9	-46.7	35.7	-56.7	0.51	-0.48	96.28
2,132.0	0.02	206.84	2,129.9	-46.7	35.7	-56.7	0.18	-0.16	126.80
2,157.0	0.13	187.62	2,154.9	-46.8	35.7	-56.7	0.45	0.44	-76.88
2,182.0	0.05	244.29	2,179.9	-46.8	35.7	-56.7	0.44	-0.32	226.68
2,207.0	0.09	301.01	2,204.9	-46.8	35.6	-56.7	0.30	0.16	226.88
2,232.0	0.06	204.34	2,229.9	-46.8	35.6	-56.7	0.46	-0.12	-386.68
2,257.0	0.08	222.58	2,254.9	-46.8	35.6	-56.7	0.12	0.08	72.96
2,282.0	0.11	11.95	2,279.9	-46.8	35.6	-56.7	0.73	0.12	597.48
2,307.0	0.06	340.69	2,304.9	-46.8	35.6	-56.7	0.27	-0.20	-125.04
2,332.0	0.14	299.62	2,329.9	-46.7	35.6	-56.7	0.41	0.32	-164.28
2,357.0	0.05	71.87	2,354.9	-46.7	35.5	-56.6	0.71	-0.36	529.00
2,382.0	0.09	172.92	2,379.9	-46.7	35.6	-56.7	0.44	0.16	404.20

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
2,407.0	0.06	229.97	2,404.9	-46.8	35.5	-56.7	0.31	-0.12	228.20
2,432.0	0.08	263.29	2,429.9	-46.8	35.5	-56.7	0.18	0.08	133.28
2,457.0	0.08	297.85	2,454.9	-46.8	35.5	-56.7	0.19	0.00	138.24
2,482.0	0.24	280.99	2,479.9	-46.8	35.4	-56.6	0.66	0.64	-67.44
2,507.0	0.29	302.92	2,504.9	-46.7	35.3	-56.5	0.45	0.20	87.72
2,532.0	0.10	239.98	2,529.9	-46.7	35.2	-56.5	1.04	-0.76	-251.76
2,557.0	0.15	245.11	2,554.9	-46.7	35.2	-56.5	0.20	0.20	20.52
2,582.0	0.17	225.53	2,579.9	-46.8	35.1	-56.5	0.23	0.08	-78.32
2,607.0	0.15	239.52	2,604.9	-46.8	35.1	-56.5	0.17	-0.08	55.96
2,632.0	0.18	249.28	2,629.9	-46.8	35.0	-56.5	0.16	0.12	39.04
2,657.0	0.19	238.55	2,654.9	-46.9	34.9	-56.5	0.14	0.04	-42.92
2,682.0	0.20	243.48	2,679.9	-46.9	34.9	-56.5	0.08	0.04	19.72
2,707.0	0.22	237.80	2,704.9	-46.9	34.8	-56.6	0.12	0.08	-22.72
2,732.0	0.21	227.34	2,729.9	-47.0	34.7	-56.6	0.16	-0.04	-41.84
2,757.0	0.19	216.24	2,754.9	-47.1	34.7	-56.6	0.17	-0.08	-44.40
2,782.0	0.27	232.36	2,779.9	-47.1	34.6	-56.7	0.41	0.32	64.48
2,807.0	0.25	211.09	2,804.9	-47.2	34.5	-56.7	0.39	-0.08	-85.08
2,832.0	0.20	212.83	2,829.9	-47.3	34.5	-56.8	0.20	-0.20	6.96
2,857.0	0.22	232.20	2,854.9	-47.4	34.4	-56.8	0.29	0.08	77.48
2,882.0	0.20	219.24	2,879.9	-47.4	34.3	-56.8	0.21	-0.08	-51.84
2,907.0	0.16	196.96	2,904.9	-47.5	34.3	-56.9	0.32	-0.16	-89.12
2,932.0	0.14	229.66	2,929.9	-47.6	34.3	-56.9	0.35	-0.08	130.80
2,957.0	0.14	226.49	2,954.9	-47.6	34.2	-56.9	0.03	0.00	-12.68
2,982.0	0.23	227.97	2,979.9	-47.6	34.2	-57.0	0.36	0.36	5.92
3,007.0	0.17	222.32	3,004.9	-47.7	34.1	-57.0	0.25	-0.24	-22.60
3,032.0	0.15	214.52	3,029.9	-47.8	34.0	-57.0	0.12	-0.08	-31.20
3,057.0	0.26	221.46	3,054.9	-47.8	34.0	-57.1	0.45	0.44	27.76
3,082.0	0.11	208.31	3,079.9	-47.9	33.9	-57.1	0.62	-0.60	-52.60
3,107.0	0.16	195.26	3,104.9	-48.0	33.9	-57.2	0.23	0.20	-52.20
3,132.0	0.24	236.96	3,129.9	-48.0	33.9	-57.2	0.64	0.32	166.80
3,157.0	0.23	238.86	3,154.9	-48.1	33.8	-57.2	0.05	-0.04	7.60
3,182.0	0.23	233.77	3,179.9	-48.1	33.7	-57.2	0.08	0.00	-20.36
3,207.0	0.24	234.24	3,204.9	-48.2	33.6	-57.3	0.04	0.04	1.88
3,232.0	0.23	209.47	3,229.9	-48.3	33.6	-57.3	0.41	-0.04	-99.08
3,257.0	0.28	233.33	3,254.9	-48.3	33.5	-57.4	0.46	0.20	95.44
3,282.0	0.27	223.15	3,279.9	-48.4	33.4	-57.4	0.20	-0.04	-40.72
3,307.0	0.26	243.65	3,304.9	-48.5	33.3	-57.4	0.38	-0.04	82.00
3,332.0	0.25	250.38	3,329.9	-48.5	33.2	-57.4	0.13	-0.04	26.92
3,357.0	0.19	244.15	3,354.9	-48.6	33.1	-57.4	0.26	-0.24	-24.92
3,382.0	0.15	243.95	3,379.9	-48.6	33.0	-57.4	0.16	-0.16	-0.80
3,407.0	0.19	227.85	3,404.9	-48.6	33.0	-57.5	0.25	0.16	-64.40
3,432.0	0.10	250.58	3,429.9	-48.7	32.9	-57.5	0.42	-0.36	90.92

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Survey Report

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H WV GEOLOGICAL SURVEY
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18')) WOODBURN, WV
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
3,457.0	0.15	253.65	3,454.9	-48.7	32.9	-57.5	0.20	0.20	12.28
3,482.0	0.16	214.67	3,479.9	-48.7	32.8	-57.5	0.42	0.04	-155.92
3,507.0	0.14	241.07	3,504.9	-48.8	32.8	-57.5	0.28	-0.08	105.60
3,532.0	0.20	218.88	3,529.9	-48.8	32.7	-57.5	0.35	0.24	-88.76
3,557.0	0.17	227.82	3,554.9	-48.9	32.7	-57.6	0.17	-0.12	35.76
3,582.0	0.16	206.83	3,579.9	-48.9	32.6	-57.6	0.24	-0.04	-83.96
3,607.0	0.23	211.43	3,604.9	-49.0	32.6	-57.6	0.29	0.28	18.40
3,632.0	0.13	205.28	3,629.9	-49.1	32.5	-57.7	0.41	-0.40	-24.60
3,657.0	0.26	231.99	3,654.9	-49.1	32.5	-57.7	0.62	0.52	106.84
3,682.0	0.23	218.60	3,679.9	-49.2	32.4	-57.8	0.26	-0.12	-53.56
3,707.0	0.26	223.90	3,704.9	-49.3	32.3	-57.8	0.15	0.12	21.20
3,732.0	0.22	221.12	3,729.9	-49.4	32.3	-57.9	0.17	-0.16	-11.12
3,757.0	0.25	222.44	3,754.9	-49.4	32.2	-57.9	0.12	0.12	5.28
3,782.0	0.27	220.49	3,779.9	-49.5	32.1	-58.0	0.09	0.08	-7.80
3,807.0	0.30	247.40	3,804.9	-49.6	32.0	-58.0	0.54	0.12	107.64
3,832.0	0.31	236.70	3,829.9	-49.7	31.9	-58.0	0.23	0.04	-42.80
3,857.0	0.29	224.54	3,854.9	-49.7	31.8	-58.0	0.27	-0.08	-48.64
3,882.0	0.29	228.85	3,879.9	-49.8	31.7	-58.1	0.09	0.00	17.24
3,907.0	0.28	230.91	3,904.9	-49.9	31.6	-58.1	0.06	-0.04	8.24
3,932.0	0.31	235.98	3,929.9	-50.0	31.5	-58.2	0.16	0.12	20.28
3,957.0	0.31	238.52	3,954.9	-50.1	31.4	-58.2	0.05	0.00	10.16
3,982.0	0.23	245.02	3,979.9	-50.1	31.3	-58.2	0.34	-0.32	26.00
4,007.0	0.27	243.30	4,004.9	-50.2	31.2	-58.2	0.16	0.16	-6.88
4,032.0	0.26	237.83	4,029.9	-50.2	31.1	-58.2	0.11	-0.04	-21.88
4,057.0	0.21	235.91	4,054.9	-50.3	31.0	-58.2	0.20	-0.20	-7.68
4,082.0	0.18	237.45	4,079.9	-50.3	30.9	-58.3	0.12	-0.12	6.16
4,107.0	0.19	224.77	4,104.9	-50.4	30.9	-58.3	0.17	0.04	-50.72
4,132.0	0.17	225.92	4,129.9	-50.4	30.8	-58.3	0.08	-0.08	4.60
4,157.0	0.18	224.49	4,154.9	-50.5	30.8	-58.3	0.04	0.04	-5.72
4,182.0	0.21	229.33	4,179.9	-50.5	30.7	-58.4	0.14	0.12	19.36
4,207.0	0.05	265.71	4,204.9	-50.6	30.7	-58.4	0.69	-0.64	145.52
4,232.0	0.15	252.17	4,229.9	-50.6	30.6	-58.4	0.41	0.40	-54.16
4,257.0	0.12	238.85	4,254.9	-50.6	30.6	-58.4	0.17	-0.12	-53.28
4,282.0	0.11	241.99	4,279.9	-50.6	30.5	-58.4	0.05	-0.04	12.56
4,307.0	0.16	199.22	4,304.9	-50.7	30.5	-58.4	0.44	0.20	-171.08
4,332.0	0.11	244.23	4,329.9	-50.7	30.5	-58.4	0.45	-0.20	180.04
4,357.0	0.13	201.72	4,354.9	-50.8	30.4	-58.5	0.36	0.08	-170.04
4,382.0	0.21	206.65	4,379.9	-50.8	30.4	-58.5	0.33	0.32	19.72
4,407.0	0.08	201.55	4,404.9	-50.9	30.4	-58.6	0.52	-0.52	-20.40
4,432.0	0.12	178.64	4,429.9	-50.9	30.4	-58.6	0.22	0.16	-91.64
4,457.0	0.18	154.59	4,454.9	-51.0	30.4	-58.7	0.34	0.24	-96.20
4,482.0	0.08	134.10	4,479.9	-51.0	30.4	-58.7	0.43	-0.40	-81.96
4,507.0	0.09	121.28	4,504.9	-51.1	30.4	-58.7	0.09	0.04	-51.28

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Survey Report

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,532.0	0.03	142.45	4,529.9	-51.1	30.5	-58.8	0.25	-0.24	84.68
4,557.0	0.04	61.21	4,554.9	-51.1	30.5	-58.8	0.18	0.04	-324.96
4,582.0	0.08	89.00	4,579.9	-51.1	30.5	-58.8	0.19	0.16	111.16
4,607.0	0.05	179.76	4,604.9	-51.1	30.5	-58.8	0.38	-0.12	363.04
4,632.0	0.03	105.95	4,629.9	-51.1	30.5	-58.8	0.20	-0.08	-295.24
4,657.0	0.03	104.72	4,654.9	-51.1	30.5	-58.8	0.00	0.00	-4.92
4,682.0	0.09	185.95	4,679.9	-51.1	30.5	-58.8	0.36	0.24	324.92
4,707.0	0.05	170.25	4,704.9	-51.1	30.5	-58.9	0.18	-0.16	-62.80
4,732.0	0.12	50.18	4,729.9	-51.1	30.6	-58.9	0.61	0.28	-480.28
4,757.0	0.05	73.18	4,754.9	-51.1	30.6	-58.9	0.31	-0.28	92.00
4,782.0	0.04	232.22	4,779.9	-51.1	30.6	-58.9	0.35	-0.04	636.16
4,807.0	0.02	31.77	4,804.9	-51.1	30.6	-58.9	0.24	-0.08	638.20
4,832.0	0.06	25.82	4,829.9	-51.1	30.6	-58.9	0.16	0.16	-23.80
4,857.0	0.06	199.88	4,854.9	-51.1	30.6	-58.9	0.48	0.00	696.24
4,882.0	0.02	183.02	4,879.9	-51.1	30.6	-58.9	0.17	-0.16	-67.44
4,907.0	0.08	236.48	4,904.9	-51.1	30.6	-58.9	0.28	0.24	213.84
4,932.0	0.11	171.26	4,929.9	-51.2	30.6	-58.9	0.42	0.12	-260.88
4,957.0	0.06	193.95	4,954.9	-51.2	30.6	-58.9	0.24	-0.20	90.76
4,982.0	0.04	202.63	4,979.9	-51.2	30.6	-59.0	0.09	-0.08	34.72
5,007.0	0.03	160.44	5,004.9	-51.2	30.6	-59.0	0.11	-0.04	-168.76
5,032.0	0.16	223.20	5,029.9	-51.3	30.5	-59.0	0.59	0.52	251.04
5,057.0	0.07	196.13	5,054.9	-51.3	30.5	-59.0	0.41	-0.36	-108.28
5,082.0	0.08	22.28	5,079.9	-51.3	30.5	-59.0	0.60	0.04	-695.40
5,107.0	0.13	60.96	5,104.9	-51.3	30.5	-59.0	0.34	0.20	154.72
5,132.0	0.10	323.43	5,129.9	-51.3	30.6	-59.0	0.70	-0.12	-390.12
5,157.0	0.07	327.93	5,154.9	-51.2	30.5	-58.9	0.12	-0.12	18.00
5,182.0	0.13	312.30	5,179.9	-51.2	30.5	-58.9	0.26	0.24	-62.52
5,207.0	0.18	307.29	5,204.9	-51.1	30.5	-58.8	0.21	0.20	-20.04
5,232.0	0.15	338.94	5,229.9	-51.1	30.4	-58.8	0.38	-0.12	126.60
5,257.0	0.21	323.76	5,254.9	-51.0	30.4	-58.7	0.30	0.24	-60.72
5,282.0	0.15	348.58	5,279.9	-51.0	30.3	-58.6	0.39	-0.24	99.28
5,307.0	0.21	321.43	5,304.9	-50.9	30.3	-58.5	0.41	0.24	-108.60
5,332.0	0.28	334.48	5,329.9	-50.8	30.3	-58.4	0.36	0.28	52.20
5,357.0	0.26	313.93	5,354.9	-50.7	30.2	-58.3	0.39	-0.08	-82.20
5,382.0	0.28	304.07	5,379.9	-50.6	30.1	-58.2	0.20	0.08	-39.44
5,407.0	0.22	325.99	5,404.9	-50.6	30.0	-58.1	0.45	-0.24	87.68
5,432.0	0.23	320.71	5,429.9	-50.5	30.0	-58.0	0.09	0.04	-21.12
5,457.0	0.24	329.11	5,454.9	-50.4	29.9	-57.9	0.14	0.04	33.60
5,482.0	0.34	334.67	5,479.9	-50.3	29.8	-57.8	0.42	0.40	22.24
5,507.0	0.33	328.84	5,504.9	-50.2	29.8	-57.7	0.14	-0.04	-23.32
5,532.0	0.25	333.97	5,529.9	-50.0	29.7	-57.5	0.34	-0.32	20.52
5,557.0	0.37	340.00	5,554.9	-49.9	29.7	-57.4	0.50	0.48	24.12

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WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Survey Report

Company: Antero
Project: Doddridge County WV
Site: R. J. Smith Pad
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,582.0	0.30	339.05	5,579.9	-49.8	29.6	-57.2	0.28	-0.28	-3.80
5,607.0	0.30	340.53	5,604.9	-49.7	29.6	-57.1	0.03	0.00	5.92
5,632.0	0.35	310.90	5,629.9	-49.5	29.5	-57.0	0.69	0.20	-118.52
5,657.0	0.22	320.74	5,654.9	-49.5	29.4	-56.9	0.55	-0.52	39.36
5,682.0	0.12	317.48	5,679.9	-49.4	29.3	-56.8	0.40	-0.40	-13.04
5,707.0	0.21	330.07	5,704.9	-49.3	29.3	-56.7	0.39	0.36	50.36
5,732.0	0.18	16.95	5,729.9	-49.3	29.3	-56.7	0.63	-0.12	187.52
5,757.0	0.21	296.10	5,754.9	-49.2	29.3	-56.6	1.02	0.12	-323.40
5,782.0	0.14	342.84	5,779.9	-49.2	29.2	-56.5	0.61	-0.28	186.96
5,807.0	0.06	3.15	5,804.9	-49.1	29.2	-56.5	0.35	-0.32	81.24
5,832.0	0.13	15.54	5,829.9	-49.1	29.2	-56.4	0.29	0.28	49.56
5,857.0	0.14	295.02	5,854.9	-49.0	29.2	-56.4	0.70	0.04	-322.08
5,882.0	0.05	168.53	5,879.9	-49.0	29.2	-56.4	0.70	-0.36	-505.96
5,899.4	0.22	141.97	5,897.3	-49.1	29.2	-56.4	1.01	0.98	-152.56
5,979.0	0.37	30.66	5,976.9	-49.0	29.4	-56.4	0.62	0.19	-139.85
6,010.0	4.99	92.79	6,007.9	-48.9	30.8	-56.9	15.57	14.90	200.42
6,041.0	8.80	97.64	6,038.6	-49.3	34.5	-58.7	12.42	12.29	15.65
6,072.0	11.23	95.01	6,069.2	-49.9	39.9	-61.2	7.97	7.84	-8.48
6,103.0	14.69	92.60	6,099.4	-50.3	46.8	-64.2	11.29	11.16	-7.77
6,134.0	17.97	92.45	6,129.1	-50.7	55.5	-67.8	10.58	10.58	-0.48
6,164.0	20.51	92.02	6,157.4	-51.1	65.4	-71.9	8.48	8.47	-1.43
6,195.0	22.65	91.57	6,186.3	-51.5	76.8	-76.5	6.92	6.90	-1.45
6,226.0	24.49	89.96	6,214.7	-51.6	89.2	-81.3	6.29	5.94	-5.19
6,257.0	25.74	87.74	6,242.7	-51.4	102.3	-86.0	5.05	4.03	-7.16
6,288.0	27.37	85.72	6,270.5	-50.6	116.2	-90.4	6.01	5.26	-6.52
6,319.0	29.80	84.25	6,297.7	-49.3	130.9	-94.7	8.16	7.84	-4.74
6,349.0	32.43	83.15	6,323.4	-47.6	146.3	-98.9	8.97	8.77	-3.67
6,380.0	35.31	81.66	6,349.1	-45.3	163.5	-103.2	9.67	9.29	-4.81
6,411.0	37.43	80.42	6,374.1	-42.4	181.6	-107.3	7.24	6.84	-4.00
6,442.0	39.35	77.61	6,398.4	-38.7	200.5	-111.0	8.37	6.19	-9.06
6,473.0	42.02	75.28	6,421.9	-34.0	220.2	-114.0	9.91	8.61	-7.52
6,504.0	43.00	71.24	6,444.7	-27.9	240.2	-115.9	9.35	3.16	-13.03
6,534.0	42.43	67.92	6,466.8	-20.8	259.3	-116.4	7.74	-1.90	-11.07
6,565.0	41.94	61.59	6,489.8	-12.0	278.1	-115.3	13.80	-1.58	-20.42
6,596.0	40.74	56.54	6,513.0	-1.5	295.6	-112.1	11.43	-3.87	-16.29
6,627.0	39.38	51.93	6,536.8	10.2	311.8	-107.4	10.53	-4.39	-14.87
6,658.0	38.70	47.64	6,560.9	22.8	326.7	-101.3	8.99	-2.19	-13.84
6,689.0	38.29	42.90	6,585.1	36.3	340.4	-93.8	9.61	-1.32	-15.29
6,719.0	38.70	38.40	6,608.6	50.5	352.6	-85.3	9.43	1.37	-15.00
6,750.0	40.07	33.02	6,632.6	66.5	364.0	-74.7	11.86	4.42	-17.35
6,781.0	41.26	28.68	6,656.1	83.8	374.4	-62.5	9.90	3.84	-14.00
6,812.0	42.74	24.87	6,679.1	102.3	383.7	-48.9	9.51	4.77	-12.29
6,843.0	44.13	20.16	6,701.7	122.0	391.9	-33.7	11.37	4.48	-15.19

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Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,874.0	46.34	16.78	6,723.5	142.9	398.8	-16.9	10.52	7.13	-10.90
6,905.0	47.92	14.97	6,744.6	164.7	405.0	1.0	6.65	5.10	-5.84
6,935.0	49.48	11.98	6,764.4	186.6	410.3	19.4	9.12	5.20	-9.97
6,966.0	51.72	8.87	6,784.1	210.2	414.6	39.6	10.60	7.23	-10.03
6,997.0	53.57	5.46	6,802.9	234.6	417.7	61.1	10.58	5.97	-11.00
7,028.0	54.64	0.42	6,821.0	259.7	418.9	83.9	13.61	3.45	-16.26
7,057.0	56.73	357.14	6,837.4	283.7	418.4	106.3	11.80	7.21	-11.31
7,088.0	60.41	356.57	6,853.6	310.1	417.0	131.3	11.97	11.87	-1.84
7,119.0	65.56	356.08	6,867.6	337.6	415.2	157.5	16.67	16.61	-1.58
7,150.0	71.15	354.55	6,879.1	366.3	412.8	185.0	18.61	18.03	-4.94
7,176.0	76.53	353.95	6,886.3	391.2	410.3	209.0	20.81	20.69	-2.31
7,211.0	82.76	353.46	6,892.6	425.4	406.6	242.1	17.85	17.80	-1.40
7,242.0	88.69	352.66	6,894.9	456.0	402.8	271.9	19.30	19.13	-2.58
7,282.0	90.34	346.58	6,895.2	495.4	395.6	311.1	15.75	4.13	-15.20
7,374.0	89.97	342.87	6,895.0	584.1	371.4	402.4	4.05	-0.40	-4.03
7,467.0	90.20	338.75	6,894.9	671.9	340.8	495.3	4.44	0.25	-4.43
7,559.0	91.01	336.23	6,893.9	756.9	305.6	587.3	2.88	0.88	-2.74
7,652.0	90.56	333.99	6,892.6	841.2	266.5	680.1	2.46	-0.48	-2.41
7,744.0	89.86	332.07	6,892.3	923.2	224.8	771.8	2.22	-0.76	-2.09
7,837.0	92.91	334.58	6,890.0	1,006.3	183.0	864.4	4.25	3.28	2.70
7,929.0	92.38	335.91	6,885.8	1,089.7	144.5	956.2	1.55	-0.58	1.45
8,022.0	91.23	336.31	6,882.8	1,174.7	106.9	1,049.1	1.31	-1.24	0.43
8,114.0	88.94	335.22	6,882.7	1,258.6	69.1	1,141.1	2.76	-2.49	-1.18
8,207.0	89.80	335.17	6,883.7	1,343.0	30.1	1,233.9	0.93	0.92	-0.05
8,300.0	91.12	337.54	6,883.0	1,428.2	-7.2	1,326.9	2.92	1.42	2.55
8,392.0	90.39	337.87	6,881.8	1,513.3	-42.1	1,418.9	0.87	-0.79	0.36
8,485.0	91.48	337.01	6,880.3	1,599.2	-77.7	1,511.9	1.49	1.17	-0.92
8,577.0	91.26	336.39	6,878.1	1,683.7	-114.1	1,603.8	0.71	-0.24	-0.67
8,670.0	89.92	335.31	6,877.1	1,768.5	-152.2	1,696.7	1.85	-1.44	-1.16
8,762.0	90.00	336.45	6,877.2	1,852.5	-189.8	1,788.7	1.24	0.09	1.24
8,855.0	90.98	338.04	6,876.4	1,938.2	-225.7	1,881.7	2.01	1.05	1.71
8,947.0	90.56	338.71	6,875.1	2,023.7	-259.6	1,973.6	0.86	-0.46	0.73
9,040.0	90.11	338.25	6,874.6	2,110.3	-293.7	2,066.6	0.69	-0.48	-0.49
9,133.0	90.62	337.29	6,874.0	2,196.3	-328.9	2,159.6	1.17	0.55	-1.03
9,225.0	89.64	338.25	6,873.8	2,281.5	-363.7	2,251.6	1.49	-1.07	1.04
9,318.0	90.40	338.72	6,873.8	2,368.0	-397.8	2,344.6	0.96	0.82	0.51
9,410.0	90.09	338.13	6,873.4	2,453.6	-431.7	2,436.6	0.72	-0.34	-0.64
9,503.0	91.38	340.27	6,872.2	2,540.5	-464.7	2,529.6	2.69	1.39	2.30
9,596.0	90.56	340.13	6,870.6	2,628.0	-496.2	2,622.5	0.89	-0.88	-0.15
9,688.0	90.28	338.59	6,869.9	2,714.1	-528.6	2,714.5	1.70	-0.30	-1.67
9,781.0	89.72	337.03	6,869.9	2,800.2	-563.7	2,807.5	1.78	-0.60	-1.68
9,873.0	90.14	336.64	6,870.0	2,884.8	-599.9	2,899.5	0.62	0.46	-0.42

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Survey Report

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
9,966.0	90.67	338.65	6,869.4	2,970.8	-635.3	2,992.4	2.24	0.57	2.16
10,058.0	91.23	339.12	6,867.8	3,056.6	-668.4	3,084.4	0.79	0.61	0.51
10,151.0	90.90	338.14	6,866.1	3,143.2	-702.3	3,177.4	1.11	-0.35	-1.05
10,243.0	90.56	337.08	6,864.9	3,228.2	-737.4	3,269.4	1.21	-0.37	-1.15
10,336.0	90.95	336.20	6,863.7	3,313.6	-774.2	3,362.4	1.03	0.42	-0.95
10,428.0	90.23	336.10	6,862.8	3,397.7	-811.4	3,454.3	0.79	-0.78	-0.11
10,521.0	90.73	337.04	6,862.0	3,483.1	-848.4	3,547.3	1.14	0.54	1.01
10,614.0	90.53	338.37	6,861.0	3,569.1	-883.7	3,640.3	1.45	-0.22	1.43
10,706.0	91.57	339.52	6,859.3	3,655.0	-916.7	3,732.2	1.69	1.13	1.25
10,799.0	90.79	340.30	6,857.4	3,742.3	-948.7	3,825.2	1.19	-0.84	0.84
10,891.0	91.57	341.05	6,855.5	3,829.1	-979.1	3,917.0	1.18	0.85	0.82
10,984.0	90.84	339.77	6,853.5	3,916.7	-1,010.3	4,009.9	1.58	-0.78	-1.38
11,076.0	90.42	338.50	6,852.5	4,002.6	-1,043.0	4,101.9	1.45	-0.46	-1.38
11,169.0	90.23	337.30	6,852.0	4,088.8	-1,078.0	4,194.9	1.31	-0.20	-1.29
11,261.0	89.75	337.38	6,852.0	4,173.7	-1,113.5	4,286.9	0.53	-0.52	0.09
11,354.0	90.34	336.12	6,851.9	4,259.1	-1,150.2	4,379.9	1.50	0.63	-1.35
11,447.0	90.03	335.35	6,851.6	4,343.9	-1,188.4	4,472.8	0.89	-0.33	-0.83
11,539.0	89.89	336.29	6,851.7	4,427.8	-1,226.1	4,564.7	1.03	-0.15	1.02
11,632.0	90.60	338.75	6,851.3	4,513.8	-1,261.6	4,657.7	2.75	0.76	2.65
11,724.0	90.02	342.20	6,850.8	4,600.5	-1,292.4	4,749.6	3.80	-0.63	3.75
11,817.0	90.57	341.51	6,850.3	4,688.8	-1,321.3	4,842.4	0.95	0.59	-0.74
11,909.0	91.20	340.35	6,848.9	4,775.8	-1,351.4	4,934.3	1.43	0.68	-1.26
12,002.0	90.62	339.95	6,847.4	4,863.2	-1,383.0	5,027.2	0.76	-0.62	-0.43
12,094.0	88.69	338.66	6,848.0	4,949.3	-1,415.5	5,119.2	2.52	-2.10	-1.40
12,187.0	89.14	338.04	6,849.7	5,035.7	-1,449.8	5,212.1	0.82	0.48	-0.67
12,279.0	89.89	338.22	6,850.5	5,121.1	-1,484.1	5,304.1	0.84	0.82	0.20
12,372.0	91.01	339.05	6,849.8	5,207.7	-1,517.9	5,397.1	1.50	1.20	0.89
12,464.0	89.78	338.90	6,849.1	5,293.6	-1,550.9	5,489.1	1.35	-1.34	-0.16
12,557.0	91.23	339.82	6,848.3	5,380.6	-1,583.7	5,582.1	1.85	1.56	0.99
12,649.0	91.07	339.42	6,846.5	5,466.8	-1,615.8	5,674.0	0.47	-0.17	-0.43
12,742.0	89.95	337.46	6,845.7	5,553.3	-1,649.9	5,767.0	2.43	-1.20	-2.11
12,834.0	90.56	336.79	6,845.2	5,638.1	-1,685.7	5,859.0	0.98	0.66	-0.73
12,927.0	90.64	335.49	6,844.3	5,723.1	-1,723.3	5,951.9	1.40	0.09	-1.40
13,019.0	90.42	336.69	6,843.4	5,807.2	-1,760.6	6,043.9	1.33	-0.24	1.30
13,112.0	89.33	337.79	6,843.6	5,893.0	-1,796.6	6,136.9	1.67	-1.17	1.18
13,204.0	89.39	337.62	6,844.6	5,978.1	-1,831.5	6,228.9	0.20	0.07	-0.18
13,297.0	90.95	339.21	6,844.4	6,064.6	-1,865.7	6,321.8	2.40	1.68	1.71
13,389.0	89.86	338.82	6,843.7	6,150.4	-1,898.6	6,413.8	1.26	-1.18	-0.42
13,482.0	91.06	340.16	6,843.0	6,237.5	-1,931.2	6,506.8	1.93	1.29	1.44
13,574.0	89.78	340.35	6,842.3	6,324.1	-1,962.3	6,598.7	1.41	-1.39	0.21
13,667.0	89.30	338.99	6,843.0	6,411.3	-1,994.6	6,691.7	1.55	-0.52	-1.46
13,760.0	90.34	338.71	6,843.3	6,498.1	-2,028.2	6,784.7	1.16	1.12	-0.30
13,852.0	91.20	338.12	6,842.1	6,583.6	-2,062.0	6,876.6	1.13	0.93	-0.64

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Survey Report

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
 Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
TVD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,945.0	90.48	337.52	6,840.7	6,669.7	-2,097.1	6,969.6	1.01	-0.77	-0.65
14,037.0	91.23	338.41	6,839.4	6,755.0	-2,131.6	7,061.6	1.26	0.82	0.97
14,130.0	91.32	337.85	6,837.3	6,841.3	-2,166.2	7,154.6	0.61	0.10	-0.60
14,222.0	89.89	337.13	6,836.3	6,926.3	-2,201.5	7,246.6	1.74	-1.55	-0.78
14,315.0	89.22	337.09	6,837.0	7,011.9	-2,237.6	7,339.6	0.72	-0.72	-0.04
14,407.0	90.31	336.40	6,837.4	7,096.4	-2,274.0	7,431.6	1.40	1.18	-0.75
14,500.0	89.36	336.38	6,837.7	7,181.7	-2,311.2	7,524.5	1.02	-1.02	-0.02
14,593.0	90.59	336.16	6,837.7	7,266.8	-2,348.6	7,617.5	1.34	1.32	-0.24
14,685.0	88.91	336.70	6,838.1	7,351.1	-2,385.4	7,709.4	1.92	-1.83	0.59
14,778.0	89.72	336.95	6,839.2	7,436.6	-2,422.0	7,802.4	0.91	0.87	0.27
14,870.0	89.92	337.40	6,839.5	7,521.4	-2,457.7	7,894.4	0.54	0.22	0.49
14,963.0	89.11	338.59	6,840.3	7,607.6	-2,492.5	7,987.4	1.55	-0.87	1.28
15,056.0	91.60	339.89	6,839.7	7,694.6	-2,525.5	8,080.4	3.02	2.68	1.40
15,148.0	90.28	338.07	6,838.2	7,780.4	-2,558.5	8,172.3	2.44	-1.43	-1.98
15,241.0	89.69	335.15	6,838.3	7,865.8	-2,595.4	8,265.3	3.20	-0.63	-3.14
15,333.0	90.37	335.95	6,838.2	7,949.5	-2,633.5	8,357.2	1.14	0.74	0.87
15,426.0	90.64	336.59	6,837.4	8,034.7	-2,670.9	8,450.2	0.75	0.29	0.69
15,518.0	91.88	338.12	6,835.4	8,119.5	-2,706.3	8,542.1	2.14	1.35	1.66
15,611.0	90.56	338.37	6,833.4	8,205.9	-2,740.8	8,635.1	1.44	-1.42	0.27
15,704.0	90.45	338.29	6,832.6	8,292.3	-2,775.1	8,728.1	0.15	-0.12	-0.09
15,796.0	89.39	339.30	6,832.7	8,378.1	-2,808.4	8,820.1	1.59	-1.15	1.10
15,889.0	89.56	337.97	6,833.6	8,464.7	-2,842.3	8,913.1	1.44	0.18	-1.43
15,981.0	90.23	338.02	6,833.7	8,550.0	-2,876.8	9,005.1	0.73	0.73	0.05
16,063.0	90.23	338.02	6,833.4	8,626.0	-2,907.4	9,087.1	0.00	0.00	0.00

PTB: [16063.0' MD][90.23° Inc][338.02° Azi]

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
PBHL Vinola Unit 1H - hit/miss target - Shape - Point	0.00	0.01	6,897.0	8,636.5	-2,913.5	14,303,839.66	1,712,980.90	39° 23' 22.042 N	80° 44' 35.408 W
- actual wellpath misses target center by 64.8usft at 16063.0usft MD (6833.4 TVD, 8626.0 N, -2907.4 E)									
LP Vinola Unit 1H - Point	0.00	0.01	6,897.0	520.0	365.0	14,295,723.12	1,716,259.39	39° 22' 1.696 N	80° 43' 53.942 W
- actual wellpath misses target center by 23.8usft at 7313.8usft MD (6895.1 TVD, 526.2 N, 387.9 E)									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
16,063.0	6,833.4	8,626.0	-2,907.4	PTB: [16063.0' MD][90.23° Inc][338.02° Azi]

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Survey Report

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Company: Antero
Project: Doddridge County WV
Site: R.J. Smith Pad:
Costlow/Duff/Gibson/Mishka/Vinola
Well: Vinola Unit 1H
Wellbore: Original Hole
Design: Surveys

Local Co-ordinate Reference: Well Vinola Unit 1H
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MD Reference: KB Elevation @ 1016.0usft (Precision 522 (18'))
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: North East R5000 Database

Checked By: _____	Approved By: _____	Date: _____
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