

## HALLIBURTON

RECEIVED

## DIRECTIONAL SURVEY REPORT

Chesapeake Appalachia LLC

Mark Owen 3H

Bethany

Brooke West Virginia

USA

NE-XX-0008200133

MAY 9 2012

WV GEOLOGICAL SURVEY  
MORGANTOWN, WV

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
1730.00	1.03	186.15	1729.96	2.99 S	5.97 E	-5.05	TIE-IN
1910.00	0.15	215.42	1909.95	4.79 S	5.66 E	-6.60	0.50
1973.00	0.86	332.56	1972.95	4.44 S	5.40 E	-6.17	1.48
2037.00	2.42	322.83	2036.92	2.94 S	4.36 E	-4.39	2.47
2099.00	3.12	317.98	2098.85	0.64 S	2.44 E	-1.53	1.19
2163.00	4.56	313.04	2162.70	2.39 N	0.58 W	2.43	2.31
2226.00	4.89	309.28	2225.49	5.80 N	4.49 W	7.08	0.71
2289.00	5.92	303.24	2288.21	9.28 N	9.29 W	12.14	1.87
2352.00	5.95	302.68	2350.87	12.82 N	14.75 W	17.51	0.10
2414.00	5.85	302.34	2412.54	16.25 N	20.13 W	22.73	0.16
2477.00	5.67	302.70	2475.22	19.65 N	25.47 W	27.92	0.29
2540.00	5.45	302.85	2537.92	22.96 N	30.60 W	32.95	0.36
2603.00	5.66	299.69	2600.63	26.12 N	35.81 W	37.87	0.59
2666.00	6.25	296.91	2663.29	29.21 N	41.57 W	42.93	1.05
2728.00	6.09	295.80	2724.93	32.17 N	47.54 W	47.96	0.32
2791.00	5.76	294.27	2787.59	34.92 N	53.43 W	52.76	0.59
2854.00	5.35	294.86	2850.30	37.46 N	58.97 W	57.23	0.66
2919.00	5.12	293.47	2915.03	39.88 N	64.38 W	61.55	0.41
2982.00	4.54	292.93	2977.80	41.98 N	69.26 W	65.35	0.91
3045.00	3.12	287.68	3040.66	43.47 N	73.19 W	68.24	2.33
3107.00	2.75	294.97	3102.58	44.61 N	76.14 W	70.43	0.84
3170.00	2.18	292.95	3165.52	45.72 N	78.62 W	72.40	0.91
3233.00	1.28	285.46	3228.49	46.37 N	80.40 W	73.69	1.47
3296.00	0.75	268.38	3291.48	46.55 N	81.50 W	74.27	0.96
3359.00	0.62	270.51	3354.48	46.54 N	82.25 W	74.55	0.22
3422.00	0.58	302.12	3417.47	46.71 N	82.85 W	74.94	0.52
3483.00	0.57	287.46	3478.47	46.96 N	83.41 W	75.39	0.24
3546.00	0.44	313.95	3541.47	47.23 N	83.88 W	75.81	0.42
3609.00	0.41	315.81	3604.47	47.56 N	84.21 W	76.25	0.05
3672.00	0.58	339.05	3667.46	48.02 N	84.48 W	76.78	0.41
3734.00	0.64	334.41	3729.46	48.62 N	84.75 W	77.44	0.13
3797.00	0.86	343.02	3792.45	49.40 N	85.04 W	78.26	0.39
3860.00	1.04	341.71	3855.45	50.39 N	85.36 W	79.30	0.30
3923.00	1.34	320.91	3918.43	51.51 N	86.00 W	80.58	0.82
3986.00	1.15	338.90	3981.42	52.67 N	86.69 W	81.92	0.69
4050.00	1.39	5.10	4045.40	54.04 N	86.85 W	83.24	0.97
4113.00	1.60	9.47	4108.38	55.67 N	86.64 W	84.67	0.39
4175.00	1.73	18.23	4170.35	57.41 N	86.20 W	86.11	0.46
4238.00	2.12	26.39	4233.32	59.36 N	85.39 W	87.60	0.75
4301.00	2.02	22.04	4296.28	61.43 N	84.45 W	89.15	0.29
4364.00	2.06	356.01	4359.24	63.59 N	84.12 W	91.02	1.46
4427.00	2.61	5.06	4422.19	66.15 N	84.07 W	93.36	1.05
4489.00	2.66	6.53	4484.12	68.98 N	83.78 W	95.86	0.13
4553.00	2.26	12.83	4548.06	71.68 N	83.33 W	98.18	0.75
4616.00	2.48	11.69	4611.01	74.23 N	82.78 W	100.32	0.37
4680.00	2.42	11.24	4674.95	76.91 N	82.24 W	102.59	0.10
4742.00	1.97	19.24	4736.91	79.20 N	81.63 W	104.48	0.88
4804.00	2.23	9.40	4798.86	81.40 N	81.08 W	106.29	0.71
4867.00	2.60	8.75	4861.81	84.02 N	80.66 W	108.55	0.60
4930.00	2.51	10.82	4924.75	86.79 N	80.19 W	110.93	0.20
4993.00	2.05	5.83	4987.70	89.27 N	79.81 W	113.07	0.80
5056.00	2.32	359.53	5050.65	91.66 N	79.71 W	115.24	0.57
5119.00	2.22	358.97	5113.60	94.15 N	79.74 W	117.55	0.16
5181.00	2.37	357.38	5175.55	96.63 N	79.82 W	119.87	0.27

5244.00	2.61	354.12	5238.49	99.36 N	80.03 W	122.47	0.45
5307.00	2.93	351.69	5301.42	102.38 N	80.41 W	125.41	0.54
5370.00	3.24	351.28	5364.33	105.73 N	80.91 W	128.70	0.50
5424.00	3.94	349.03	5418.22	109.07 N	81.50 W	132.00	1.32
5456.00	3.62	349.58	5450.15	111.14 N	81.89 W	134.06	1.01
5488.00	4.01	354.11	5482.08	113.25 N	82.18 W	136.12	1.55
5519.00	6.10	342.85	5512.96	115.90 N	82.78 W	138.80	7.41
5551.00	11.69	332.51	5544.56	120.40 N	84.78 W	143.73	18.11
5582.00	16.09	337.98	5574.65	127.17 N	87.84 W	151.15	14.79
5614.00	18.52	338.30	5605.20	136.01 N	91.38 W	160.67	7.59
5645.00	18.98	336.63	5634.55	145.21 N	95.20 W	170.63	2.29
5677.00	18.14	336.33	5664.89	154.55 N	99.27 W	180.82	2.65
5708.00	17.19	337.01	5694.43	163.19 N	103.00 W	190.23	3.13
5740.00	18.83	340.59	5724.86	172.41 N	106.56 W	200.11	6.17
5771.00	23.02	342.66	5753.81	182.92 N	110.03 W	211.15	13.73
5803.00	26.28	343.06	5782.89	195.67 N	113.96 W	224.43	10.19
5834.00	29.98	342.40	5810.22	209.62 N	118.30 W	238.98	12.00
5865.00	34.48	342.28	5836.44	225.38 N	123.32 W	255.45	14.51
5897.00	39.18	342.31	5862.05	243.64 N	129.15 W	274.56	14.67
5928.00	42.70	342.23	5885.46	262.99 N	135.33 W	294.79	11.36
5959.00	47.88	342.13	5907.26	283.95 N	142.07 W	316.74	16.71
5991.00	53.21	340.54	5927.59	307.35 N	149.99 W	341.38	17.10
6022.00	57.29	337.59	5945.26	331.12 N	159.10 W	366.83	15.31
6053.00	60.89	334.71	5961.18	355.43 N	169.86 W	393.41	14.07
6085.00	63.08	332.23	5976.22	380.70 N	182.48 W	421.59	9.68
6116.00	66.47	330.60	5989.43	405.32 N	195.90 W	449.47	11.94
6147.00	70.19	331.33	6000.87	430.51 N	209.88 W	478.09	12.19
6178.00	75.51	330.28	6010.01	456.35 N	224.33 W	507.51	17.47
6210.00	79.76	331.84	6016.86	483.70 N	239.45 W	538.56	14.11
6241.00	83.28	333.83	6021.44	510.98 N	253.44 W	569.12	13.00
6273.00	84.11	335.16	6024.95	539.68 N	267.14 W	600.89	4.90
6304.00	85.10	335.35	6027.87	567.71 N	280.05 W	631.73	3.25
6336.00	86.42	338.33	6030.23	597.05 N	292.61 W	663.63	10.18
6398.00	89.94	339.04	6032.20	654.77 N	315.13 W	725.58	5.78
6461.00	89.45	337.39	6032.54	713.26 N	338.51 W	788.57	2.72
6523.00	89.57	337.22	6033.07	770.46 N	362.43 W	850.56	0.34
6587.00	89.23	336.74	6033.74	829.36 N	387.45 W	914.56	0.93
6650.00	88.86	336.77	6034.79	887.24 N	412.31 W	977.54	0.59
6713.00	91.45	337.36	6034.62	945.25 N	436.86 W	1040.54	4.22
6776.00	92.40	337.06	6032.51	1003.30 N	461.25 W	1103.50	1.59
6838.00	92.06	337.12	6030.09	1060.37 N	485.37 W	1165.45	0.56
6900.00	91.45	336.30	6028.19	1117.29 N	509.87 W	1227.42	1.65
6964.00	91.32	337.16	6026.64	1176.07 N	535.14 W	1291.39	1.35
7026.00	90.95	336.92	6025.41	1233.14 N	559.32 W	1353.38	0.71
7089.00	90.43	336.44	6024.65	1290.99 N	584.26 W	1416.37	1.13
7150.00	90.65	336.37	6024.07	1346.89 N	608.68 W	1477.36	0.37
7213.00	92.34	336.56	6022.43	1404.63 N	633.82 W	1540.33	2.71
7276.00	92.34	336.42	6019.85	1462.35 N	658.93 W	1603.26	0.22
7339.00	91.51	336.06	6017.73	1519.98 N	684.30 W	1666.21	1.44
7401.00	91.85	336.99	6015.92	1576.82 N	708.99 W	1728.18	1.60
7464.00	91.35	337.27	6014.16	1634.85 N	733.46 W	1791.15	0.90
7526.00	91.26	336.96	6012.74	1691.95 N	757.56 W	1853.14	0.52
7589.00	90.80	336.81	6011.61	1749.89 N	782.29 W	1916.12	0.77
7652.00	90.52	336.58	6010.88	1807.74 N	807.21 W	1979.11	0.57
7716.00	90.00	336.52	6010.59	1866.45 N	832.68 W	2043.11	0.82
7778.00	89.57	336.00	6010.82	1923.20 N	857.64 W	2105.09	1.08
7841.00	89.57	336.37	6011.29	1980.84 N	883.08 W	2168.08	0.58
7905.00	89.48	336.25	6011.83	2039.45 N	908.79 W	2232.06	0.23
7968.00	88.86	335.49	6012.74	2096.94 N	934.54 W	2295.03	1.56
8031.00	89.17	334.69	6013.83	2154.07 N	961.07 W	2357.97	1.36
8093.00	89.17	334.15	6014.73	2209.99 N	987.83 W	2419.88	0.87
8156.00	89.35	333.44	6015.54	2266.51 N	1015.64 W	2482.75	1.17
8219.00	89.88	333.15	6015.96	2322.79 N	1043.95 W	2545.58	0.95
8282.00	89.91	333.61	6016.08	2379.11 N	1072.18 W	2608.43	0.73
8344.00	90.89	335.45	6015.65	2435.08 N	1098.84 W	2670.34	3.37
8405.00	92.40	336.01	6013.89	2490.66 N	1123.90 W	2731.29	2.64
8468.00	92.10	336.28	6011.42	2548.23 N	1149.36 W	2794.22	0.65
8531.00	91.76	336.77	6009.30	2605.99 N	1174.45 W	2857.18	0.96
8594.00	91.42	337.07	6007.56	2663.92 N	1199.13 W	2920.15	0.72
8656.00	91.26	336.78	6006.11	2720.95 N	1223.43 W	2982.13	0.54
8719.00	90.65	336.45	6005.06	2778.76 N	1248.43 W	3045.12	1.10

8782.00	90.86	336.62	6004.23	2836.55 N	1273.51 W	3108.10	0.44
8845.00	90.74	336.80	6003.35	2894.41 N	1298.41 W	3171.09	0.35
8908.00	90.40	337.19	6002.72	2952.40 N	1323.03 W	3234.09	0.82
8971.00	91.39	339.40	6001.74	3010.92 N	1346.32 W	3297.07	3.83
9033.00	91.14	339.17	6000.37	3068.90 N	1368.25 W	3359.02	0.54
9096.00	90.62	339.46	5999.40	3127.83 N	1390.50 W	3421.98	0.94
9158.00	90.28	339.58	5998.92	3185.91 N	1412.19 W	3483.94	0.58
9221.00	90.06	339.89	5998.73	3245.01 N	1434.01 W	3546.88	0.61
9284.00	90.00	339.80	5998.70	3304.15 N	1455.72 W	3609.83	0.17
9347.00	89.60	339.85	5998.92	3363.29 N	1477.44 W	3672.77	0.64
9410.00	89.63	339.65	5999.34	3422.39 N	1499.25 W	3735.72	0.32
9472.00	89.42	340.13	5999.86	3480.61 N	1520.57 W	3797.66	0.85
9535.00	89.51	339.77	6000.45	3539.79 N	1542.17 W	3860.59	0.58
9598.00	88.98	339.38	6001.28	3598.82 N	1564.15 W	3923.54	1.03
9661.00	89.08	339.67	6002.35	3657.83 N	1586.18 W	3986.49	0.48
9724.00	88.52	338.93	6003.67	3716.75 N	1608.45 W	4049.44	1.48
9787.00	88.55	339.41	6005.28	3775.62 N	1630.84 W	4112.39	0.78
9850.00	87.59	339.30	6007.40	3834.54 N	1653.04 W	4175.32	1.53
9913.00	87.56	339.37	6010.06	3893.43 N	1675.25 W	4238.23	0.12
9976.00	87.66	338.94	6012.69	3952.26 N	1697.65 W	4301.15	0.70
10038.00	87.57	338.71	6015.28	4010.02 N	1720.03 W	4363.07	0.39
10101.00	89.17	336.63	6017.07	4068.26 N	1743.96 W	4426.04	4.17
10164.00	89.51	336.90	6017.80	4126.15 N	1768.81 W	4489.03	0.69
10227.00	89.78	336.13	6018.19	4183.93 N	1793.91 W	4552.02	1.31
10290.00	91.14	335.17	6017.68	4241.32 N	1819.89 W	4614.99	2.63
10353.00	91.05	333.70	6016.48	4298.14 N	1847.07 W	4677.89	2.35
10416.00	90.00	330.82	6015.90	4353.89 N	1876.39 W	4740.62	4.85
10479.00	90.89	331.40	6015.41	4409.05 N	1906.82 W	4803.24	1.68
10538.00	90.89	329.96	6014.49	4460.48 N	1935.71 W	4861.82	2.43
10601.00	90.65	327.52	6013.64	4514.33 N	1968.40 W	4924.09	3.89
10664.00	90.92	328.10	6012.78	4567.64 N	2001.96 W	4986.20	1.02
10727.00	93.70	330.29	6010.24	4621.70 N	2034.19 W	5048.49	5.60
10757.00	94.59	333.03	6008.07	4648.03 N	2048.40 W	5078.26	9.60
10820.00	95.25	337.03	6002.67	4704.92 N	2074.89 W	5140.96	6.42
10883.00	94.74	337.73	5997.18	4762.85 N	2099.02 W	5203.72	1.37
10946.00	94.60	337.42	5992.05	4820.89 N	2122.97 W	5266.51	0.54
11009.00	93.73	337.86	5987.47	4879.00 N	2146.87 W	5329.34	1.55
11072.00	93.03	339.49	5983.76	4937.59 N	2169.74 W	5392.21	2.82
11135.00	92.81	339.66	5980.55	4996.55 N	2191.70 W	5455.09	0.44
11197.00	92.62	339.37	5977.61	5054.56 N	2213.37 W	5516.98	0.56
11260.00	93.21	339.34	5974.41	5113.44 N	2235.55 W	5579.86	0.93
11323.00	92.65	339.99	5971.19	5172.44 N	2257.42 W	5642.73	1.35
11386.00	89.26	339.45	5970.14	5231.52 N	2279.25 W	5705.66	5.45
11449.00	88.15	339.60	5971.56	5290.52 N	2301.28 W	5768.60	1.78
11510.00	87.66	340.13	5973.79	5347.75 N	2322.27 W	5829.50	1.19
11573.00	87.99	340.28	5976.19	5406.99 N	2343.58 W	5892.38	0.59
11636.00	88.12	340.19	5978.32	5466.24 N	2364.87 W	5955.27	0.25
11699.00	87.99	339.73	5980.46	5525.39 N	2386.45 W	6018.17	0.75
11762.00	88.21	339.90	5982.54	5584.49 N	2408.17 W	6081.08	0.43
11825.00	87.78	339.69	5984.74	5643.58 N	2429.92 W	6143.99	0.76
11888.00	92.25	339.70	5984.73	5702.65 N	2451.77 W	6206.92	7.10
11951.00	90.90	340.80	5983.00	5761.92 N	2473.05 W	6269.82	2.77
12014.00	90.15	340.32	5982.42	5821.33 N	2494.02 W	6332.72	1.41
12077.00	89.97	339.69	5982.35	5880.53 N	2515.56 W	6395.66	1.04
12140.00	89.69	339.67	5982.54	5939.60 N	2537.44 W	6458.61	0.44
12203.00	89.51	338.66	5982.98	5998.48 N	2559.85 W	6521.58	1.63
12266.00	90.77	341.36	5982.83	6057.68 N	2581.38 W	6584.51	4.73
12329.00	91.36	342.41	5981.66	6117.55 N	2600.97 W	6647.30	1.91
12391.00	91.39	342.23	5980.17	6176.60 N	2619.79 W	6709.06	0.31
12454.00	91.44	342.45	5978.62	6236.61 N	2638.90 W	6771.81	0.36
12517.00	91.76	342.27	5976.85	6296.63 N	2657.99 W	6834.55	0.57
12580.00	91.26	341.82	5975.19	6356.54 N	2677.40 W	6897.32	1.07
12643.00	90.06	339.59	5974.46	6415.99 N	2698.21 W	6960.21	4.01
12705.00	90.28	339.73	5974.28	6474.13 N	2719.76 W	7022.16	0.42
12768.00	90.34	339.48	5973.94	6533.18 N	2741.71 W	7085.11	0.41
12831.00	90.59	339.80	5973.43	6592.24 N	2763.62 W	7148.06	0.64
12893.00	90.34	339.76	5972.93	6650.42 N	2785.05 W	7210.01	0.41
12956.00	89.82	339.30	5972.84	6709.44 N	2807.08 W	7272.97	1.10
12968.00	89.91	338.75	5972.87	6720.64 N	2811.38 W	7284.96	4.70
13020.00	89.91	338.75	5972.96	6769.11 N	2830.23 W	7336.95	0.01

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 MORGANTOWN, WV

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CALCULATION BASED ON MINIMUM CURVATURE METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT  
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 337.42 DEGREES (GRID)  
A TOTAL CORRECTION OF -8.14 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD  
HORIZONTAL DISPLACEMENT (CLOSURE) AT 13020.00 FEET  
IS 7336.96 FEET ALONG 337.31 DEGREES (GRID)

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