

Survey Calculation Program

Chesapeake Operating Inc.
Lynette Howes 3H
Upshur Co, WV

M.W.D. OPERATOR: T. Parrilla/D. Dotson

RECEIVED

DIRECTIONAL DRILLERS: J. Delmedico/R. Jacob
Magnetic Declination: -9.13

Job #: 4543

MAR 20 2012

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

Minimum Curvature Calculation

Vertical Section 346.82

No.	Survey Depth	INC	AZM	TVD	N-S	E-W	Vertical Section	DLS/ 100
Tie-In	2435	0.34	88.57	2434.98	-1.86	7.21	-3.46	0.00
1	2460	0.18	81.05	2459.98	-1.85	7.32	-3.47	0.65
2	2524	0.18	65.31	2523.98	-1.79	7.51	-3.46	0.08
3	2588	0.26	56.88	2587.98	-1.67	7.73	-3.39	0.13
4	2651	0.18	34.29	2650.98	-1.51	7.90	-3.28	0.18
5	2714	0.26	60.13	2713.98	-1.36	8.08	-3.17	0.20
6	2775	0.26	36.75	2774.98	-1.18	8.28	-3.04	0.17
7	2869	0.44	32.97	2868.98	-0.71	8.61	-2.65	0.19
8	2900	0.44	9.06	2899.97	-0.49	8.69	-2.46	0.59
9	2962	0.18	8.54	2961.97	-0.16	8.74	-2.15	0.42
10	3024	0.26	6.87	3023.97	0.08	8.78	-1.92	0.13
11	3087	0.18	346.56	3086.97	0.32	8.77	-1.69	0.18
12	3149	0.26	339.97	3148.97	0.54	8.70	-1.45	0.14
13	3212	0.18	308.33	3211.97	0.74	8.57	-1.24	0.23
14	3275	0.26	340.67	3274.97	0.94	8.45	-1.02	0.23
15	3338	0.18	334.79	3337.97	1.16	8.36	-0.78	0.13
16	3402	0.44	320.28	3401.97	1.44	8.16	-0.46	0.42
17	3465	0.18	315.80	3464.97	1.70	7.93	-0.16	0.41
18	3528	0.18	235.38	3527.97	1.71	7.78	-0.11	0.37
19	3591	0.26	245.58	3590.97	1.60	7.57	-0.17	0.14
20	3654	0.18	210.95	3653.97	1.45	7.39	-0.27	0.24
21	3718	0.09	228.44	3717.97	1.33	7.30	-0.37	0.15
22	3781	0.44	183.79	3780.97	1.06	7.25	-0.62	0.61
23	3845	0.26	162.43	3844.97	0.67	7.28	-1.00	0.34
24	3908	0.26	135.89	3907.97	0.44	7.42	-1.27	0.19
25	3971	0.44	135.01	3970.96	0.16	7.69	-1.60	0.29
26	4034	0.44	146.00	4033.96	-0.21	8.00	-2.03	0.13
27	4098	0.53	116.29	4097.96	-0.54	8.40	-2.45	0.41
28	4162	0.53	129.65	4161.96	-0.86	8.89	-2.87	0.19
29	4225	0.53	129.03	4224.95	-1.23	9.34	-3.33	0.01
30	4289	0.79	139.76	4288.95	-1.76	9.86	-3.96	0.45
31	4353	0.70	128.07	4352.94	-2.34	10.45	-4.66	0.28
32	4416	1.14	124.29	4415.94	-2.93	11.27	-5.42	0.70
33	4543	0.26	69.27	4542.93	-3.54	12.58	-6.31	0.80
34	4606	0.18	1.33	4605.93	-3.39	12.72	-6.20	0.40
35	4670	0.62	333.03	4669.92	-2.98	12.57	-5.76	0.73
36	4734	0.79	329.51	4733.92	-2.29	12.18	-5.01	0.27

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No.	Survey Depth	INC	AZM	TVD	N-S	E-W	Vertical Section	DLS/ 100
37	4798	0.53	332.68	4797.92	-1.64	11.83	-4.30	0.41
38	4860	0.79	299.98	4859.91	-1.18	11.32	-3.73	0.72
39	4922	0.97	293.57	4921.90	-0.75	10.47	-3.12	0.33
40	4986	0.88	284.51	4985.90	-0.41	9.50	-2.57	0.27
41	5049	0.70	265.88	5048.89	-0.32	8.65	-2.28	0.49
42	5111	0.62	248.21	5110.89	-0.47	7.96	-2.27	0.35
43	5175	0.18	226.50	5174.88	-0.67	7.56	-2.38	0.72
44	5237	0.18	181.68	5236.88	-0.83	7.49	-2.52	0.22
45	5300	0.18	174.74	5299.88	-1.03	7.50	-2.71	0.03
46	5362	0.18	177.37	5361.88	-1.23	7.51	-2.91	0.01
47	5423	0.97	207.96	5422.88	-1.78	7.27	-3.39	1.34
48	5485	1.41	213.94	5484.87	-2.87	6.60	-4.30	0.74
49	5548	1.49	214.90	5547.85	-4.19	5.70	-5.38	0.13
50	5610	0.53	216.13	5609.84	-5.08	5.07	-6.10	1.55
51	5672	0.18	259.99	5671.83	-5.33	4.80	-6.28	0.68
52	5734	0.18	19.61	5733.83	-5.25	4.74	-6.20	0.50
53	5797	0.53	48.26	5796.83	-4.97	4.99	-5.97	0.61
54	5860	0.88	48.79	5859.83	-4.45	5.57	-5.61	0.56
55	5923	1.23	46.77	5922.82	-3.67	6.43	-5.04	0.56
56	5987	1.23	47.74	5986.80	-2.74	7.44	-4.36	0.03
57	6050	0.26	17.59	6049.80	-2.15	7.98	-3.91	1.61
58	6113	0.26	319.23	6112.80	-1.90	7.93	-3.66	0.40
59	6175	0.62	335.14	6174.79	-1.49	7.70	-3.21	0.61
60	6237	0.70	344.81	6236.79	-0.82	7.46	-2.50	0.22
61	6301	0.88	349.73	6300.78	0.04	7.27	-1.62	0.30
62	6363	0.88	353.07	6362.78	0.98	7.13	-0.67	0.08
63	6426	1.14	0.36	6425.77	2.08	7.07	0.42	0.46
64	6489	0.62	7.04	6488.76	3.05	7.12	1.35	0.84
65	6552	0.44	62.15	6551.76	3.50	7.37	1.73	0.82
66	6591	0.53	72.43	6590.76	3.63	7.68	1.78	0.32
67	6603	0.60	63.60	6602.76	3.67	7.79	1.80	0.93
68	6635	1.00	56.70	6634.75	3.90	8.17	1.93	1.28
69	6666	3.30	3.50	6665.73	4.94	8.45	2.88	9.09
70	6698	7.90	356.00	6697.57	8.05	8.35	5.94	14.53
71	6730	11.50	349.40	6729.11	13.38	7.61	11.29	11.76
72	6761	14.60	343.40	6759.30	20.17	5.93	18.28	10.90
73	6793	17.70	341.60	6790.04	28.65	3.24	27.16	9.81

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74	6825	20.80	340.50	6820.25	38.62	-0.19	37.65	9.75
75	6856	23.00	342.30	6849.01	49.58	-3.87	49.16	7.42
76	6888	25.00	345.30	6878.24	62.08	-7.49	62.15	7.32
77	6920	26.90	348.10	6907.01	75.71	-10.70	76.15	7.06
78	6952	29.00	351.10	6935.28	90.46	-13.39	91.13	7.90
79	6984	30.90	352.40	6963.01	106.27	-15.68	107.04	6.27
80	7015	32.50	352.70	6989.38	122.42	-17.79	123.25	5.19
81	7046	34.20	351.50	7015.28	139.30	-20.14	140.22	5.88
82	7078	37.20	350.30	7041.26	157.73	-23.10	158.84	9.63
83	7108	40.30	349.20	7064.65	176.21	-26.44	177.59	10.58
84	7140	44.40	348.80	7088.30	197.36	-30.56	199.13	12.84
85	7171	47.90	349.30	7109.77	219.31	-34.80	221.46	11.35
86	7203	50.90	349.60	7130.59	243.19	-39.25	245.73	9.40
87	7235	52.80	349.10	7150.36	267.92	-43.90	270.87	6.06
88	7267	56.00	348.30	7168.98	293.43	-49.00	296.87	10.20
89	7299	58.50	348.80	7186.29	319.81	-54.34	323.77	7.92
90	7331	61.40	347.30	7202.32	346.90	-60.08	351.46	9.93
91	7363	63.00	347.20	7217.24	374.51	-66.33	379.77	5.01
92	7395	65.00	346.90	7231.27	402.54	-72.77	408.53	6.31
93	7427	66.50	346.30	7244.41	430.92	-79.54	437.70	4.99
94	7459	69.00	346.60	7256.53	459.71	-86.47	467.31	7.86
95	7490	70.90	346.20	7267.16	488.01	-93.32	496.43	6.25
96	7522	73.50	346.70	7276.94	517.63	-100.46	526.90	8.26
97	7554	75.50	346.50	7285.49	547.62	-107.61	557.73	6.28
98	7586	75.90	346.40	7293.39	577.77	-114.87	588.74	1.29
99	7618	77.40	346.00	7300.78	608.00	-122.30	619.87	4.84
100	7650	81.30	345.10	7306.69	638.45	-130.14	651.31	12.50
101	7682	83.30	344.80	7310.98	669.07	-138.38	683.00	6.32
102	7714	83.70	344.90	7314.60	699.76	-146.69	714.78	1.29
103	7746	85.30	344.50	7317.67	730.49	-155.09	746.61	5.15
104	7778	87.30	344.70	7319.73	761.27	-163.57	778.51	6.28
105	7810	87.70	344.70	7321.13	792.11	-172.01	810.46	1.25
106	7873	89.00	344.80	7322.94	852.86	-188.57	873.39	2.07
107	7934	89.00	344.90	7324.01	911.73	-204.51	934.35	0.16
108	7996	88.90	345.10	7325.15	971.61	-220.56	996.31	0.36
109	8058	88.70	345.00	7326.44	1031.50	-236.55	1058.26	0.36
110	8121	89.80	344.50	7327.27	1092.27	-253.12	1121.21	1.92
111	8185	89.50	344.40	7327.66	1153.93	-270.27	1185.16	0.49

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112	8248	89.10	344.20	7328.43	1214.57	-287.32	1248.09	0.71
113	8311	89.50	344.70	7329.20	1275.26	-304.21	1311.03	1.02
114	8374	90.20	345.60	7329.36	1336.16	-320.35	1374.01	1.81
115	8438	90.40	346.00	7329.03	1398.20	-336.05	1437.99	0.70
116	8500	89.60	345.50	7329.03	1458.29	-351.31	1499.98	1.52
117	8564	90.20	347.10	7329.14	1520.47	-366.47	1563.98	2.67
118	8627	90.10	347.80	7328.98	1581.96	-380.16	1626.97	1.12
119	8691	89.80	347.30	7329.03	1644.46	-393.96	1690.97	0.91
120	8755	89.40	346.80	7329.48	1706.83	-408.30	1754.97	1.00
121	8817	90.40	347.60	7329.59	1767.29	-422.04	1816.96	2.07
122	8881	90.30	347.70	7329.20	1829.81	-435.72	1880.96	0.22
123	8945	89.90	347.70	7329.08	1892.34	-449.36	1944.95	0.63
124	9008	90.00	347.80	7329.14	1953.90	-462.72	2007.94	0.22
125	9071	89.40	347.60	7329.47	2015.45	-476.15	2070.93	1.00
126	9135	90.90	347.20	7329.30	2077.91	-490.11	2134.92	2.43
127	9197	90.80	347.10	7328.38	2138.35	-503.89	2196.92	0.23
128	9261	90.20	346.80	7327.82	2200.70	-518.34	2260.91	1.05
129	9323	90.20	346.60	7327.61	2261.03	-532.61	2322.91	0.32
130	9385	90.10	346.70	7327.44	2321.36	-546.92	2384.91	0.23
131	9448	89.90	346.90	7327.44	2382.69	-561.31	2447.91	0.45
132	9511	90.10	347.00	7327.44	2444.06	-575.53	2510.91	0.35
133	9575	89.80	346.60	7327.50	2506.37	-590.15	2574.91	0.78
134	9639	90.60	348.30	7327.28	2568.84	-604.05	2638.91	2.94
135	9703	90.60	348.70	7326.61	2631.55	-616.81	2702.87	0.62
136	9767	90.10	348.20	7326.22	2694.26	-629.63	2766.85	1.10
137	9830	90.00	348.10	7326.16	2755.91	-642.56	2829.83	0.22
138	9894	89.50	348.40	7326.44	2818.57	-655.60	2893.81	0.91
139	9957	89.30	348.00	7327.10	2880.24	-668.48	2956.79	0.71
140	10021	89.10	348.20	7327.99	2942.85	-681.68	3020.76	0.44
140	10084	89.10	348.40	7328.98	3004.54	-694.45	3083.74	0.32
142	10147	90.40	348.00	7329.26	3066.20	-707.33	3146.72	2.16
143	10210	90.50	348.30	7328.76	3127.86	-720.27	3209.70	0.50
144	10273	90.30	347.60	7328.32	3189.47	-733.42	3272.68	1.16
145	10336	90.20	347.60	7328.05	3251.00	-746.95	3335.68	0.16
146	10399	89.50	346.60	7328.21	3312.41	-761.01	3398.67	1.94
147	10463	90.20	345.70	7328.38	3374.55	-776.33	3462.67	1.78
148	10523	90.40	345.70	7328.07	3432.69	-791.15	3522.66	0.33
149	10586	89.90	345.30	7327.90	3493.68	-806.93	3585.64	1.02

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150	10648	89.50	344.60	7328.23	3553.55	-823.03	3647.60	1.30
151	10711	90.00	346.40	7328.50	3614.54	-838.80	3710.58	2.97
152	10775	89.20	346.10	7328.95	3676.70	-854.01	3774.58	1.33
153	10838	89.20	346.20	7329.83	3737.87	-869.09	3837.57	0.16
154	10902	89.20	346.50	7330.72	3800.05	-884.19	3901.56	0.47
155	10964	90.90	348.90	7330.67	3860.62	-897.40	3963.55	4.74
156	11027	91.30	349.00	7329.46	3922.44	-909.47	4026.49	0.65
157	11090	91.10	348.90	7328.14	3984.26	-921.54	4089.43	0.35
158	11154	90.70	348.60	7327.13	4047.02	-934.03	4153.39	0.78
159	11217	89.70	346.50	7326.91	4108.54	-947.61	4216.38	3.69
160	11279	89.80	347.20	7327.18	4168.91	-961.71	4278.38	1.14
161	11343	89.40	346.50	7327.63	4231.23	-976.27	4342.38	1.26
162	11406	89.50	346.60	7328.23	4292.50	-990.93	4405.37	0.22
163	11468	90.20	347.30	7328.40	4352.90	-1004.93	4467.37	1.60
164	11530	90.50	346.60	7328.02	4413.30	-1018.92	4529.37	1.23
165	11594	90.30	346.60	7327.57	4475.55	-1033.76	4593.37	0.31
166	11656	90.00	345.80	7327.41	4535.76	-1048.54	4655.36	1.38
167	11719	90.10	346.00	7327.35	4596.86	-1063.89	4718.35	0.35
168	11781	90.30	346.10	7327.14	4657.03	-1078.84	4780.35	0.36
169	11843	88.60	346.00	7327.73	4717.20	-1093.78	4842.34	2.75
170	11907	88.60	345.70	7329.30	4779.24	-1109.43	4906.31	0.47
171	11971	88.70	345.50	7330.80	4841.21	-1125.34	4970.28	0.35
172	12034	88.70	345.30	7332.23	4902.16	-1141.21	5033.24	0.32
173	12097	89.10	345.80	7333.44	4963.16	-1156.93	5096.21	1.02
174	12160	90.90	347.80	7333.44	5024.49	-1171.32	5159.21	4.27
175	12223	91.20	348.10	7332.29	5086.09	-1184.47	5222.19	0.67
176	12286	89.50	347.00	7331.90	5147.60	-1198.05	5285.18	3.21
177	12328	89.20	346.60	7332.38	5188.49	-1207.64	5327.17	1.19
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