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Birmingham Coal & Coke Company, Inc.
Gooden Creek No. 2 Mine
Primary Road No. 1
Drainage Structure DS1P 0+69

10 Year 6 Hour Event

J. David McGehee, PE/LS

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General Information

Storm Information:

Storm Type:	SCS 6 Hour
Design Storm:	10 yr - 6 hr
Rainfall Depth:	4.200 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Drainage Structure DS1P 0+69

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	11.760	11.760	3.55	0.49

Structure Detail:

Structure #1 (Null)

Drainage Structure DS1P 0+69

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	11.760	0.141	0.000	0.000	55.000	M	3.55	0.487
	Σ	**11.760**						**3.55**	**0.487**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	9.17	30.00	327.00	0.760	0.119
		8. Large gullies, diversions, and low flowing streams	6.49	40.00	616.00	7.640	0.022
#1	**1**	**Time of Concentration:**					**0.141**

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Birmingham Coal and Coke Co., Inc. - Gooden Creek No. 2 Mine Primary Road No. 1 Drainage Structure DS1P 0 + 69

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0190	2.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 3.55 cfs

Maximum Headwater = 2.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (10 in)	**Discharge (cfs) (12 in)**	Discharge (cfs) (15 in)
0.20	0.16	**0.19**	0.24
0.40	0.44	**0.53**	0.68
0.60	0.82	**0.98**	1.22
0.80	1.26	**1.50**	1.88
1.00	1.70	**2.10**	2.62
1.20	2.04	**2.70**	3.44
1.40	2.20	**3.21**	4.34
1.60	2.35	**3.58**	5.10
1.80	2.50	**3.77**	5.79
2.00	2.60	**3.97**	6.40
2.20	2.70	**4.13**	6.78
2.40	2.80	**4.29**	7.10
2.60	2.90	**4.45**	7.37
2.80	3.00	**4.60**	7.64
3.00	3.08	**4.74**	7.89

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Birmingham Coal & Coke Company, Inc.
Gooden Creek No. 2 Mine
Primary Road No. 1
Drainage Structure DS1P 62+60

10 Year 6 Hour Event

J. David McGehee, PE/LS

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General Information

Storm Information:

Storm Type:	SCS 6 Hour
Design Storm:	10 yr - 6 hr
Rainfall Depth:	4.200 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Drainage Structure DS1P 62+60

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	511.000	511.000	504.16	44.69

Structure Detail:

Structure #1 (Null)

Drainage Structure DS1P 62+60

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	212.000	0.205	0.147	0.443	30.000	M	0.00	0.000
	2	213.000	0.171	0.000	0.000	77.000	M	289.26	28.372
	3	39.000	0.010	0.080	0.442	81.000	M	91.17	7.400
	4	47.000	0.019	0.078	0.442	81.000	M	109.87	8.918
	Σ	**511.000**						**504.16**	**44.690**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	2.50	5.00	200.00	0.400	0.138
		8. Large gullies, diversions, and low flowing streams	2.86	35.00	1,223.00	5.070	0.067
#1	**1**	**Time of Concentration:**					**0.205**
#1	2	1. Forest with heavy ground litter	19.64	22.00	112.00	1.120	0.027
		8. Large gullies, diversions, and low flowing streams	19.00	80.00	421.00	13.070	0.008
		9. Small streams flowing bankfull	2.16	140.00	6,491.00	13.210	0.136
#1	**2**	**Time of Concentration:**					**0.171**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	4.00	2.00	50.00	2.000	0.006
		8. Large gullies, diversions, and low flowing streams	39.29	110.00	280.00	18.800	0.004
#1	**3**	**Time of Concentration:**					**0.010**
#1	4	5. Nearly bare and untilled, and alluvial valley fans	12.00	12.00	100.00	3.460	0.008
		8. Large gullies, diversions, and low flowing streams	23.85	145.00	608.00	14.650	0.011
#1	**4**	**Time of Concentration:**					**0.019**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	16.57	85.00	513.00	12.210	0.011
		9. Small streams flowing bankfull	2.16	140.00	6,491.00	13.210	0.136
#1	**1**	**Muskingum K:**					**0.147**
#1	3	8. Large gullies, diversions, and low flowing streams	12.71	15.00	118.00	10.690	0.003

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		9. Small streams flowing bankfull	2.07	75.00	3,627.04	12.940	0.077
#1	**3**	**Muskingum K:**					**0.080**
#1	4	8. Large gullies, diversions, and low flowing streams	11.11	15.00	135.00	9.990	0.003
		9. Small streams flowing bankfull	2.10	74.06	3,526.66	13.040	0.075
#1	**4**	**Muskingum K:**					**0.078**

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Birmingham Coal and Coke Co., Inc. - Gooden Creek No. 2 Mine, Primary Road No. 1 Drainage Structure DS1P 62 + 60

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
160.00	2.20	0.0190	10.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 42 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 126.00 cfs

Maximum Headwater = 10.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (36 in)	**Discharge (cfs) (42 in)**	Discharge (cfs) (45 in)
1.00	6.29	**7.33**	7.86
2.00	17.78	**20.73**	22.21
3.00	32.64	**38.08**	40.80
4.00	47.70	**58.63**	62.82
5.00	59.26	**75.36**	83.31
6.00	68.91	**89.29**	99.82
7.00	76.33	**101.29**	113.94
8.00	81.19	**112.03**	126.49
9.00	85.61	**120.54**	137.91
10.00	89.82	**126.69**	147.31
11.00	93.82	**132.56**	154.31
12.00	97.64	**138.19**	160.97
13.00	101.34	**143.59**	167.36
14.00	104.93	**148.80**	173.53
15.00	108.36	**153.84**	179.50

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Birmingham Coal & Coke Company, Inc.
Gooden Creek No. 2 Mine
Primary Road No. 1
Drainage Structure DS1P 70+66

10 Year 6 Hour Event

J. David McGehee, PE/LS

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General Information

Storm Information:

Storm Type:	SCS 6 Hour
Design Storm:	10 yr - 6 hr
Rainfall Depth:	4.200 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Drainage Structure DS1P 70+66

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	15.800	15.800	30.03	2.39

Structure Detail:

Structure #1 (Null)

Drainage Structure DS1P 70+66

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	1.600	0.117	0.062	0.423	30.000	M	0.00	0.000
	2	11.400	0.092	0.006	0.422	77.000	M	23.49	1.859
	3	2.800	0.015	0.000	0.000	81.000	F	6.55	0.531
	Σ	**15.800**						**30.03**	**2.390**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	7.07	20.00	283.00	0.670	0.117
#1	**1**	**Time of Concentration:**					**0.117**
#1	2	1. Forest with heavy ground litter	29.10	110.00	378.00	1.360	0.077
		8. Large gullies, diversions, and low flowing streams	11.99	70.00	584.00	10.380	0.015
#1	**2**	**Time of Concentration:**					**0.092**
#1	3	5. Nearly bare and untilled, and alluvial valley fans	21.55	25.00	116.00	4.640	0.006
		8. Large gullies, diversions, and low flowing streams	12.86	45.00	350.00	10.750	0.009
#1	**3**	**Time of Concentration:**					**0.015**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	1. Forest with heavy ground litter	33.33	65.00	195.00	1.460	0.037
		8. Large gullies, diversions, and low flowing streams	13.16	130.00	988.00	10.880	0.025
#1	**1**	**Muskingum K:**					**0.062**
#1	2	8. Large gullies, diversions, and low flowing streams	9.35	20.00	214.00	9.170	0.006
#1	**2**	**Muskingum K:**					**0.006**

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Birmingham Coal and Coke Co., Inc. - Gooden Creek No. 2 Mine Primary Road No. 1 Drainage Structure DS1P 70 + 66

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0190	3.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 30.00 cfs

Maximum Headwater = 3.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
0.30	0.86	**1.04**	1.21
0.60	2.44	**2.92**	3.41
0.90	4.47	**5.36**	6.26
1.20	6.88	**8.26**	9.63
1.50	9.62	**11.54**	13.46
1.80	12.64	**15.17**	17.70
2.10	15.93	**19.12**	22.30
2.40	19.46	**23.36**	27.25
2.70	23.22	**27.87**	32.51
3.00	26.87	**32.64**	38.08
3.30	29.91	**37.66**	43.93
3.60	32.76	**42.23**	50.06
3.90	35.39	**46.39**	56.44
4.20	37.83	**50.23**	62.10
4.50	40.13	**53.79**	67.35