June 20,2014

Michael J. Harrison, P.E.
Alabama Surface Mining Commission
P. O. Box 2390
Jasper, AL 35502-2390

RE: **Black Warrior Minerals, Inc.**
Mine No. 1, P-3950, R-5

Dear Mr. Harrison:

I hereby certify the enclosed detailed re-evaluation plan for Sediment Basin 119 for the above referenced Mine are in accordance with the Regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and as amended to date and that the information used in the enclosed basin design plans is true and correct to the best of my knowledge and belief.

If you have any questions or need additional information, please do not hesitate to contact our office.

Sincerely,

McGehee Engineering Corp.

Sanford M. Hendon, P.E.
Alabama Reg. No. 18208

BLACK WARRIOR MINERALS, INC.
MINE NO. 1, P-3950, R-5

Introduction

Revision R-5 proposes to add 28 acres of mining area to the permit and one (1) new sediment basin (103). Twenty-one of the new mining acres will be controlled by Basin 103.

Basin 103 will be upstream of existing basin 119. While this basin is designed to meet effluent at its respective discharge points there will be increased flow to existing Basin 119 due to the increased disturbed area. These plans re-evaluate Basin 119 with the additional mining area being added and the upstream pond.

Basin 119

Basin 119 was constructed and certified on March 29, 2013. The existing top of dam elevation was checked on 2-10-14 and found to be 3.55 feet above the crest of the emergency spillway.

SedCad analyses were performed on the 10 year 24 hour and the 25 year 6 hour events with all of the drainage area of Basins 103 as graded and bare.

Conclusion

The peak effluent for Basin 119 decreased slightly due to the immediate area around the pond being revegetated (Seeded 2-12). The peak stage and the peak outflow increased due to the additional disturbed areas of Basins 103, 104 & 106. The existing as-built top of dam still more than 1.0 feet of dry free board above the peak stage of the 25 year event. The existing concrete channel depth in the control section and tail section still provides more than 1.0 feet of dry freeboard.

Therefore, **no modifications are proposed or needed for existing basin 119** for the additional mining area added for Revision R-5.

A summary of the pertinent design details is attached as well as the SedCad printouts and watershed map.

Sediment Basin 119

ITEM	Approved Plans	Revision R-5	Difference
Drainage Area – Acres	112.0	113.5	+1.5
Disturbed Area – Acres	30.0	30.0	-0-
Sediment Storage – Ac-Ft.	2.37	2.37	-0-
Detention Storage – Ac-Ft.	0.38	0.38	-0-
Permanent Pool Capacity Ac-Ft.	2.75	2.75	-0-
Detention Storage @ Normal Pool – Ac-Ft.	1.68	1.68	-0-
Permanent Pool Capacity @ Normal Pool Ac-Ft.	4.05	4.05	-0-
Total Basin Storage Capacity @ 10 Year Peak Stage – Ac-Ft.	5.44	5.60	+0.16
Total Runoff Volume 10 Year Event Ac- Ft	22.75	26.6	+3.85
Peak Stage of 25 Year Event – Feet	388.11’	388.40’	+0.29
Siphon Inlet Elev. – Feet	384.0’	384.0’	-0-
Emergency Spillway Elev. – Feet	386.0’	386.0’	-0-
Minimum Top of Dam (Design)– Feet	389.11’	389.40’	+0.29
Minimum Top of Dam (Construct)– Feet	390.0’		
Actual As- Built Top of Dam – Feet	389.55’	389.55’	-0-
Actual Dry Freeboard – Feet	1.44’	1.15’	-0.29’
Peak Inflow 25 Year – CFS	140.42	177.70	+37.35
Peak Outflow 25 Year Event – CFS	121.65	154.08	+32.43
Peak Effluent 10 Year Event – ml/l	0.21	0.01	-0.20
Peak Flow Depth Spillway Control Section	1.5’	1.71’	+0.21
Actual Concrete Channel Depth Spillway Control Section	3.5’	3.5’	-0-
Actual Dry Freeboard – Spillway Control Section	2.0’	1.79’	-0.21’
Peak Flow Depth Spillway Tail Section	0.48’	0.55’	+0.07
Actual Concrete Channel Depth Spillway Tail Section	2.2’	2.2’	-0-
Actual Dry Freeboard – Spillway Tail Section	1.72’	1.65’	-0.07

NO MODIFICATIONS ARE NEEDED OR PROPOSED FOR BASIN 119.

Black Warrior Minerals, Mine No. 1 P-3950, Approved Design , Basin 119 Spillway Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	0.5	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	121.65 cfs	
Depth:	1.50 ft	2.50 ft
Top Width:	17.99 ft	21.99 ft
Velocity:	5.41 fps	
X-Section Area:	22.47 sq ft	
Hydraulic Radius:	1.202 ft	
Froude Number:	0.85	

Black Warrior Minerals, Mine No. 1 P-3950 Revision R-5, Basin 119 Spillway Control Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	0.5	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	154.08 cfs	
Depth:	1.71 ft	2.71 ft
Top Width:	18.85 ft	22.85 ft
Velocity:	5.83 fps	
X-Section Area:	26.42 sq ft	
Hydraulic Radius:	1.344 ft	
Froude Number:	0.87	

Black Warrior Minerals, Mine No. 1 P-3950, Approved Design , Basin 119 Spillway Tail Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	25.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	121.65 cfs	
Depth:	0.48 ft	1.48 ft
Top Width:	13.92 ft	17.92 ft
Velocity:	19.57 fps	
X-Section Area:	6.21 sq ft	
Hydraulic Radius:	0.439 ft	
Froude Number:	5.16	

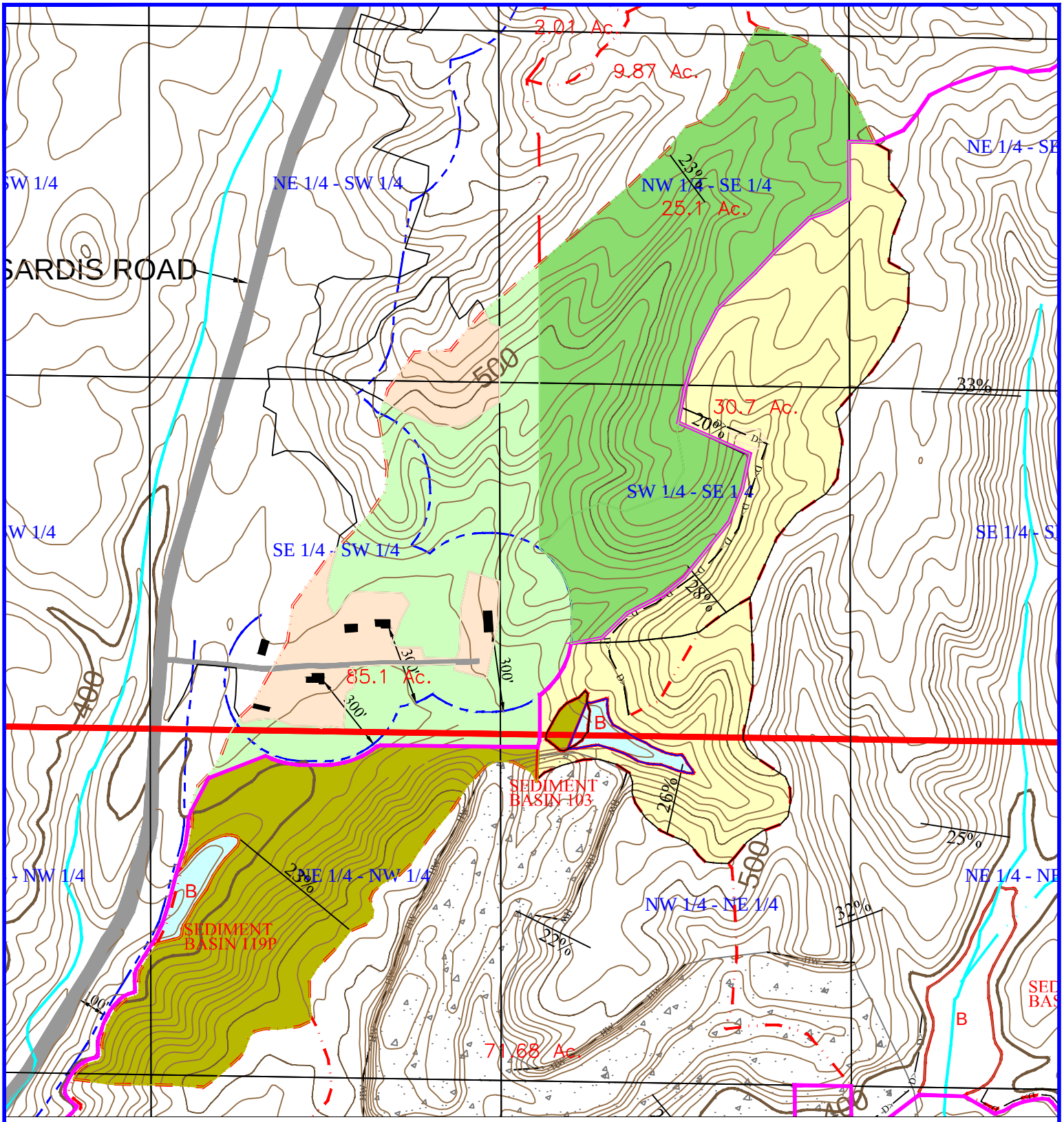
Black Warrior Minerals, Mine No. 1 P-3950 Revision R-5, Basin 119 Spillway Tail Section

Material: Concrete, Rubble

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
12.00	2.0:1	2.0:1	25.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	154.08 cfs	
Depth:	0.55 ft	1.55 ft
Top Width:	14.21 ft	18.21 ft
Velocity:	21.32 fps	
X-Section Area:	7.23 sq ft	
Hydraulic Radius:	0.500 ft	
Froude Number:	5.27	



Contour Interval = 10 ft.

BLACK WARRIOR MINERALS, INC.

MINE NO. 1
ASMC PERMIT NO. P-3950, R-5
WATERSHED MAP BASIN 119 Re-evaluation
SCALE: 1" = 500'

SEDIMENT BASINS 119 & 103

mcgehee engineering corp
post office box 3431
jasper, alabama 35502-3431
telephone: (205) 221-0686 fax: 221-7721
email: cw@mcgehee.org

- PERMIT BOUNDARY
- GRADED & BARE, CN 81
- SEEDED 2-12 MONTHS, CN 74
- FOREST GOOD COVER, CN 72
- FOREST POOR COVER, CN 75
- LAWN / OPEN SPACE, CN 64
- B SEDIMENT BASIN, C.N. 100
- DRAINAGE DIVIDE
- D> DIVERSION DITCH
- SETBACK / OFFSET

BLACK WARRIOR MINERALS, INC.
MINE NO. 1, P-3950, R-5

HYDROLOGY AND SEDIMENTOLOGY PREDICTION
10 YEAR - 24 HOUR PRECIPITATION EVENT
SEDIMENT BASINS 119 & 103

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Black Warrior Minerals
Mine No. 1, P-3950, R-5

Sediment Basin 119 with 103

10 Year - 24 Hour Precipitation Event

Sanford M. Hendon, P.E.

General Information

Storm Information:

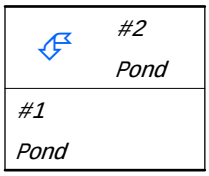
Storm Type:	drn58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	5.900 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	97.000%	98.000%
2.0000	93.000%	97.000%
1.0000	82.000%	85.000%
0.5000	63.000%	70.000%
0.3000	52.000%	46.000%
0.2000	44.000%	37.000%
0.1000	34.000%	26.000%
0.0500	22.000%	15.000%
0.0300	18.000%	12.000%
0.0200	10.000%	9.000%
0.0100	7.000%	6.000%
0.0050	5.000%	4.000%
0.0030	3.000%	2.000%
0.0010	2.000%	1.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Sediment Basin 119
Pond	#2	==>	#1	0.065	0.379	Sediment Basin 103



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	3.16	40.00	1,265.00	5.33	0.065
#2	**Muskingum K:**					**0.065**

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	In	31.500	31.500	40.24	10.08	362.7	46,105	34.38	19.46
	Out			38.48	10.08	16.9	2,251	0.02	0.01
#1	In	82.000	113.500	100.79	26.60	101.4	5,211	3.20	1.86
	Out			98.45	27.33	22.3	1,140	0.01	0.01

Particle Size Distribution(s) at Each Structure

Structure #2 (Sediment Basin 103):

Size (mm)	In	Out
3.0000	98.000%	100.000%
2.0000	97.000%	100.000%
1.0000	85.000%	100.000%
0.5000	70.000%	100.000%
0.3000	46.000%	100.000%
0.2000	37.000%	100.000%
0.1000	26.000%	100.000%
0.0500	15.000%	100.000%
0.0300	12.000%	100.000%
0.0200	9.000%	100.000%
0.0100	6.000%	100.000%
0.0050	4.000%	85.811%
0.0030	2.000%	42.906%
0.0010	1.000%	21.453%
0.0001	0.000%	0.000%

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	99.118%	100.000%
0.5000	84.775%	100.000%
0.3000	62.486%	100.000%
0.2000	53.738%	100.000%
0.1000	43.024%	100.000%
0.0500	32.109%	100.000%
0.0300	29.060%	100.000%
0.0200	25.608%	100.000%
0.0100	22.658%	100.000%
0.0050	18.334%	83.428%
0.0030	9.217%	41.943%

Size (mm)	In	Out
0.0010	4.659%	21.200%
0.0001	0.000%	0.000%

Structure Detail:

Structure #2 (Pond)

Sediment Basin 103

Pond Inputs:

Initial Pool Elev:	453.00 ft
Initial Pool:	2.50 ac-ft
*Sediment Storage:	3.67 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
453.00	20.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	454.23 ft
H'graph Detention Time:	1.18 hrs
Pond Model:	CSTRS
Dewater Time:	1.30 days
Trap Efficiency:	95.34 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
449.93	0.671	0.000	0.000		Top of Sed. Storage
450.00	0.677	0.045	0.000		
450.50	0.722	0.395	0.000		
451.00	0.768	0.767	0.000		
451.50	0.816	1.163	0.000		
452.00	0.865	1.583	0.000		
452.50	0.918	2.029	0.000		
453.00	0.973	2.502	0.000		Spillway #1
453.50	1.030	3.003	1.830	19.55	
454.00	1.088	3.532	25.483	11.40	
454.23	1.114	3.787	38.478	0.20	Peak Stage
454.50	1.146	4.090	53.905		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
455.00	1.205	4.678	93.036	
455.50	1.265	5.295	141.972	
456.00	1.327	5.943	200.972	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
449.93	0.000	0.000
450.00	0.000	0.000
450.50	0.000	0.000
451.00	0.000	0.000
451.50	0.000	0.000
452.00	0.000	0.000
452.50	0.000	0.000
453.00	0.000	0.000
453.50	1.830	1.830
454.00	25.483	25.483
454.50	53.905	53.905
455.00	93.036	93.036
455.50	141.972	141.972
456.00	200.972	200.972

Structure #1 (Pond)

Sediment Basin 119

Pond Inputs:

Initial Pool Elev:	384.00 ft
Initial Pool:	1.06 ac-ft
*Sediment Storage:	1.68 ac-ft
Dead Space:	0.00 %

**Sediment capacity calculated from 0.079 times disturbed area*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
386.00	20.00	2.00:1	2.00:1	12.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
385.33	384.00	370.00	4.00	100.00	0.0140

Pond Results:

Peak Elevation:	387.88 ft
H'graph Detention Time:	2.49 hrs
Pond Model:	CSTRS
Dewater Time:	1.25 days
Trap Efficiency:	78.02 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
381.85	0.422	0.000	0.000		Top of Sed. Storage
382.00	0.431	0.063	0.000		
382.50	0.464	0.287	0.000		
383.00	0.499	0.528	0.000		
383.50	0.535	0.786	0.000		
384.00	0.572	1.063	0.000		
384.50	0.610	1.358	1.188	3.01*	
385.00	0.650	1.674	1.210	3.15*	
385.33	0.678	1.893	1.224	2.17*	Spillway #2
385.50	0.693	2.009	1.231	1.25	
386.00	0.737	2.367	1.252	4.50	Spillway #1
386.50	0.783	2.747	3.462	3.85	
387.00	0.830	3.150	31.358	10.90	
387.50	0.878	3.577	64.349	0.75	
387.88	0.916	3.920	98.448	0.35	Peak Stage
388.00	0.928	4.028	109.217		
388.50	0.979	4.505	164.727		
389.00	1.031	5.007	231.029		
389.50	1.085	5.536	308.376		
390.00	1.140	6.092	397.069		
390.50	1.238	6.687	497.431		
391.00	1.340	7.331	609.800		
391.50	1.446	8.027	734.514		
392.00	1.556	8.777	871.913		
392.50	1.670	9.584	1,022.333		
393.00	1.788	10.448	1,186.105		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
393.50	1.910	11.372	1,363.556	
394.00	2.036	12.358	1,555.005	
394.50	2.166	13.409	1,760.766	
395.00	2.300	14.525	1,981.145	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
381.85	0.000	0.000	0.000
382.00	0.000	0.000	0.000
382.50	0.000	0.000	0.000
383.00	0.000	0.000	0.000
383.50	0.000	0.000	0.000
384.00	0.000	0.000	0.000
384.50	0.000	1.188*	1.188
385.00	0.000	1.210*	1.210
385.33	0.000	1.224	1.224
385.50	0.000	1.231	1.231
386.00	0.000	1.252	1.252
386.50	2.189	1.273	3.462
387.00	30.064	1.293	31.358
387.50	63.036	1.313	64.349
388.00	107.884	1.333	109.217
388.50	163.374	1.353	164.727
389.00	229.657	1.372	231.029
389.50	306.985	1.391	308.376
390.00	395.659	1.410	397.069
390.50	496.003	1.428	497.431
391.00	608.353	1.447	609.800
391.50	733.049	1.465	734.514
392.00	870.430	1.483	871.913
392.50	1,020.832	1.501	1,022.333
393.00	1,184.587	1.518	1,186.105
393.50	1,362.020	1.536	1,363.556
394.00	1,553.452	1.553	1,555.005
394.50	1,759.196	1.570	1,760.766
395.00	1,979.558	1.587	1,981.145

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)
#2	1	30.700	0.000	0.000	0.000	81.000	F	39.01	9.689
	2	0.800	0.000	0.000	0.000	100.000	F	1.24	0.393
	Σ	**31.500**						**40.24**	**10.082**
#1	1	22.100	0.293	0.016	0.399	73.000	S	12.98	3.702
	2	5.500	0.176	0.016	0.399	64.000	S	2.56	0.676
	3	21.300	0.214	0.000	0.000	74.000	M	17.74	4.404
	4	1.000	0.000	0.000	0.000	100.000	F	1.55	0.491
	5	32.100	0.200	0.000	0.000	77.000	M	28.97	7.249
	Σ	**113.500**						**100.79**	**26.605**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.024	200.00	24.00	0.9000	1.0000	2	362.7	47,539	35.45	20.24
	2	0.032	200.00	0.01	0.0001	1.0000	1	0.0	0	0.00	0.00
	Σ							**362.7**	**46,105**	**34.38**	**19.46**
#1	1	0.320	400.00	15.00	0.0030	1.0000	1	5.6	1,903	1.36	0.79
	2	0.320	400.00	3.00	0.0030	1.0000	1	0.1	159	0.11	0.07
	3	0.240	200.00	20.00	0.0500	1.0000	2	76.9	22,532	16.60	9.40
	4	0.001	400.00	0.01	0.0001	1.0000	1	0.0	0	0.00	0.00
	5	0.032	400.00	24.00	0.0030	1.0000	1	2.0	358	0.26	0.15
	Σ							**101.4**	**5,211**	**3.20**	**1.86**

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	10.00	40.00	400.00	0.800	0.138
		6. Grassed waterway	10.00	60.00	600.00	4.740	0.035
		7. Paved area and small upland gullies	5.33	40.00	750.00	4.640	0.044
		8. Large gullies, diversions, and low flowing streams	3.75	60.00	1,600.00	5.800	0.076
#1	**1**	**Time of Concentration:**					**0.293**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	3. Short grass pasture	2.50	20.00	800.00	1.260	0.176
#1	**2**	**Time of Concentration:**					**0.176**
#1	3	4. Cultivated, straight row	5.00	40.00	800.00	1.990	0.111
		7. Paved area and small upland gullies	4.00	60.00	1,500.00	4.020	0.103
#1	**3**	**Time of Concentration:**					**0.214**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	5.00	20.00	400.00	6.700	0.016
#1	**2**	**Muskingum K:**					**0.016**

BLACK WARRIOR MINERALS, INC.
MINE NO. 1, P-3950, R-5

HYDROLOGY AND SEDIMENTOLOGY PREDICTION
25 YEAR - 6 HOUR PRECIPITATION EVENT
SEDIMENT BASINS 119 & 103

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Black Warrior Minerals
Mine No. 1, P-3950, R-5

Sediment Basin 119 with 103

25 Year - 6 Hour Precipitation Event

Sanford M. Hendon, P.E.

General Information

Storm Information:

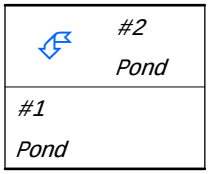
Storm Type:	SCS 6 Hour
Design Storm:	25 yr - 6 hr
Rainfall Depth:	4.900 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	97.000%	98.000%
2.0000	93.000%	97.000%
1.0000	82.000%	85.000%
0.5000	63.000%	70.000%
0.3000	52.000%	46.000%
0.2000	44.000%	37.000%
0.1000	34.000%	26.000%
0.0500	22.000%	15.000%
0.0300	18.000%	12.000%
0.0200	10.000%	9.000%
0.0100	7.000%	6.000%
0.0050	5.000%	4.000%
0.0030	3.000%	2.000%
0.0010	2.000%	1.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Sediment Basin 119
Pond	#2	==>	#1	0.065	0.379	Sediment Basin 103



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	3.16	40.00	1,265.00	5.33	0.065
#2	**Muskingum K:**					**0.065**

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#2	In	31.500	31.500	92.27	7.69	495.7	73,508	54.81	34.56
	Out			73.59	7.69	27.9	3,674	0.09	0.07
#1	In	82.000	113.500	177.70	19.95	125.6	7,401	4.22	2.72
	Out			154.08	22.49	36.8	1,907	0.08	0.06

Particle Size Distribution(s) at Each Structure

Structure #2 (Sediment Basin 103):

Size (mm)	In	Out
3.0000	98.000%	100.000%
2.0000	97.000%	100.000%
1.0000	85.000%	100.000%
0.5000	70.000%	100.000%
0.3000	46.000%	100.000%
0.2000	37.000%	100.000%
0.1000	26.000%	100.000%
0.0500	15.000%	100.000%
0.0300	12.000%	100.000%
0.0200	9.000%	100.000%
0.0100	6.000%	100.000%
0.0050	4.000%	71.035%
0.0030	2.000%	35.517%
0.0010	1.000%	17.759%
0.0001	0.000%	0.000%

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	93.720%	100.000%
0.3000	70.569%	100.000%
0.2000	61.339%	100.000%
0.1000	50.034%	100.000%
0.0500	38.517%	100.000%
0.0300	35.299%	100.000%
0.0200	31.658%	100.000%
0.0100	28.546%	97.356%
0.0050	20.042%	68.354%
0.0030	10.074%	34.358%

Size (mm)	In	Out
0.0010	5.090%	17.359%
0.0001	0.000%	0.000%

Structure Detail:

Structure #2 (Pond)

Sediment Basin 103

Pond Inputs:

Initial Pool Elev:	453.00 ft
Initial Pool:	2.50 ac-ft
*Sediment Storage:	3.67 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
453.00	20.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	454.75 ft
H'graph Detention Time:	0.71 hrs
Pond Model:	CSTRS
Dewater Time:	0.96 days
Trap Efficiency:	94.37 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
449.93	0.671	0.000	0.000		Top of Sed. Storage
450.00	0.677	0.045	0.000		
450.50	0.722	0.395	0.000		
451.00	0.768	0.767	0.000		
451.50	0.816	1.163	0.000		
452.00	0.865	1.583	0.000		
452.50	0.918	2.029	0.000		
453.00	0.973	2.502	0.000		Spillway #1
453.50	1.030	3.003	1.830	19.50	
454.00	1.088	3.532	25.483	2.75	
454.50	1.146	4.090	53.905	0.60	
454.75	1.176	4.386	73.585	0.10	Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
455.00	1.205	4.678	93.036	
455.50	1.265	5.295	141.972	
456.00	1.327	5.943	200.972	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
449.93	0.000	0.000
450.00	0.000	0.000
450.50	0.000	0.000
451.00	0.000	0.000
451.50	0.000	0.000
452.00	0.000	0.000
452.50	0.000	0.000
453.00	0.000	0.000
453.50	1.830	1.830
454.00	25.483	25.483
454.50	53.905	53.905
455.00	93.036	93.036
455.50	141.972	141.972
456.00	200.972	200.972

Structure #1 (Pond)

Sediment Basin 119

Pond Inputs:

Initial Pool Elev:	384.00 ft
Initial Pool:	1.06 ac-ft
*Sediment Storage:	1.68 ac-ft
Dead Space:	0.00 %

**Sediment capacity calculated from 0.079 times disturbed area*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
386.00	20.00	2.00:1	2.00:1	12.00

Fixed Siphon

Crest Elev	Inlet Elev	Outlet Elev	Diameter (in)	Length (ft)	Manning's n
385.33	384.00	370.00	4.00	100.00	0.0140

Pond Results:

Peak Elevation:	388.40 ft
H'graph Detention Time:	4.82 hrs
Pond Model:	CSTRS
Dewater Time:	0.91 days
Trap Efficiency:	70.68 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
381.85	0.422	0.000	0.000		Top of Sed. Storage
382.00	0.431	0.063	0.000		
382.50	0.464	0.287	0.000		
383.00	0.499	0.528	0.000		
383.50	0.535	0.786	0.000		
384.00	0.572	1.063	0.000		
384.50	0.610	1.358	1.188	3.01*	
385.00	0.650	1.674	1.210	3.15*	
385.33	0.678	1.893	1.224	2.17*	Spillway #2
385.50	0.693	2.009	1.231	1.30	
386.00	0.737	2.367	1.252	4.40	Spillway #1
386.50	0.783	2.747	3.462	3.90	
387.00	0.830	3.150	31.358	1.05	
387.50	0.878	3.577	64.349	1.95	
388.00	0.928	4.028	109.217	0.60	
388.40	0.969	4.413	154.082	0.20	Peak Stage
388.50	0.979	4.505	164.727		
389.00	1.031	5.007	231.029		
389.50	1.085	5.536	308.376		
390.00	1.140	6.092	397.069		
390.50	1.238	6.687	497.431		
391.00	1.340	7.331	609.800		
391.50	1.446	8.027	734.514		
392.00	1.556	8.777	871.913		
392.50	1.670	9.584	1,022.333		
393.00	1.788	10.448	1,186.105		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
393.50	1.910	11.372	1,363.556	
394.00	2.036	12.358	1,555.005	
394.50	2.166	13.409	1,760.766	
395.00	2.300	14.525	1,981.145	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Fixed Siphon (cfs)	Combined Total Discharge (cfs)
381.85	0.000	0.000	0.000
382.00	0.000	0.000	0.000
382.50	0.000	0.000	0.000
383.00	0.000	0.000	0.000
383.50	0.000	0.000	0.000
384.00	0.000	0.000	0.000
384.50	0.000	1.188*	1.188
385.00	0.000	1.210*	1.210
385.33	0.000	1.224	1.224
385.50	0.000	1.231	1.231
386.00	0.000	1.252	1.252
386.50	2.189	1.273	3.462
387.00	30.064	1.293	31.358
387.50	63.036	1.313	64.349
388.00	107.884	1.333	109.217
388.50	163.374	1.353	164.727
389.00	229.657	1.372	231.029
389.50	306.985	1.391	308.376
390.00	395.659	1.410	397.069
390.50	496.003	1.428	497.431
391.00	608.353	1.447	609.800
391.50	733.049	1.465	734.514
392.00	870.430	1.483	871.913
392.50	1,020.832	1.501	1,022.333
393.00	1,184.587	1.518	1,186.105
393.50	1,362.020	1.536	1,363.556
394.00	1,553.452	1.553	1,555.005
394.50	1,759.196	1.570	1,760.766
395.00	1,979.558	1.587	1,981.145

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)
#2	1	30.700	0.000	0.000	0.000	81.000	F	89.23	7.369
	2	0.800	0.000	0.000	0.000	100.000	F	3.04	0.325
	Σ	**31.500**						**92.27**	**7.695**
#1	1	22.100	0.293	0.016	0.399	73.000	S	19.61	2.712
	2	5.500	0.176	0.016	0.399	64.000	S	3.76	0.468
	3	21.300	0.214	0.000	0.000	74.000	M	31.47	3.245
	4	1.000	0.000	0.000	0.000	100.000	F	3.80	0.407
	5	32.100	0.200	0.000	0.000	77.000	M	53.95	5.428
	Σ	**113.500**						**177.70**	**19.954**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#2	1	0.024	200.00	24.00	0.9000	1.0000	2	495.7	75,936	56.62	36.05
	2	0.032	200.00	0.01	0.0001	1.0000	1	0.0	0	0.00	0.00
	Σ							**495.7**	**73,508**	**54.81**	**34.56**
#1	1	0.320	400.00	15.00	0.0030	1.0000	1	5.9	2,325	1.61	1.11
	2	0.320	400.00	3.00	0.0030	1.0000	1	0.1	199	0.14	0.09
	3	0.240	200.00	20.00	0.0500	1.0000	2	89.3	30,697	22.38	14.62
	4	0.001	400.00	0.01	0.0001	1.0000	1	0.0	0	0.00	0.00
	5	0.032	400.00	24.00	0.0030	1.0000	1	2.4	502	0.36	0.23
	Σ							**125.6**	**7,401**	**4.22**	**2.72**

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	10.00	40.00	400.00	0.800	0.138
		6. Grassed waterway	10.00	60.00	600.00	4.740	0.035
		7. Paved area and small upland gullies	5.33	40.00	750.00	4.640	0.044
		8. Large gullies, diversions, and low flowing streams	3.75	60.00	1,600.00	5.800	0.076
#1	**1**	**Time of Concentration:**					**0.293**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	3. Short grass pasture	2.50	20.00	800.00	1.260	0.176
#1	**2**	**Time of Concentration:**					**0.176**
#1	3	4. Cultivated, straight row	5.00	40.00	800.00	1.990	0.111
		7. Paved area and small upland gullies	4.00	60.00	1,500.00	4.020	0.103
#1	**3**	**Time of Concentration:**					**0.214**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	8. Large gullies, diversions, and low flowing streams	5.00	20.00	400.00	6.700	0.016
#1	**2**	**Muskingum K:**					**0.016**