mcgehee engineering corp

July 27. 2015

Stephen Miles, P.E.
Alabama Surface Mining Commission
P. O. Box 2390
Jasper, AL 35502-2390

RE: **Black Warrior Minerals, Inc.**
Mine No. 2, P-39__

Dear Mr. Miles:

I hereby certify the enclosed detailed design plans for Sediment Basin 104 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.

Bradley K. Simmons, P.E.
Alabama Reg. No. 33277

ALABAMA LICENSED No. 33277 PROFESSIONAL ENGINEER BRADLEY K. SIMMONS

Post Office Box 3431 • 450 19th Street West • Jasper, Alabama 35502-3431 • 205-221-0686 • Fax 205-221-7721 • staff@mcgehee.org

SEDIMENT BASIN CONSTRUCTION SPECIFICATIONS

Sediment basins (temporary or permanent) will be designed and constructed using the following as minimum specifications:

1. EMBANKMENT REQUIREMENTS

A) The minimum width of the top of the embankment will under no circumstance be less than twelve (12) feet.

B) The embankment will have a minimum front and back slope no steeper than the slopes listed on the detailed design sheet.

C) The foundation area of the embankment will be cleared and grubbed of all organic matter with no surface slope steeper than 1 horizontal to 1 vertical. The entire wet area, as measured from the upstream toe of the embankment to the normal pool level, will be cleared of trees and large brush.

D) A core will be constructed in a cutoff trench along the centerline of the embankment. The cutoff trench will be of suitable depth and width to attain relatively impervious material.

E) The embankment construction material will be free of sod, roots, stumps, rocks, etc., which exceed six (6") inches in diameter. The embankment material will be placed in layers of twelve (12") inches or less and compacted to ninety five (95%) percent of the standard proctor density, as set forth in ASTM.

F) The embankment, foundation and abutments will be designed and constructed to be stable under normal construction and operating conditions, with a minimum static safety factor of 1.3 at normal pool level with steady seepage saturation conditions.

G) The actual constructed height of the embankment will be a minimum of five (5%) percent higher than the design height to allow for settling over the life of the embankment.

H) The design embankment height for temporary impoundments will be a minimum of one (1) foot above the maximum water level anticipated from a 10 Year - 24 Hour or a 25 Year - 6 Hour precipitation event (whichever is greater). The design embankment height for permanent impoundments will be a minimum of one (1) foot above the maximum water level anticipated from a 10 Year - 24 Hour or a 25 Year - 6 Hour precipitation event (whichever is greater).

I) For embankments constructed as point source discharges, the embankment will be constructed and abutments keyed into undisturbed, virgin, ground if at all possible. In the event that this can not be achieved, additional design and construction specifications will be submitted in the detailed design plans.

J) The embankment and all areas disturbed in the construction of the embankment will be seeded with a mixture of perennial and annual grasses, fertilized and mulched to prevent erosion and ensure restabilization. Hay dams, silt fences, rock check dams, etc. will be installed, where deemed necessary, as additional erosion prevention methods.

K) For basins that will be constructed in spoil material or other pervious previously mined areas, the interior or "wet" area of the basin will be lined with a minimum of one (1') foot of clay material with a permeability no greater than 1 x 10^{-6} cm/sec up to the emergency spillway elevation. The clay liner material will be placed in lifts no greater than six (6") inches and compacted to ninety-five (95) percent of the standard proctor density.

2. DISCHARGE STRUCTURE REQUIREMENTS

A) The primary spillway will be designed to adequately carry the anticipated peak runoff from a 10 Year - 24 Hour precipitation event. The combination primary and secondary (emergency) spillway system will be designed to safely carry the anticipated peak runoff from a 25 Year - 6 Hour precipitation event. When sediment basins are proposed in the drainage course of a public water supply, the spillway system will be designed and constructed to adequately carry the runoff from a 50 Year - 24 Hour precipitation event.

B) Channel linings, for secondary (emergency) spillways will be a trapezoidal open channel constructed in natural ground and planted with a mixture of both annual and perennial grasses being predominantly fescue and bermuda. In the event that the spillway can not be constructed in natural ground the spillway will be lined with riprap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).

C) When consisting of pipe, the primary spillway will be installed according to Class "C" pipe installation for embankment bedding.

D) Sediment basins with a single spillway system, such as a skimmer board, will be a trapezoidal open channel constructed in consolidated, nonerodible material and lined with rip-rap, concrete, asphalt or durable rock (See Detailed Design Plans for Spillway Lining).

E) The primary spillway will be designed and constructed with device to eliminate floating solids from leaving the impoundment. This device will consist of a turned down elbow when using pipe or a skimmer system when using an open channel spillway.

F) When necessary, to prevent erosion of the embankment or discharge area, a splash pad of rip-rap, durable rock, sacrete, etc. will be installed at the discharge end of the primary spillway.

G) The combined spillway systems, for sediment basins constructed in series, will be designed to adequately accommodate the entire drainage area.

3. INSPECTION, MAINTENANCE AND CERTIFICATION REQUIREMENTS

A) Inspections will be conducted regularly during construction of the sediment basin by a qualified registered professional engineer or other qualified person under the direction of a professional engineer. Upon completion of construction, the sediment basin will be certified, by a qualified registered professional engineer, to the Regulatory Authority as having been constructed in accordance with the approved detailed design plans.

B) Sediment basins will be inspected semi-monthly for erosion, instability, etc., with maintenance performed as necessary, until the removal of the structure or until a Phase III Bond Release is granted.

C) Sediment basins will be examined quarterly for structural weakness, instability, erosion, slope failure, or other hazardous conditions with maintenance performed as necessary.

D) Formal inspections will be made annually, by a qualified registered professional engineer or other qualified person under the direction of a professional engineer, including any reports or modifications, in accordance with 880-X- 10C- .20[1(j)] of the Alabama Surface Mining Regulations.

E) Retained sediment will be removed from each sediment basin when the accumulated sediment reaches the maximum allowable sediment volume as set forth in the detailed design plans.

4. BASIN REMOVAL REQUIREMENTS

A) Upon completion of mining, reclamation, restabilization and effluent standards being met, each sediment basin not proposed as a permanent water impoundment will be dewatered in a controlled manner by either pumping or siphoning. Upon successful dewatering, a determination will be made as to the retained sediment level in the basin. After determining the retained sediment level, a channel will be cut into the embankment down to the retained sediment level on the side of the embankment deemed most suitable to reach natural ground without encountering prohibiting rock. The embankment material removed from this newly constructed channel will be spread and compacted over the previous impoundment (wet area) area to prevent erosion and ensure restabilization. The newly constructed channel will be of adequate width (minimum 30 feet) and sloped to a grade (approximately 1% to 3%) which will cause all surface drainage to travel across this area in sheet flow, minimizing the possibility of erosion. Also, where necessary, hay dams will be installed in strategic locations across the width of the channel to retain sediment and slow the water velocity to a favorable rate. Upon removal of the embankment section, all disturbed areas will be graded in such a manner to ensure slope stability, successful restabilization and to minimize erosion. All disturbed areas will be seeded with a mixture of annual and perennial grasses, fertilized and mulched. No slope, existing or created in the removal of the sediment basin, will be left on a grade that will slip or slough.

5. PERMANENT WATER IMPOUNDMENT REQUIREMENTS

A) Prior to a request for a Phase II Bond Release, all sediment basins being left as permanent water impoundments will have supplemental data submitted to the Regulatory Authority concerning water quality, water quantity, size, depth, configuration, postmining land use, etc.

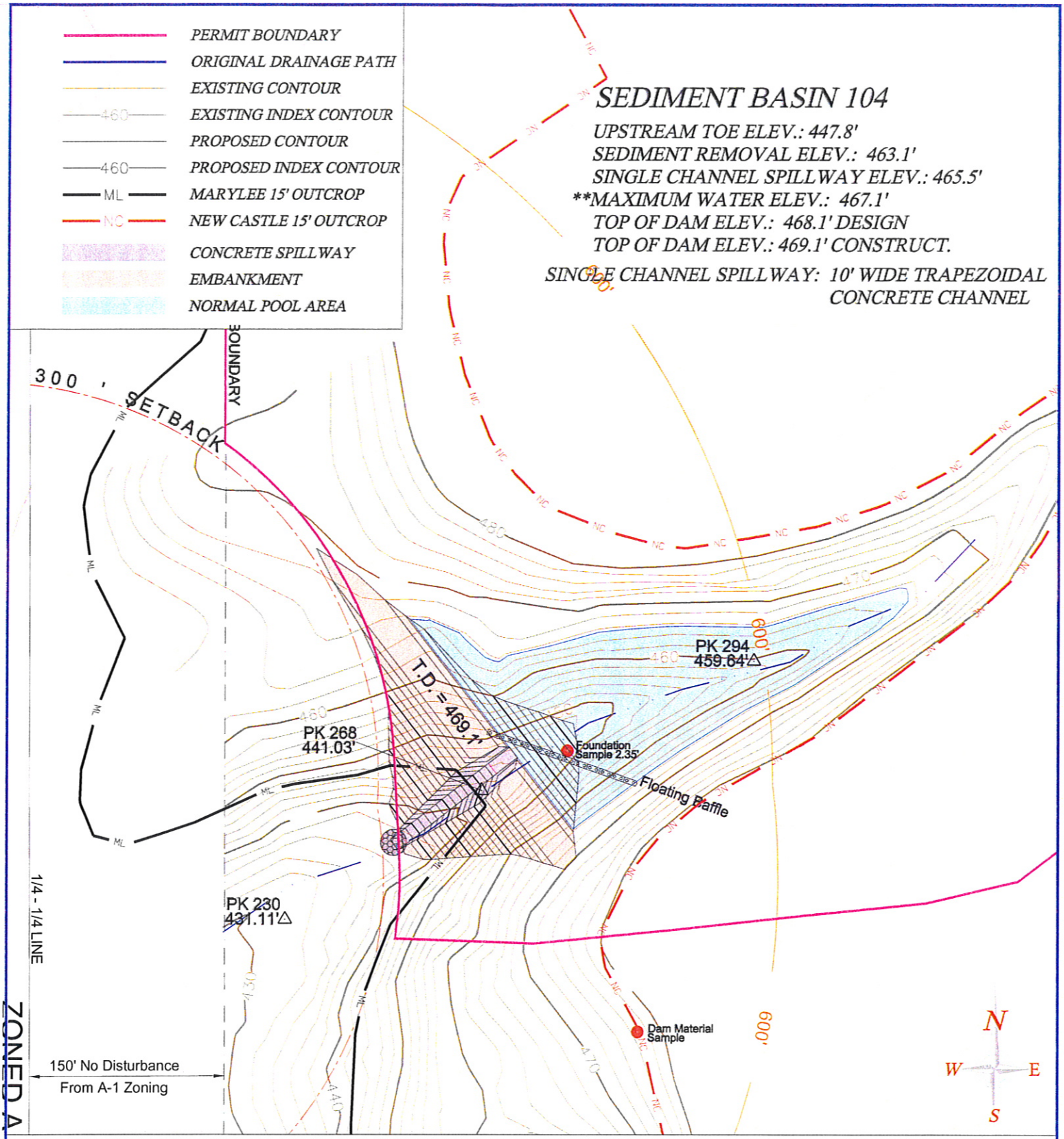
B) Final grading slopes of the entire permanent water impoundment area will not exceed a slope of 2 Horizontal to 1 Vertical to provide for safety and access for future water users.

DETAILED DESIGN PLANS
SEDIMENT BASIN 104

General Notes:

1. Coal may be present in the embankment and pool area. If coal is encountered during embankment construction it will be removed.

2. Portions of the pool area may be mined through and reconstructed after basin is certified. The embankment and spillway system will remain undisturbed after certification.



NOTE: CROP COAL ENCOUNTERED IN THE EMBANKMENT AREA MAY BE REMOVED DURING BASIN CONSTRUCTION
NOTE: AFTER BASIN IS CERTIFIED, PORTIONS OF POOL AREA MAY BE MINED THROUGH AND RECONSTRUCTED EMBANKMENT AND SPILLWAY TO REMAIN UNDISTURBED AFTER CERTIFICATION.

Contour Interval = 2 ft.

SCALE: 1" = 100'

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BLACK WARRIOR MINERALS, INC.

MINE NO. 2
ASMC PERMIT NO. P-39__

PLAN VIEW DRAWING
SEDIMENT BASIN 104

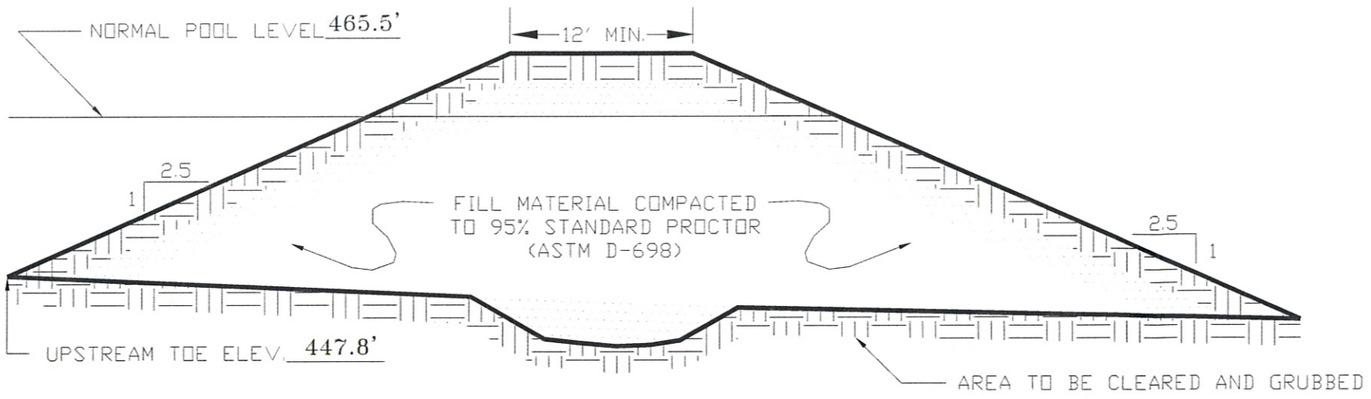
COMPANY: BLACK WARRIOR MINERALS, INC.

MINE NAME: MINE NO. 2

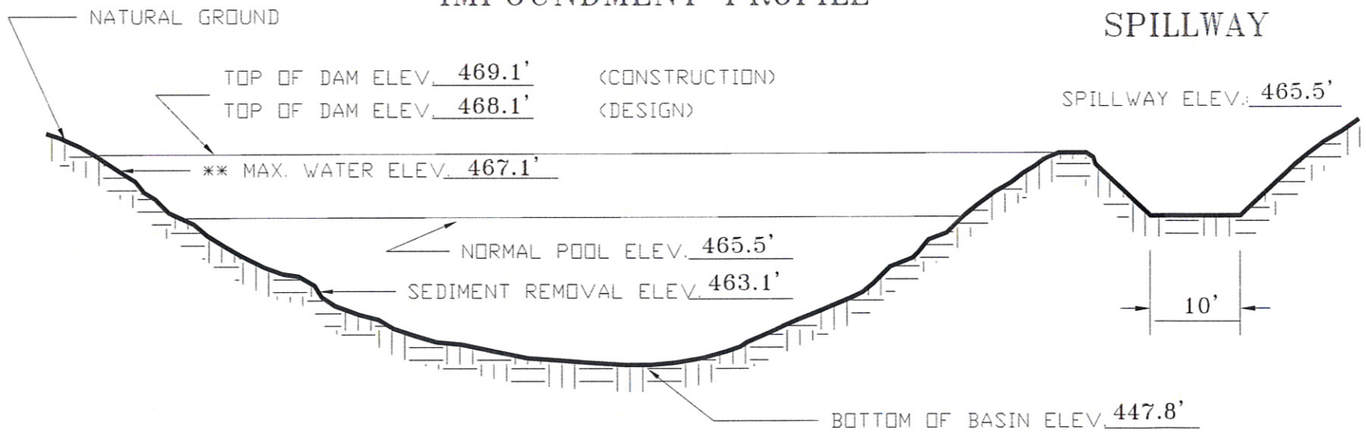
PERMIT #: P-39__

BASIN I.D. #: SEDIMENT BASIN 104

EMBANKMENT CROSS-SECTION

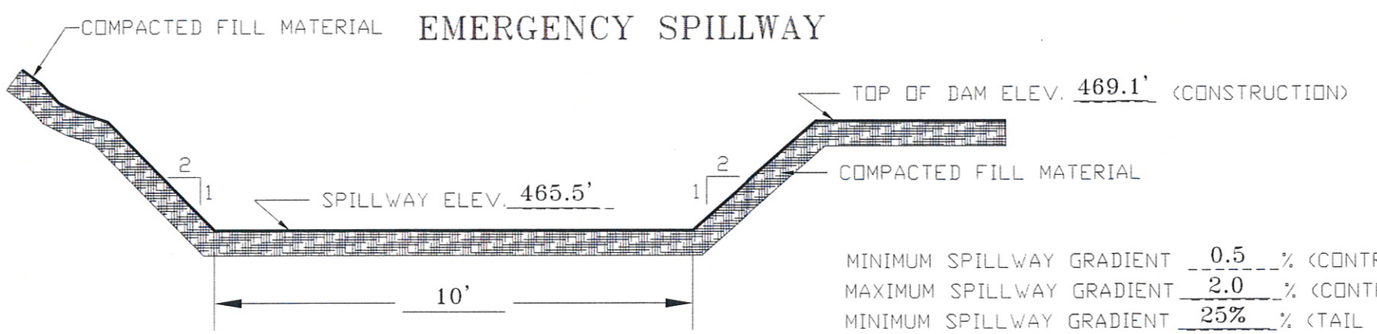


IMPOUNDMENT PROFILE



SPILLWAY

EMERGENCY SPILLWAY



MINIMUM SPILLWAY GRADIENT 0.5 % (CONTROL SECTION)

MAXIMUM SPILLWAY GRADIENT 2.0 % (CONTROL SECTION)

MINIMUM SPILLWAY GRADIENT 25% % (TAIL DITCH SECTION)

MAXIMUM SPILLWAY GRADIENT 40% % (TAIL DITCH SECTION)

SEE SPILLWAY CONTROL SECTION AND TAIL DITCH DESIGN FOR CHANNEL LINING REQUIREMENTS.

KEY BASIN PARAMETERS

DRAINAGE AREA	23.7	ACRES
DISTURBED AREA	23.7	ACRES
SEDIMENT STORAGE	2.37	AC.FT.
DETENTION STORAGE	1.26	AC.FT.
PERMANENT POOL CAPACITY	3.63	AC.FT.
* TOTAL BASIN STORAGE CAPACITY	4.27	AC.FT.
** PEAK INFLOW	69.51	C.F.S.
** PEAK OUTFLOW	63.03	C.F.S.

* 10 YEAR - 24 HOUR PRECIPITATION EVENT.

** 25 YEAR - 6 HOUR PRECIPITATION EVENT.

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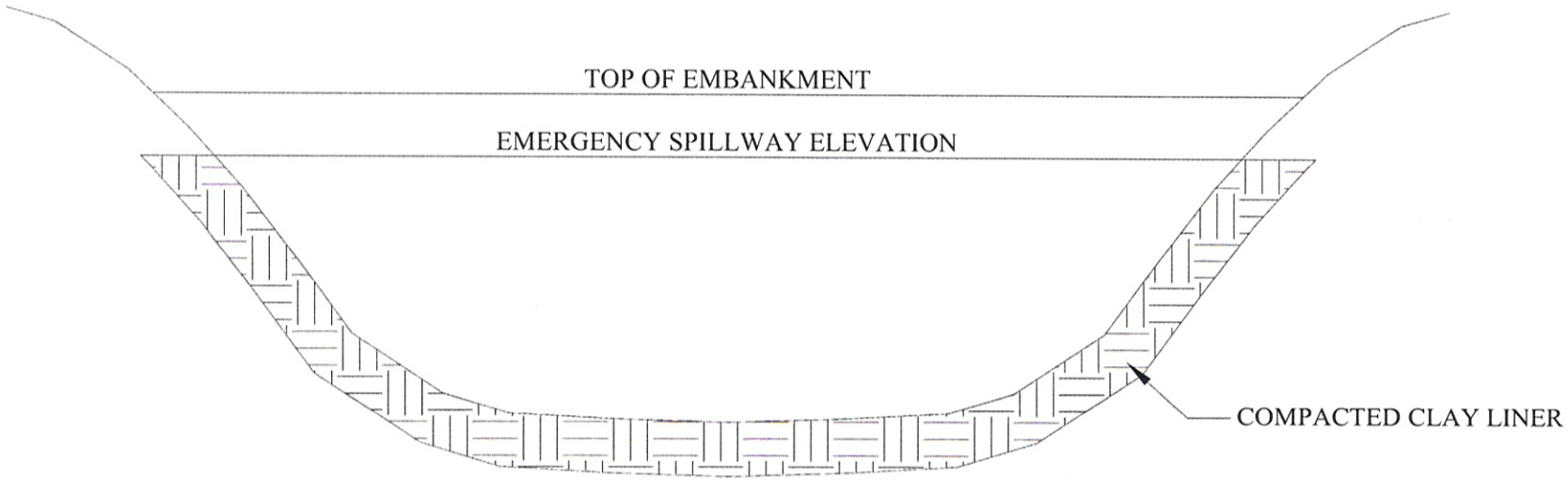
TYPICAL IMPOUNDMENT PROFILE
CLAY LINER CROSS-SECTION



In the event that a sediment basin must be constructed in spoil material, that part of the interior or wet area located in spoil material will be lined with a minimum of one (1') foot of clay material with a permeability no greater than 0.000001 cm./sec. up to the emergency spillway elevation. The clay liner material will be placed in lifts no greater than six (6") inches and compacted to ninety-five (95) percent of the standard proctor density.

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Black Warrior Minerals, Inc. - Mine No. 2
Sediment Basin 104

Elevation-Area-Capacity Table

Elevation (ft)	Area (ac)	Capacity (ac-ft)
447.80	0.000	0.000
448.00	0.001	0.000
448.30	0.003	0.001
448.80	0.006	0.003
449.30	0.011	0.007
449.80	0.018	0.014
450.00	0.021	0.018
450.30	0.025	0.025
450.80	0.032	0.039
451.30	0.039	0.057
451.80	0.048	0.079
452.00	0.051	0.089
452.30	0.056	0.105
452.80	0.065	0.135
453.30	0.075	0.170
453.80	0.086	0.210
454.00	0.090	0.228
454.30	0.097	0.256
454.80	0.110	0.307
455.30	0.124	0.366
455.80	0.138	0.431
456.00	0.144	0.459
456.30	0.153	0.504
456.80	0.167	0.584
457.30	0.183	0.671
457.80	0.198	0.767
458.00	0.205	0.807
458.30	0.215	0.870
458.80	0.231	0.981
459.30	0.248	1.101
459.80	0.266	1.230
460.00	0.273	1.284
460.30	0.288	1.368
460.80	0.312	1.518
461.30	0.338	1.680

Elevation (ft)	Area (ac)	Capacity (ac-ft)
461.80	0.365	1.856
462.00	0.376	1.930
462.30	0.393	2.045
462.80	0.423	2.249
463.30	0.453	2.468
463.80	0.484	2.702
464.00	0.497	2.800
464.30	0.518	2.953
464.80	0.555	3.221
465.30	0.592	3.508
465.80	0.631	3.813
466.00	0.647	3.941
466.30	0.671	4.139
466.80	0.712	4.485
467.30	0.755	4.851
467.80	0.798	5.239
468.00	0.816	5.401
468.30	0.847	5.650
468.80	0.899	6.087
469.30	0.952	6.549
469.80	1.008	7.039
470.00	1.030	7.243

SPILLWAY CHANNEL SPECIFICATIONS
SEDIMENT BASIN 104

The entire control section and tail ditch section of the emergency spillway will be cut into the compacted fill of the embankment and lined with a minimum of 4 inches of reinforced concrete. All concrete will be reinforced with 10 gauge, 6" x 6" welded wire mesh. Fibermesh may be added to the concrete for additional strength, however, the addition of fibermesh shall not be used in place of the required 6" x 6" welded wire. The control section and tail ditch section of the emergency spillway will extend from the inner face of the embankment, past the centerline of the embankment and be carried out beyond the downstream slope of the embankment.

The gradient of the control section of the emergency spillway will not be less than one half (0.5%) percent and will not exceed two (2.0%) percent. The gradient of the tail ditch section of the emergency spillway will not be less than twenty-five (25%) percent and will not exceed forty (40%) percent.

The concrete liner of the control section of the emergency spillway will be a minimum of 2.6 feet as measured vertically, allowing 1.6 feet for the maximum anticipated flow and 1.0 feet of dry freeboard. The concrete liner of the tail ditch section of the emergency spillway will be a minimum of 1.4 feet as measured vertically, allowing 0.4 feet for the maximum anticipated flow and 1.0 foot of dry freeboard. There will be a transition zone of at least 20 feet in length between the control section and the tail section where the concrete liner will vary from 2.6 feet to 1.4 feet at the end of the transition. The flow line of the spillway will be smoothed at the transition to avoid abrupt changes in the flow line slope.

The minimum depth of the control section is based on the peak stage of 25 year 6 hour rainfall event while the minimum depth of the tail section is based on the SedCad4 utility run with the peak flow 63.03 CFS on the minimum tail ditch slope of 25%.

Black Warrior Minerals, Inc. - Mine No. 2 Sediment Basin 104 Spillway Tail Section

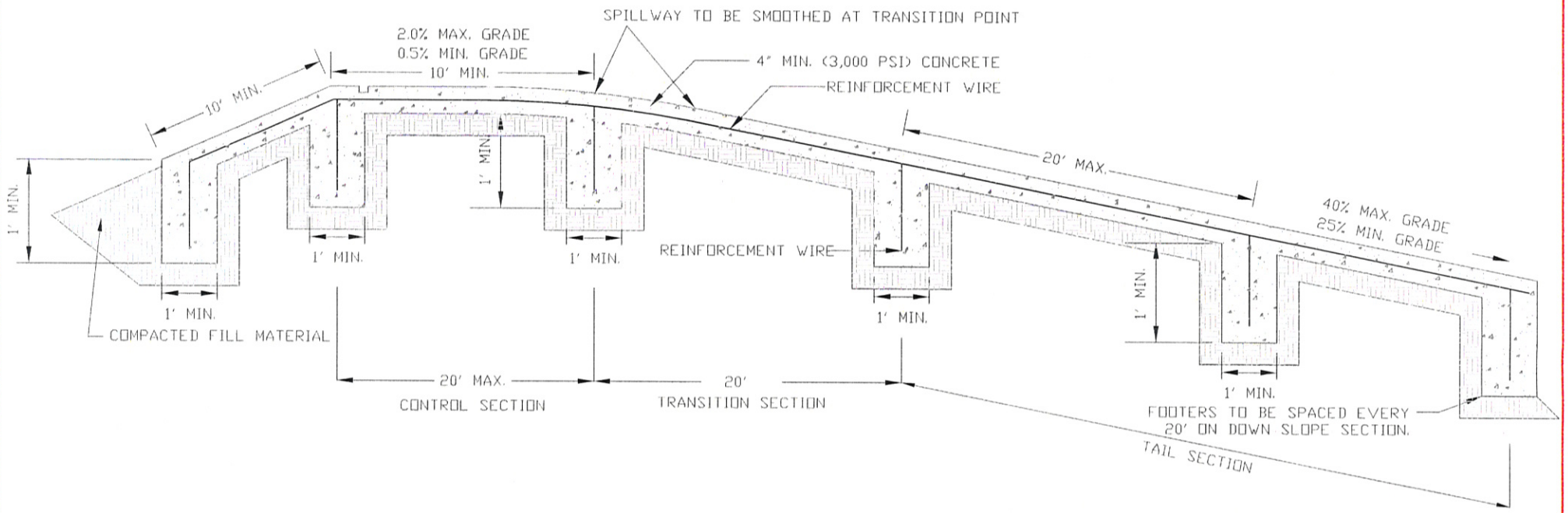
Material: Concrete, Rubble

Trapezoidal Channel

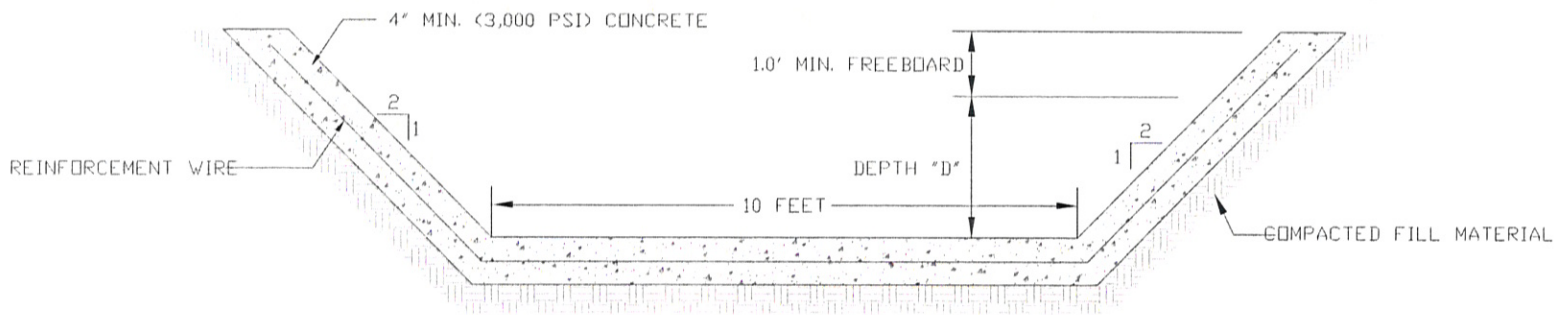
Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	25.0	0.0220	1.00		

	w/o Freeboard	w/ Freeboard
Design Discharge:	63.03 cfs	
Depth:	0.36 ft	1.36 ft
Top Width:	11.44 ft	15.44 ft
Velocity:	16.28 fps	
X-Section Area:	3.87 sq ft	
Hydraulic Radius:	0.333 ft	
Froude Number:	4.93	

SEDIMENT BASIN 104 SPILLWAY PROFILE



TYPICAL SPILLWAY CROSS-SECTION



SPILLWAY FLOW DEPTH "D" = 1.6' FEET (CONTROL SECTION)

SPILLWAY FLOW DEPTH "D" = 0.4' FEET (TAIL DITCH SECTION)

TOTAL SPILLWAY DEPTH "D+1" = 2.6' FEET (CONTROL SECTION)

TOTAL SPILLWAY DEPTH "D+1" = 1.4' FEET (TAIL DITCH SECTION)

NOTE: TOTAL SPILLWAY DEPTH IN TRANSITION SECTION VARIES FROM 2.6 FEET TO 1.4 FEET

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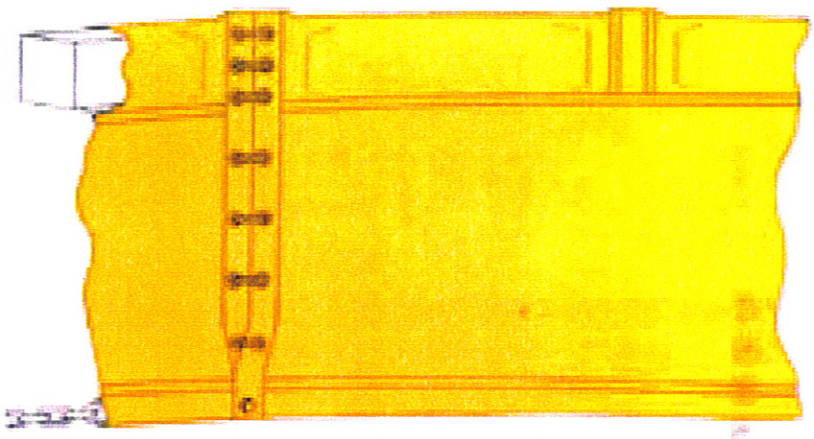
SUBSURFACE WITHDRAWAL DEVICE AND FLOATING SILT BOOM

Lightweight Turbidity Curtain

Application: Calm waters with little current, such as lakes, ponds, canals and shoreline areas.



Specifications

- Curtain to be anchored at the maximum anticipated peak stage elevation (10 Year – 24 Hour Precipitation Event).
- PVC coated floatations - ultraviolet resistant
- Geotextile fabric screens
- Chain ballast with connectors
- Double sewn seams with grommets
- Depths per requirements ' 50' sections = Minimum 24" deep
- Fabric - Polyester reinforced vinyl high visibility yellow
- Connector - Sections are laced together through grommets and load lines are bolted together.
- Flotation - 6" expanded polystyrene over 9 lbs./ft. buoyancy.
- Ballast - 1/4" galvanized chain (.7 lbs/ft).

BLACK WARRIOR MINERALS, INC.
MINE NO. 2, P-3985

HYDROLOGY AND SEDIMENTOLOGY PREDICTION
10 YEAR - 24 HOUR PRECIPITATION EVENT
SEDIMENT BASIN 104

Black Warrior Minerals
Mine No. 2 P-39
Sediment Basin 104

10 Year 24 Hour Event

Bradley K. Simmons, P.E.

General Information

Storm Information:

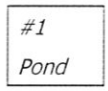
Storm Type:	drn58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	5.900 inches

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 104



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)
#1	In	23.700	23.700	30.30	7.60	286.3	48,280	36.00	20.36
	Out			29.66	7.60	15.4	3,098	0.07	0.04

Particle Size Distribution(s) at Each Structure

Structure #1:

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%	74.435%
0.0030	2.000%	37.218%
0.0010	1.000%	18.609%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Sediment Basin 104

Pond Inputs:

Initial Pool Elev:	465.50 ft
Initial Pool:	1.26 ac-ft
*Sediment Storage:	2.37 ac-ft
Dead Space:	20.00 %

**Sediment capacity calculated from 0.100 times disturbed area*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
465.50	10.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	466.49 ft
H'graph Detention Time:	0.83 hrs
Pond Model:	CSTRS
Dewater Time:	0.93 days
Trap Efficiency:	94.63 %

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)	
463.08	0.439	0.000	0.000		Top of Sed. Storage
463.30	0.453	0.100	0.000		
463.80	0.484	0.334	0.000		
464.00	0.497	0.432	0.000		
464.30	0.518	0.584	0.000		
464.80	0.555	0.853	0.000		
465.30	0.593	1.139	0.000		
465.50	0.608	1.260	0.000		Spillway #1
465.80	0.631	1.445	1.250	9.90	
466.00	0.647	1.573	2.083	0.95	
466.30	0.671	1.771	19.355	11.35	
466.49	0.687	1.901	29.661	0.15	Peak Stage

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
466.80	0.712	2.117	46.726	
467.30	0.755	2.484	84.431	
467.80	0.798	2.872	131.389	
468.00	0.816	3.033	152.957	
468.30	0.847	3.283	188.351	
468.80	0.899	3.719	255.637	
469.30	0.952	4.182	333.601	
469.80	1.008	4.672	422.612	
470.00	1.030	4.875	461.393	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
463.08	0.000	0.000
463.30	0.000	0.000
463.80	0.000	0.000
464.00	0.000	0.000
464.30	0.000	0.000
464.80	0.000	0.000
465.30	0.000	0.000
465.50	0.000	0.000
465.80	1.250	1.250
466.00	2.083	2.083
466.30	19.355	19.355
466.80	46.726	46.726
467.30	84.431	84.431
467.80	131.389	131.389
468.00	152.957	152.957
468.30	188.351	188.351
468.80	255.637	255.637
469.30	333.601	333.601
469.80	422.612	422.612
470.00	461.393	461.393

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	23.000	0.100	0.000	0.000	81.000	F	29.22	7.259
	2	0.700	0.010	0.000	0.000	100.000	F	1.08	0.344
	$\sum$	**23.700**						**30.30**	**7.603**

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)
#1	1	0.024	200.00	26.00	0.9000	1.0000	2	286.3	50,032	37.31	21.31
	2	0.032	200.00	0.01	0.0010	1.0000	1	0.0	0	0.00	0.00
	$\sum$							**286.3**	**48,280**	**36.00**	**20.36**

BLACK WARRIOR MINERALS, INC.
MINE NO. 2, P-3985

HYDROLOGY AND SEDIMENTOLOGY PREDICTION
25 YEAR - 6 HOUR PRECIPITATION EVENT
SEDIMENT BASIN 104

Black Warrior Minerals
Mine No. 2 P-39
Sediment Basin 104

25 Year 6 Hour Event

Bradley K. Simmons, P.E.

General Information

Storm Information:

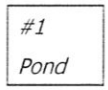
Storm Type:	SCS 6 Hour
Design Storm:	25 yr - 6 hr
Rainfall Depth:	4.900 inches

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 104



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)
#1	In	23.700	23.700	69.51	5.81	391.3	76,908	57.35	36.11
	Out			63.03	5.81	25.8	5,207	0.46	0.29

Particle Size Distribution(s) at Each Structure

Structure #1:

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%	90.962%
0.0050	4.000%	60.641%
0.0030	2.000%	30.321%
0.0010	1.000%	15.160%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Sediment Basin 104

Pond Inputs:

Initial Pool Elev:	465.50 ft
Initial Pool:	1.26 ac-ft
*Sediment Storage:	2.37 ac-ft
Dead Space:	20.00 %

**Sediment capacity calculated from 0.100 times disturbed area*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
465.50	10.00	2.00:1	2.00:1	10.00

Pond Results:

Peak Elevation:	467.02 ft
H'graph Detention Time:	0.43 hrs
Pond Model:	CSTRS
Dewater Time:	0.58 days
Trap Efficiency:	93.40 %

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)	
463.08	0.439	0.000	0.000		Top of Sed. Storage
463.30	0.453	0.100	0.000		
463.80	0.484	0.334	0.000		
464.00	0.497	0.432	0.000		
464.30	0.518	0.584	0.000		
464.80	0.555	0.853	0.000		
465.30	0.593	1.139	0.000		
465.50	0.608	1.260	0.000		Spillway #1
465.80	0.631	1.445	1.250	9.90	
466.00	0.647	1.573	2.083	0.95	
466.30	0.671	1.771	19.355	2.60	
466.80	0.712	2.117	46.726	0.50	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
467.02	0.731	2.275	63.029	0.05 Peak Stage
467.30	0.755	2.484	84.431	
467.80	0.798	2.872	131.389	
468.00	0.816	3.033	152.957	
468.30	0.847	3.283	188.351	
468.80	0.899	3.719	255.637	
469.30	0.952	4.182	333.601	
469.80	1.008	4.672	422.612	
470.00	1.030	4.875	461.393	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
463.08	0.000	0.000
463.30	0.000	0.000
463.80	0.000	0.000
464.00	0.000	0.000
464.30	0.000	0.000
464.80	0.000	0.000
465.30	0.000	0.000
465.50	0.000	0.000
465.80	1.250	1.250
466.00	2.083	2.083
466.30	19.355	19.355
466.80	46.726	46.726
467.30	84.431	84.431
467.80	131.389	131.389
468.00	152.957	152.957
468.30	188.351	188.351
468.80	255.637	255.637
469.30	333.601	333.601
469.80	422.612	422.612
470.00	461.393	461.393

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	23.000	0.100	0.000	0.000	81.000	F	66.85	5.521
	2	0.700	0.010	0.000	0.000	100.000	F	2.66	0.285
	$\sum$	**23.700**						**69.51**	**5.806**

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)
#1	1	0.024	200.00	26.00	0.9000	1.0000	2	391.3	79,871	59.56	37.94
	2	0.032	200.00	0.01	0.0010	1.0000	1	0.0	0	0.00	0.00
	$\sum$							**391.3**	**76,908**	**57.35**	**36.11**

BLACK WARRIOR MINERALS, INC.
MINE NO. 2, P-3985

STABILITY ANALYSIS

STABILITY ANALYSIS PROCEDURE

The computer program used to analyze the slope stability was the REAME Slope Stability Program as developed by Dr. Yang H. Huang, P.E. of the University of Kentucky.

The soil type of the foundation material beneath the proposed embankment structure of Sediment Basin 104 was sampled, analyzed and classified by personnel of McGehee Engineering Corp. The depths to the stiff base of Sediment Basin 104 (2.35') was measured by personnel of McGehee Engineering Corp.

The soil type to be used in the construction of the proposed embankment structure of Sediment Basin 104 was sampled, analyzed and classified by personnel of McGehee Engineering Corp. This sample of material was taken from adjacent ridge top material that is representative of the material to be used as dam material.

SOIL PROPERTIES

USAGE	TYPE	COHESION (psf)	INTERNAL ANGLE OF FRICTION	EFFECTIVE DENSITY (pcf)
104 FOUND.	SC	100.00	27.92	133.52
104 DAM	SM	270.00	33.02	132.14

ANALYSIS RESULTS

BASIN	STATIC SAFETY FACTOR
104	1.747

mcgehee engineering corp

SIEVE ANALYSIS

(ASTM C136-96a)

Company Name: Black Warrior Minerals
Location: Mine #2
Sample I.D.: Basin 104
Description: Foundation

Sample Date: 1/28/14
Analyzed By: C. Smith
Date Analyzed: 2/10/14
Requested By: S. Hendon

Weight of Oven Dry Sample (W): **1002.0 Grams**

Sieve No.	Sieve + Sample Weight	Sieve Weight	Sample Weight Retained	Percent of Total Retained	Cumulative Weight Percent	Percent Retained	Percent Finer
1"	0.0	0.0	0.0	0.0	0.0	0.0	100.0
3/4"	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1/2"	540.0	540.0	0.0	0.0	0.0	0.0	100.0
4	616.0	513.0	103.0	10.3	10.3	10.3	89.7
10	645.0	462.0	183.0	18.3	28.5	28.5	71.5
40	698.0	383.0	315.0	31.4	60.0	60.0	40.0
200	421.6	333.0	88.6	8.8	68.8	68.8	31.2
Pan	692.4	380.0	312.4	31.2	100.0	100.0	0.0
	Total Weight (W1):		1002.0				

SOIL CLASSIFICATION

Unified System (ASTM D-2487)

Liquid Limit: 31.1
Plastic Limit: 22.4
Plasticity Index: 8.7

Soil Classification: SC

Coarse Grained
Clayey Sand

Effective Cohesion: 0.6940 psi
Total Cohesion: 8.610 psi
Permeability: 0.50 ft/yr
Maximum Dry Density: 116.0 pcf
Optimum Moisture: 15.1 %
Effective Cohesion: 99.9 psf
Angle of Internal Friction: 27.92 degrees
Mass Unit Weight: 133.52 pcf

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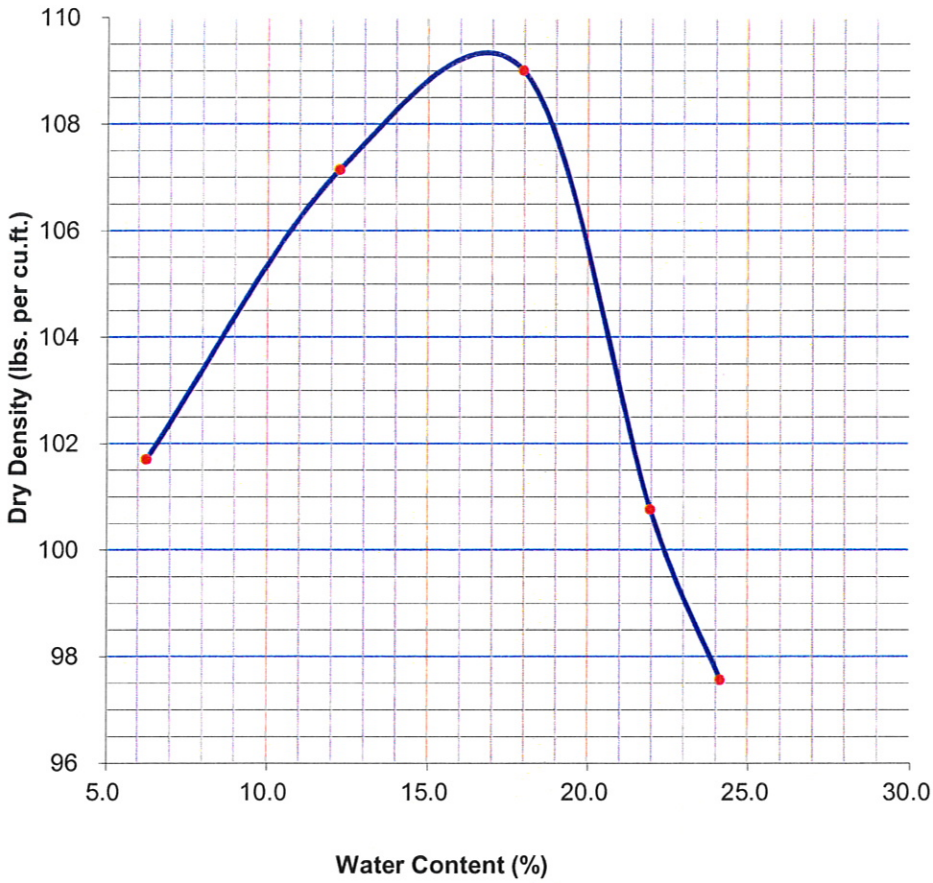
Black Warrior Minerals
Mine #2, Basin 104, Dam Material
Moisture Density Relationship
(Proctor Method)



ASTM D-698 Method A	Water Content %	Specific Gravity	%> No. 4	%< No. 200	LL %	PL %	PI %
			13.2	22.9	22.9	20.8	2.1

Sample Description, Classification and Location	Sample No.: Basin 104 Dam Material
Coarse Grained Silty Sand	Optimum Moisture Content= 16.9 Maximum Dry Density = 109.3

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1

STANDARD PROCTOR COMPACTION TEST (ASTM D-698)

Company Name: Black Warrior Minerals
Location: Mine #2
Sample I.D.: Basin 104
Description: Dam Material

Sampled By: B. Justice
Sample Date: 1/28/14
Analyzed By: C. Smith
Date Analyzed: 2/10/14
Requested By: S. Hendon

Weight of Mold (W1): 4,229 Grams

Test No.	Wt. of Mold & Wet Soil (w2) grams	Wt. of wet Soil (w2-w1) grams	Wet Unit Wt. (w2-w1)/c lb/cu-ft	Moisture Content (w) %	Dry Unit Weight lb/cu-ft
1	5,863	1,634	108.1	6.3	101.7
2	6,047	1,818	120.2	12.2	107.1
3	6,173	1,944	128.6	18.0	109.0
4	6,087	1,858	122.9	22.0	100.8
5	6,060	1,831	121.1	24.1	97.6
6					
7					

Constant C = 15.12 (conversion factor)

MOISTURE CONTENT DETERMINATION

Test No.	1	2	3	4	5	6	7
Can No.	1	2	3	4	6		
Wt. of Can, a, (g)	20.47	21.41	20.57	20.45	20.52		
Wt. of Can + Wet Soil, b, (g)	96.01	86.31	90.01	100.37	94.40		
Wt. of Can + Dry Soil, c, (g)	91.56	79.24	79.44	85.98	80.04		
* Moisture Content, w, (%)	6.26	12.23	17.95	21.96	24.13		

* Moisture Content, w = (b - c)/(c - a) x 100

REAME
(Rotational Equilibrium Analysis of Multilayered Embankments)
Black Warrior Minerals, Inc.
Mine No. 2, P-39__
Sediment Basin 104 -Static Case

```
 Number of cases to be analyzed   1
 Case Number   1

Number of boundary lines=  4
Number of points  on boundary lines are:     2     2     3     7

On boundary line no. 1 Point no. and coordinates are:
1    .000   33.000   2  500.000    .000

On boundary line no. 2 Point no. and coordinates are:
1  200.000   22.150   2  341.916   12.784

On boundary line no. 3 Point no. and coordinates are:
1    .000   35.350   2  200.000   22.150   3  244.250   39.850

On boundary line no. 4 Point no. and coordinates are:
1    .000   39.850   2  244.250   39.850   3  253.250   43.450   4  265.250   43.450   5  320.263   21.445
6  341.916   12.784   7  500.000    2.350

Line no. and slope of each segment are:
   1   -.066
   2   -.066
   3   -.066    .400
   4    .000    .400    .000   -.400   -.400   -.066

No. of radius control zones=  1   Plot or no plot=  1   No. of seepage cases=  1

Total no. of lines at bottom of radius control zones  is:   1

For rad. cont. zone no.  1   Radius decrement=     .000   No. of Circles=  5   Id no. for first circle=,  1
  Line no.=  1   Begin pt. no.=  1   End pt. no.=  2

Soil no.  Cohesion    F. angle    Unit wt.
   1    100.000      27.920     133.520
   2    270.000      33.020     132.140
   3      .000        .000      62.400

Seismic coefficient=     .000   Min. depth of tallest slice=     .000   Unit weight of water=   62.400

The factors of safety are determined by the SIMPLIFIED BISHOP method

NSPG= 1  NSRCH= 0  No. of slices= 10  No. of add. radii= 2

No. of points on water table for each case=  6

Under seepage condition 1point no. and         coordinates of water table are:
1    .000   39.850   2  244.250   39.850   3  275.619   32.813   4  320.263   21.445   5  341.916   12.784
6  500.000    2.350

point1=(  266.000,    64.000) point2=(  266.000,    44.000) point3=(  343.000,    44.000) NJ=   2 NI=   2
  Automatic search will follow after grid with XINC=   10.000 and YINC=   10.000

At point (  266.000,    64.000) under seepage   1,the radius and the corresponding factor of safety are:
     48.451   7.581      42.873   8.920      37.296   9.163      31.718   9.496      26.141   10.447
  Lowest factor of safety=    7.581 and occurs at radius =    48.451
```

At point (266.000, 54.000) under seepage 1,the radius and the corresponding factor of safety are:
38.472 7.768 32.893 8.891 27.314 8.745 21.735 8.576 16.156 9.643
25.454 8.561 23.595 8.528 19.875 8.686 18.015 8.930
Lowest factor of safety= 7.768 and occurs at radius = 38.472

At point (266.000, 44.000) under seepage 1,the radius and the corresponding factor of safety are:
28.494 8.566 22.953 9.595 17.412 9.082 11.871 9.899 6.330 12.088
21.106 9.172 19.259 9.118 15.565 9.144 13.718 9.636
Lowest factor of safety= 8.566 and occurs at radius = 28.494

At point (304.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
50.986 1.813 47.520 2.211 44.055 2.440 40.589 2.948 37.123 4.325
Lowest factor of safety= 1.813 and occurs at radius = 50.986

At point (304.500, 54.000) under seepage 1,the radius and the corresponding factor of safety are:
41.008 1.899 37.681 2.336 34.354 2.575 31.027 3.088 27.699 4.535
Lowest factor of safety= 1.899 and occurs at radius = 41.008

At point (304.500, 44.000) under seepage 1,the radius and the corresponding factor of safety are:
31.029 2.102 27.841 2.617 24.653 2.845 21.464 3.359 18.276 4.853
Lowest factor of safety= 2.102 and occurs at radius = 31.029

At point (343.000, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
53.522 2.151 52.408 2.477 51.295 3.214 50.182 4.685 49.069 8.336
Lowest factor of safety= 2.151 and occurs at radius = 53.522

At point (343.000, 54.000) under seepage 1,the radius and the corresponding factor of safety are:
43.543 2.293 42.569 2.636 41.594 3.375 40.620 5.180 39.645 9.350
Lowest factor of safety= 2.293 and occurs at radius = 43.543

At point (343.000, 44.000) under seepage 1,the radius and the corresponding factor of safety are:
33.565 2.502 32.729 2.889 31.893 3.654 31.058 5.908 30.222 10.803
Lowest factor of safety= 2.502 and occurs at radius = 33.565

For piezometric line No. 1

At point (304.500, 64.000) ,RADIUS 50.986
the minimum factor of safety is 1.813

At point (304.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
50.986 1.813 47.520 2.211 44.055 2.440 40.589 2.948 37.123 4.325
Lowest factor of safety= 1.813 and occurs at radius = 50.986

At point (314.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
51.645 1.697 48.790 2.169 45.935 2.443 43.080 3.015 40.226 4.732
Lowest factor of safety= 1.697 and occurs at radius = 51.645

At point (324.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
52.303 1.647 50.060 2.120 47.816 2.545 45.572 3.210 43.329 5.238
Lowest factor of safety= 1.647 and occurs at radius = 52.303

At point (334.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:

52.962 1.729 51.329 2.043 49.697 2.841 48.064 3.698 46.431 6.262
Lowest factor of safety= 1.729 and occurs at radius = 52.962

At point (324.500, 74.000) under seepage 1,the radius and the corresponding factor of safety are:
62.281 1.620 59.899 2.160 57.517 2.481 55.134 3.126 52.752 5.098
Lowest factor of safety= 1.620 and occurs at radius = 62.281

At point (324.500, 84.000) under seepage 1,the radius and the corresponding factor of safety are:
72.260 1.601 69.739 2.114 67.218 2.423 64.697 3.064 62.176 4.971
Lowest factor of safety= 1.601 and occurs at radius = 72.260

At point (324.500, 94.000) under seepage 1,the radius and the corresponding factor of safety are:
82.238 1.593 79.578 2.073 76.919 2.377 74.259 3.006 71.599 4.837
Lowest factor of safety= 1.593 and occurs at radius = 82.238

At point (324.500, 104.000) under seepage 1,the radius and the corresponding factor of safety are:
92.216 1.609 89.418 2.058 86.619 2.333 83.821 2.954 81.023 4.693
Lowest factor of safety= 1.609 and occurs at radius = 92.216

At point (334.500, 94.000) under seepage 1,the radius and the corresponding factor of safety are:
82.897 1.679 80.848 2.044 78.799 2.583 76.751 3.334 74.702 5.548
Lowest factor of safety= 1.679 and occurs at radius = 82.897

At point (314.500, 94.000) under seepage 1,the radius and the corresponding factor of safety are:
81.580 1.686 78.309 2.090 75.038 2.314 71.767 2.834 68.496 4.306
Lowest factor of safety= 1.686 and occurs at radius = 81.580

At point (327.000, 94.000) under seepage 1,the radius and the corresponding factor of safety are:
82.403 1.591 79.896 2.102 77.389 2.416 74.882 3.068 72.375 4.988
Lowest factor of safety= 1.591 and occurs at radius = 82.403

At point (329.500, 94.000) under seepage 1,the radius and the corresponding factor of safety are:
82.567 1.608 80.213 2.134 77.859 2.462 75.505 3.141 73.150 5.148
Lowest factor of safety= 1.608 and occurs at radius = 82.567

At point (327.000, 96.500) under seepage 1,the radius and the corresponding factor of safety are:
84.897 1.590 82.356 2.090 79.814 2.404 77.272 3.053 74.731 4.954
Lowest factor of safety= 1.590 and occurs at radius = 84.897

At point (327.000, 99.000) under seepage 1,the radius and the corresponding factor of safety are:
87.392 1.591 84.816 2.080 82.239 2.394 79.663 3.039 77.086 4.919
Lowest factor of safety= 1.591 and occurs at radius = 87.392

At point (329.500, 96.500) under seepage 1,the radius and the corresponding factor of safety are:
85.062 1.605 82.673 2.125 80.284 2.450 77.895 3.124 75.506 5.113
Lowest factor of safety= 1.605 and occurs at radius = 85.062

At point (324.500, 96.500) under seepage 1,the radius and the corresponding factor of safety are:
84.733 1.595 82.038 2.066 79.344 2.366 76.649 2.992 73.955 4.803
Lowest factor of safety= 1.595 and occurs at radius = 84.733

For piezometric line No. 1

At point (327.000, 96.500) ,RADIUS 84.897 the minimum factor of safety is 1.590

Cross section in distorted scale. Numerals indicate boundary line no. If there area more than 10 bound. lines, alphabets will then be used. P indicates Piezometric line. If a portion of Piezometric line coincides with the ground or another boundary line, only the ground or boundary line will be shown. X indicates intersection of two boundary lines. * indicates failure surface. The minimum factor of safety is 1.590