BLACK WARRIOR MINERALS, INC.
MINE NO. 1, P-3950, R-5
Addendum to ATTACHMENT II-H

PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION (880-X-8E-.06(1)(F))

This addendum to the PHC addresses the impacts of adding 28 mining acres and deleting 14 mining acres to the permit. The total permitted area increases from 340 to 354 acres.

1. PHC OF SURFACE MINING ACTIVITIES

A well inventory was conducted by McGehee Engineering Corp. in July of 2010 on the original permit application. Door to door interviews were conducted on occupied dwelling within one half mile of the permit boundary to determine if domestic wells were present. This inventory was updated in February of 2014. The updated inventory revealed that there are 16 new residences within the half-mile radius of the proposed Revision R-5 permit boundary of Mine No. 1 that were not surveyed with the original permit.

There was one new well located on Residence ID# 113 (previously ID# 97). The well is owned by Cecil F. & Janie C. Hatcher (1260 Crossfield Ln, Gardendale, AL, 35071) and is used to water a garden. The owner declined to have the well sampled. The other three wells were identified in the original survey. These wells are located on ID# 68, #71 and # 119. None of the three previously identified wells are currently in use.

The primary water source for all residents within the half- mile radius of Mine No. 1 is obtained from the Birmingham Waterworks. See Well Inventory and Hydro-Geo Map.

There were no other known seeps, springs, or underground discharges located within the permit area. During the drilling of the monitoring wells and exploration holes at this mine no stratigraphic horizons were observed to consistently produce water in usable quantities. None of the monitoring wells produced sufficient water continuously for even a domestic well.

Overburden material given in the Geochemistry part of the original permit application shows that significant changes in the pH of groundwater are not likely to occur. The overburden analyses spreadsheets show that the neutralization potential and potential acidity of the spoil material result in near neutral to slightly basic acid base accounts. The groundwater samples in Attachment II-F of this permit application indicate slightly acidic to near neutral conditions exist at this site.

The following chart shows the thickness-weighted averages for each overburden hole.

Drill Hole ID	Percent Sulfur	Neutralization Potential	Acid-Base Account	Tons/Acre Excess CaCO3
OB-1	0.1522	25.4441	20.6865	6088
OB-2	0.1519	21.3291	16.5821	4311
OB-3	0.1655	20.4928	15.3202	3595
Average	0.1565	22.422	17.5296	4664.67

The weighted averages indicate that there is sufficient alkaline material contained in the overburden at this mine to neutralize the amounts of acid forming material contained within the overburden. The thickness-weighted average is an average based on each individual drillhole. The thickness-weighted average includes all intervals down to the lowest coal seam to be mined but does not include the coal seams. Water that infiltrates will have to pass through the spoil. This material has buffering capabilities and is not potentially acid forming. Therefore, acid mine drainage at this site is not anticipated and no adverse changes in the pH are likely to occur.

All surface water from the proposed mine site will drain mainly to the south toward Crooked Creek. During mining, some pumping to the sediment basins will be necessary. Once reclamation is complete the ground water should continue to flow from areas of higher head to areas of lower head. Once reclamation is complete, surface water runoff will flow to the basins naturally with the help of diversions.

Onsite groundwater quality is expected to decrease slightly in the form of increased mineralization and a lower pH due to groundwater being in direct contact with unweathered material. Groundwater quantity is expected to increase significantly due to the additional fracturing of layers of shale and sandstone and creating voids by mining. After mining, groundwater movement near the permit boundary will be towards the mine site from areas adjacent to the permit area with higher topography. Infiltration, permeability and storage within the permit area should begin to decrease as regrading and revegetation along with weathering takes place. After years of weathering, compaction and chemical breakdown of the overburden it will begin to act as a soil again. With time the groundwater storage should approximate pre-mining conditions.

Surface water within the permit area consists of runoff in direct response to rainfall. There are no perennial streams or springs located within the permit boundary.

Baseline data collected at surface water DSW-1 (Crooked Creek downstream), USW-1A (U.T. to Crooked Creek upstream), and USW-1B (Crooked Creek upstream) are shown in the table entitled Pre-Mine Surface Water Baseline Data in the Surface Water Hydrology. Water quality projections are included for Station DSW-1 as submitted in the original permit, projections based on the mining area for Revision R-5 as well as a comparison to active mining data collected since 2011. Station DSW-1 has a drainage area 10,368 acres or 16.2 square miles

Any changes that may occur to the receiving stream are expected to be short term and should return to near pre-mining levels after reclamation.

Baseline Surface water quality at specific flow rates are given in the table entitled Surface Water Projections in the regression workbooks. The surface water projections show that all parameters are within EPA limitations.

The NPDES maximum and average limitations as set forth by ADEM for Mine No. 1 are as follows: The pH limit is between 6.0 - 9.0 s.u.; TSS maximum limit is 70 mg/l and the average is 35 mg/l; Fe maximum limit is 6.0 mg/l and the average is 3.0 mg/l; Mn maximum limit is 4.0 mg/l and the average is 2.0 mg/l.

However, the water quality is expected to be well within the limits as set forth by ADEM. This fact is demonstrated by the Comparison of Actual vs. Predicted Table in the Surface Water Projection

Based on information revealed in the Geochemistry and Groundwater sections of this application, impacts to the receiving streams will be minimal. The parameters most likely to be affected by this mining operation will be the pH, iron, manganese, and total suspended solids. With the removal of vegetation surface water runoff will increase. Sediment levels in surface water runoff will increase due to the vegetation being removed. Removal of vegetation will allow surface runoff to transport fine grained sediment into the receiving streams. The sediment levels in surface water runoff will be controlled by sediment basins. The long-term effects of mining at this site on surface water quality and quantity in Crooked Creek will be negligible. It can be concluded that based on the information from the regressions and water quality from the

adjacent previously mined areas little impact, if any, should occur to the groundwater and surface water regime as a result of this mining operation.

2. FINDINGS

The following are findings of the Determination of the Probable Hydrologic Consequences for the proposed permit area and adjacent area as determined based on baseline hydrologic, geologic and other site specific information for this permit application:

A. ADVERSE IMPACTS TO THE HYDROLOGIC BALANCE

Within the proposed permit area, a minor amount of water was encountered above and below the Jagger Coal Seam. Groundwater within the permit area appears to be contained in a poorly connected fracture system of the alternating sequences of sandstone and shales in the Pottsville Formation. This system forms isolated perched water tables with little areal extent.

B. ACID-FORMING OR TOXIC-FORMING MATERIALS

During the preparation of the Determination of the Probable Hydrologic Consequences for the proposed permit area and adjacent areas as determined based on baseline hydrologic, geologic and other site specific information collected for this permit application there is enough neutralization potential in the overburden to neutralize any acid forming material that might be encountered.

The only preventive or remedial measures necessary are in the handling of the coal stockpiles and immediate pit area. Coal stockpiles will be created by constructing a pad made of compacted clay or shale of acceptable permeability of desired thickness to carry the weight of loading and transportation equipment. Coal stockpiles will be graded or shaped and constructed

on a mild slope in a manner to provide adequate drainage and minimize contamination of water. Coal stockpiles will be located in such a manner whereas excess drainage may be diverted from coal stockpile areas. When the coal stockpile become no longer necessary it will be reclaimed by removing the coal which makes up the pad by truck, covering the pad area with four (4) feet of the best available non-toxic, non-combustible material and revegetating in accordance with the approved Reclamation Plan (Part IV-C-5). The pit bottom consist of alternating sequences of a sandy shale. According to drilling, there is no major potential acid forming material within the permit boundary. The only potential areas of acid forming material are coal stockpiles. The reclamation for coal stockpiles is outlined above.

C. CONTAMINATION, DIMINUTION OR INTERRUPTION OF WATER SOURCE

The only domestic, agricultural, or industrial uses of surface water within the proposed permit area or adjacent area was the small farm pond in the NE/SW of Section 9 believed to be used to water horses. The only other use of surface water within the proposed permit area or adjacent area would be Fish and Wildlife.

D. SEDIMENT YIELD

An estimate of the amount of sediment yield from the proposed permit area before, during and after mining was calculated using the Universal Soil Loss Equation (A = R K LS CP) as obtained from chapter five (5), pages 311-341, of **Applied Hydrology and Sedimentology For Disturbed Areas** by B. J. Barfield, R. C. Warner, and C. T. Haan. All "k" values for each soil type within the permit area were taken from the soil survey book from the appropriate county. All length slope factors were taken from slope lengths and slope steepness within the permit area.

The Universal Soil Loss Equation is dependent on the erosive power of rainfall, the soil erodibility, slope and slope length, degree of soil cover and conservation practices. The Universal Soil Loss Equation is based on the assumption that all sediment eroded away will enter the receiving stream. This equation does not take into account that some of the sediment will be deposited before entering the receiving stream.

Also, sediment basins are constructed on the outer perimeter of the permit area to control runoff and sediment leaving the permit area. The Sediment Basins have an average trap efficiency of 94.3 this trap efficiency will be calculated into the soil loss equation to get a more representative number for the actual amount of sediment leaving the permit area. Universal Soil Loss Equation (A = R K LS CP)* Basin Trap Efficiency.

A = COMPUTED SOIL LOSS IN TONS/ACRE PER YEAR * BASIN TRAP EFF

The basin trap efficiency is not applied to before mining and five years after reveg.

SOIL LOSS FOR INCREMENT 1

Basin Trap Efficiency 93.0%

Time Period	R	K	LS	Cp	A
Before Mining	350	0.30	24	0.500	1260.0
During Mining	350	0.24	24	0.900	127.0
2 Months after Reveg	350	0.30	24	0.140	24.7
12 Months After Reveg	350	0.30	24	0.050	8.8
5 Years After Reveg	350	0.30	24	0.009	22.7

SOIL LOSS FOR INCREMENT 2

Basin Trap Efficiency 93.0%

Time Period	R	K	LS	Cp	A
Before Mining	350	0.30	24.8	0.500	1302.0
During Mining	350	0.24	24.8	0.900	131.2
2 Months after Reveg	350	0.30	24.8	0.140	25.5
12 Months After Reveg	350	0.30	24.8	0.050	9.1
5 Years After Reveg	350	0.30	24.8	0.009	23.4

SOIL LOSS FOR INCREMENT 3

Basin Trap Efficiency 93.0%

Time Period	R	K	LS	Cp	A
Before Mining	350	0.30	24.2	0.500	1270.5
During Mining	350	0.24	24.2	0.900	128.1
2 Months after Reveg	350	0.30	24.2	0.140	24.9
12 Months After Reveg	350	0.30	24.2	0.050	8.9
5 Years After Reveg	350	0.30	24.2	0.009	22.9

SOIL LOSS FOR INCREMENT 4

Basin Trap Efficiency 93.0%

Time Period	R	K	LS	Cp	A
Before Mining	350	0.30	23.8	0.500	1249.5
During Mining	350	0.24	23.8	0.900	125.9
2 Months after Reveg	350	0.30	23.8	0.140	24.5
12 Months After Reveg	350	0.30	23.8	0.050	8.7
5 Years After Reveg	350	0.30	23.8	0.009	22.5

SOIL LOSS FOR INCREMENT 5

Basin Trap Efficiency 93.0%

Time Period	R	K	LS	Cp	A
Before Mining	350	0.30	18.6	0.500	976.5
During Mining	350	0.24	18.6	0.900	98.4
2 Months after Reveg	350	0.30	18.6	0.140	19.1
12 Months After Reveg	350	0.30	18.6	0.050	6.8
5 Years After Reveg	350	0.30	18.6	0.009	17.6

E. ACIDITY, TSS, TDS, FE, MN, PH

1. Acidity

The results of the overburden analysis presented in the Geochemistry part of this permit application indicates that the overburden's Neutralization Potential is significantly higher than the Maximum Potential Acidity. Based on the Neutralization Potential of the overburden, low Sulfates of the groundwater and surface water, and that the Alkalinity level of the surface water is more than the Acidity levels, the Acidity should not have any adverse effects onsite or offsite.

2. TSS, TDS, Fe, Mn, and pH:

The parameters most likely to be affected in the groundwater system onsite will be higher iron, manganese, and dissolved solids during active mining. Exposure of the overburden to oxidation during mining will release some of the neutralizing agents present in the spoil. The parameters most likely to be affected in surface water system onsite are a decrease in pH, an increase in iron, manganese, and total suspended solids. Total suspended solids will be controlled by using seven (7) sediment control structures. The pit configuration will minimize the impact on runoff quantity. All runoff will drain to the basins naturally. Once reclamation is complete surface water runoff should continue to flow to the basins naturally. These sediment basins will be designed to retain all settleable solids, skim and retain all floating solids, and provide adequate detention volume and time to minimize the contribution of suspended solids and dissolved solids into the receiving streams. Timely re-contouring and revegetation of the disturbed area will minimize contamination to the surface and groundwater systems.

F. FLOODING AND STREAMFLOW ALTERATIONS

During mining, sediment basins 041, 042, 044, 046, 103, 118 & 119 will be constructed in the outer perimeter of the proposed mine site. These sediment basins will have storm detentions to absorb the increase of surface run-off, if it should occur. This mining operation will not alter the drainage area of Crooked Creek. Therefore, the quantity of flow of the streams should not be adversely effected on or offsite.

G. GROUNDWATER AND SURFACE WATER AVAILABILITY

A well inventory was conducted by McGehee Engineering Corp. in July of 2010 on the original permit application. Door to door interviews were conducted on occupied dwelling within one half mile of the permit boundary to determine if domestic wells were present. This inventory was updated in February of 2014. The updated inventory revealed that there are 16 new residences within the half-mile radius of the proposed Revision R-5 permit boundary of Mine No. 1 that were not surveyed with the original permit.

There was one new well located on Residence ID# 113 (previously ID# 97). The well is owned by Cecil F. & Janie C. Hatcher (1260 Crossfield Ln, Gardendale, AL, 35071) and is used to water a garden. The owner declined to have the well sampled. The other three wells were identified in the original survey. These wells are located on ID# 68, #71 and # 119. None of the three previously identified wells are currently in use.

The primary water source for all residents within the half- mile radius of Mine No. 1 is obtained from the Birmingham Waterworks.

Probable Hydrologic Consequences Certification Statement:

I, Sanford M. Hendon, a Registered Professional Engineer, hereby certify that this Addendum to the Probable Hydrologic Consequences included in this application was prepared by McGehee Engineering Corp, under my direct supervision, and that the information included therein is correct and accurate tot he best of my knowledge and belief.

McGehee Engineering Corp.

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

ALABAMA REGISTERED No. 18208 PROFESSIONAL ENGINEER SANFORD M. HENDON

2-21-14
Date

BLACK WARRIOR MINERALS, INC.
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ORIGINAL PERMIT SURFACE WATER PROJECTIONS

STREAM STATION:	DSW-1	0	MINING RATIO :	0.0346
DRAINAGE AREA (square miles) :	16.2		RECESSION INDEX :	65
MINING AREA (acres):	359		PRECIPITATION :	56

	pH	TSS	Fe	Mn	SpC
X Coefficients	-0.3850	0.0014	0.0164	-0.2776	-0.2601
Constants	7.5185	0.9390	-0.3318	-1.0551	2.3700

PROJECTED DISCHARGE OF SEDIMENT BASINS BASED ON NPDES DISCHARGE LIMITS

	pH	TSS	Fe	Mn	SpC
	s.u.	mg/l	mg/l	mg/l	umhos/cm
During Mining	6.00	35	6.00	4.00	2000
After Mining	6.00	35	6.00	4.00	2000

LOW FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	0.12	7.87	9	0.45	0.16	403
During	0.13	7.80	10	0.64	0.29	455
After	0.13	7.80	10	0.64	0.29	457

AVERAGE FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	1.55	7.45	9	0.47	0.08	209
During	1.58	7.39	10	0.66	0.21	270
After	1.56	7.39	10	0.66	0.21	271

HIGH FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	80.26	6.79	9	0.50	0.03	75
During	81.64	6.76	10	0.69	0.16	141
After	80.81	6.76	10	0.69	0.16	141

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R-5 PERMIT SURFACE WATER PROJECTIONS

STREAM STATION:	DSW-1	0	MINING RATIO :	0.0341
DRAINAGE AREA (square miles) :	16.2		RECESSION INDEX :	65
MINING AREA (acres):	354		PRECIPITATION :	56

	pH	TSS	Fe	Mn	SpC
X Coefficients	-0.3850	0.0014	0.0164	-0.2776	-0.2601
Constants	7.5185	0.9390	-0.3318	-1.0551	2.3700

PROJECTED DISCHARGE OF SEDIMENT BASINS BASED ON NPDES DISCHARGE LIMITS

	pH	TSS	Fe	Mn	SpC
	s.u.	mg/l	mg/l	mg/l	umhos/cm
During Mining	6.00	35	6.00	4.00	2000
After Mining	6.00	35	6.00	4.00	2000

LOW FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	0.12	7.87	9	0.45	0.16	403
During	0.13	7.80	10	0.64	0.29	455
After	0.13	7.80	10	0.64	0.29	457

AVERAGE FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	1.55	7.45	9	0.47	0.08	209
During	1.58	7.39	10	0.66	0.21	269
After	1.56	7.39	10	0.66	0.21	270

HIGH FLOW

Mining Conditon	Flow cfsm	pH s.u.	TSS mg/l	Fe mg/l	Mn mg/l	SpC umhos/cm
Before	80.26	6.79	9	0.50	0.03	75
During	81.63	6.76	10	0.69	0.16	140
After	80.80	6.76	10	0.69	0.16	141

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COMPARISION OF ACTUAL VS PREDICTION

STREAM STATION:	DSW-1	0	MINING RATIO :	0.0341
DRAINAGE AREA (square miles) :	16.2		RECESSION INDEX :	65
MINING AREA (acres):	354		PRECIPITATION :	56

	pH	TSS	Fe	Mn	SpC
X Coefficients	-0.3850	0.0014	0.0164	-0.2776	-0.2601
Constants	7.5185	0.9390	-0.3318	-1.0551	2.3700

DISCHARGE OF SEDIMENT BASINS

	pH	TSS	Fe	Mn	SpC
	s.u.	mg/l	mg/l	mg/l	umhos/cm
redicted During Mining (based on NPDES parameters)	6.00	35	6.00	4.00	2000
Actual Mining (107 samples)	7.86	8.84	0.46	0.65	916

STATION DSW-1 LOW FLOW DURING MINING (< 5.0 CFS)

	Flow	pH	TSS	Fe	Mn	SpC
	cfs	s.u.	mg/l	mg/l	mg/l	umhos/cm
Predicted	2.08	7.35	10	0.66	0.21	255
Actual average (4 samples)	3.22	6.92	11	0.49	0.10	522

STATION DSW-1 AVERAGE FLOW DURING MINING (> 5.0 CFS and < 30.0 CFS)

	Flow	pH	TSS	Fe	Mn	SpC
	cfs	s.u.	mg/l	mg/l	mg/l	umhos/cm
Predicted	25.54	6.94	10	0.68	0.17	166
Actual average (3 samples)	9.49	7.56	5	0.55	0.10	377

STATION DSW-1 HIGH FLOW DURING MINING (> 30.0 CFS)

	Flow	pH	TSS	Fe	Mn	SpC
	cfs	s.u.	mg/l	mg/l	mg/l	umhos/cm
Predicted	1322.33	6.31	10	0.71	0.15	103
Actual average (4 samples)	54.92	7.44	7	0.38	0.06	212
Highest Flow sampled	77.52	6.65	6	0.53	0.60	179