ATTACHMENT II-H

DETERMINATION OF THE PROBABLE HYDROLOGIC CONSEQUENCES

Baseline data collected at surface water monitoring sites SW-3, SW-4, -2462708, and 0246053 are attached. Parameters analyzed at site SW-3, SW-4, -2462708, and 0246053 include pH, Total Iron, Total Manganese, Specific Conductance, Acidity, Alkalinity, and Sulfates. The log values of these parameters, except pH (which is already in $\log_{10}$ form), acidity, and alkalinity were plotted vs. the corresponding $\log_{10}$ value of the flow rate for both sites using Excel. The pH was plotted vs. the log of the flow (discharge) without alteration. The log value of sulfates were plotted vs. the log value of specific conductance. The plots for both sites are attached. The data values mentioned above were linear regressed by the 'least squares' method using Excel. Values for the square of the multiple correlation coefficient (R2), the intercept (b), and the slope (m) for each parameter are shown on each plot for Mud Creek (02462053) and an unnamed tributary to Buffalo Creek (-2462708). The regression line y = (m)x +(b) on the plot is used to predict surface water quality values below the mine site in the receiving streams at specific flowrates before mining by Shannon, LLC occurs. These specific flows are at the 7Q2, average, and 2 year floods. The method for calculating the 7Q2 flowrate in the receiving streams is shown in "Low-Flow Characteristics of Alabama Streams", Geological Survey of Alabama, Bulletin 117. Calculating average flow in the receiving streams is shown in "A Method of Estimating Average Streamflow and Headwater Limits in U.S. Army Corps of Engineers, Mobile District, Alabama and Adjacent States", U.S. Geological Survey, Water-Resources

Investigations, Open-File Report 81-59. The method of calculating the 2-year flowrate in the receiving streams is shown in "Magnitude and Frequency of Floods in Alabama", Water Resources Investigations Report 84-4191.

Surface water quality values for baseline conditions at these specific flowrates for surface water monitoring site 02462053 and -2462708 are shown in the attached Regression Workbook for 02462053 and Regression Workbook for -2462708. The surface water projections show that all parameters are within EPA limitations. Performance monitoring on the unnamed tributary to Buffalo Creek will be collected at surface water monitoring site -2462708. Performance monitoring on Mud Creek will be collected at surface water monitoring site 02462053 downstream of the mine site.

Information provided in the Weighted Average Overburden Analysis sheets for this site revealed that only one interval in DH-1727 at a depth of 380.0' - 385.0' was tested as being potentially acid-forming other than intervals located below the coal seams in DH-1726 and DH-1727 which were contaminated with coal. With timely reclamation, excess neutralization potential of the overburden material, and the location of these intervals within the stratigraphic column these intervals should not pose a problem. The weighted averages indicate that that there is more than sufficient alkaline material within the overburden at this proposed mine site to neutralize the minimal amount of potentially acid forming material.

Due to the fact that all overburden at this site does not occupy similar areas, intervals

shown in the attached results of geochemical analysis which are located in the upper portions of the drill logs occupy a smaller volume than intervals which are located closer to the bottom, consequently, their acid-base accounts do not contribute as substantially to the overall chemistry of the overburden. In an attempt to more accurately describe the acid-base potential of the overburden at the Shannon Mine No. 4 site, a spreadsheet which was developed at the Pennsylvania Dept. of Environmental Resources, Bureau of Mining and Reclamation was employed. This Overburden Analysis Spreadsheet only takes into account the volume occupied by each interval tested, but also the amount of coal lost into the spoil. The results of the Volumetric Overburden Analysis method from overburden geochemistry sites DH-12575, DH-12608, DH-14092, DH-14095, DH-1725, DH-1726, and DH-1727 are favorable: overburden at the Shannon Mine No. 4 contains an average of 18.77 (tons CaCO3/1000 tons overburden) excess neutralization potential.

As shown on the Hydro-Geo Map the proposed permit area is underlain by the abandoned works of Black Diamond Coal Mining Co.'s Shannon Mine and Sumter Mine. Both underground mines are within the Blue Creek Seam and have been extensively mined. There were no records found on the pre-law surface mining activities. The Upper New Castle, Lower New Castle, and Mary Lee are the only seams that outcrop within the proposed permit area. The Upper New Castle, Lower New Castle, Mary Lee, Blue Creek and Jagger Coal Seams have been surface mined within the proposed permit and adjacent areas. The Blue Creek Seam has been extensively underground mine within the proposed permit and adjacent areas. A

dewatering well will be installed to dewater the underground workings of the Blue Creek Seam if dewatering becomes necessary. Water from the dewatering well will be pumped to an approved basin for treatment priot to being discharged. There is no anticipated subsidence from the dewatering of the Black Diamond Coal Mining Co.'s Adger Mine. All underground mine openings encountered during mining will be mined through or sealed as outlined in the Engineering Section (Part III-A) of this application.

'During Mining' water quality estimates for the receiving stream is also given in the attached Regression Workbook for -2462708 and Regression Workbook for 02462053. All estimates for quality and quantity of the receiving stream during the mining of the proposed permit area is based on: 1) baseline surface water quality, 2) the size of the proposed permit area within its respective watershed, 3) the drainage area of each watershed of the receiving streams at their respective monitoring site, 4) the anticipated discharge quality of the sediment basins, and 5) the amount of previous disturbance within each watershed. During the development of "During Mining" surface water quality projections it was assumed that surface water leaving the mine site will meet EPA and ADEM effluent limitations but will be of the lowest quality, ie, will have a pH of 6 s.u., a FeT of 6 mg/l, a MnT of 4 mg/l, a TSS of 70 mg/l, and a SpC of 2000.

Surface water runoff in the proposed permit is in direct response to rainfall. Sediment levels in surface runoff will increase due to vegetation being removed. The sediment levels in surface runoff will be controlled by sediment basins around the perimeter of

the proposed permit area as designed in Part III-B of this application. Timely regrading and liming of revegetation as outlined in Part IV of this application will minimize exposure of unweathered overburden and result in conditions which could result in low quality surface water or groundwater discharge.

The long term effects of mining by Shannon, LLC on surface water quality and quantity in the receiving stream is also shown in the attached Regression Workbook for -2462708 and Regression Workbook for 02462053. Post mining surface water quality in the receiving streams will be of generally lower quality as compared to baseline values but this difference will be negligible due mainly to the large amount of previous disturbance within the watershed.

Groundwater encountered above the Jagger Seam within the proposed permit area has been significantly affected due to the previous surface and underground mining operations on all seams. Due to the fracturing of low permeability shale strata, groundwater availability within the permit area will increase. Groundwater quality within this interval within the proposed permit area should decrease somewhat due to increased conductivities, total iron, total manganese, sulfate levels, and decreased pH's due to groundwater being in direct contact with the unweathered material. The expected changes in mineralization and sulfates within this interval are not expected to be significant due to the amount of previous disturbance within the proposed permit area. Off-site groundwater in this interval is also not expected to be significantly affected due to the fact that mine site is bounded by previous disturbance.

Impact with respect to on-site groundwater quality for the aquifer located below the Jagger coal seam is not anticipated as a result of mining at this proposed mine site. The reasoning for this statement is largely due to the presence of on and off-site previous mining (pre-law and permanent program) on the Mary Lee Group. As shown in the Groundwater Section the average baseline of iron and sulfate levels for groundwater below the Jagger Coal Seam are indicative of coal related impact. This information indicates that impact to this interval has already occurred, therefore no significant additional impact is anticipated to occur either on or off-site.

As stated in Part II-F, a well inventory conducted by PERC Engineering Co., Inc. in June of 2011, revealed that there were sixty (64) structures (62 residences and an office and a church) within a ½ mile radius of the proposed permit area. See the Well Inventory Map for the location of groundwater users in relation to the proposed mine site. Of the sixty-two (62) residences, four (4) residences have groundwater wells. SM4-17 and SM4-20 use their wells for secondary purposes, SM4-36 & SM4-37 use the same well as their primary source of groundwater, and SM4-39 uses their well as a primary source of groundwater. One (1) residence SM4-14 has a well but does not use it as a source of water. See attached Well Inventory Summary and Well Analysis Sheets for pertinent information about the well inventory. These residences are located updip of the proposed mining operation and are not expected to be affected by this operation.

However, in the event that it is discovered that a groundwater user(s) exists within the ½ mile radius, and it is shown that mining by Shannon, LLC has diminished the quality or quantity of the well(s), one of the following methods of replacing the resident's domestic supply will be implemented: 1) an alternative source of groundwater for either shallow groundwater wells or wells with inadequate casing would involve drilling a new well in which the casing would penetrate an aquitard, such as shale below the lowest target coal seam, and the well would also terminate below the aquitard in water-producing strata, such as sandstone, or 2) connect the residence to an existing municipal water supply, or 3) other methods which replace the groundwater users supply and is agreeable to both the user and the operator will be considered an alternative.

During the drilling of the overburden and exploratory drill holes at this proposed mine site no stratigraphic horizons were observed to produce water in usable quantities. The only interval that produces enough water to be used as a primary source of water (domestic well) is the strata located below the Jagger Coal Seam which is the Jagger Bedrock. The three residences located within a ½ mile radius of the proposed mine site have wells that are drilled into the Jagger Bedrock. However, the Jagger Bedrock in this area is unsuited for domestic consumption without a filter system. The Jagger Bedrock aquifer has be affected by the previous mining within the surrounding area. Within the permit area, the movement of regional groundwater (Jagger Bedrock) is to the northwest and southwest which is in the direction of the axis of the Blue Creek Syncline which controls the dip of the local strata and to the

southwest which is the direction of plunge of the Blue Creek Syncline. Before and after mining groundwater movement will be controlled by topography and dip of the local strata. After mining groundwater movement within the proposed permit area will be controlled by the dip of the pit floor. Seeps and springs are not anticipated at this proposed site due to the dip of the strata being to the southwest and northwest which is dipping in the direction ot the axis of the Blue Creek Syncline. ll. If seeps and springs were to occur they would probably occur on the southwest end of the proposed permit which is the direction of the plunge of the overall strata. However, if seeps and springs were to occur the excess neutralization potential in the strata overlying the coal seams should prevent the formation of acid mine drainage. During mining, pumping to the sediment basins will be necessary due to the local strata dipping in the opposite direction of the topography. Once reclamation has been completed, surface water will flow to the basins naturally. As shown in the regressions and water quality projections of the receiving streams little impact, if any should occur as a result of this mining operation.

CERTIFICATION STATEMENT:

All information including surface water modeling, groundwater interpretations, and estimates of surface and groundwater impact estimated in Parts II-H was prepared for Shannon, LLC at the Shannon Mine No. 4 site, by me or under my supervision and I hereby certify that it is true and correct to the best of my knowledge or belief.

_____ Date:_____

W. Keith Madison, P.G.
Alabama Reg. No. 0122

PHC FINDINGS:

The findings of the preceding Determination of the Probable Hydrologic Consequences for Shannon, LLC at their Shannon Mine No. 4 is as follows:

A) Acid or toxic-forming materials:

Information provided in the Weighted Average Overburden Analysis sheets for this site revealed that only one interval in DH-1727 at a depth of 380.0' - 385.0' was tested as being potentially acid-forming other than intervals located below the coal seams in DH-1726 and DH-1727 which were contaminated with coal. With timely reclamation, excess neutralization potential of the overburden material, and the location of these intervals within the stratigraphic column these intervals should not pose a problem. The weighted averages indicate that there is more than sufficient alkaline material within the overburden at this proposed mine site to neutralize the minimal amount of potentially acid forming material.

Due to the fact that all overburden at this site does not occupy similar areas, intervals shown in the attached results of geochemical analysis which are located in the upper portions of the drill logs occupy a smaller volume than intervals which are located closer to the bottom, consequently, their acid-base accounts do not contribute as substantially to the overall chemistry of the overburden. In an attempt to more accurately describe the acid-base potential

of the overburden at the Shannon Mine No. 4 site, a spreadsheet which was developed at the Pennsylvania Dept. of Environmental Resources, Bureau of Mining and Reclamation was employed. This spreadsheet not only takes into account the volume occupied by each interval tested, but also the amount of coal lost into the spoil. The results of the Volumetric Overburden Analysis method from overburden geochemistry sites DH-12575, DH-12608, DH-14092, DH-14095, DH-1725, DH-1726, and DH-1727 are favorable: overburden at the Shannon Mine No. 4 contain an average of 18.77 (tons CaCO3/1000 tons overburden) excess neutralization potential.

Numerous exploratory drill holes within and adjacent to the proposed permit area were utilized to construct a Structure Contour Map for the bottom of the Jagger Coal Seam. See attached Hydro-Geo Map.

The only preventative and remedial measures necessary in the handling of coal stockpiles and tailings from the pit. Coal stockpiles will be located within the permitted and bonded area such that drainage from the area will be routed through one or more of the sediment basins that are to be constructed. In general an area will be graded to a relatively level state. Upon completion of the subgrade, a relatively impervious pad or liner will be constructed to a minimum thickness of 12 inches. The pad or liner will be made of a clayey material possessing a maximum permeability coefficient of 1×10^{-6} centimeters per second. The material will be placed in 6 inch compacted lifts to 95 percent of

the standard proctor density. A pad will be constructed of coal material over the relatively impervious pad or liner with material created by cleaning the coal in the pit. Small terraces and/or temporary diversions will be used as necessary to minimize surface runoff across the stockpile areas. After the stockpile area has served its useful purpose the pad material that can not meet market specifications will be buried within the permit area no closer than 30 feet from any remaining highwalls and 100 feet from any drainage courses and a minimum of 10 feet above the bottom of the lowest coal seam being mined and will be placed under a minimum of four (4) feet of the best available non-acid and non-toxic forming and non-combustible material. The pad area will be covered with four (4) of the best available non-acid and non toxic forming and non-combustible material and revegetating in accordance with the approved Reclamation Plan (Part IV-5).

B) Adverse impacts to the hydrologic balance:

Within the proposed permit area, minor amounts of water were encounter above the Jagger Coal Seam. Groundwater within the proposed permit area appear to be contained in a poorly connected fracture system of the alternating sequences of sandstone and shales in the Pottsville Formation. The poorly connected fracture system forms isolated percehed water tables with little aerial extent.

C) Contamination, diminution, and interruption of water source:

During Mining surface water quality estimates for the receiving stream is also given in the attached Regression Workbook for -2462708 and Regression Workbook for 02462053. All estimates for quality and quantity of the receiving stream during the mining of the proposed permit area is based on: 1) baseline surface water quality, 2) the size of the proposed permit area within its respective watershed, 3) the drainage area of each watershed of the receiving streams at their respective monitoring site, 4) the anticipated discharge quality of the sediment basins, and 5) the amount of previous disturbance within each watershed. During the development of "During Mining" surface water quality projections it was assumed that surface water leaving the mine site will meet EPA and ADEM effluent limitations but will be of the lowest quality, ie, will have a pH of 6 s.u., a FeT of 6 mg/l, a MnT of 4 mg/l, a TSS of 70 mg/l, and a SpC of 2000.

Groundwater encountered above the Jagger Seam within the proposed permit area has been significantly affected due to the previous surface and underground mining operations. Due to the fracturing of low permeability shale strata, groundwater availability within the permit area will increase. Groundwater quality within this interval within the proposed permit area should decrease somewhat due to increased conductivities, total iron, total manganese, sulfate levels, and decreased pH's due to groundwater being in direct contact with the unweathered material. The expected changes in mineralization and sulfates within this interval are not expected to be significant

due to the amount of previous disturbance within the proposed permit area. Off-site groundwater in this interval is also not expected to be significantly affected due to the fact that mine site is bounded by previous disturbance.

Impact with respect to on-site groundwater quality for the aquifer located below the Jagger coal seam is not anticipated as a result of mining at this proposed mine site. The reasoning for this statement is largely due to the presence of on and off-site previous mining (pre-law and permanent program) on the Mary Lee Group. As shown in the Groundwater Section the average baseline of iron and sulfate levels for groundwater below the Jagger Coal Seam are indicative of coal related impact. This information indicates that impact to this interval has already occurred, therefore no significant additional impact is anticipated to occur either on or off-site.

D) Sediment yield from disturbed areas:

The Universal Soil Loss Equation (A = R K LS CP) as shown in Chapter 5, pages 311-341, of "Applied Hydrology and Sedimentology For Disturbed Areas" by B. J. Barfield, R. C. Warner, and C. T. Haan. was used to estimate the amount of sediment delivered to the receiving stream from the proposed permit area. In the Universal Soil Loss Equation (A = R K LS CP); 'A' is represented as soil loss per unit of area in tons/acre, 'R' is the maximum 30-minute intensity for a given rainstorm, 'K' is the soil erodibility factor taken

from the soil survey book of the county where the mining is taking place, ‘LS’ is the length slope factor which is taken from the slope lengths and steepness within the permit area, ‘CP’ factor which is the effectiveness of cover material and conservation practices. As stated in “Applied Hydrology and Sedimentology For Disturbed Areas” the rate of erosion from an exposed area depends on the erosive power of rainfall, the soil erodibility, slope and slope length, degree of soil cover and conservation practices. The USLE does not take into account that soil leaving the proposed permitted will be deposited prior to being discharged into the receiving stream. The trapping efficiency of the sediment basins will be incorporated into the USLE to get a more representative number for the amount of sediment leaving the proposed permit area. The average sediment basin trapping efficiency for the proposed permit area is 92.0%. As stated in the Surface Water Section all basins are proposed as permanent water impoundments. As shown in the following Universal Soil Loss Equation calculations the basin trap efficiency was not use in the before mining calculations, however, is was used in the calculations for soil loss during mining, 2 months after revegetation, 12 months after revegetation, and 5 years after revegetation,

ESTIMATED SOIL LOSS PER INCREMENT

A = (R K LS CP)* Basin Trap Efficiency
Average Basin Trap Efficiency = 92%
All sediment basins are proposed as temporary water impoundments.

SOIL LOSS FOR INCREMENT NO. 1

Land Use Category	R	K	LS	CP	A tons/acre/yr.
Pre-mining	350	0.32	11	0.500	616.0
During Mining	350	0.24	11	0.900	66.5
2 Months after Reveg	350	0.24	11	0.140	10.3
12 Months after Reveg	350	0.24	11	0.050	3.7
5 Years after Reveg	350	0.24	11	0.009	8.3

SOIL LOSS FOR INCREMENT NO. 2

Land Use Category	R	K	LS	CP	A tons/acre/yr.
Pre-mining	350	0.32	15	0.500	840.0
During Mining	350	0.24	15	0.900	90.7
2 Months after Reveg	350	0.24	15	0.140	14.1
12 Months after Reveg	350	0.24	15	0.050	5.0
5 Years after Reveg	350	0.24	15	0.009	11.3

SOIL LOSS FOR INCREMENT NO. 3

Land Use Category	R	K	LS	CP	A tons/acre/yr.
Pre-mining	350	0.32	20	0.500	1120.0
During Mining	350	0.24	20	0.900	168.0
2 Months after Reveg	350	0.24	20	0.140	18.8
12 Months after Reveg	350	0.24	20	0.050	6.7
5 Years after Reveg	350	0.24	20	0.009	15.0

SOIL LOSS FOR INCREMENT NO. 4

Land Use Category	R	K	LS	CP	A tons/acre/yr.
Pre-mining	350	0.32	13	0.500	784.0
During Mining	350	0.24	13	0.900	84.17
2 Months after Reveg	350	0.24	13	0.140	13.2
12 Months after Reveg	350	0.24	13	0.050	4.7
5 Years after Reveg	350	0.24	13	0.009	10.6

SOIL LOSS FOR INCREMENT NO. 5

Land Use Category	R	K	LS	CP	A tons/acre/yr.
Pre-mining	350	0.32	12	0.500	672.0
During Mining	350	0.24	12	0.900	72.6
2 Months after Reveg	350	0.24	12	0.140	11.3
12 Months after Reveg	350	0.24	12	0.050	4.0
5 Years after Reveg	350	0.24	12	0.009	9.1

As shown above in the calculations for the Estimated Soil Loss Per Increment the post mining erosion is shown to be less than the pre-mining condition. This is due to portions of the proposed permit area being previously disturbed and that the basins are proposed as permanent water impoundments, and should continue to treat discharge from the proposed permit area, even after bond releases have been granted.

E) Acidity

Information provided in the Overburden Analysis sheets for this proposed mine site revealed that the overburden contains an average of 18.77 (tons CaCO3/1000 tons overburden) excess neutralization potential. Based on the Neutralization Potential of the overburden, low Sulfates of the surface water and groundwater, and that the Alkalinity levels are two to three times more than the Acidity levels, Acidity should not have an adverse effect at this proposed mine site.

F) TSS, TDS, Fe, Mn, pH, other:

The long term effects of mining by Shannon, LLC on surface water quality in the receiving stream is also shown in the attached Regression Workbook for -2462708 and Regression Workbook for 02462053. The parameters most likely to be affected onsite are a decrease in pH, an increase in total iron, total manganese, and total suspended solids. All parameters are expected to be within NPDES limitations. The total suspended will be controlled by sediment

basins. All basin will have to be pumped to during the mining operation. Once the reclamation has been surface water runoff will flow to the basins naturally. Timely regrading and liming of revegetation as outlined in Part IV of this application will minimize exposure of unweathered overburden and result in conditions which could result in low quality surface water or groundwater discharge. Post mining surface water quality in the receiving streams will be of generally lower quality as compared to baseline values but this difference will be negligible due mainly to the large amount of previous disturbance in the watershed.

G) Flooding or Streamflow Alterations:

Sediment basins will be designed to receive surface runoff from the disturbed areas within the proposed permit area. This proposed mining operation will not alter the drainage areas of Blue Creek and the unnamed tributary to Valley Creek.

H) Groundwater and Surface Water Availability:

As stated in Part II-F, a well inventory conducted by PERC Engineering Co., Inc. in June of 2011, revealed that there were sixty (64) structures (62 residences and an office and a church) within a ½ mile radius of the proposed permit area. See the Well Inventory Map for the location of groundwater users in relation to the proposed mine site. Of the sixty-two (62) residences, three (3) residences have groundwater wells. SM4-17 uses their well to water

livestock, SM4-36 & SM4-37 use the same well as their primary source of groundwater, and SM4-39 uses their well as a primary source of groundwater. One (1) residence SM4-14 has a well but does not use it as a source of water. All residences except for SM4-17, SM$-36, and SM$-37 use municipal water supplied by The Warrior River Water Authority as their primary source of water. See attached Well Inventory Summary and Well Inventory Sheets for pertinent information about the well inventory. These residences are located updip of the proposed mining operation and are not expected to be affected by this operation.

H) Other:

No other impacts are anticipated at this site.

I) Supplemental Information:

None required for this mine site.