ATTACHMENT II-E

GEOLOGY

GEOLOGY (880-X-8E-.06(2))

The CDM Mining & Equipment, LLC - Masseyline mine site is located in northeastern Jefferson County one (1) mile west/southwest of the town of Masseyline, Alabama in Sections 24, 25 and 36, Township14 South, Range 2 West as viewed from the Trafford U.S.G.S. 7.5 minute Quadrangle maps (See attached Mine Site Location Map and Hydro-Geo Map).

Masseyline mine will occupy approximately 367 acres and 367 acres will be bonded as mining area and will be disturbed in the mining process. An additional 11 acres will be bonded as incidental acres for the coal stockpile, office area, equipment storage, offsite sediment basins and primary haul roads PR-01, PR-02 and PR-03.

The mine site is located within the Locust Fork drainage basin and more specifically the Gurley Creek drainage basin of the Cumberland Plateau physiographic section as shown on page 5 of "Hydrologic Assessment of Area 23, Eastern Coal Province, Alabama". The Cumberland Plateau section is the southernmost section of the Appalachian Plateau's province of the Appalachian Highland Region. The Cumberland Plateau borders the Highland Rim section to the north, the Valley and Ridge province to the southeast and the Coastal Plane section to the southwest and consists of flat-topped high-elevation plateaus separated by deep, steep-sided valleys. Tops of the plateaus slope gently from the northeast to the southwest. The landforms are the result of differential erosion of the underlying strata with the more resistant rock of the great conglomerate of the Lower Coal Measures of the Appalachian Coal Field forming the ridges and the steep-sided valleys from erosional actions acting upon the softer strata below.

The proposed Masseyline Mine is located in the northeastern area of Jefferson County and is underlain by the Pottsville Formation of Pennsylvanian age of the Warrior Coal Field. The proposed site lies due west of the Pottsville Formation outcrop along the eastern edge of the Warrior Coal Field and is bordered on the east by the Pre-Pennsylvanian limestones, dolomites, sandstones, cherts and shales exposed during the anticlinal uplift of Murphree's Valley that has separated by uplift actions the Warrior Coal Field from the Cahaba Coal and exposed the hematites of Red Mountain in the Birmingham area. This has resulted in an outcrop of the Pottsville both west and east of the Pre-Pennsylvanian measures as described on page 8 of "Hydrologic Assessment of Area 23, Eastern Coal Province, Alabama". The seams to be mined are the Lick Creek, Jefferson and the Black Creek coal beds.

The Warrior Coal Basin is a homoclinal structure with all underlying strata tilted in the same direction with a near uniform dip angle. Strata generally trend to the northwest and dip southwestward plunging gently to the southwest thirty (30') feet to two hundred (200') feet per mile but generally averages approximately fifty (50) feet per mile. The proposed mine site is located in the north eastern portion of the Warrior Coal Field, southeast of the Coalburg Syncline. The homocline structure of the Warrior Coal Field has been formed by uplift of the Murphree Valley anticline and regional dip and strike of the strata have been modified locally by faults, folds and synclines. The coal seam outcrops along the eastern edge of the Warrior Field have been modified by a narrow synclinal trough resulting in a gentle upward fold of the immediate outcrop strata.

Structurally the Warrior Basin in synclinal in nature with the synclinal axis extending from north-central Mississippi in the west to north-central Alabama in the east. The syncline is tilted to the southwest with a regional dip of 30 to 200 feet per mile. Four (4) major structures found within the Warrior Basin that modify the basic dip of the Warrior Syncline are the Warrior, Coalburg and Arkadelphia Synclines and the Sequatchie Anticline. The fold axis of the synclinal trends is parallel to the Appalachian system in a northeast-southwest direction and plunge to the southwest with the regional dip. Faulting is generally found perpendicular to the fold axis of the synclinal trend and tend to be high angle.

The strata which have been exposed by old un-reclaimed surface coal mining operations and existing outcrops in the vicinity of Masseyline Mine includes weathered sandstones, sandstone, interbedded sandstones and shales, shales and coal associated with the Black Creek Group. According to historical data published in "Depositional Setting of the Pottsville Formation in the Black Warrior Basin", the Black Creek Group lies approximately 100 to 300 feet above the "J" Group and from 40 to 130 feet below the Mary Lee Coal Group with the Black Creek Group occurring within a stratigraphic interval from 45 to 160 feet thick.

The coal seams to be mined at this site are the Lick Creek, Jefferson and Black Creek. The site consists of open highwall left from pre-law (pre-1969) surface coal mining operations that have disrupted natural drainage flows and have resulted numerous natural pools, chance vegetation and spoil piles. Bethel Road intersects and divides the proposed mine site and the area to the north of Bethel Road has been reclaimed by a Bureau of Land Management-Abandoned Mine

Lands program. From Bethel Road to the north, the highwall has been eliminated and reclaimed along with the existing spoil piles developed with the previous mining operations. It appears that the operations have mined through Gurley Creek to remove the Black Creek Coal seam due north of the proposed permit but within the 100' stream setback. Due to these factors, the Black Creek Coal seam does not outcrop at any point on the proposed permit but drilling data have shown that the bottom elevation of the seams occurs from a low elevation of 430.61' MSL at DH#18 to a high elevation of 544.17' MSL at DH#24 and averages 26.52 inches in thickness. Overburden thickness above the Black Creek seam averages 98' in thickness with a maximum thickness of 130' over the proposed minable area of the permit. Outcrops have been severed on both the Lick Creek and the Jefferson seams by previous mining. Both coal seams can be viewed in the existing highwalls. To the west of these highwalls, both the Lick Creek and Jefferson outcrop along the drainage channels with the Lick Creek outcropping from a low elevation of 520' MSL along the drainage channels to a high of 550' MSL in the extreme northwest area of the permit. Following the same analogy, the Jefferson seam outcrops from a low elevation of 505' MSL to a high of 550' MSL following the existing drainage channel from the southeast to the northwest. (See Hydro-Geo Map and/or Permit Map for the location of coal outcrops.) The Lick Creek shows to be continuous in areas above the existing outcrop elevations but exhibits random partings with a low seam thickness of 7" in the top split of DH#24 to a high seam thickness of 27" in DH#15 and an overall average thickness of 23.80". Using the same methodology, the Jefferson seam shows to be continuous in areas above the existing outcrop elevation and also exhibits random partings with a low seam thickness of 6" in both the top and bottom splits of DH#15 to a high seam thickness of 40" in DH#2.

The lithology description for this site has been developed from a composite of four (4) overburden sample drill holes drilled by CDM Mining & Equipment, LLC. using a Chicago Pneumatic CP-650 utilizing a 6-3/4 inch drill bit and by twenty-eight (28) exploratory rotary drill holes drilled by and under the supervision of personnel of CDM Mining & Equipment, LLC utilizing the same equipment. (See drawings entitled Overburden Columns for a graphical representation of the four (4) overburden sample borings and Drillhole Columns - Sheet 1 of 3, Drillhole Columns - Sheet 2 of 3 and Drillhole Columns - Sheet 3 of 3 for a graphical representation of the twenty-eight (28) exploratory drill holes.)

To more accurately describe the lithology of the proposed permit area, five (5) geologic fence diagrams (cross-sections) have been developed at strategic locations. The locations of these geologic cross-sections of the mine area are shown on the Hydro-Geo Map and are designated as Geologic Section A-A', Geologic Section B-B' , Geologic Section C-C', Geologic Section D-D' and Geologic Section E-E' are generated by the digital geologic model as described in the following text.

The lithology description was developed as a composite of the four (4) overburden sample drill holes drilled by CDM Mining & Equipment, LLC using a Chicago Pneumatic utilizing a 6-3/4 inch drill bit and by twenty-eight (28) exploratory rotary drill holes drilled by and under the supervision of CDM Mining & Equipment, LLC utilizing the same equipment.

Incorporating these exploration drillhole data, overburden sample drillhole data and surface contour data, a digital model of the entire proposed mine site has been developed using Carlson

Mining 2012 with AutoCad 2012 computer software. The methodology of this software constructs a geologic model of the mine site by constructing a surface grid file on 20' X 20' spacing to determine the top limits of the said geologic model. Strata grid files are then developed to correspond to the same 20' X 20' grid spacing for the bottom elevation of each strata layer from the top limit elevation surface grid to the bottom elevation grid of the Black Creek Coal seam. (Note that all drillhole and/or overburden column drawings are shown in the drawings with the legend and descriptions of the corresponding strata grid files.) These surface and strata grid files are correlated from the top (ground surface) to the bottom (bottom of Black Creek coal) and are defined by a Pre-Calculated Grid file which constitutes the geologic model for the site. All grid files other that the surface (top) grid are based on the drillhole data developed from exploration drilling at the site.

Once the geologic model has been constructed, geologic fence diagrams, cross-sections and volumetric calculations can be constructed as required. (See MW-1/OB-1, MW-2/OB-2, MW-3/OB-3 and MW-4/OB-4 for detailed drawings showing the overburden sequences/lithology of the overburden sample holes as well as specific data on the wellhead appliances installed in each overburden sample/monitoring well hole.) Overburden lithology remains constant across the extent of the proposed mine site. See enclosed drawings of these exploratory drill columns for geologic details of the overburden and exploratory drill holes shown by Overburden Columns and by Drillhole Columns - Sheet 1 of 3, Drillhole Columns - Sheet 2 of 3 and Drillhole Columns - Sheet 3 of 3. The following table lists the historical drillhole data and personnel in charge of drilling operations corresponding to the graphical exploration drill columns depicted below in Exhibit 2.1.

EXHIBIT 2.1		
Drill Hole ID	Drilling Supervisor	Drill Date
MW-1(OB-1)	CDM Personnel	10/2008
MW-2(OB-2)	CDM Personnel	10/2008
MW-3(OB-3)	CDM Personnel	10/2008
MW-4(OB-4)	CDM Personnel	10/2008
DH#01	CDM Personnel	10/2008
DH#02	CDM Personnel	10/2008
DH#03	CDM Personnel	10/2008
DH#04	CDM Personnel	10/2008
DH#05	CDM Personnel	10/2008
DH#06	CDM Personnel	10/2008
DH#07	CDM Personnel	10/2008
DH#08	CDM Personnel	10/2008
DH#09	CDM Personnel	10/2008
DH#10	CDM Personnel	10/2008
DH#11	CDM Personnel	10/2008
DH#12	CDM Personnel	10/2008
DH#13	CDM Personnel	10/2008
DH#14	CDM Personnel	10/2008
DH#15	CDM Personnel	10/2008
DH#16	CDM Personnel	10/2008
DH#17	CDM Personnel	10/2008
DH#18	CDM Personnel	10/2008
DH#19	CDM Personnel	10/2008
DH#20	CDM Personnel	10/2008
DH#21	CDM Personnel	10/2008
DH#22	CDM Personnel	10/2008
DH#23	CDM Personnel	10/2008
DH#24	CDM Personnel	10/2008
DH#25	CDM Personnel	10/2008
DH#26	CDM Personnel	10/2008
DH#27	CDM Personnel	10/2008
DH#29	CDM Personnel	10/2008

According to the "Hydrologic Assessment of Area 23, Eastern Coal Province, Alabama", the regional dip of the Pottsville formation is to the southwest but due to northeast limb of the Warrior Coal Field synclinal structure the local strike has been distorted from general Warrior Field values by its proximity to the Murphree Valley anticline and the strike is approximately South 46° 44' West and the strata dips to the northwest at about 2.65 degrees.

The total sulfur percentages of the coal seam to be mined at this proposed site is listed below. These totals are based on core samples taken during the exploration drilling process.

Seam	Percent Sulfur (Dry)
Lick Creek	2.38%
Jefferson	2.86%
Black Creek	0.70%

CHEMICAL ANALYSIS OF OVERBURDEN

Per the requirements of Section 880-X-8E-.06(2) chemical analysis of the geologic strata to be disturbed in the mining process were conducted. Methodology is described as follows:

(1) Four (4) overburden drill holes have been drilled at the proposed mine site to document the chemical properties of the overburden materials and for acid base accounting purposes. These drill holes were drilled with a Chicago Pneumatic CP-650 rotary air drill and the overburden cuttings generated by the process were collected in five (5) foot intervals, logged, labeled and prepared for laboratory analysis. The cuttings were sampled in minimum five (5) foot increments and at each change of the lithology of the overburden materials. In some instances due to drilling constraints and to maintain continuity the five (5) foot interval may not be maintained but these instances are rare and generally the required sample intervals have been maintained. The geologic properties of the overburden strata are noted in the geologic logs listed in Exhibit 2.2 and a graphical representation of the lithology at each overburden testing site is depicted by the drawing entitled Overburden Columns.

(2) Samples collected in the field were then packed in chronological order, packed and shipped for analysis to Standard Laboratories, Inc. located in Whitesburg, Kentucky. Chemical analysis was performed on each lithologic unit by a laboratory test for the total sulfur of that unit. Using industry standard methodology the total sulfur is converted to potential acidity by multiplying total sulfur percent by 31.25. The results of these analyses determine potential acidity and are reported in tons of calcium carbonate equivalent per 1000 tons of material. Any overburden with a potential acidity less than

zero (0) tons calcium carbonate equivalent per 1000 tons of overburden material is not considered acid or toxic-forming. The final laboratory reports from Standard Laboratories, Inc reported Acid Base Accounts of each strata interval. This Acid Base Account reported Potential Acidity, Paste pH, Total Sulfur (Dry Basis), Neutralization Potential and Net Potential Surplus/Deficiency (+/-) Results of all chemical analysis for each strata sampled are listed by drill hole in Exhibit 2.3.

(3) Neutralization potential is the ability of strata units to neutralize acid material and is reported in tons of calcium carbonated equivalent per 1000 tons of material. The results of overburden analyses for this parameter are listed in Exhibit 2.3.

(4) Acid-base account is a mathematical determination developed by calculating the neutralization potential minus potential acidity. This parameter is the results of these calculations reported as a deficiency (-) or excess (+) for each geologic column interval.

(5) Due to the extent of previous mining and lack of reclamation, areas of influence were considered only on non-mined areas of the proposed permit. Previously mined areas will be utilized for spoil placement only.

(6) From the chemical data determined by Standard Laboratories, Inc. the composite results of all overburden intervals have been tabulated using the industry standard spreadsheet program designed by the Pennsylvania Department of Environmental Resources, Bureau of Mining and Reclamation.

(7) According to the results of the overburden analysis spreadsheets each overburden hole and corresponding area of influence shows a deficiency of native alkaline materials to neutralize all acid forming strata. See Exhibit 2.4 for spreadsheet outputs for each

overburden hole. The following table shows the mass-weighted averages for each overburden hole.

Drill Hole ID	Percent Sulfur	Neutralization Potential	Acid-Base Account	Tons/Acre CaCO3 (Deficiency*)
MW-1/OB-1	0.1884	2.2176	-3.6714	(145)
MW-2/OB-2	0.0589	1.2890	-0.5517	(17)
MW-3/OB-3	0.2661	0.1798	-8.1372	(1512)
MW-4/OB-4	0.0095	0.0179	-0.2805	(574)

* Parentheses indicate deficiencies of native alkaline materials

The Geology sections of this permit application were prepared by Jerry W. Williams who is licensed by the State of Alabama as a Professional Engineer. I certify that the information in this section is correct and accurate to the best of my knowledge and belief.

Jerry W. Williams,
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