Black Warrior Minerals, Inc.
Mine No. 2, P-39__
ATTACHMENT IV-C-2

TOPSOIL VARIANCE APPLICATION

Prepared by:

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INTRODUCTION

Section 880-X-10C-(5) of the Rules and Regulations of the State of Alabama Surface Mining Commission allows for substituting selected overburden materials for topsoil "if the person who conducts surface mining activities can demonstrate to the State Regulatory Authority that the resulting soil medium is equal to or more suitable for sustaining revegetation than the available topsoil, and the substitute material is the best available to support revegetation". The purpose of this study is to prove that the criteria stated above is met for Black Warrior Minerals, Inc. at the proposed Mine No. 2 site so that selected overburden may be utilized. This study is requesting a topsoil variance in favor of a heterogeneous overburden at the Mine No. 2 - Permit P-39__. The total acreage for the permit area is approximately 1,348.0 acres. Black Warrior Minerals, Inc. is requesting a Topsoil Variance on the entire permit area with the exception of prime soils (Nauvoo Fine Sandy Loam, 2-8% Slopes). Of the 1,348.0 acres approximately 1,307.0 acres will be mining acres and 41.0 acres will be roads, ponds, offices and equipment storage areas. There are 2.0 acres of soil in Increment No. 4 to be saved and redistributed. The proposed Topsoil Variance will apply to 118.0 acres in Increment No. 1, 294.0 acres in Increment No. 2, 122.0 acres in Increment No. 3, 440.0 acres in Increment No. 4, and 372.0 acres in Increment No. 5.

MINE SITE INFORMATION

Mine No. 2 occupies approximately 1,348.0 acres of which approximately 1,307.0 acres are mining acres and 41.0 acre is ponds access roads and haul roads. Mine No. 2 is located in 2, 3, 9, 10, 11, 14, 15, & 16, Township 15 South, Range 3 West, all located in Jefferson County, Alabama as found on the Gardendale U.S.G.S. Quadrangles. The attached Soils Map, shows the Mine site location, soil types within the permit area, previously mined areas, drill hole locations, topsoil and overburden collection sites.

SOILS PRESENT BEFORE MINING

Soils present within the permit area are as follows:

Palmerdale Complex	Steep	(Previously Mined)
Montevallo- Nauvoo Association	Steep	
Nauvoo Fine Sandy Loam	2-8% Slopes	
Nauvoo Fine Sandy Loam	8-15% Slopes	
Sullivan-State Complex	0-2% Slopes	

LAND USE

The pre-mining land use of the permitted area consists of previously mined area and unmanaged timberland. The proposed post mining land use of the permit area will be Undeveloped/No Current Use. The proposed revegetation will be grasses on all disturbed areas.

SOIL DESCRIPTIONS

The following descriptions were obtained from the Jefferson County Soil Conservation Service.

29—Montevallo-Nauvoo association, steep. This map unit consists of soils on strongly dissected areas of sandstone and shale plateaus in the northern and western parts of the county. Extensive surface and deep mining of coal occur in this area. The underlying layers of sandstone, siltstone, shale, and coal are nearly level. The ridges are commonly underlain by sandstone, and the side slopes are generally underlain by shale and siltstone. The soils are in a regular pattern that is closely related to landscape position and underlying parent material. Areas of this map unit are large. Slope ranges from 6 to 55 percent.

Montevallo soils, on the steep sides of ridges, make up about 40 percent of the map unit. Typically, the surface layer is very dark gray shaly silt loam and dark grayish brown shaly silt loam about 6 inches thick. The subsoil is yellowish brown very shaly silt loam about 10 inches thick. The underlying material is weathered siltstone and shale (fig. 8). The slope of Montevallo soils in this map unit is generally more than 15 percent.

Nauvoo soils, on ridgetops and ridge sides, make up about 25 percent of most areas. Typically, the surface layer is dark grayish brown fine sandy loam about 6 inches thick. The subsoil is about 36 inches thick. The upper 6 inches is yellowish brown fine sandy loam, and the lower 30 inches is yellowish red clay loam. The underlying material is soft, highly weathered sandstone. The slope of Nauvoo soils in this map unit is generally 6 to 15 percent.

The available water capacity is very low for Montevallo soils and moderate for Nauvoo soils. In most years, there are periods in which soil moisture is not adequate for optimum plant growth. These periods are longer for Montevallo soils. Both soils are moderately permeable and have a low shrink-swell potential. Surface runoff is rapid for Montevallo soils and moderately rapid for Nauvoo soils. If these soils do not have plant cover, sheet and rill erosion is a very severe hazard for Montevallo soils and a severe hazard for Nauvoo soils. The surface layer of both soils is strongly acid to very strongly acid. Nauvoo soils can be tilled within a wide range in moisture content.

Minor soils in this association are Alien, Docena, Gorgas, Holston, State, Sullivan, and Townley soils. Also some areas have sandstone bedrock outcrop, and a few M have been surface mined for coal. Alien and Holston soils are on fans, foot slopes, and toe slopes. Docena, State, and Sullivan soils are in depressionsdrainageways, and on flood plains. Gorgas soils are on side slopes. Townley soils, the most extensive of the minor soils, are on ridgetops and upper sides of ridges; slope ranges from 10 to 25 percent. These minor soils and Rock outcrop make up about 35 percent of the map unit.

The soils of this map unit are used primarily for woodland. Many small areas have been altered by surface mining of coal. A few small areas are used for cultivated crops and pasture.

Montevallo soils are not suited to cultivated crops, pasture, or hay because of steep slopes, the hazard of erosion, and shallow soil depth. Areas of Nauvoo soils and the minor Townley soils are suited to these uses, but they are limited by slope and the hazard of erosion. Areas of these soils are generally long and narrow, small, and poorly accessible.

The soils of this map unit are suited to woodland use. Suitable species, productivity potential, and management problems are variable.

Montevallo soils are suited to coniferous trees, and the potential productivity is moderate. However, the steep and shallow soil depths are limitations. During wet seasons windthrow of trees is a moderate hazard. Constructing and maintaining roads for logging, loading, areas, and fire lanes is difficult on these soils. Poor harvesting techniques can cause severe erosion.

Nauvoo soils are well suited to coniferous and deciduous trees, and the potential productivity is moderate to high. There are no significant management concerns. These soils are well suited to constructing and maintaining roads for logging, loading areas, and fire lanes. If grading is necessary for loading areas, stockpiling of the surface layer material and re-spreading it after harvest will help vegetation restoration.

Montevallo soils are not favorable for residential and industrial uses because of steep slopes and shallow soil depth. Septic tank effluent may flow out to the surface because of pressure caused by elevation difference, or it flow laterally or downslope through rock cracks, and then surface around residential units at a lower elevation. Plant growth is difficult to maintain on the steep, shallow Montevallo soils. Extensive excavation is needed to prepare dwelling sites on these soils, and potential soil loss is severe. Nauvoo soils are favorable for residential and industrial uses, but slope is a limitation. Also, areas of Nauvoo soils and the included Townley soils are generally long and narrow and are poorly accessible.

The soils of this map unit are suited to most low traffic recreation uses. Nauvoo soils are better suited to most recreation facilities than Montevallo soils.

A few sites are suitable for pond construction. Many areas of Montevallo soils have suitably shaped basins. However, these soils are shallow in depth and have poor reservoir basins. In such basins, excessive seepage may occur through rock cracks and old root channels. Also, suitable soil material for dams is not available.

Surface and subsurface mining of coal is extensive in many areas of these soils. Reclaiming these soils after surface mining operations is difficult because of the remaining steep slopes, the droughty nature of rock spoil, and the wide variation of reaction. Grading and reapplying topsoil will help reduce these problems. Most of the needed topsoil can be stockpiled onsite before

mining. Montevallo soils are a poor source of topsoil because they are shallow and have steep slopes. A much thicker layer of topsoil can be obtained from some minor soils, primarily

Nauvoo, Alien, and Holston soils. The loamy subsoil of these soils can be modified for suitable rooting medium by applying lime and fertilizer and by minimizing tillage.

The Montevallo soils are in capability subclass Vlle and in woodland ordination group 4d. The Nauvoo soils are in capability subclass IVe and in woodland ordination group 2o.

30—Nauvoo fine sandy loam, 2 to 8 percent slopes. This is a gently sloping to sloping, well drained soil on medium to broad ridgetops and upland plateaus that are underlain by sandstone. Slopes are convex. The landscape also has a few small, upland drainage ways, and some areas have weakly expressed knolls and depressions. Areas are 20 to 200 acres or more and irregular in shape.

Typically, the surface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsoil is about 42 inches thick. The upper 5 inches is strong brown loam; the next 18 inches is yellowish red sandy clay loam; and the lower 19 inches is mottled yellowish red, red, and yellowish brown sandy clay loam. Below the subsoil is about 4 inches of loam mottled in shades of red, brown, and yellow. The underlying material is highly weathered, red and yellow sandstone. In places, the soils are similar to Nauvoo soils except that the subsoil is yellower, the soil is 50 to 60 inches thick, or the depth to weathered sandstone is 60 to 70 inches. In some places, the slope is more than 8 percent.

The available water capacity of this soil is moderate. However, in most years there are periods during the growing season in which soil moisture is not adequate for optimum plant growth. Permeability is moderate, and the shrink-swell potential is low. Surface runoff is moderately slow. If this soil is cultivated, sheet and rill erosion is a moderate hazard. Unless limed, the surface layer is strongly acid to very strongly acid. This soil can be tilled within a wide range in moisture content.

Included with this soil in mapping are areas of Docena, Gorgas, Montevallo, Sullivan, and Townley soils. Also included are soils that are similar to the Nauvoo soil except that they have moderately slowly permeable subsoil or are 40 to 60 inches deep to hard bedrock. The included soils make up about 20 percent of the map unit. Docena, Gorgas, Montevallo, and Sullivan soils are contrasting soils, and use and management are different from Nauvoo soils. These contrasting soils make up about 15 percent of most areas.

This soil is used primarily for cultivated crops, pasture, and hay crops. Many areas adjacent to roads are used for residential sites.

This soil is well suited to cultivated crops. Slope and the hazard of erosion are limitations (fig. 9). Plant cover is needed half of the time. Terracing, contour stripcropping, contour farming, using cover crops, using minimum tillage, returning crop residue to the soil, and establishing

grassed waterways help to control erosion. Seedbeds can be prepared by minimum tillage. Crops respond well to irrigation.

This soil is well suited to pasture and hay. There are no significant management concerns.

Coniferous and deciduous trees are well suited to this soil, and the potential productivity is high. There are no significant management concerns.

This soil has many favorable properties for residential uses. Low strength is a moderate limitation for local roads and streets. In areas that are to be cut and filled, the surface layer should be removed, stockpiled, and respread to provide a good rooting medium for plants. Septic tank absorption fields function well on this soil. This gently sloping to sloping soil is favorable for industrial and commercial sites because only a small amount of cutting and filling is needed.

This soil is well suited to most recreation uses. In some areas, grading is needed for sites for intense recreation uses. The surface layer should be removed before grading, stockpiled, and respread to provide a good rooting medium for plants.

Many sites for pond construction exist on this soil. Seepage and the underlying highly weathered sandstone are moderate limitations. To minimize the risk of seepage, construction materials should not be removed from the reservoir floor.

This Nauvoo soil is in capability subclass lie and in woodland ordination group 2o.

35—Palmerdale complex, steep. This complex consists of steep, somewhat excessively drained Palmerdale soils and other soils on surface mining spoil piles. The sediment-producing slope and highwalls have convex slopes. The sediment-receiving benches, drainageways, and basins have concave slopes (fig. 10). Slope ranges from 15 to 60 percent in most areas. Areas are 40 to 1,000 or more acres and irregular in shape. The areas of Palmerdale soils and other soils in this complex are so intricately mixed, or so small, that mapping them separately was not practical.

Palmerdale soils and similar soils make up about 70 percent of the map unit. Typically, Palmerdale soils are more than 60 inches thick. The soil is dark gray very shaly silt loam. In places, soils are similar to Palmerdale soils except that they are medium acid to moderately alkaline, or they have slopes of less than 15 percent.

Other soils on benches, in drainageways, and in basins make up about 20 percent of the map unit. These soils are more than 60 inches thick. Typically, they have a silt loam surface layer about 10 inches thick. The underlying material is very shaly silt loam.

The available water capacity for Palmerdale soils is low. There are lengthy periods in which soil moisture is not adequate for optimum plant growth. Palmerdale soils are moderately rapidly permeable and have a low shrink-swell potential. These soils are subject to subsidence. Surface

runoff is very rapid. The hazard of rill and channel erosion is very severe. The surface layer is strongly acid to very strongly acid in Palmerdale soils and medium acid to moderately alkaline in soils similar to Palmerdale soils.

Included in mapping are areas of Montevallo, Nauvoo, and Townley soils. The included soils and areas of escarpments, highwalls, and bedrock outcrop make up about 10 percent of the map unit.

The soils are not suited to cultivated crops, pasture, and hay because of steep slopes, fragments on the surface, and the droughty nature of the soils.

Present land use of these soils is oriented primarily towards reclamation and establishment of trees (fig. 11).

Reclaiming Palmerdale soils is difficult because of steep slopes, the hazard of erosion, droughtiness, and the acidity of the soil. In addition, north facing slopes are subject to soil freezing to a depth of several inches and "frost heave" during thawing. Some of the problems of reclamation can be minimized by applying topsoil from other soils and adding lime and fertilizer. The information in table 12 should be used to locate sources of topsoil.

Palmerdale soils are suited to coniferous and deciduous trees; the potential productivity is moderate. Coniferous trees are generally favorable trees to establish on these soils. Management concerns include a severe erosion hazard, a severe equipment use limitation, and a severe seedling mortality rate. Some areas are not accessible because of slope gradients and the location of highwalls. Other soils on benches and toe slopes and in basins and drainageways have a higher potential productivity than Palmerdale soils. The alkaline soils are poorly suited to most trees, especially pines.

The soils of this map unit are in capability subclass Vlls and in woodland ordination group 3x.

39—**Sullivan-State Complex, 0 to 2 percent slopes.** This complex consists of nearly level, well drained Sullivan soils on flood plains and well drained State soils on stream terraces. The drainage basins on which these soils are located are dominated by sandstone and shale. Areas are 40 or more acres and long and narrow. The areas of Sullivan and State soils are so intricately mixed, or so small, that mapping them separately was not practical.

Sullivan soils and similar soils make up about 50 percent of the map unit. Typically, the surface layer of Sullivan soils is dark brown silt loam about 4 inches thick. The subsoil is about 35 inches thick. The upper 16 inches is dark yellowish brown silt loam, and the lower 19 inches is very dark grayish brown loam. The underlying material is dark brown sandy loam to a depth of more than 60 inches. In places, soils are similar to Sullivan soils except that they have a sandy loam or loamy sand texture in all layers.

State soils make up about 25 percent of the map unit. Typically, the surface layer of State soils is dark brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 31 inches thick. It is yellowish brown clay loam that has very pale brown mottles in the lower part. The underlying material is mottled sandy loam to a depth of more than 60 inches.

The available water capacity of these soils is moderate to high. Soil moisture is adequate for optimum plant growth throughout the growing season. Both soils are moderately permeable and have a low shrink-swell potential. Surface runoff is slow. These soils are subject to frequent, brief flooding. The soils are subject to erosion and deposition of sediment from floodwaters. A seasonal high water table is at 4 to 6 feet during winter and early spring. The surface layer of both soils is very strongly acid to neutral. The soils can be tilled over a wide range in moisture content.

Included with these soils in mapping are areas of soils similar to Sullivan soils except that they are more poorly drained and are in narrow drainageways and depressions adjacent to uplands. Also included are small areas of Docena and Holston soils on stream terraces and toe slopes. The included soils make up about 25 percent of the map unit. Docena and Holston soils are contrasting soils, and use and management are different from Sullivan or State soils. These contrasting soils make up about 10 percent of most areas.

The soils of this map unit are used primarily for pasture and hay and for woodland. Some areas are cultivated. A few areas are used for industrial, commercial, and residential facilities.

These soils are well suited to cultivated crops. However, flooding is a hazard. Diversions help to reduce erosion. Crops grown on these soils should be tolerant of floodwaters. Seedbeds can be prepared by minimum tillage.

These soils are well suited to pasture and hay. Flooding is a management concern. Deferred grazing during wet periods will help prevent soil compaction by livestock and sod damage.

Coniferous and deciduous trees are well suited to these soils. The potential productivity is high. Flooding is a management concern. If trees are harvested during dry periods, heavy equipment is less damaging to these soils. Access is poor to some areas of these soils that are surrounded by steep soils.

These soils are not favorable for residential and industrial uses because of the seasonal high water table and the flooding hazard. These limitations are difficult to overcome. Earthfill is necessary to control flooding on these soils.

Some areas of these soils can be used for several kinds of recreation, mainly parks, playgrounds, golf courses, and horse farms. Fill is needed for certain facilities. Location of individual facilities should be related to the degree of flooding for the site. Consideration should also be given to deposits of sediment and debris from floodwaters.

The soils that are suitable for pond construction are commonly surrounded by steep soils which are poor sources of soil material for construction. The watershed should be carefully evaluated for potential sediment deposits, floating debris, and water quality if the pond is to be constructed downstream from urban areas.

The soils of this map unit are in capability subclass llw. The Sullivan soils are in woodland ordination group 2w, and the State soils are in woodland ordination group 2o.

GEOLOGIC DESCRIPTION

The Black Warrior Minerals, Inc.- Mine No. 2 is located in northern Jefferson County near Morris, in Sections 2, 3, 9, 10, 11, 14, 15, & 16, Township 15 South, Range 3 West, Jefferson County, Alabama as seen from 1979 photo Gardendale Quadrangle (see attached Mine Site Location Map and Hydro-Geo Map). This mine will consist of only surface mining methods. The proposed mine site will occupy approximately one thousand three hundred forty-seven (1,347) acres of which approximately one thousand three hundred and six (1,306) acres will be mining acres and forty-one (41) acres will be roads, ponds, office and equipment storage areas. This mine site is located within the Cumberland Plateau section of the Appalachian Plateaus Physiographic Province Geologic Map of Alabama dated 1989. The mine site is primarily underlain by the Pottsville Formation of Pennsylvanian age and is characterized according to the "Hydrologic Assessment, Eastern Coal Province Area 23, Alabama" as the following: alternating beds of gray sandstone, conglomerate, siltstone, and shale with beds of coal and underclay. There are no faults within the permit area. The coal seams to be mined at this site will be the New Castle, Mary Lee, and Blue Creek coal seams. Structurally the permit area is north of the Coalburg Syncline as shown on the attached Major Structures Map, which was taken from "Depositional setting of the Pottsville Formation in the Black Warrior Basin".

Geochemistry:
The rocks outcropping within the permit area belong to the upper Pottsville Formation and consist of clastic sediments of a deltaic environment. Generally the coals of the Warrior Coal Field are separated by sequences of gray sandstone, conglomerate, siltstone, shale and underclay according to the "Hydrologic Assessment, Eastern Coal Province Area 23, Alabama". All drill holes available at this site showed similar cyclothemic beds of sandy shales, sandstones.

Eight (8) drill holes were used to describe the lithology within the permit and surrounding area. Drill holes MW/OB-4, OB-5, OB-6, OB-7, MW/OB-8, OB-9, OB-10, OB-11 were drilled by Hand Service Company in February of 2015. All drill holes were rotary drilled. The cuttings were sampled in a minimum of five foot increments or at each strata change. For the lithologic description of the drill holes and monitoring wells see the attached Lithologic Description MW/OB-4, OB-5, OB-6, OB-7, MW/OB-8, OB-9, OB-10, OB-11 and drill logs. For the locations of drill holes and monitoring wells see the attached map entitled Hydro-Geo Map. All analyses were performed by McGehee Engineering Corp.'s lab.

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

Drill Hole ID	Percent Sulfur	Neutralizatio n Potential	Acid-Base Account	Tons/Acre Excess CaCO3
MW/OB-4	0.2029	16.4899	10.1483	2106
OB-5	0.2115	17.2879	10.6786	4066
OB-6	0.2078	14.3667	7.8736	3501
OB-7	0.1984	14.8223	8.6226	3531
MW/OB-8	0.1780	14.7188	9.1559	1198
OB-9	0.1637	13.9162	8.7995	3103
OB-10	0.1914	19.8724	13.8920	4395
OB-11	0.1987	18.8714	12.6629	5943
Average	0.1941	16.2932	10.2292	3480.38

According to the overall average Acid Base Accounts of the overburden sampled in the overburden holes, there is a small portion of the overburden that could be considered mildly acid forming material. There are a few areas within each drill hole that show a negative ABA. The negative ABA in the strata surrounding the coal seams is due to contamination from the coal seam. The coal seams within each overburden hole contain a high amount of acid forming material. However, only a small portion of this material will be spoiled. 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.

For the chemical analyses of the overburden materials see the Over burden Analysis Spreadsheet. See the attached Hydro-Geo Map for the locations of the overburden holes and attached Theisson Polygon Map for overburden hole area of influence.

Sulfur Content of Coal:

The total sulfur percentages of the coal seams to be mined at this site are listed below. The total sulfur percentages of each coal seam are based on averages of many coal samples.

Seam	Percent Sulfur (raw Dry)
New Castle	1.3
Mary Lee	2.0
Blue Creek	1.7

Coal Seam(s) Information:

Based on drilling results there is three (3) mine able seams, the New Castle, Mary Lee, and Blue Creek at this mine site. The coal seams will be mined as deep as economically possible. For coal seam information, see the following table:

SEAM	THICKNESS	OVERBURDEN	STRIKE/DIP
New Castle	1.8’	50’	N 45 ^{O} E/ S 1.3^{O} E
Mary Lee	2.7’	103’	N 50 ^{O} E/ S 1.35 ^{O} E
Blue Creek	1.8’	121’	N 52^{O} E/ S 1.2^{O} E

DRILL HOLE LITHOLOGIC LOGS

SAMPLING TECHNIQUES

Soil and overburden samples were taken at locations shown on the attached **Soils Map**. The Soils Map shows the mine site location, soil types within the permit area, previously mined areas within and adjacent (without topsoil) to the permit area, and topsoil and overburden collection sites. Soil samples of each soil were collected throughout the permit area.

Topsoil Samples were taken by digging a cylindrical to slightly conical shaped hole 10-12 inches deep with a spade. All contents of this section are included in the sample. Sieve analysis were conducted on oven-dry composite samples to determine coarse fragment and soil percentages. Results of these analyses are listed in Table 2.

Spoil Samples were taken by digging a cylindrical to slightly conical shaped hole 10-12 inches deep with a spade. All contents of this section are included in the sample. Sieve analysis were conducted on oven-dry composite samples to determine coarse fragment and soil percentages. Results of these analyses are listed in Table 2.

The minus 2 mm (or soil) fraction of all samples are then sent to Auburn University Soil Testing Laboratory for the following analyses: soil fertility; pH; recommendations for post-mining revegetation; % sand, silt, and clay; CEC; available water capacity; neutralization potential; maximum potential acidity; % organic matter; and ppm of nitrate nitrogen in the soil. Results of the analyses are shown in Table 3.

*NOTE: available water capacity conducted by Auburn University Testing Laboratory is determined on only the soil (-2mm) fraction of the sample. To obtain a "total" available water capacity, the AWC should be multiplied by the fraction of the soil sample obtained in the field. See Table 5 for an Estimation of the Total Available Water Capacity.

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-1**

Sampled: **3/31/15**

Analyzed: **4/16/15**

Analyzed By: **JW**

Sample Weight: **1978.3 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	21.0	1.1	1.1	98.9
¾”	19.00	75.9	3.8	4.9	95.1
½”	12.50	193.4	9.8	14.7	85.3
4	4.75	720.4	36.4	51.1	48.9
10	2.00	378.6	19.1	70.2	29.8
Pan	---	589.0	29.8	100.0	0.0

% of sample that is coarse fragments: **70.2**

% of sample that is soil: **29.8**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-2**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **1977.7 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	0.6	0.0	0.0	100.0
½”	12.50	20.3	1.0	1.1	98.9
4	4.75	313.0	15.8	16.9	83.1
10	2.00	594.4	30.1	46.9	53.1
Pan	---	1049.4	53.1	100.0	0.0

% of sample that is coarse fragments: **46.9**

% of sample that is soil: **53.1**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-3**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **2026.7 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	65.5	3.2	3.2	96.8
¾”	19.00	49.3	2.4	5.7	94.3
½”	12.50	128.5	6.3	12.0	88.0
4	4.75	457.4	22.6	34.6	65.4
10	2.00	435.4	21.5	56.1	43.9
Pan	---	890.6	43.9	100.0	0.0

% of sample that is coarse fragments: **56.1**

% of sample that is soil: **43.9**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-4**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **1969.7 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	13.9	0.7	0.7	99.3
½”	12.50	14.7	0.7	1.5	98.5
4	4.75	209.8	10.7	12.1	87.9
10	2.00	635.0	32.2	44.3	55.7
Pan	---	1096.3	55.7	100.0	0.0

% of sample that is coarse fragments: **44.3**

% of sample that is soil: **55.7**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-5**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **2024.8 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	26.2	1.3	1.3	98.7
½”	12.50	103.7	5.1	6.4	93.6
4	4.75	281.7	13.9	20.3	79.7
10	2.00	475.5	23.5	43.8	56.2
Pan	---	1137.7	56.2	100.0	0.0

% of sample that is coarse fragments: **43.8**

% of sample that is soil: **56.2**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-6**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **1982.3 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	41.9	2.1	2.1	97.9
½”	12.50	73.5	3.7	5.8	94.2
4	4.75	247.9	12.5	18.3	81.7
10	2.00	577.5	29.1	47.5	52.5
Pan	---	1041.5	52.5	100.0	0.0

% of sample that is coarse fragments: **47.5**

% of sample that is soil: **52.5**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-7**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **1977.1 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	0.0	0.0	0.0	100.0
½”	12.50	8.3	0.4	0.4	99.6
4	4.75	178.8	9	9.5	90.5
10	2.00	651.8	33.0	42.4	57.6
Pan	---	1138.2	57.6	100.0	0.0

% of sample that is coarse fragments: **42.4**

% of sample that is soil: **57.6**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **TS-8**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **1979.8 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	0.0	0.0	0.0	100.0
¾”	19.00	0.0	0.0	0.0	100.0
½”	12.50	22.6	1.1	1.1	98.9
4	4.75	220.1	11.1	12.3	87.7
10	2.00	621.7	31.4	43.7	56.3
Pan	---	1115.4	56.3	100.0	0.0

% of sample that is coarse fragments: **43.7**

% of sample that is soil: **56.3**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **SP-1**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **2044.0 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	75.2	3.7	3.7	96.3
¾”	19.00	88.1	4.3	8.0	92.0
½”	12.50	64.8	3.2	11.2	88.8
4	4.75	443.2	21.7	32.8	67.2
10	2.00	384.1	18.8	51.6	48.4
Pan	---	988.6	48.4	100.0	0.0

% of sample that is coarse fragments: **51.6**

% of sample that is soil: **48.4**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **SP-2**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **2005.1 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	131.3	6.5	6.5	93.5
¾”	19.00	169.1	8.4	15.0	85.0
½”	12.50	120.5	6.0	21.0	79.0
4	4.75	374.4	18.7	39.7	60.3
10	2.00	315.4	15.7	55.4	44.6
Pan	---	894.4	44.6	100.0	0.0

% of sample that is coarse fragments: **55.4**

% of sample that is soil: **44.6**

Average size left in 1" Sieve: **1.0"**

TABLE 2 - SIEVE ANALYSIS

Company Name: **Black Warrior Minerals, Inc.**

Mine Name: **Mine No. 2, P-39__**

Sample I.D.: **SP-3**

Sampled: **3/31/15**

Analyzed: **04/16/15**

Analyzed By: **JW**

Sample Weight: **2029.7 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cummulative Percent Retained	Percent Finer
1”	25.00	29.5	1.5	1.5	98.5
¾”	19.00	142.9	7.0	8.5	91.5
½”	12.50	288.1	14.2	22.7	77.3
4	4.75	688.2	33.9	56.6	43.4
10	2.00	379.8	18.7	75.3	24.7
Pan	---	501.2	24.7	100.0	0.0

% of sample that is coarse fragments: **75.3**

% of sample that is soil: **24.7**

Average size left in 1" Sieve: **1.0"**

CHEMICAL ANALYSIS COMPARISONS

Examination of the physical and chemical comparison between the average of the topsoils within the permit area and the average of the overburden samples collected reveals that selected overburden at the Mine No. 2 site is equal to or more suitable than the natural topsoils present as a plant growth medium. The pH of the topsoils ranged between 4.30 and 4.90, the pH of the previously mined overburden samples ranged between 4.60 and 5.50, the pH of the selected overburden samples (drill holes MW/OB-4, OB-5, OB-6, OB-7, MW/OB-8, OB-9, OB-10, and OB-11) ranged between 3.82 and 9.52. The post mine land use proposes to be Undeveloped/No Current Use. Auburn University has recommended an average of 2 tons/acre of limestone on the naturally occurring topsoils and 2 tons/acre of limestone on the selected overburden material.

Auburn University has recommended an average of 60 Pounds Per Acre of N on the naturally occurring topsoils and 60 Pounds Per Acre of N on the previously mined selected overburden material to be used as a substitute material. Auburn University has recommended an average of 56 Pounds Per Acre of P_2O_5 on the naturally occurring topsoils and an average of 0 Pounds Per Acre of P_2O_5 on the previously mined selected overburden material. Auburn University has recommended an average of 20 Pounds Per Acre of K_2O on the naturally occurring topsoils and 27 Pounds Per Acre of K_2O on the previously mined selected overburden material to be used as a substitute material.

The acid-base accounts for both the previously mined overburden material and the selected overburden material (drill holes) to be used as a substitute material were both positive. The acid-base account for the natural soils was slightly positive. The selected overburden material (previously mined overburden) was significantly higher in neutralization potential than the natural soils. The previously mined selected overburden material had a lower average of nitrate nitrogen 7.9 ppm (the most accessible form of nitrogen for plants) than the native topsoils 16.7 ppm.

TEXTURAL ANALYSIS COMPARISON

Textural analyses revealed, that the overburden samples (previously mined area) have slightly less soil and more coarse fragments than the topsoil samples and the analyses from Auburn on the – 2 mm fraction indicates that the quality of the soil in the overburden samples was higher than that shown by the natural topsoil. The ability of the overburden (Shale) material to breakdown can be seen at this site and on the adjacent property.

The previously mined selected overburden soil averaged less sand, and more silt and clay than the topsoil. The native soils at the Mine No. 2 site are higher the available water capacity for the native soil particles is (0.1300 cm./cm. average). The "Total" available water capacity as shown in Table 4 is also low (0.0871 in./in. average). The water holding capacity for the previously mined selected overburden material is high (0.1100 in./in. average). The "Total" available water capacity of the overburden is (0.0678 in./in. average). As shown in the topsoil -vs- overburden table, the overburden had more silt and clay and less sand than the native topsoil samples. This resulted in the overburden having a slighty lower "Total" available water capacity than the native topsoil. This shows that the overburden is relatively equal in suitability for post mining revegetation. The overburden at the Mine No. 2 is better than the native topsoils in the following parameters: pH, extractable nutrients, and required soil amendments. As shown in the overburden and topsoil comparison, the overburden is more suitable for surface mine revegetation and therefore satisfies the criteria set forth in section 880-X-10C.08(5).

TABLE 4

TOPSOIL VS. OVERBURDEN COMPARISON

	NATURAL SOILS (range)	PREVIOUSLY MINED OVERBURDEN (range)	SELECTED OVERBURDEN DRILL HOLES (range)
pH (low)	4.3	4.6	3.82
pH (high)	4.9	5.5	9.52

EXTRACTABLE NUTRIENTS FOR P, K, & Mg, (lbs./acre)

	NATURAL SOILS (average)	PREVIOUSLY MINED OVERBURDEN (average)	SELECTED OVERBURDEN DRILL HOLES (average)
PHOSPHOROUS	38	86	N/A
POTASSIUM	195	156	N/A
MAGNESIUM	216	514	N/A

RECOMMENDATIONS FOR LIMESTONE, N, P-205, K-20:

	NATURAL SOILS (average)	PREVIOUSLY MINED OVERBURDEN (average)	SELECTED OVERBURDEN DRILL HOLES (average)
LIMESTONE (ton/acre)	2	2	N/A
NITROGEN (lbs./acre)	60	60	N/A
P-205 (lbs./acre)	56	0	N/A
K-20 (lbs./acre)	20	27	N/A
NO_3 – N (ppm)	16.7	7.9	N/A

TABLE 4

TOPSOIL VS. OVERBURDEN COMPARISON
(continued)

	NATURAL SOILS (average)	PREVIOUSLY MINED OVERBURDEN (average)	SELECTED OVERBURDEN DRILL HOLES (average)
NEUTRALIZATION POTENTIAL	1.475	4.13	16.2932
MAXIMUM POTENTIAL ACIDITY	2.4388	2.6167	6.0640
SULFUR (%)	0.0780	0.0838	0.1941
ACID-BASE ACCOUNT	-0.9638	1.5133	10.2292
SAND (%)	41.33	55.21	N/A
SILT (%)	34.06	25.63	N/A
CLAY (%)	24.61	19.16	N/A
AVAILABLE WATER CAPACITY (cm/cm)	0.13	0.11	N/A
COARSE FRAGMENTS (%)	49.4	60.8	N/A
SOIL (%)	50.6	39.2	N/A
TOTAL AVAILABLE WATER CAPACITY (cm/cm)	0.0871	0.0678	N/A
SOIL ERODIBILITY FACTOR “K”	0.30	0.24	N/A

TABLE 5

TOTAL AVAILABLE WATER CAPACITY

	PERCENT OF SAMPLE RETAINED			
SAMPLE I.D.	**1"**	**1/2"**	**1/4"**	**2 mm**
TS-1	1.1	9.8	36.4	19.1
TS-2	0.0	1.0	15.8	30.1
TS-3	3.2	6.3	22.6	21.5
TS-4	0.0	0.7	10.7	32.2
TS-5	0.0	1.3	13.9	23.5
TS-6	0.0	3.7	12.5	29.1
TS-7	0.0	0.4	9.0	33.0
TS-8	0.0	1.1	11.1	31.4
AVERAGE	**0.5**	**3.0**	**16.5**	**27.5**

SIEVE OPENING	**PERCENT RETAINED**	**AWC FACTOR**	**AWC in./in.**
1"	0.5	0.0389	0.0002
1/2"	3.0	0.0492	0.0015
1/4"	16.5	0.0603	0.0099
2 mm	27.5	0.1149	0.0316
TOTAL			**0.0432**

< 2mm average from Table 2: 50.6%
> 2mm average from Table 2: 49.4%
Average available water capacity of < 2mm from Auburn Data = 0.1300 cm/cm.

50.6% X 0.1300 cm/cm = 0.0658 cm/cm

49.4% X 0.0432 cm/cm = 0.0213 cm/cm

Total = 0.0871 cm/cm

Average Total Available Water Capacity for the Native Soils = 0.0871 cm/cm.

Available water capacity values were obtained from "A Method of Comparing Soil Materials for Plant Available Water" which was supplied by the Alabama Surface Mining Commission.

TABLE 5

TOTAL AVAILABLE WATER CAPACITY
PREVIOUSLY MINED OVERBURDEN

PERCENT OF SAMPLE RETAINED

SAMPLE I.D.	1"	1/2"	1/4"	2 mm
SP-1	3.7	3.2	21.7	18.8
SP-2	6.5	6.0	18.7	15.7
SP-3	1.5	14.2	33.9	18.7
AVERAGE	**3.9**	**7.8**	**24.8**	**17.7**

SIEVE OPENING	PERCENT RETAINED	AWC FACTOR	AWC in./in.
1"	3.9	0.0389	0.0015
1/2"	7.8	0.0492	0.0038
1/4"	24.8	0.0603	0.0149
2 mm	17.7	0.1149	0.0204
TOTAL			**0.0407**

< 2mm average from Table 2: 39.2%
> 2mm average from Table 2: 60.8%
Average available water capacity of < 2mm from Auburn Data = 0.1100 cm/cm.

39.2% X 0.1100 cm/cm = 0.0431 cm/cm

60.8% X 0.0407 cm/cm = 0.0247 cm/cm

Total = 0.0678 cm/cm

Average Total Available Water Capacity for the Native Soils = 0.0678 cm/cm.

Available water capacity values were obtained from "A Method of Comparing Soil Materials for Plant Available Water" which was supplied by the Alabama Surface Mining Commission.

CONCLUSION

The pH of the native topsoil was very low and the pH of the selected overburden (previously mined overburden) was much higher. The selected overburden (previously mined overburden) at the Mine No. 2 was more fertile than the native topsoil, as shown in the extractable nutrients comparison on Table 4.

The average acid-base account of the previously mined overburden taken from the permit area was +1.5133, selected overburden (drill hole MW/OB-4, OB-5, OB-6, OB-7, MW/OB-8, OB-9, OB-10, OB-11) was +10.2292, and the native topsoil was -0.9638.

The previously mined overburden samples contained more silt and clay and less sand than the topsoil samples. When the Total Available Water Capacity of the native topsoil was calculated as shown in Table 5, the resulting value was 0.0871 cm/cm. The Total Available Water Capacity of the previously mined area was slightly lower at 0.0678 cm/cm based on analysis performed by Auburn University Soils Testing Laboratory.

The surrounding areas mined during pre-law and the area mined by Drummond Company, Inc. (P-3185) saved no topsoil and have had no problem with the plant growth. Therefore, using a selected substitute material during mining should not pose any problems with plant growth. A topsoil variance was approved for the adjacent Black Warrior Minerals, Inc. (P-3951).

As shown in this study the selected overburden material at the Mine No. 2 site is equal to or more suitable for sustaining revegetation and is the best to support revegetation and therefore satisfies the criteria set forth in 880-X-10C.08-(5).

OVERBURDEN RESTABILIZATION PLAN

All overburden shall be backfilled, compacted, and graded so that the post mining slope shall approximate the pre-mining slope (See Attachment IV-B-3) and in a timely manner (See Part IV-B-2). Overburden will be rough graded with a Caterpillar type dozer. Once rough grading has been completed, a farm-type tractor will be used to disc the overburden to its final contour, decrease compaction, and increase the mechanical breakage of the surface layer. If any rocks +24 inches in diameter remain on the surface, they will be collected and buried. All slopes too steep to operate farm equipment on will use the following criteria to evaluate the textural quality of the graded overburden:

A) Rocks of size larger than ten (10") inches shall not exceed 10% by weight of the substitute material, and no rocks larger than twenty-four (24) inches can be included in the substitute material.

B) Rock between three (3") inches and ten (10") inches in size shall not exceed 15% by weight of the topsoil substitute material.

C) The substitute material shall not contain more than 50% by weight of materials between 3 and .75 inches in size.

D) The substitute material shall contain at least 30% by weight of material less than 2 millimeters in size.

Sampling frequency shall be 1 sample per 20 acres. Overburden sampling will follow the guidelines as described in the "SAMPLING TECHNIQUES" section of this report.

Based on the sieve analysis shown in Table 2 the overburden material meets the grading requirements of the Topsoil Variance. The final texture samples will be sent to the Auburn University Soil Laboratory where the following tests will be conducted: % sand, silt, and clay; textural classification; pH, % sulfur; fertility ratings for phosphorus, potassium, and magnesium; and amendment recommendations for limestone, nitrogen, phosphorus, and potassium. An acid base account will be calculated from the sulfur and neutralization potential readings. Results of this analyses will be used to determine the amount of soil amendments, if any, to be applied to the plant medium. All results of analyses will be submitted to the Regulatory Authority for review. Any acid-forming materials encountered will be covered with four (4) feet of non-toxic, non-acid forming material.

ON-SITE
COLOR PHOTOS

Previously Mined Area Showing Established Vegetation

Previously Mined Area Showing Established Trees and Vegetation

AUBURN DATA

Report on Soil Test

Auburn University Soil Testing Laboratory

Auburn University, AL 36849-5411

McGehee Engineering Corp Inc

450 19th St West

Jasper, AL 35501

County:Walker

District:1

Test Date:04/22/15

				SOIL TEST RESULTS				RECOMMENDATIONS			
LAB No.	Sample Designation	Crop	Soil Group*	pH**	Phosphorus P***	Potassium K***	Magnesium Mg***	Calcium Ca***	LIME-STONE	N	P_2O_5	K_2O
					Pounds/Acre				Tons/Acre	Pounds/Acre		
17972	Black Warrior Minerals Mn 2 SP 1 See Comment 1 See Comment 2	Revegetation	4	4.6	H 84	M 144	H 271	H 1502	2.5	60	0	40
17973	SP 2 See Comment 1 See Comment 2	Revegetation	4	5.5	H 94	H 199	H 638	H 2380	1.5	60	0	0
17974	SP 3 See Comment 1 See Comment 2	Revegetation	4	4.6	H 81	M 126	H 632	H 1052	1.5	60	0	40
17975	TS 1 See Comment 1 See Comment 2	Revegetation	4	4.2	M 68	H 232	H 134	H 514	4.5	60	40	0
17976	TS 2 See Comment 1 See Comment 2	Revegetation	4	4.9	L 23	M 180	H 235	H 1039	1.5	60	70	40
17977	TS 3 See Comment 1 See Comment 2	Revegetation	4	5.0	M 38	H 220	H 202	H 791	2.0	60	50	0
17978	TS 4 See Comment 1 See Comment 2	Revegetation	4	4.5	L 29	M 165	H 112	H 317	2.5	60	60	40

* 1. Sandy soil (CEC ‹ 4.6 $cmol_c kg^{-1}$)

* 2. Loams and Light clays (CEC = 4.6-9.0 $cmol_c kg^{-1}$)

* 3. Clays and soils high in organic matter (CEC > 9.0 $cmol_c kg^{-1}$)

* 4. Clays of the Blackbelt (CEC > 9.0 $cmol_c kg^{-1}$)

** 7.4 or higher - Alkaline - - - - - - - - - - - - - - 6.6-7.3 - Neutral - - - - - - - - - - - - - 6.5 or lower - Acid - - - - - - - - - - - - -5.5 or lower - Strong Acid

*** Extractable nutrients in pounds per acre

If soil group = 1, 2 or 3, Method of Analysis = Mehlich-1. If soil group = 4, Method of Analysis = Miss/Lancaster.

Approved by:

Print Date: July 6, 2015

Report on Soil Test

Auburn University Soil Testing Laboratory

Auburn University, AL 36849-5411

McGehee Engineering Corp Inc

450 19th St West

Jasper, AL 35501

County:Walker

District:1

Test Date:04/22/15

				SOIL TEST RESULTS					RECOMMENDATIONS			
LAB No.	Sample Designation	Crop	Soil Group*	pH**	Phosphorus P***	Potassium K***	Magnesium Mg***	Calcium Ca***	LIME-STONE	N	P_2O_5	K_2O
					Pounds/Acre				Tons/Acre	Pounds/Acre		
17979	TS 5 See Comment 1 See Comment 2	Revegetation	4	5.4	M 53	H 221	H 231	H 1456	1.5	60	40	0
17980	TS 6 See Comment 1 See Comment 2	Revegetation	4	4.3	L 22	M 121	H 143	H 436	2.5	60	70	40
17981	TS 7 See Comment 1 See Comment 2	Revegetation	4	5.0	M 57	H 244	H 386	H 818	2.5	60	40	0
17982	TS 8 See Comment 1 See Comment 2	Revegetation	4	5.3	VL 11	M 173	H 284	H 990	1.0	60	80	40

Comment No.1: Soil acidity (low pH) can be corrected with either dolomitic or calcitic lime.

Comment No.2: For perennial winter grass pasture, apply N, P, and K as recommended by September 1. Repeat N application in February. If grass is to be cut for hay, in February apply up to 40 pounds N and 35 pounds K2O per ton of anticipated hay yield.

The number of samples processed in this report is: 11

For further information call your county agent: (205) 221-3392

* 1. Sandy soil (CEC ‹ 4.6 $cmol_c kg^{-1}$)

* 2. Loams and Light clays (CEC = 4.6-9.0 $cmol_c kg^{-1}$)

* 3. Clays and soils high in organic matter (CEC > 9.0 $cmol_c kg^{-1}$)

* 4. Clays of the Blackbelt (CEC > 9.0 $cmol_c kg^{-1}$)

** 7.4 or higher - Alkaline - - - - - - - - - - - - - - 6.6-7.3 - Neutral - - - - - - - - - - - - - 6.5 or lower - Acid - - - - - - - - - - - - -5.5 or lower - Strong Acid

*** Extractable nutrients in pounds per acre

If soil group = 1, 2 or 3, Method of Analysis = Mehlich-1. If soil group = 4, Method of Analysis = Miss/Lancaster.

Approved by:

Print Date: July 6, 2015

Auburn University
Soil Testing Laboratory
Mine Analysis Report

McGehee Engineering
PO Box 3431
Jasper Al 35502

ALFA Agricultural Service & Research Building
961 S. Donahue Dr.
Auburn University, Auburn, AL 36849-5411
Phone (334)844-3958
Soillab@auburn.edu

Mine Name : Black Warrior Minerals Mine No.2 Special Analysis #: 15.G0117-G0127

						Soil Texture				
		OM	NO_3-N	Neutralizing Potential		%	%	%		H_2O avail.
Lab I.D.	Sample I.D.	%	ppm	Tons $CaCO_3$/1000 Tons material	max pot.acid.	Sand	Silt	Clay	Textural Class	cm^3/cm^3
17972	SP 1	15.3	8.1	1.9	4.46	58.13	24.38	17.50	Sandy Loam	0.11
17973	SP 2	9.6	10.2	5.6	2.79	40.63	36.88	22.50	Loam	0.13
17974	SP 3	3.7	5.4	4.9	0.60	66.88	15.63	17.50	Sandy Loam	0.09
17975	TS 1	16.4	11.6	<1.0	6.84	50.63	24.38	25.00	Sandy clay loam	0.11
17976	TS 2	4.0	20.5	<1.0	1.29	36.88	33.13	30.00	Clay loam	0.13
17977	TS 3	6.2	17.8	1.2	5.31	60.63	19.38	20.00	Sandy clay loam	0.10
17978	TS 4	2.5	21.3	<1.0	1.02	35.63	27.50	36.88	Clay loam	0.13
17979	TS 5	9.0	16.4	<1.0	1.20	38.75	41.25	20.00	Loam	0.14
17980	TS 6	3.4	14.2	<1.0	0.77	33.75	41.25	25.00	Loam	0.14
17981	TS 7	10.7	16.3	3.2	2.09	34.38	45.63	20.00	Loam	0.15
17982	TS 8	3.9	15.5	2.4	0.99	40.00	40.00	20.00	Loam	0.14

MULTIPLE SULFUR ANALYSES

		%	%	%	%	%					
Lab I.D.	Sample I.D.	1rst	2nd	3rd	4rth	Ave					
17972	SP 1	0.139	0.124	0.156	0.152	0.143					
17973	SP 2	0.0917	0.0845	0.0702	0.111	0.0894					
17974	SP 3	0.0218	0.0151	0.0190	0.0203	0.0191					
17975	TS 1	0.204	0.217	0.227	0.228	0.219					
17976	TS 2	0.0475	0.0446	0.0395	0.0336	0.0413					
17977	TS 3	0.167	0.160	0.161	0.192	0.170					
17978	TS 4	0.0423	0.0317	0.0298	0.0268	0.0326					
17979	TS 5	0.0387	0.0346	0.0427	0.0375	0.0384					
17980	TS 6	0.0267	0.0222	0.0300	0.0199	0.0247					
17981	TS 7	0.0926	0.0443	0.0622	0.0680	0.0667					
17982	TS 8	0.0374	0.0342	0.0286	0.0261	0.0316					

DATE: 7-6-15