

**McWANE, INC.  
BURTON MINE, P-3753, R-15  
ATTACHMENT IV-C-2**

**McWANE, INC.  
BURTON MINE, P-3753  
ATTACHMENT IV-C-2**

**TOPSOIL VARIANCE APPLICATION  
ADDENDUM**

Prepared by:

**MCGEHEE ENGINEERING CORP.**

P. O. Box 3431  
540 19th Street West  
Jasper, Alabama 35502-3431  
Telephone: (205) 221-0686

**McWANE, INC.  
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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". McWane, Inc. already has a topsoil variance approved for its existing permit. The purpose of this study is to prove that the criteria stated above is met for McWane, Inc. at current Burton Mine site. This study is requesting the topsoil variance in favor of a heterogeneous overburden at the Burton Mine - Permit P-3753. A previous Topsoil Variance Application Addendum was submitted and approved under Revision R-12 for the area being requested by this addendum. The approved R-12 topsoil variance did not include the Nauvoo-Sipsey Urban Complex, 2 to 12% slopes, Sipsey Loamy Sand, 4 to 18% slopes, or the Townley Silt Loam, 6 to 15% slopes. This addendum to the topsoil variance requested that the heterogeneous overburden be approved as a substitute material for these soils.

The total acreage for the permit area is approximately 546.0 acres. McWane, Inc. is requesting a Topsoil Variance on the Nauvoo-Sipsey Urban Complex, 2 to 12% slopes, Sipsey Loamy Sand, 4 to 18% slopes, and the Townley Silt Loam, 6 to 15% slopes with the exception of the areas included for primary roads and sediment basins. The topsoil waiver will address 70.0 acres in Increment 4 that includes Nauvoo-Sipsey Urban Complex, 2 to 12% slopes, Sipsey Loamy Sand 4 to 18% slopes, and the Townley Silt Loam, 6 to 15% slopes soils.

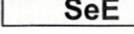
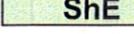
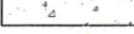
**MINE SITE INFORMATION**

The Burton Mine occupies approximately 546.0 acres of which approximately 521.0 acres are mining acres and 25 acres are roads, ponds, and other incidentals. The Burton Mine is located in Sections 17, 18, 19, 20, and 29, Township 14 South, Range 5 West, Walker County, Alabama as found on the Sipsey U.S.G.S. Quadrangles. The attached Soils Map shows the Mine site location, soil types within the permit area and drill hole/topsoil collection sites.

**McWANE, INC.**  
**BURTON MINE, P-3753, R-15**  
**SOILS MAP**

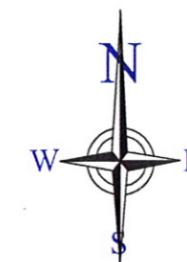
SCALE: 1" = 500'

**SOILS MAP LEGEND**

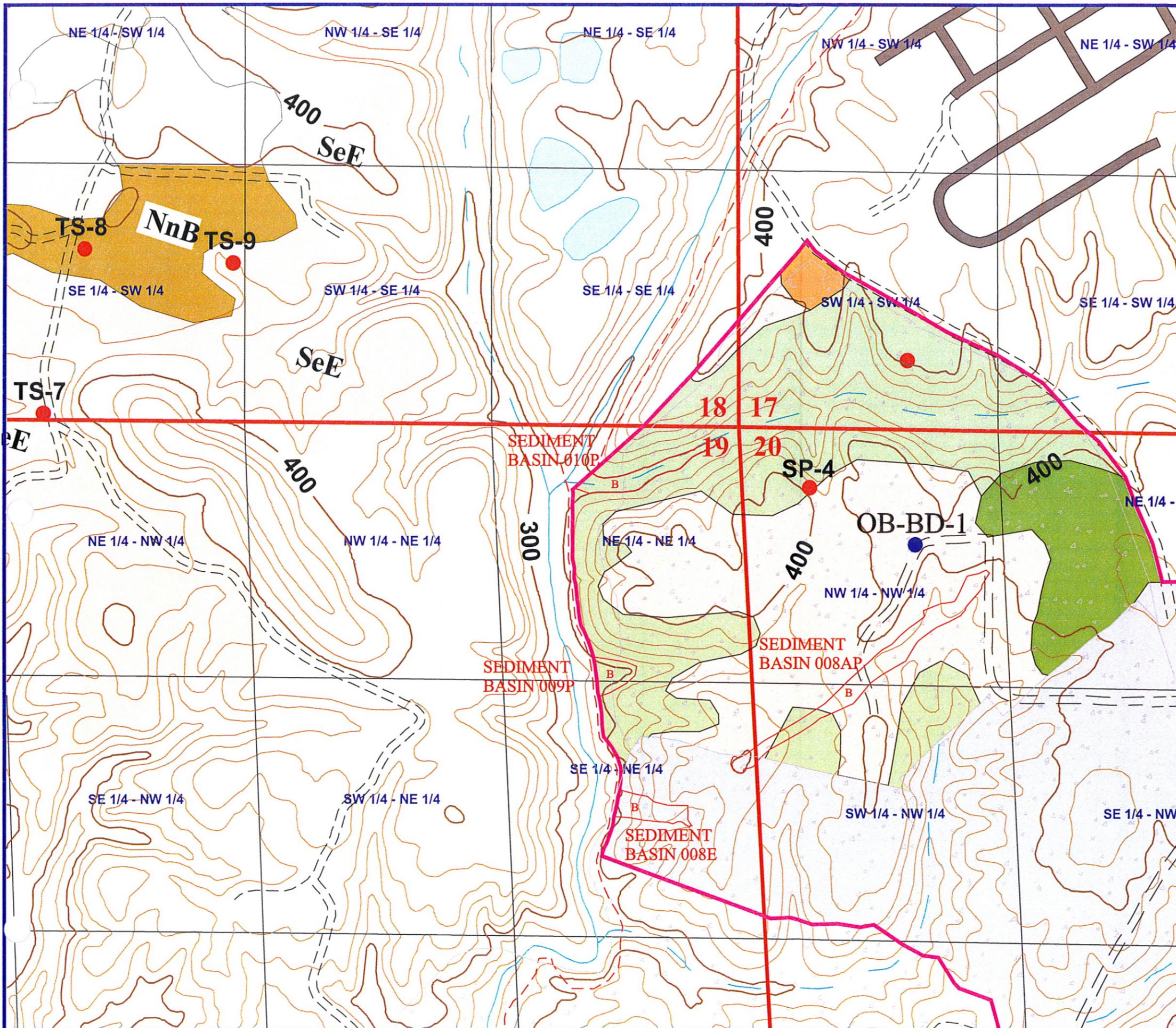
	<b>NcC</b>	NAUVOO - SIPSEY URBAN COMPLEX, 2 TO 12 % SLOPES
	<b>NnB</b>	NAUVOO AND NECTAR FINE SANDY LOAMS, 2 TO 6% SLOPES
	<b>SeE</b>	SIPSEY LOAMY SAND, 4 TO 18 % SLOPES
	<b>ShE</b>	*SIPSEY-BANKHEAD COMPLEX, 15 TO 45. % SLOPES
	<b>ToD</b>	TOWNLEY SILT LOAM, 6 TO 15 % SLOPES
		PREVIOUSLY MINED
		PREVIOUSLY MINED UNDER ORIGINAL TOPSOIL VARIANCE
	<b>TS-2</b>	TOPSOIL SAMPLE LOCATION
	<b>OB-BD-1</b>	MONITORING WELL/OVERBURDEN HOLE

\*THE SIPSEY-BANKHEAD COMPLEX, 15 TO 45% SLOPES WAS APPROVED IN THE REVISION R-12 TOPSOIL VARIANCE APPLICATION.

ALL SOILS DATA AND MAPPING TAKEN FROM SOIL SURVEY OF THE WALKER COUNTY, AL, U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICES.



**MEC**  
**mcgehee engineering corp**  
 post office box 3431  
 jasper, alabama 35502-3431  
 telephone: (205) 221-0686 fax: 221-7721  
 email: cw@mcgehee.org



**SOILS PRESENT BEFORE MINING**

Soils present within the permit area are as follows:

Nauvoo-Sipsey Urban Complex	2 to 12% slopes
Townley Silt Loam	6 to 15% slopes
Sipsey Loamy Sand	4 to 18% slopes

**LANDUSE**

The pre-mining landuse of the permitted area consisted of undeveloped/no current use with trees and undeveloped no current use without trees. The proposed post mining landuse of the permit area will be Undeveloped/No Current Use with grasses as the primary vegetative cover. Sediment basins are proposed as permanent water impoundments.

**SOIL DESCRIPTIONS**

The following descriptions were obtained from the Data obtained from the United States NRCS.

## BRILLIANT SERIES

The Brilliant series consists of deep, somewhat excessively drained; moderately rapidly permeable soils that formed in medium acid to alkaline spoil material in sloping to very steep areas that have been strip-mined for coal. Slopes range from 6-60%. The soils are loamy-skeletal, mixed, nonacid, thermic Typic Undorthents.

Brilliant soils are geographically associated with Palmerdale soils. Palmerdale soils are more acid than Brilliant soils. They are in landscape positions similar to those of the Brilliant soils. Brilliant soils are commonly adjacent to nearly all of the other soils in the survey area. The adjacent soils are better developed than the Brilliant and have a lower content of coarse fragments throughout. They are in undisturbed areas.

Typical pedon of Brilliant extremely channery loam, in an area of Brilliant and Palmerdale extremely channery loams, 6-60% slopes, 1,800 feet east and 1,000 feet south of the northwest corner of sec. 17, T. 14 S., R. 8 W.

- Ap 0 – 5 inches: grayish brown (10 YR 5/2) extremely channery loam; massive; friable; about 75% coarse siltstone and sandstone fragments ranging from 1/8 inch to more than 60" in diameter; neutral; gradual wavy boundary.
- C 5 – 60 inches: dark grayish brown (10YR 5/2) extremely channery loam; massive; friable; about 80% coarse fragments, mainly siltstone fragments and some sandstone fragments, ranging from 1/8 inch to more than 60" in diameter; neutral.

The spoil material is more than 60" thick. Reaction ranges from medium acid to neutral throughout the profile. The content of coarse fragments ranges, by volume, from 60-90% in the Ap and C horizons. Sandstone, siltstone, and shale fragments range from about 1/8 inch to more than 60" in diameter.

The Ap horizon has hue of 10 YR, 2.5Y, or 5Y, value of 3-5, and chroma of 1 or 2. It is extremely channery loam unless the original soil material has been replaced during reclamation.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4, and chroma of 1 or 2. The fine-earth fraction is mainly loam, but the range includes silt loam.

## PALMERDALE SERIES

The Palmerdale series consists of deep, somewhat excessively drained, moderately rapidly permeable soils that formed in acid spoil material in sloping to very steep areas that have been surface strip-mined for coal. Slopes range from 6-60%. The soils are loamy-skeletal, mixed, acid, thermic Typic Undorthents.

Palmerdale soils are geographically associated with Brilliant soils. Brilliant soils are less acid than the Palmerdale soils. Palmerdale soils are commonly adjacent to nearly all of the other soils in the survey area. The adjacent soils are better developed than the Palmerdale soils and have a lower content of coarse fragments throughout. They are in undisturbed areas.

Typical pedon of Palmerdale extremely channery loam, in an area of Brilliant and Palmerdale extremely channery loams, 6-60% slopes, 2,000 feet west and 1,600 feet south of the northeast corner of sec.33, T. 14 S., R. 6 W.

- Ap 0 – 6 inches: dark grayish brown (2.5YR 4/2) extremely channery loam; weak medium granular structure; friable; few fine roots; about 70% randomly oriented coarse fragments, mostly channery siltstone; very strongly acid; gradual wavy boundary.
- C 6 -60 inches: dark grayish brown (2.5YR 4/2) extremely channery loam; weak medium granular structure; friable; about 80% randomly oriented coarse fragments, mostly siltstone; very strongly acid.

The mine spoil is more than 60 inches thick. Reaction ranges from extremely acid to strongly acid throughout the profile unless the surface layer has been limed. The content of coarse fragments ranges, by volume, from about 60-80%. The size of the fragments ranges from about 1/8 inch to 60”.

The A horizon has hue of 10 YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1-6. The fine-earth fraction is loamy or sandy loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. The fine-earth fractions is loam or silt loam.

## SIPSEY SERIES

The Sipsey series consists of moderately deep, well drained; moderately permeable soils that formed in loamy material weathered from sandstone. These soils are gently sloping to moderately steep ridgetops and side slopes. Slopes range from 4 to 30 percent. The soils are fine-loamy, siliceous, thermic Typic Hapludults.

Sipsey soils are geographically associated with Bankhead, Montevallo, Nauvoo, Sunlight, and Townley soils. Bankhead soils have a coarse-loamy control section. They are on side slopes. Nauvoo soils have a red, fine-loamy argillic horizon. They are in landscape positions similar to those of the Sipsey soils. Montevallo and Sunlight soils have a loamy-skeletal control section. They are on side slopes. Townley soils have a clayey argillic horizon. They are in landscape positions similar to those of the Sipsey soils.

Typical pedon of Sipsey loamy sand, 4 to 18 percent slopes, 900 feet west and 1,000 feet north of the southeast corner of sec.35, T. 12 S., R. 7 W.

- A 0 - 4 inches: brown (10YR 4/3) loamy sand; weak fine granular structure; very friable; many fine and medium roots; about 5 percent, by volume, sandstone channers; strongly acid; abrupt wavy boundary.
- E 4 - 10 inches: yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; friable; common fine and few medium roots; about 5 percent, by volume, sandstone channers; moderately acid; clear wavy boundary.
- EB 10 - 16 inches: yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; very friable; about 10 percent, by volume, sandstone channers; strongly acid; clear wavy boundary.
- Bt 16 - 31 inches: strong brown (7.5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; friable; few thin distinct patchy clay films on faces of peds; about 10 percent, by volume, sandstone channers, increasing to 25 percent within the lower 4 inches; strongly acid; clear wavy boundary.
- Cr 31 - 60 inches: strong brown and yellowish brown, level-bedded, weathered sandstone.

**SIPSEY SERIES CONTINUED...**

The thickness of the solum and the depth to soft bedrock range from 20 to 40 inches. Reaction ranges from very strongly acid to medium acid throughout the profile unless the surface layer has been limed. The content of sandstone and siltstone fragments ranges, by volume, from 0 to 15 percent.

The A horizon has hue of 10YR or 2.5YR, value of 4 to 5, and chroma of 3 to 6. It is loamy sand or sandy loam.

The E and EB horizons have hue of 7.5YR or 10YR, value of 4 to 5, and chroma of 4 to 6. They are loamy sand or sandy loam. Some pedons do not have an E or EB horizon.

The Bt horizon has hue of 7.5YR to 10YR, value of 4 to 5, and chroma of 4 to 8. In some pedons the lower part of this horizon has mottles in shades of brown or yellow. This horizon is sandy loam, loam, sandy clay loam, or clay loam. In some pedons the content of coarse fragments in the lower part of this horizon ranges, by volume, from 15 to 35 percent.

The Cr horizon is weakly cemented to slightly weathered sandstone. It can be cut with a spade in most places.

## BANKHEAD SERIES

The Bankhead series consists of moderately deep, well drained; moderately rapidly permeable soils that residuum and colluvium derived from sandstone. These soils are on moderately steep to very steep side slopes. Slopes range from 15 to 60 percent. The soils are coarse-loamy, siliceous, thermic Typic Dystrochrepts.

Bankhead soils are geographically associated with Nauvoo, Nectar, Sipsey, Sunlight, and Townley soils. Nauvoo and Sipsey soils have a fine-loamy argillic horizon. They are on ridgetops, the upper slopes, and benches. Nectar and Townley soils have a clayey argillic horizon. Nectar soils are on the less sloping ridgetops, and Townley soils are on the less sloping side slopes and ridges. Sunlight soils are shallower over bedrock than the Bankhead soils. They are in landscape positions similar to those of the Bankhead soils.

Typical pedon of Bankhead sandy loam, in an area of Sipsey-Bankhead complex, 15 to 45 percent slopes, 1,375 feet east and 200 feet south of the northwest corner of sec.23, T. 12 S., R. 9 W.

- A 0 – 4 inches: very dark grayish brown (10YR 3/2) sandy loam; weak fine granular structure; very friable; common fine and medium roots; about 10 percent, by volume, small sandstone channers 2 to 20 millimeters in size; strongly acid; clera wavy boundary.
- Bw1 4 - 13 inches: brownish yellow (10YR 6/6) channery sandy loam; weak fine subangular blocky structure; very friable; common medium roots; about 20 percent, by volume, sandstone channers 2 to 30 millimeters in size; strongly acid; gradual wavy boundary.
- Bw2 13 - 26 inches: yellowish brown (10YR 5/6) cobbly sandy loam; weak fine subangular blocky structure; very friable; few medium roots; about 33 percent, by volume, sandstone cobbles 3 to 10 inches in size; strongly acid; abrupt wavy boundary.
- R 26 inches: fractured, hard, yellowish brown sandstone; loamy material in the cracks.

**BANKHEAD SERIES CONTINUED...**

The thickness of the solum and the depth to hard bedrock range from 20 to 40 inches. Reaction is very strongly acid to strongly acid throughout the profile unless the surface layer has been limed.

The A horizon has hue of 10YR, value of 3 to 4, and chroma of 1 to 3. It is less than 5 inches thick. It is sandy loam, fine sandy loam, loam sand, or the channery or cobbly analogs of those textures. The content of coarse fragments ranges, by volume, from 5 to 25 percent.

The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 8. It is sandy loam or gravelly, channery, or cobbly sandy loam. The content of coarse fragments ranges, by volume, from 5 to 35 percent.

The R horizon is hard to weathered sandstone. Soil material is in the crack between the rocks.

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**TOWNLEY SERIES**

The Townley series consists of moderately deep, well drained, slowly permeable soils that formed in shale, siltstone, or interbedded shale, siltstone, and sandstone residuum. These soils are on uplands. Slope ranges from 8 to 15 percent.

Townley soils are geographically associated with Albertville, Docena, Holston, Leesburg, Montevallo, Nauvoo, Palmerdale, State, and Sullivan soils. Albertville, Holston, and Leesburg soils are deeper to bedrock. Docena soils are moderately well drained. Montevallo soils are shallow to shale and have more fragments. Nauvoo soils have loamy B2t horizons. Palmerdale soils formed in coal strip mine spoil. State and Sullivan soils are subject to flooding.

Typical pedon of Townley silt loam, in an area of Townley-Nauvoo complex, 8 to 15 percent slopes, in a wooded area about 1 1/2 miles northwest of Shannon, 1,500 feet west and 100 feet south of the northeast corner of sec. 6, T. 19 S., R. 3 W.

A1—O to 4 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; many fine, medium and large roots; few fine shale fragments; medium acid; abrupt wavy boundary. B1—4 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common fine, medium, and large roots; common fine root pores; few fine shale fragments; very strongly acid; abrupt wavy boundary. B2t—7 to 25 inches; yellowish red (5YR 5/6) silty clay; yellow and red weathered fragment streaks; strong coarse and medium angular blocky structure; firm; few fine, medium, and large roots; common fine root pores; thick continuous clay films on faces of peas; common shale fragments and weathered shale layers; very strongly acid; gradual wavy boundary. Cr—25 to 32 inches; red and yellow, consolidated, weathered shale.

Solum thickness is 20 to 36 inches. Reaction ranges from strongly acid to very strongly acid in all horizons except where the surface layer has been limed. De soft, consolidated shale is 20 to 40 inches.

The A1 or A2 horizon is 4 to 6 inches thick. This horizon has hue of 10YR or 7.5YR, value of 3 through 4 and chrome of 2 through 4. Texture is silt loam or I

In some pedons, there is a thin B1 horizon of silt loam, or silty clay loam.

The B2t horizon is silty clay, clay, or silty clay loam. This horizon has hue of 2.5YR, 5YR, or 7.5YR; value of 4 or 5; and chrome of 6 through 8. In some pedons, lower part of the B2t horizon is mottled or has multicolored streaks. Fragments of fine shale range from few to common in the B2t horizon and generally increase with depth.

In some pedons, there is a B3 or C horizon that color and texture similar to those of the B2t horizon

The Cr horizon is soft, weathered shale or siltstone interbedded shale, siltstone, and sandstone.

## GEOLOGIC DESCRIPTION

The geologic information provided in Part II-E of the Burton Mine permit application describes the stratigraphy of the mine site from drillholes within the permit area as follows:

The proposed mine site will occupy approximately five hundred forty-six (546) acres of which approximately five hundred twenty-one (521) acres will be mining acres and twenty-five (25) 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 Jefferson and Black Creek Coal Seams.

Structure within the region of Walker County considered here is fairly simple. The strata lie nearly horizontal. Calculated strike within the proposed mine area shows a range for each coal seam, and they are as follows: Jefferson Seam N 14<sup>o</sup> 58' 42" W and Black Creek at N 50<sup>o</sup> 24' 48" W. Calculated dip in the same areas and for the same coal seams is as follows: Jefferson S 1.1352° W and Black Creek at S 1.1751° W, except where local rolls in the strata (primarily the coal) are found. Past and present mining in the general area has shown these rolls to be quite common.

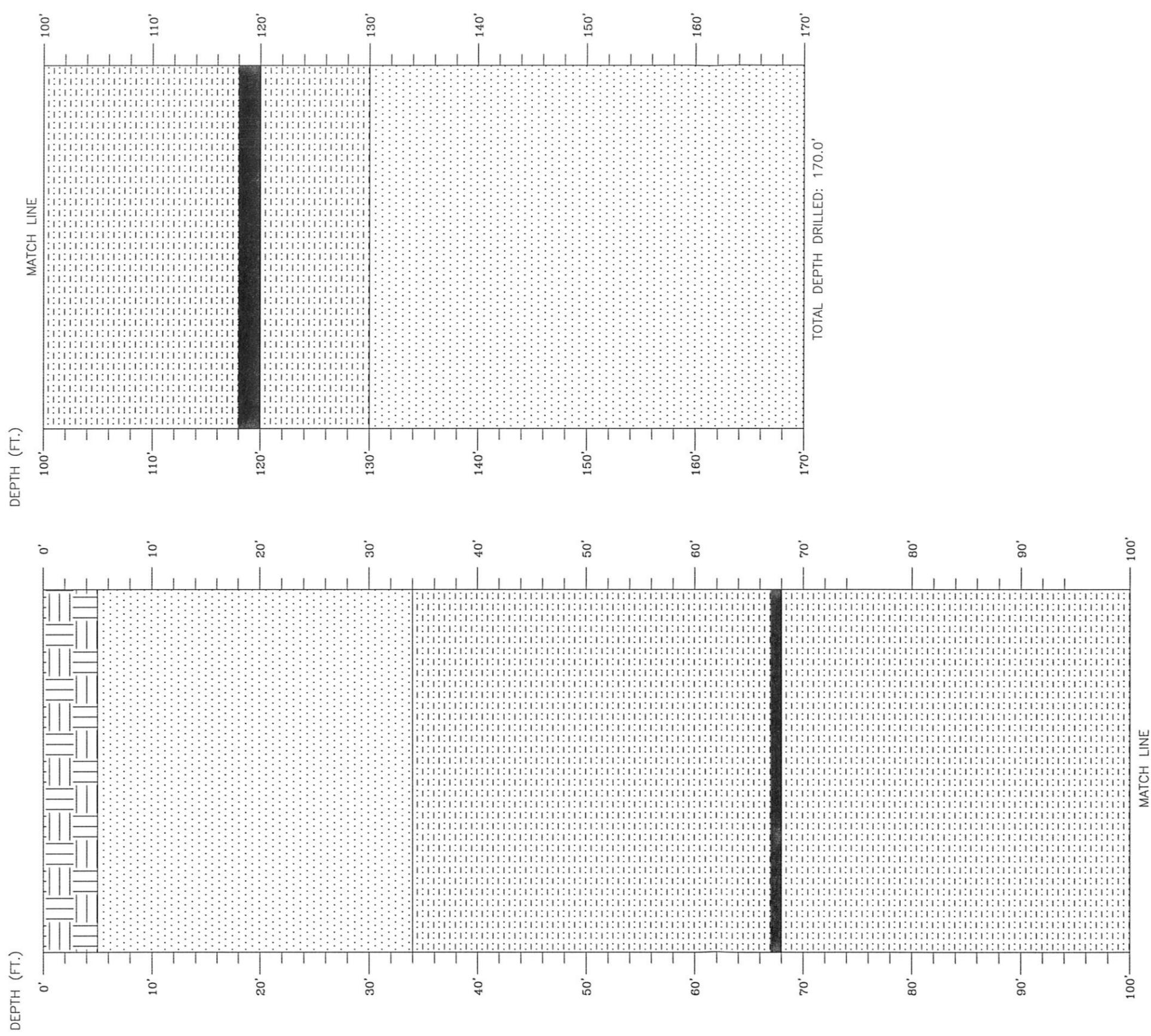
Drill logs and overburden sampling results have been obtained throughout the proposed mine site. Overburden sampling results and drill log data used in this report were obtained from onsite drill hole data. See attached [Soils Map](#).

Drill hole [OB-BD-1](#) was drilled by Reed Mining in April of 2009. 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 [OB-BD-1](#) and [drill logs](#). For the locations of drill holes and monitoring wells see the attached map entitled [Soils Map](#). All analyses were performed by McGehee Engineering Corp.'s lab. Laboratory results show the average Total Sulfur of the Black Creek Seam overburden throughout the area is 0.0495%, Neutralization Potential is +13.9858 and Maximum Potential Acidity is +3.03, resulting in an average Acid Base Account of +12.4376.

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**DRILL HOLE LOGS**

SURFACE ELEVATION 403.32' M.S.L.



LOG LEGEND

- SHALE AND SANDSTONE
- SANDSTONE
- COAL
- RASH
- CLAY
- BACKFILL

SHEET

1 OF 1

FILE NAME:

McWane, Inc.

Burton Mine R-12

MCWANE, INC.

BURTON MINE, P-3753

ATTACHMENT II-E

OVERBURDEN HOLE: OB-BD-1

SCALE: H: 1" = 0.5'

V: 1" = 10'

MCGEHEE  
ENGINEERING CORP.

P. O. BOX 3431

450 19TH STREET WEST

JASPER, AL 35502-3431

(205) 221-0686

## LOG OF DRILLING

AREA: SIPSEY  
COUNTY: WALKER  
DRILLER: LOWELL FARRIS  
ELEVATION: 403.32

DRILL HOLE NO.: OB-BD-1  
STATE: ALABAMA  
DATE DRILLED: 4/18/2009  
MAP NUMBER: N/A

M.S.L.	TOTAL	STRATA	THICKNESS
ELEV.	DEPTH	DESCRIPTION	FT. & 10ths
403.32	0.00	Clay	5.00
398.32	5.00	Sandstone	29.00
369.32	34.00	Water	0.00
369.32	34.00	Shale and Sandstone	33.00
336.32	67.00	Jefferson Coal	1.00
335.32	68.00	Shale and Sandstone	50.00
285.32	118.00	Black Creek Coal	2.00
283.32	120.00	Shale and Sandstone	10.00
273.32	130.00	Sandstone	40.00
233.32	170.00	Total Depth	

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**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. The spoil sample (SP-4) was collected within the permit area in the area that was recently mined. Soil samples (TS-7, TS-8, and TS-9) were taken adjacent to the permit area on soils that are representative of the Nauvoo-Sipsey Urban Complex, 2 to 12% slopes, Sipsey Loamy Sand, 4 to 18% slopes, or the Townley Silt Loam, 6 to 15% slopes soils that were previously onsite.

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 analyses were conducted on oven-dry composite samples to determine coarse fragment and soil percentages. Results of these analyses are listed in Table 2.

Drill samples from the overburden holes were obtained by capturing cuttings from rotary drilled holes. The cuttings were sampled at each strata change, or in minimum five-foot increments. The down pressure was disengaged at each strata change or interval to allow all of the cuttings to be blown from the hole before proceeding with the next interval, to prevent contamination of the sampled interval. Cuttings were logged and collected and stored in gallon size sip-lock type bags at McGehee Engineering Corp.'s lab for further inspection and analyses.

**TABLE 1 - SIEVE ANALYSIS**

TABLE 1 - SIEVE ANALYSIS

Company Name: **MCWANE, INC.**

Mine Name: **Burton Mine, P-3753**

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

Sampled: **03/14/14**

Analyzed: **03/20/14**

Analyzed By: **JW**

Sample Weight: **2003.3 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cumulative 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	7.3	0.4	0.4	99.6
4	4.75	194.0	9.7	10.0	90.0
10	2.00	291.0	14.5	24.6	75.4
Pan	---	1511	75.4	100.0	0.0

% of sample that is coarse fragments: **24.6**

% of sample that is soil: **75.4**

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

**TABLE 1 - SIEVE ANALYSIS**

Company Name: **MCWANE, INC.**

Mine Name: **Burton Mine, P-3753**

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

Sampled: **03/14/14**

Analyzed: **03/20/14**

Analyzed By: **JW**

Sample Weight: **1931.0 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cumulative 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	2.0	0.1	0.1	99.9
4	4.75	84.0	4.4	4.5	95.5
10	2.00	247.0	12.8	17.2	82.8
Pan	---	1598.0	82.8	100.0	0.0

% of sample that is coarse fragments: 17.2

% of sample that is soil: 82.8

Average size left in 1" Sieve: 1.0"

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TABLE 1 - SIEVE ANALYSIS

Company Name: **MCWANE, INC.**

Mine Name: **Burton Mine, P-3753**

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

Sampled: **03/14/14**

Analyzed: **03/20/14**

Analyzed By: **JW**

Sample Weight: **2008.1 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cumulative 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	1.1	0.1	0.1	99.9
4	4.75	42.0	2.1	2.1	97.9
10	2.00	67.0	3.3	5.5	94.5
Pan	---	1898.0	94.5	100.0	0.0

% of sample that is  
coarse fragments: 5.5

% of sample that is  
soil: 94.5

Average size left in 1" Sieve: 1.0"

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**TABLE 1 - SIEVE ANALYSIS**

Company Name: **MCWANE, INC.**

Mine Name: **Burton Mine, P-3753**

Sample I.D.: **TS-9**

Sampled: **03/14/14**

Analyzed: **03/20/14**

Analyzed By: **JW**

Sample Weight: **2007.0 gm**

Sieve No.	Sieve Opening (mm)	Weight Retained on each Sieve (gm)	Percent of Weight Retained on each Sieve	Cumulative 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	0.0	0.0	0.0	100.0
4	4.75	33.0	1.6	1.6	98.4
10	2.00	100.0	5.0	6.6	93.4
Pan	---	1874.0	93.4	100.0	0.0

% of sample that is coarse fragments: 6.6

% of sample that is soil: 93.4

Average size left in 1" Sieve: 1.0"

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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 2.

\*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 3 for an Estimation of the Total Available Water Capacity.

The acid-base account results for Spoil Sample SP-4 is shown to be of poor quality as shown on the Auburn results. After inspection of the material sampled, it was determined that the sample was contaminated with coal, which caused the high maximum potential acidity value. A subsequent sample of the spoil material was taken and analyzed. The results are more representative of the spoil material. The results are attached and are shown in Table 2.

### **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 Burton Mine site is more suitable than the natural topsoils present as a plant growth medium. The pH of the topsoils ranged between 4.1 and 5.1, the pH of the previously mined overburden samples was 6.68, the pH of the selected overburden samples (drill holes OB-BD-1) ranged between 4.2 and 7.41. The post mine land use proposes to be Undeveloped/No Current Use. Auburn University has recommended an average of 2.5 tons/acre of limestone on the naturally occurring topsoils and 2.5 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 0 Pounds per Acre of P<sub>2</sub>O<sub>5</sub> on the naturally occurring topsoils and an average of 60 Pounds per Acre of P<sub>2</sub>O<sub>5</sub> on the previously mined selected overburden material. Auburn University has recommended an

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average of 50.0 Pounds per Acre of  $K_2O$  on the naturally occurring topsoils and 0.0 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 the natural soils were slightly positive at 0.20 while the selected overburden material (drill holes) had a higher positive value at 5.30. The previously mined overburden was positive at a +12.44. The previously mined overburden and selected overburden material (drill holes) were both significantly higher in neutralization potential than the natural soils.

The pH of the previously mined overburden and selected overburden material (drill holes) are both more alkaline than the natural soils. Auburn University recommendations for applied nutrients are basically equal for the previously mined overburden and the natural soils, indicating the previously mined and selected overburden (drill holes) is at least equal to the natural soils.

**TEXTURAL ANALYSIS COMPARISON**

Textural analyses revealed that the overburden samples (previously mined area) have less soil and more coarse fragments than the topsoil samples. However, 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 native soils and previously mined selected overburden soil (<2mm) averaged basically the same percent sand, silt and clay. The soil samples indicate the previously mined selected overburden >2mm averages approximately 14.8% more coarse fragments than the native soils. The available water capacity for the natural topsoil soil particles is (0.1273 cm./cm. average) while the available water capacity for the previously mined selected overburden is (0.0961 cm./cm. average). The "Total" available water capacity as shown in Table 3 is basically equal.

The overburden at Burton Mine is better than the native topsoils in the following parameters: pH, extractable nutrients, neutralization potential. As shown in the overburden and topsoil comparison, the overburden is equal or more suitable for surface mine revegetation and therefore satisfies the criteria set forth in section 880-X-10C.08(5).

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**TABLE 2**

**TOPSOIL VS. OVERBURDEN COMPARISON**

	Topsoil (TS-7, TS-8, TS-9)	PREVIOUSLY MINED/ SPOIL OVERBURDEN (SP-4) (range)	SELECTED OVERBURDEN OB-BD-1 (range)
pH (low)	4.1	6.68	4.20
pH (high)	5.1	6.68	7.41

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

	Sipsey-Bankhead Complex 15 to 45% slopes	PREVIOUSLY MINED OVERBURDEN (average)	SELECTED OVERBURDEN OB-BD-1 (average)
PHOSPHOROUS	46	29	N/A
POTASSIUM	111	224	N/A
MAGNESIUM	238	989	N/A
CALCIUM	635	3691	N/A

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

	Sipsey-Bankhead Complex 15 to 45% slopes (average)	PREVIOUSLY MINED OVERBURDEN (average)	SELECTED OVERBURDEN OB-BD-1 (average)
LIMESTONE (ton/acre)	2.5	2.5	N/A
NITROGEN (lbs./acre)	60	60	N/A
P-205 (lbs./acre)	0	60	N/A
K-20 (lbs./acre)	50	0	N/A
NO <sub>3</sub> – N (ppm)	3.4	3.8	N/A

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**TABLE 2**  
**TOPSOIL VS. OVERBURDEN COMPARISON**  
(Continued)

	Topsoil (TS-7, TS-8, TS-9)	PREVIOUSLY MINED OVERBURDEN (SP-4) (average)	SELECTED OVERBURDEN OB-BD-1 (average)
NEUTRALIZATION POTENTIAL	1.00	8.10	+15.47
MAXIMUM POTENTIAL ACIDITY	0.80	2.80	+3.03
SULFUR (%)	0.0257	0.0890	+0.0495
ACID-BASE ACCOUNT	0.20	5.30	+12.44
SAND (%)	33.75	40.00	N/A
SILT (%)	39.79	27.50	N/A
CLAY (%)	26.46	32.50	N/A
AVAILABLE WATER CAPACITY (cm/cm)	0.14	0.12	N/A
COARSE FRAGMENTS (%)	9.8	24.6	N/A
SOIL (%)	90.2	75.4	N/A
TOTAL AVAILABLE WATER CAPACITY (cm/cm)	0.1273	0.0961	N/A
SOIL ERODIBILITY FACTOR "K"	0.30	0.24	N/A

TABLE 3

TOTAL AVAILABLE WATER CAPACITY  
 NATIVE SOILS

SAMPLE I.D.	PERCENT OF SAMPLE RETAINED			
	1"	1/2"	1/4"	2 mm
TS-7	0.0	0.1	4.4	12.8
TS-8	0.0	0.1	2.1	3.3
TS-9	0.0	0.0	1.6	5.0
AVERAGE	0.0	0.1	2.7	7.0

SIEVE OPENING	PERCENT RETAINED	AWC FACTOR	AWC in./in.
1"	0.0	0.0389	0.0000
1/2"	0.1	0.0492	0.0000
1/4"	2.7	0.0603	0.0016
2 mm	7.0	0.1149	0.0081
TOTAL			<u>0.0097</u>

< 2mm average from Table 2: 90.2%

> 2mm average from Table 2: 9.8%

Average available water capacity of < 2mm from Auburn Data = 0.14 cm/cm.

90.2% X 0.14 cm/cm = 0.1263 cm/cm

9.8% X 0.0097 cm/cm = 0.0010 cm/cm

Total = 0.1273 cm/cm

Average Total Available Water Capacity for the Native Soils = 0.1273 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 3

TOTAL AVAILABLE WATER CAPACITY  
 PREVIOUSLY MINED OVERBURDEN

SAMPLE I.D.	PERCENT OF SAMPLE RETAINED			
	1"	1/2"	1/4"	2 mm
SP-1	0.0	0.4	9.7	14.5
AVERAGE	0.0	0.4	9.7	14.5

SIEVE OPENING	PERCENT RETAINED	AWC FACTOR	AWC in./in.
1"	0.0	0.0389	0.0000
1/2"	0.4	0.0492	0.0002
1/4"	9.7	0.0603	0.0058
2 mm	14.5	0.1149	0.0167
<b>TOTAL</b>			<b>0.0227</b>

< 2mm average from Table 2: 75.4%

> 2mm average from Table 2: 24.6%

Average available water capacity of < 2mm from Auburn Data = 0.12 cm/cm.

75.4% X 0.12 cm/cm = 0.0905 cm/cm.

24.6% X 0.0227 cm/cm = 0.0056 cm/cm

Total = 0.0961 cm/cm

Average Total Available Water Capacity for the Previous Mined Soils = 0.0961 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 lower than the pH of the selected overburden (drill holes). The selected overburden (previously mined overburden) at the Burton Mine was more fertile than the native topsoil, as shown in the extractable nutrient comparison on Table 2.

The average acid-base account of the selected overburden (drill holes OB-BD-1) was +12.44, the native topsoil was +0.20, and the acid-base account of the spoil samples was +5.30.

Additionally, the surrounding areas mined during pre-law saved no topsoil and have had no problem with the plant growth (See attached pictures). Therefore, using a selected substitute material during mining should not pose any problems with plant growth. The best available material on site will be used as the final cover.

As shown in this study the selected overburden material at the Burton Mine 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 Caterpillar type dozers. 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 1 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 these 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.

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**ATTACHMENT IV-C-2**

**AUBURN DATA**

Mine Analysis Report  
Auburn University  
Soil Testing Lab



McGehee Engineering  
PO Box 3431  
Jasper AL : 35502  
County: Walker

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

Mine Name: Reed Minerals, Inc., Burton Bend 3

Special Analysis #: 14.G0039-G0044

Soil Texture

Lab I.D.	Sample I.D.	OM %	NO <sub>3</sub> -N ppm	Neutralizing Potential Tons CaCO <sub>3</sub> /1000 Tons materia	max pot.acid.	Sand %	Silt %	Clay %	Textural Class	H <sub>2</sub> O avail. cm <sup>3</sup> /cm <sup>3</sup>
16021	SP4	10.8	3.8	<1.0	15.98	40.00	27.50	32.50	Clay Loam	0.12
16022	TS7	2.9	2.7	<1.0	1.30	17.50	53.75	28.75	Silty Clay Loam	0.17
16023	TS8	2.5	2.9	<1.0	0.58	41.88	32.50	25.63	Loam	0.13
16024	TS9	1.7	4.7	<1.0	0.53	41.88	33.13	25.00	Loam	0.13
16025	TS10	1.0	2.9	<1.0	0.51	54.38	25.63	20.00	Sandy Clay Loam	0.11
16026	TS11	4.3	2.7	<1.0	1.19	42.50	26.25	31.25	Clay Loam	0.12

MULTIPLE SULFUR ANALYSES

Lab I.D.	Sample I.D.	1rst %	2nd %	3rd %	4rth %	Ave %
16021	SP4	0.473	0.568	0.551	0.454	0.511
16022	TS7	0.0500	0.0465	0.0364	0.0337	0.0416
16023	TS8	0.0229	0.0186	0.0162	0.0168	0.0187

16024	TS9	0.0197	0.0186	0.0138	0.0154	0.0169				
16025	TS10	0.0139	0.0183	0.0137	0.0188	0.0162				
16026	TS11	0.0405	0.0428	0.0363	0.0333	0.0382				
DATE:										



# 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: Jackson  
District: 1

SOIL TEST RESULTS										RECOMMENDATIONS			
LAB No.	Test Date	Sample Designation	Crop	Soil Group*	pH**	Phosphorus	Potassium	Magnesium	Calcium	LIME-STONE	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
						P***	K***	Mg***	Ca***				
										Tons/Acre		Pounds/Acre	
16021	03/28/14	Reed Minerals/ Burton Bend 3 SP4  See Comment 1 See Comment 2	Revegetation	4	4.0	L 29	H 224	H 989	H 3691	2.5	60	60	0
16022	03/28/14	TS7  See Comment 1 See Comment 2	Revegetation	4	5.1	VH 162	M 147	H 540	H 1308	2.5	60	0	40
16023	03/28/14	TS8  See Comment 1 See Comment 2	Revegetation	4	4.1	H 105	L 83	H 57	L 145	3.0	60	0	60
16024	03/28/14	TS9  See Comment 1 See Comment 2	Revegetation	4	5.0	VH 148	L 103	H 118	H 451	2.0	60	0	50
16025	03/28/14	TS10  See Comment 2	Revegetation	4	6.0	H 92	VL 45	H 122	H 568	0.0	60	0	80
16026	03/28/14	TS11  See Comment 1 See Comment 2	Revegetation	4	4.0	M 49	L 112	H 100	H 318	4.0	60	40	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 K<sub>2</sub>O per ton of anticipated hay yield.

\* 1. Sandy soil (CEC < 4.6 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 3. Clays and soils high in organic matter (CEC > 9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 2. Loams and Light clays (CEC = 4.6-9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 4. Clays of the Blackbelt (CEC > 9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\*\* 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: *Green Huluka*

Print Date: May 27, 2014

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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: Jackson

District: 1

The number of samples processed in this report is: 6

For further information call your county agent: (256) 574-2143

\* 1. Sandy soil (CEC < 4.6 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 3. Clays and soils high in organic matter (CEC > 9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 2. Loams and Light clays (CEC = 4.6-9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\* 4. Clays of the Blackbelt (CEC > 9.0 cmol<sub>c</sub>kg<sup>-1</sup>)

\*\* 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: *Green Huluta*

Print Date: May 27, 2014

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**McWANE, INC.**  
**BURTON MINE, P-3753, R-15**  
**ATTACHMENT IV-C-2**

**ON-SITE**  
**COLOR PHOTOS**

Previously mined area adjacent to permit showing good vegetation



**Reclamation within the permit area showing good vegetation**



**McWANE, INC.  
BURTON MINE, P-3753, R-15  
ATTACHMENT IV-C-2**

**Reclamation within the permit area showing good vegetation**

