

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

1. Geologic Description of the Permit and Adjacent Area

The Quality Coal Co., Inc. – Dutton Hill Mine No. 2 is located in Walker County, west of Jasper in Sections 22, 23, 26 & 27, Township 14 South, Range 8 West, Walker County, Alabama as seen from 1981 USGS Jasper Quadrangle (see attached [Mine Site Location Map](#) and [Hydro/Geo Map](#)). Dutton Hill Mine No. 2 is proposed to be surface mining and auger mining. The proposed mine site will occupy approximately one hundred fifty-eight (158) acres of which one hundred fifty-two (152) will be mining acres. 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, page 8” as the following: The Pottsville Formation consists chiefly of alternating beds of gray sandstone, conglomerate, siltstone, and shale with beds of coal and underclay. The coal seams to be mined at this site will be the New Castle, Mary Lee and Blue Creek Coal Seams.

The most common geologic structural features in the Warrior Basin are faults and folds. The faults generally tend to be normal faults with a dominant northwest-southeast orientation. There are no faults within the permit area.

2. 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.

A total of eight (8) drill holes were used to describe the lithology within the permit and surrounding area. Three of the drill holes were rotary drilled by either Mack O’Rear or Eddie Owen of Quality Coal. The remaining five drill holes were drilled by Drummond Company personnel. Cuttings for drill holes to be analyzed were logged and collected and stored in gallon size sip-lock type bags at McGehee Engineering Corp.’s lab for further inspection and analyses. The cuttings were sampled in minimum five foot increments and at each lithologic change. For the lithologic description of the drill holes and monitoring wells see the attached Lithologic Description Drawings [P-3920 MW-2/OB-1](#), [MW-1/OB-1](#), [MW-2](#), [W7750C](#), [W7304C](#), [W6697C](#), [W6696C](#), [W6695C](#) 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.

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

Drill Hole ID	Percent Sulfur	Neutralization Potential	Acid-Base Account	Tons/Acre Excess CaCO ₃
MW-1 / OB-1	0.2465	21.0432	13.3387	3197
P-3920 MW-2/OB-2	0.1857	13.1777	7.3750	864

According to the Acid Base Accounts of the overburden sampled there were three intervals in MW-2/OB-1 that exhibited acid forming potential. The interval from 55'-59.1' immediately above the New Castle Seam showed a percent sulfur of 2.7 and a deficiency of -74.38. This interval probably had contamination from the New Castle Coal seam. The other two zones were from 80' -85' (0.0 % sulfur and NP -28.5) and 85'-90' (0.0 % sulfur and NP -14.5). Although this ten foot zone shows to be acid forming when spoiled with the remainder of the Blue Creek parting (76.9' -80' and 90' - 95.5'), the blended Blue Creek parting shows an excess tons/ acres of CaCO₃ of 234 tons. The entire hole blended together showed an excess of 8 tons per acre. There is more than enough neutralization potential present in the overburden immediately above and below the zones to neutralize any acid formation without any special overburden handling.

Overburden hole MW-1/OB-1 has no zones of potential to be acid forming material other than the strata directly above or below the coal seams due to coal contamination. The weighted averages indicate that there is more alkaline material than acid forming material contained in the overburden at this mine. MW-1/OB-1 does not extend to or below the Blue Creek seam. The parting between the Mary Lee and Blue Creek seams is between 12 and 18 feet. MW-1/OB-1 is 12 ft. below the Mary Lee seam so therefore a majority of the parting was sampled.

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A majority of the permit area has been previously surface mined by pre-law mining activities. All previously mined areas have great vegetation growth and show no signs of acid forming material areas.

For the chemical analyses of the overburden materials see the [Overburden Analysis Spreadsheet](#). See the attached [Hydro-Geo Map](#) for the locations of the overburden holes.

3. 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 from Drummond Coal Company, Inc.

Seam	Percent Sulfur (Total as-received)
New Castle	3.94
Mary Lee	0.86
Blue Creek	1.91

4. 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 New Castle, Mary Lee, and Blue Creek will be mined as deep as economically possible. For coal seam information, see the following table:

SEAM	THICKNESS	OVERBURDEN	STRIKE/DIP
New Castle	0.80'	82'	N 66 ^o 13.68' E S 1 ^o 39.04 E
Mary Lee	2.00'	20'	N 66 ^o 13.68' E S 1 ^o 39.04 E
Blue Creek	1.50'	13'	N 66 ^o 13.68' E S 1 ^o 39.04 E

OVERBURDEN ANALYSIS SPREADSHEET

OPERATOR: **QUALITY COAL**

PERMIT NO: **DUTTON HILL MINE NO. 2 P-3 DRILL HOLE: P-3920 MW-2/OB-1**

COUNTY: **WALKER** TOWNSHIP:

THRESHOLD SULFUR NP FIZZ 0 0.00 0

VALUES: 0 0.00 0

CLAY 3450
 SHALE 3700
 SILTSTONE 3750 ALK ADD(tns/ac CaCO3):
 SANDSTONE 3670 COAL SEAMS:
 LIMESTONE 3670 STATE PLANE ZONE:
 COAL 1800 FEET (NORTH/SOUTH):
 CARBONOLITI 2580 FEET (EAST/WEST):
 OTHER 3670 SURFACE ELEV. (FT):

BOTTOM DEPTH (FT)	THICKNESS FEET	ROCK TYPE	FIZZ RATING	SULFUR %	NP	DEFICIENCY /EXCESS	ACREAGE	UNIT WT		FRACTION		TONS		NET NP (TONS)	TONS OF OVERBURDEN
								TONS/AC-FT	SPOILED	MPA	NP				
5.00	5.00	CL	0	0.00	0.00	0.00	1.00	3450	1.00	0.00	0.00	0.00	0.00	0.00	17250
10.00	5.00	CL	0	0.00	0.00	0.00	5.35	3450	1.00	0.00	0.00	0.00	0.00	0.00	92215
15.00	5.00	SH	0	0.10	6.80	3.68	7.52	3700	1.00	434.67	945.85	511.18	511.18	139096	
20.00	5.00	SH	0	0.80	26.30	1.30	9.69	3700	1.00	4482.36	4715.44	233.08	233.08	179294	
25.00	5.00	SH	0	0.00	27.00	27.00	11.86	3700	1.00	0.00	5926.31	5926.31	5926.31	219493	
30.00	5.00	SH	0	0.00	27.00	27.00	14.04	3700	1.00	0.00	7011.67	7011.67	7011.67	259692	
35.00	5.00	SH	0	0.00	29.00	29.00	16.21	3700	1.00	0.00	8696.82	8696.82	8696.82	299890	
40.00	5.00	SH	0	0.00	24.50	24.50	20.56	3700	1.00	0.00	9317.04	9317.04	9317.04	380287	
45.00	5.00	SH	0	0.00	25.00	25.00	24.90	3700	1.00	0.00	11517.11	11517.11	11517.11	460685	
50.00	5.00	SH	0	0.10	24.00	20.88	29.25	3700	1.00	1690.88	12985.96	11295.08	11295.08	541082	
55.00	5.00	SH	0	0.00	19.00	19.00	33.59	3700	1.00	0.00	11808.10	11808.10	11808.10	621479	
59.10	4.10	SH	0	2.70	10.00	-74.38	37.55	3700	1.00	48060.43	5696.05	-42364.38	569605	3249	
60.00	0.90	CO	0	0.00	0.00	0.00	40.11	1800	0.05	0.00	0.00	0.00	0.00	0.00	822472
65.00	5.00	SH	0	0.60	16.50	-2.25	44.46	3700	1.00	15421.35	13570.79	-1850.56	-1850.56	902869	
70.00	5.00	SH	0	0.00	21.00	21.00	48.80	3700	1.00	0.00	18960.25	18960.25	18960.25	983266	
75.00	5.00	SH	0	0.00	18.50	18.50	53.15	3700	1.00	0.00	18190.43	18190.43	18190.43	9601	
76.90	1.90	CO	0	0.00	0.00	0.00	56.15	1800	0.05	0.00	0.00	0.00	0.00	0.00	684395
80.00	3.10	SH	0	0.00	11.00	11.00	59.67	3700	1.00	0.00	7528.34	7528.34	7528.34	1177024	
85.00	5.00	SH	0	0.00	-28.50	-28.50	63.62	3700	1.00	0.00	0.00	0.00	0.00	0.00	1224458
90.00	5.00	SH	0	0.00	-14.50	-14.50	66.19	3700	1.00	0.00	0.00	0.00	0.00	0.00	1304855
95.00	5.00	SH	0	0.00	10.00	10.00	70.53	3700	1.00	0.00	13048.55	13048.55	13048.55	134907	
95.50	0.50	SH	0	0.00	10.50	10.50	72.92	3700	1.00	0.00	1416.53	1416.53	1416.53	0	
97.00	1.50	CO	0	0.00	0.00	0.00	75.75	1800	0.00	0.00	0.00	0.00	0.00	0.00	0
102.00	5.00	SH	0	0.00	11.00	11.00	78.75	3700	0.00	0.00	0.00	0.00	0.00	0.00	0
107.00	5.00	SH	0	0.00	12.00	12.00	94.00	3700	0.00	0.00	0.00	0.00	0.00	0.00	0

TOTAL OVERBURDEN VOL.(ACRE-FT): 2986
 PERCENT SANDSTONE: 0%
 NP/MPA RATIO: 2.16
 TONS/ACRE REQUIRED (1:1): 864 EXCESS

Thickmess Weighted Averages
 PERCENT SULFUR 0.1857
 NP 13.1777
 ABA Account 7.3750

TOTAL (TONS): 70089.70
 TOTAL (TONS/THOUSAND): 6.36
 PERCENT SULFUR 13.72
 NP 7.37
 ABA Account 81245.55

5. Coal Cropline(s) Location:

For a map showing the outcrop location with respect to the proposed permit area; see the attached [Hydro-Geo Map](#). The only seam that outcrops within the permit area is the New Castle seam.

6. Geologic Description Support Data:

For maps or cross-sections used to support the geologic description see the attached map(s) entitled [Geologic Investigation Cross-Sections A-A', B-B', and C-C'](#).

7. Drill Hole Locations and Elevations:

For elevations and locations of drill holes and other sample sites, see attached [Hydro-Geo Map](#) and Lithologic Description Drawings. [P-3920 MW-2/OB-1](#), [MW-1/OB-1](#), [MW-2](#), [W7750C](#), [W7304C](#), [W6697C](#), [W6696C](#), [W6695C](#) and [Drill Logs](#).

8. Sampling and Analytical Data:

Samples were collected by employees of McGehee Engineering Co. Samples were taken every five (5) feet or change in lithology. Each overburden sample was described and analyzed. Chemical analysis, including Paste pH, Total Sulfur, and Neutralization Potential were conducted by personnel of McGehee Engineering Corp.'s lab in accordance with Field and Laboratory Methods Applicable to Overburden and Minesoils developed, USEPA, Environment Protection Technology Series, EPA-600/2-78-054 dated March 1978 guidelines.

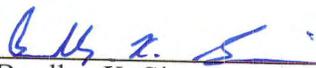
9. Required Additional Overburden Testing:

Indications of additional overburden testing or additional parameters have not been received at this time. If drilled or sampled during the preparation of this application, portions of all of the overburden samples shall be retained for additional testing at the office of McGehee Engineering Corp. until the issuance of the permit. Based on the geologic data (acid base account), there was a small amount of acid or toxic forming materials disclosed in the overburden holes, however there is a sufficient amount of alkaline material within the overburden to neutralize this potential acid forming material.

10. Certification Statement

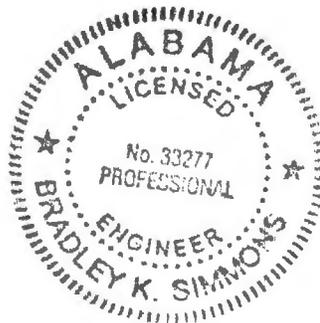
I, Bradley K. Simmons, hereby certify that the information contained in Attachment II-E, and all maps, plans, and cross-sections included in the answers to Parts II-E, of this application were either prepared under my direct supervision or prepared and certified by other professional engineers or geologists, and that the information included herein is correct and accurate to the best of my knowledge and belief.

McGehee Engineering Corp.



Bradley K. Simmons, P.E.

AL Reg. No. 33277



10/23/14

Date