

GEOLOGY

The Cahaba Resources, LLC – Carter West Mine site is located in Section 34, Range 8 West, Township 20 South in Tuscaloosa County, Alabama. The proposed mine site is approximately 61.0 acres, of which approximately 55.0 acres will be bonded as mining acres (see attached [Permit Map](#)). Approximately 51.0 acres of the 61.0 acre permit area has been previously disturbed by mining, and approximately 41.0 of the 51.0 previously mined acres have not yet been reclaimed. The majority of the permit area, including Increment No. 1 and Increment No. 6, a total of 49.0 acres, is land owned by Cahaba Resources, LLC. Increment No. 2 is owned by Warrior Met Coal Land, LLC. One of the primary objectives of this project is to reclaim the un-reclaimed previously mined area for the surface owners.

Structurally, the site is located within the Warrior Coal Basin. The Warrior Basin is the southernmost of a series of basins of the Appalachian Plateau. The Pottsville Formation consists of sandstones, siltstones, shales, clays, and coal seams of varying thicknesses. The Warrior Coal Basin is formed by a large gentle syncline that extends from north-central Mississippi to north-central Alabama. This syncline tilts southwestward and has a dip that ranged between 30 and 200 feet per mile. There are three synclines and two anticlines of the Pottsville formation towards the interior of the Warrior Coal Basin. Of these, the major structures are the Warrior and Coalburg synclines, and the Sequatchie anticline. The fold axes are parallel to the Appalachian system in a northeast-southwest direction and plunge to the southwest with the regional dip. The strata which underlies and outcrops in this region is of the Pottsville Formation of the Pennsylvanian Age and the Coker Formation of the Cretaceous Age. The Coker Formation consists of fine micaceous sand, varicolored micaceous clay, and thin chert and quartz gravel beds.

According to "Depositional Settings of the Pottsville Formation in the Black Warrior Basin" The Brookwood Coal Group is the stratigraphically highest coal group in the Warrior Coal Basin and the Carter Seam of the Brookwood Coal Group is the target seam at this mine site. The Guide, Brookwood and Milldale seams generally overly the Carter seam, but are not expected to be present in most locations due to previous mining activity in the area. If encountered, however, these other seams will be recovered.

"Depositional Settings of the Pottsville Formation in the Black Warrior Basin" states that the Carter Seam occurs approximately 20 to 40 feet above the Johnson Seam, approximately 30 feet below the Milldale Seam, ranges in thickness from 5 to 30 inches, and is valued as a metallurgical or coking coal.

Approximately three quarters of the proposed permit area has been previously disturbed by pre-law mining of Brookwood Group Coal Seams, although it is not known of any others than the Carter were mined. Exploratory drilling within the proposed permit boundary reveals that the Carter Seam outcrops between approximately 435 and 466 ft. MSL and averages approximately 18 inches thick.

To describe the lithology of the permit area to the depth of recovery in the area, two cross-sections have been developed. These cross sections are shown on the [Hydro/Geo Map](#) and are designated as [Geologic Section A-A' and Geologic Section B-B'](#).

Overburden thickness above the Carter Coal Seam ranges from 0 ft. at the cropline to approximately 51 ft. at the deepest point. Cretaceous material within the proposed permit area

ranges from 15 ft. to 42 ft. in thickness and is approximately 33 ft. thick as shown on the attached drill hole lithologies.

The Coker Formation strata to be disturbed within the proposed permit area can be described as weathered sandy surface material followed by unconsolidated, weathered sand and clay with small amounts of quartz pebbles. The color of this interval ranges from a medium red-brown at the surface to light yellow brown at the base of the formation. In areas where the thickness of the Pottsville Formation is not dictated by surface topography, the thickness of the Pottsville strata overlying the Carter Seam within the proposed permit area ranges from approximately 11.5 feet to 16 feet with an average thickness of approximately 13.83 ft. thick as shown from available drill hole lithologies. The lithology of Pottsville Formation strata overlying the Carter Seam within the proposed permit area consists of either a single shale layer ranging from 6.5 to 16 feet thick or (towards the west of the proposed permit) a sandstone interval which overlies the shale layer. The sandstone interval is a fine to medium grained tightly cemented sandstone which is medium to very hard. In some places the groundwater which has migrated through the highly conductive cretaceous sediments has weathered the first few inches of the Pottsville sandstones and shales. This lithology was taken from drill holes within and adjacent to the proposed permit area and these intervals vary in thickness depending upon their location within the proposed permit area. The orientation of this contact, which has a profound effect on groundwater movement in the Cretaceous aquifer, is shown on the map as dipping towards the South and West.

Although no faults are known to exist within this small permit area, it is known from previous permit applications in this area (by both Black Warrior Minerals and The Drummond Company) that there is at least one fault to the west and southwest of this permit. This fault (or faults) has an influence on the structure and orientation of the Carter coal seam and the overlying strata proposed to be disturbed by coal recovery operations at this site.

According to 'Depositional Settings of the Pottsville Formation in the Black Warrior Basin', investigations have shown that the depositional environment of the coal and enclosing strata has a direct bearing on the character of the coal seams, that the thickness and extent of the seam is largely determined by the relief of the surface on which the coal swamp developed, and that the nature of the sediments which overlie the coal (overburden) have a strong influence on coal quality including sulfur and trace element content. The reference also states that the prevailing theory is that the Pottsville Formation represents a progradation sequence that ranges from Barrier Island deposits near the base of the Formation grading through Lower Delta Plain and transitional deposits into Upper Delta Plain deposits as you ascend into the upper part of the Formation. In addition, the reference states that all depositional systems comprise one or more interrelated depositional environments which are in turn represented in the rock record by one or more lithofacies defined by the sedimentologic and biologic processes active within each environment. Based on this information, the fact that the Brookwood Coal Group is the highest coal group in the Pottsville, and on site-specific drill data presented in this report, all indicate that the Brookwood Coal Group was formed in an upper delta plain depositional environment. As shown in 'Depositional Settings of the Pottsville Formation in the Black Warrior Basin', upper delta plain deposits are fluvial in nature, meaning a fresh water depositional environment, and were not deposited in a marine environment (which has been connected to low quality runoff from coal related facilities).

The Cretaceous deposits, which overlay the Pottsville strata at the mine site, are thought to be the Coker Formation, or more specifically, the lowest part of the Coker Formation, which has

been called the Cottondale Formation. According to 'Geology of the Coastal Plain of Alabama', the Cottondale is present only in the immediate vicinity of Tuscaloosa and the Warrior River and is an apparent nonmarine sand having only a small amount of gravel at the base. The reference also states that the Cottondale Formation contains no glauconite. Glauconite is defined as essentially a hydrous potassium iron silicate which commonly occurs in sedimentary rocks of marine origin, therefore if there is no glauconite present, the sedimentary material probably did not form in a marine environment. The reference also states that the coarse-grained sand and carbonaceous clay in the formation are believed to have accumulated at or close to a shoreline, perhaps near the mouth of a river. In addition, the reference states that the quartz and quartzite discs might indicate prolonged erosion on the swash zone of a beach.

The only deviation from this depositional model is a thin interval at the Coker-Pottsville contact which is locally known to exist. This interval is thought to be re-worked Pottsville Formation strata and is a sand channel, or high energy deposit. This interval is thin (generally less than 3 ft. thick), is discontinuous (meanders), and has periodically caused reclamation problems at other local facilities due to adverse geochemical quality. The dominant lithology for this interval is a light grey friable, or unconsolidated sand. It should be noted that none of the lithologic descriptions presented in this report contains such a description, however due to the discontinuous (meandering) nature of the interval, may or may not exist within the proposed permit area.

Information utilized to describe the orientation, lithology, and geochemistry of the Carter West Mine and adjacent areas include the following drill holes and geochemical analysis sites: [CRCWMOB-2, CRCWMOB-6, CRCWMDH-5, and P-3986 CRCMDH-1](#). These sites were drilled with an air rotary drill rig. All of the above-mentioned sites were drilled and/or cased specifically for this report, with the exception of P-3986 CRCMDH-1, which was drilled for the P-3986 Carter Mine ASMC Permit Geology report. Samples were collected by qualified personnel from PERC Engineering Company, Inc. every 5 feet in depth or change in lithology, cataloged, and stored in gallon sized resealable storage bags for later inspection and testing. These samples were delivered to the Standard Labs Laboratory where the lithology of the samples was determined by a qualified professional. See attached lithologic descriptions. In addition, several exploratory drill holes and channel samples were drilled/excavated by the Operator to determine coal seam elevation and extent. See attached Coal Boundary Map and the attached 'Pertinent Information for Selected Exploratory Drill Holes and Channel Samples'.

Geochemical analysis sites drilled to describe coal and overburden geochemistry specifically for this report include [Geochemical Analysis Site CRCWMOB-2 and CRCWMOB-6](#). The representative area for each of these two sites was determined using the Theissen Polygon method which is shown on the [Theissen Polygon Map](#). Chemical analysis, including pH and neutralization potential was conducted on overburden samples from the above-mentioned sites at the Standard Labs Laboratory according to ASTM guidelines (See attached analysis). Overburden material taken from CRCWMOB-6 was composed of mostly spoiled material with coal mixed in, as this location was most likely previously disturbed. Coal was found to be at a depth of 12.5' below the surface, and a mixture of shale, gravel, clay, and coal was found above. CRCWMOB-2 represents material taken from an area with minimal disturbances. Here, the Coker formation material is apparent, with approximately 32' of red clay above a 5' layer of clay and gravel. Below the Coker Formation is approximately 4' of shale, and the Carter Seam is found at a depth of 45'.

The elevations of all drill holes, geochemical analysis sites, and groundwater monitoring wells utilized in this report were estimated from a 2-foot contour interval mapping.

Drill sites CRCWMOB-2, CRCWMDH-5, CRCWMOB-6, and P-3986 CRCMDH-1 were utilized to construct the Hydro-Geo Map for the Carter Seam. This map is utilized to determine the elevation and orientation of the target coal seam within the coal recovery area.

GEOLOGY CERTIFICATION STATEMENT

I, Zachary Wilbanks, a registered professional engineer, hereby certify that the information, cross-sections, data, maps, etc., contained in this general plan in Attachment II-E are true and correct to the best of my knowledge and belief.

Wilbanks Engineering & Environmental Solutions, LLC

Zachary Wilbanks, P.E
Alabama Reg. No. 34440

Date