

Module 7: Geologic Information

Instructions: Information submitted under Module 7.1, 7.2, 7.3, 7.4, 7.5, and 7.6 must be certified by a licensed professional geologist. Information submitted under Module 7.7, 7.8, and 7.9 must be certified by the individual that certified Sections 6.2 and 6.3 of Module 6.

7.1 Drill Logs

Provide borehole data sufficient to describe the stratigraphy at the following sites covered by this application: coal preparation activity sites, coal refuse disposal sites, sites which will be surface-mined, and areas which will be undermined. Borehole information must cover the stratigraphic interval from the surface to the deeper of the following: the bottom of the shallowest aquifer system beneath the site or proposed underground mine, or the bottom of existing underground mine workings lying beneath the site or proposed underground mine. (If the application is for an underground mine which is more than 200 feet below surface drainage and not underlain by existing mine workings, the drill hole core boring information need only extend to the stratum immediately below the coal seam to be mined.) Use Form 7.1A for general reporting purposes, or Form 7.1B if overburden analysis is required.

This application pertains to underground mining operations only within the 1,457.9 acre expansion area situated north of the active Rustic Ridge #1 Mine. There are no coal preparation activities or coal refuse disposal activities proposed by this application.

Drill hole information describing the stratigraphy within the underground expansion area is provided on the enclosed Form 7.1A: Geologic Drill Logs. The seam of coal that will be mined is the Lower Kittanning based upon coal seam intervals, presence of two limestone (Brush Creek, Middle Kittanning) marker beds and published geology. Drill log information is provided to describe the stratigraphy extending from the surface to the strata underlying that seam of coal. The Lower Kittanning Coal is the lowest member of the Kittanning Formation of the Allegheny Group, and this seam of coal does not outcrop within the permit boundary and is entirely below drainage within the mine plan area. Generally, the Lower Kittanning Coal is underlain by the Kittanning Sandstone of the Clarion Formation and overlain by the Columbiana Shale. Primary lithologic units within the underground expansion area consists of sequences of limestone, claystone, shale, sandy shale, sandstone, and coal comprising the Glenshaw and Allegheny Groups.

No existing mines are known to lie beneath the Lower Kittanning Coal in or near the permit boundary.

7.2 Geologic Cross Sections

Provide geologic cross sections or fence diagrams which correlate the stratigraphic information contained in the drill logs. Cross sections or fence diagrams should be of appropriate scale, detail and orientation that they can be used to depict stratigraphic and hydrologic conditions at surface sites where coal preparation, coal refuse disposal, and surface mining operations will take place, and in settings where underground mining will take place. Cross sections should include information on lithology, stratigraphy, existing groundwater and surface water, monitoring wells, water supplies, and aquifers within the stratigraphic interval for which data was collected. Limits of proposed surface activities and underground mining activities should also be shown. Include static water level data and groundwater flow directions. Lines of cross section should be shown on the Exhibits 6.2, 6.3 and 8.2.

Refer to Exhibit 7.2: Geologic Cross Sections E-E', F-F', G-G' and H-H'. Lines of cross sections are identified on Exhibits 6.3 and 8.2.

7.3 **Geologic Structure**

Describe the local geologic structure and its relation to the regional geologic structure. Describe the attitude of the bedrock. Attach maps or diagrams as necessary.

The Rustic Ridge #1 Mine underground permit expansion area is situated in the west-central area of the Allegheny Mountain section of the Appalachian Plateau Physiographic Province in Pennsylvania.

Regional structural mapping has been obtained from *Atlas No. 48 Geology and Mineral Resources of the Donegal Quadrangle, Pennsylvania*, by Marchant N. Shaffner, PA Geological Survey, 1963. The regional mapping illustrates that the permit expansion area is located within the Allegheny Mountain Section of the Appalachian Plateau Province. Regionally, geology is typically composed of a series of parallel, rounded ridges and valleys striking to the northeast-southwest. Two of these ridges, the Chestnut Ridge Anticline and the Laurel Hill Anticline, are located approximately 2.7 miles west and 5.0 miles east of the underground expansion area, respectively.

The structurally upgradient portion of the expansion area is along the lower eastern flank of the Chestnut Ridge Anticline having a Lower Kittanning bottom of coal elevation of approximately 1425 ft-msl, approximately 35 feet lower in elevation than the active underground permit area. Within the eastern portion of the permit expansion area, geologic structure decreases to an elevation of approximately 1230 ft-msl within the Ligonier Syncline. The trace of the synclinal axis loses its identity in a mild structural low and reappears northwest of Donegal as a northeast plunging structural bulge originating in the foothills of Chestnut Ridge, gradually widening into a broad, nearly symmetrical basin.

The dip of the Lower Kittanning coal seam along the eastern flank of the Chestnut Ridge Anticline is approximately 3.8%. Within the basin of the Ligonier Syncline dip of the Lower Kittanning coal seam decreases to approximately 0.9% to 1.3%. Refer to Exhibit 6.3 for the location of the Ligonier Syncline relative to the permit area.

7.4 **Fracturing**

Describe the attitude and characteristics of joints, cleats, fracture zones and faults as they occur at surface sites where coal preparation, coal refuse disposal, and surface underground mining operations will take place within the underground permit area of a proposed underground mining operation. Show linear traces of faults and fracture zones on the Exhibit 8.2.

No evidence (published or obtained by drilling) of faulting affecting the Lower Kittanning coal seam is known to exist in the underground expansion area. The orientation of the face and butt cleats of the Lower Kittanning coal are N69°W - N19°E respectively as determined from a geologic study of Mines 32 and 33 in Cambria County. A linear analysis was conducted by MSHA for the Donegal Mine permit area. Linears may represent surface expressions of fractures (joints) in the rocks. However, linears have not been ground-truthed in the permit area. The linears obtained from MSHA are shown on Exhibits 6.3 and 8.2.

7.5 **Additional Geologic Information - Underground Mines**

- a. Provide the following based on drill hole data representative of the underground permit area using form 7.1B. (Enclose in separate envelope, if coal analysis is confidential.)
 - i. Lithologic description of the strata immediately above and below the coal seam to be mined;

The proposed Rustic Ridge #1 Mine expansion area is overlain by sedimentary rock of the Glenshaw Formation of the Conemaugh Group and the Kittanning Formation of the Allegheny Group and is underlain by the Clarion Formation of the Allegheny

Group. From the drill logs, the rock strata immediately above the Lower Kittanning coal seam consists of shale and shaly sandstone units.

ii. Neutralization potential of roof strata, coal, and floor strata;

The general analysis of the roof, floor, and coal for the Rustic Ridge #1 Mine permit area, by evidence of drill hole 11618 is as follows:

Strata Layer	Strata Thickness (ft.)	Sulfur Percentage	Neutralization Potential
Roof Strata	3.0	0.14	17.25
Lower Kittanning Coal	3.5+	0.02	26.13
Floor Strata	1.00	7.36	0.12

iii. Total sulfur content of roof strata, coal, and floor strata;

Refer to 7.5) 2) above.

b. Provide the percent RQD results for overburden strata in each stream valley where underground mining will take place at depths less than 200 feet. Report results under "Lithologic Description" on Form 7.1A.

All stream valleys within the permit expansion area have more than 200 feet of cover thickness.

i. Additional RQD results may be required in circumstances where the applicant is proposing multiple seam mining, where an alternative pillar plan is submitted, or for areas where postmining mine pool levels may exceed surface elevations or where there is a potential flow loss in streams.

No applicable, none of the above circumstances apply. Available RQD data is provided on Form 7.1A: Geologic Drill Logs.

7.6 Additional Geologic Information on Sites where Overburden will be Excavated

Note: The requirement for overburden analysis may be applicable to any site where overburden is removed to the level of a mineable coal seam and should be resolved prior to application submittal. This can be done as part of the pre-application review process or more informally through a meeting and discussion with District Office personnel.

No additional overburden removal is proposed as part of this permit application. Entry to the underground mine will be made at the existing slope entries. Refer to original approved permit application for the Rustic Ridge #1 Mine for the overburden report.

a. Request for Waiver of Overburden Analysis Yes ☐ No ☒

Typically, the Department will not grant waivers if the proposed site meets any of the following criteria:

- Lies within a High Quality, Exceptional Value, Wilderness Trout Stream or other stream sensitive to mining impact;
- Is in proximity to a public water supply;
- There is an absence of mining in the watershed or little mining on seam(s) of interest;
- There is an indication of acid or elevated metals from the same seam(s) on adjacent mines; or
- Removal of alkaline material is proposed.

As stated above, if the proposed site clearly qualifies under one of the above five (5) categories, overburden analysis will almost certainly be required. If a waiver is requested, the applicant must provide a written narrative explanation and documentation supporting the basis for the waiver. This narrative must provide evidence that there is equivalent information available and must include:

- vi. A discussion as to the relationship between the proposed site and the five (5) categories discussed above;
- vii. An explanation as to the existing hydrogeologic information that supports the waiver (e.g. stratigraphy, water chemistry, nearby overburden analyses, and so forth); and
- viii. Previous mining history on the watershed or adjacent areas (including percentage or relative acreages of mined and unmined portions of the watershed) and the postmining water quality associated with the proposed seams (including specific examples).

b. Overburden Analysis Report

The overburden analysis report must include at a minimum:

- i. Geologic logs of overburden analysis test holes. This must include a lithologic description (including the information requested in Form 7.1B, lithologic thickness of strata and depth of strata, type of drill used, collar elevation and the geologist who logged the hole. The Munsell system is to be used for color identification. Water condition information must include static water level (measured 24 or more hours after drilling), where water was encountered and estimated yield. This information is to be presented on a completed Form 7.1B "Overburden Analysis Data" or on a similar form approved by the Department.

An explanation of considerations employed in determining the following:

- (1) Borehole spacing and number of holes,
 - (2) Sampling depth, and
 - (3) Sampling intervals of overburden analysis test holes.
- ii. A series of stratigraphic cross-sections or fence diagrams including all overburden analysis test holes, plus other representative test holes. It is suggested that the vertical exaggeration not be more than five (5) times the horizontal scale. The vertical scale must be sufficient to show all potentially acidic and alkaline zones and any zones proposed for special handling; a scale of one (1) inch to 20 feet or greater is recommended. The stratigraphic correlations between overburden holes and other test holes must be shown. Additionally hydrogeologic information (such as water table, perched systems and so forth) should be portrayed.
 - iii. Overburden holes accurately located on Exhibit 6.2. Overburden holes must be surveyed such that surface elevations and hole locations are accurately determined and plotted.
 - iv. Results of the chemical analysis of all overburden strata, coals and strata immediately below the coal. Acid-base accounting data must be presented on Form 7.1B "Overburden Analysis Data" or on a similar form approved by the Department. Actual laboratory analysis sheets may be submitted in addition to Form 7.1B. Forms of sulfur (when submitted) should be submitted on a separate sheet.
 - v. Techniques and methods of chemical analyses. References pertaining to technique or method should be cited as appropriate (e.g. Sobek, and others 1978, p. 47-50; ASTM Method D2492-84) and where a standard method is not used or has been modified, the method used should be described in detail.
 - vi. An identification of any stratigraphic units possessing the potential for significant acid or alkaline production and an overall interpretation of the overburden analysis data. The criterion and rationale by which the overburden is being judged must be explained.
 - vii. The name, address and telephone number of the individual(s) responsible for the collection and analysis of the data and interpretation of the data.

7.7 Surface Mines and Coal Refuse Disposal Areas

Submit the following information on all active, completed and abandoned surface mines and coal refuse disposal sites which lie within 1,000 feet of the permit area. Show sites on Exhibits 6.2, 6.3 and 9.1.

Operator:	Milrock Mining, Inc.	Firestone Coal, Inc.	V & B Excavating	Unknown	The Rondell Co.
Site Name:	Champion #1	Keller	Brown	Unknown	Nedrow Strip
Permit No.:	3376SM9	34A77SM14	65892305	Unknown	3476SM2
Map Key:	S1	S2	S3	S4	S5
Status:	Abandoned	Reclaimed	Active	Reclaimed	Reclaimed
Coal Seams:	UF, LF, UK	UF, LF	Shale Pit	Assumed UF	UF
Augering: (yes/no)					Yes
Discharge: (yes/no)					

7.8 Underground Mines

Submit the following information on all active, completed and abandoned underground mines, which lie within 1,000 feet of the permit area. Show boundaries and openings on Exhibits 6.2, 6.3, and 9.1.

Operator:	Eastern Associated Coal Corp	Country Bank		
Site Name:	Melcroft No. 3 Mine	Unknown		
Permit No.:	562	Unknown		
Map Key:	D1	D2		
Status:	Sealed	Abandoned		
Coal Seams:	Lower Kittanning	Upper Freeport		
Opening Elev.'s:	1443.90'	~1600'		
Discharge Elev.'s:	1441.93'	None		
Mine Pool Elev.'s:	1445'	None		

7.9 Waste Disposal Facilities/Sites

Submit the following information on all hazardous, municipal, and residual waste disposal sites (either active or completed) which lie within 1,000 feet of the permit area. Show sites on Exhibits 6.2, 6.3, and 9.1.

Operator:				
Site Name:				
Permit No.:				
Map Key:				
Status:				
Waste Type:				