STRUCTURAL INFORMATION  
08/2021

Description

Describe the local geologic structure and its relationship to the regional structure. Use diagrams and regional structural relief maps where applicable (in addition to stratigraphic cross section(s) submitted on web form. Reference sources of information.

The permit area is situated along the northern edge of the Winder 7.5 minute USGS topographic map (see the attached map) and is located in the Appalachian Plateaus physiographic province. The local geologic structure is consistent with the regional structure which consists of a series of broad, gently plunging, open folds having moderate amplitudes and generally trending northeast-southwest. The stratigraphy of the overlying strata is contained in the Conemaugh Group, with the coal seams, ranging from the Upper Freeport (E) to the Middle Kittanning (C), residing in the Allegheny Group.

The predominate local feature is the Wilmore Syncline which lies approximately 1 mile to the northwest of the central portion of the permit area. The entire permit area lies on the southeastern flank of this syncline. The general strike of the local structure is N 25° E as based on drill hole information complied for the permit application and supplemented by drill holes from the adjacent Mine 78 deep mine. The permit area is dipping in a northwestern direction towards the Wilmore Syncline at approximately 4%.

The geologic description is based on local drilling information, supplemented by information obtained from Mineral Resource Report 101, “Bedrock Geologic Map, Coal-Resource Maps, and Digital Datasets of part of the Windber Quadrangle, Somerset County, Pennsylvania.”
Mining is being proposed for coal seams in the Allegheny Group, ranging from the Middle Kittanning Coal Seam to the Upper Freeport Coal Seam. Overlying strata will extend into the bottom of the Conemaugh Group formation.
PERMIT AREA

EXPLANATION
Coal Lines

Brush Creek coal
Upper Freeport coal
Lower Freeport coal
Upper Kittanning coal
Middle Kittanning coal
Lower Kittanning coal
Clarion coal
Brookville coal
Upper Mercer coal
Lower Mercer coal

Anticline
Structure contour

Syncline
Structure contour

MAP RELIABILITY
Coal crop lines—very good
Structure contours—good

SOURCES
Coal lines by J. R. Shaulis; modified by J. R. Shaulis from Pennsylvania (1944), based on elevations contours and internal lines.
Structure contours from unpublished mine data, drill-hole records, and geological logs, U.S. Bureau of Mines (1959), and interpretation of topographic maps and aerial photographs.

James R. Shaulis 2007
## Joints and Fractures

Indicate joint and fracture orientations on the Environmental Resources map (or USGS map if locations are outside limits), using standard joint strike and dip symbols, where fracture/joint measurements were taken. Rose diagrams may be submitted if available.

<table>
<thead>
<tr>
<th>Type of Joint or Fracture</th>
<th>Lithology</th>
<th>Number of Measurements</th>
<th>Depth Below Surface</th>
<th>Aperture (width)</th>
<th>Map (Env Res or USGS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress relief joint (1)</td>
<td>Sandstone</td>
<td>1</td>
<td>10’ from surface</td>
<td>1 inch</td>
<td>Env Res</td>
</tr>
</tbody>
</table>

References and sources of the joint and fractures data (site specific measurements, publication source, etc.).

(1) Taken from the adjacent Hoffman No. 10 West Mine (SMP No. 11060103)