

Subject: Underground Mine Outcrop Barriers and Post Mining Hydrology Evaluation

Date: May 22, 1996 Revised: November 15, 2012

Approval: Lewis Halstead

Purpose: This procedure is intended to prevent the occurrence of a “mine blowout,” and to prescribe the requirements for the evaluation of post underground mining hydrologic impacts prior to bond reduction for operations that proposes underdrainage mining and/or where the Secretary has determined the application has an elevated risk of blowout or offsite impacts. “Blowouts” are a rapid release of large volume of water impounded in underground mine workings to the land surface due to the failure of outcrop barrier pillar.

1. The permit applicant must leave an unmined section of coal where the coal seam approaches the land surface so as to create an outcrop barrier pillar except:
 - a. Where the applicant has demonstrated in the permit application that based upon the geologic and hydrologic conditions in the permit area no accumulation of water in the underground workings will occur;
 - b. In those locations where the applicant has proposed mine entries for ventilation and transportation of men and materials.
 - c. Areas where a determination has been made that hydrologic head relief is required.
2. The permit applicant must demonstrate the outcrop barrier is of sufficient width to support the overburden and prevent its failure and sudden release of water due to water pressure against the unmined coal. The applicant must provide an outcrop barrier pillar design based on sound engineering principles. An overburden blow out and stability analysis must be performed and included in the permit package.
3. When the overburden blow out and stability analysis indicates that the coal seam is the weakest point, the permit applicant may use the Empirical Formula (commonly known as the Rule of Thumb) which states that the width of the outcrop barrier $W = 50 + H$ where W is the width of the coal barrier in feet and H is the maximum hydrostatic head that can be built on the outcrop barrier.
4. The outcrop barrier design must also consider seepage analysis in estimating the flow that will be expected from the barrier. The outcrop barrier may be lengthened if estimated flow rates are such that surface water hydrology is likely to be adversely impacted. Alternatively, methods to decrease seepage by use of

impermeable materials behind the barrier including curtain grouting may be prescribed.

5. Where underground mining is proposed to be conducted to an adjacent abandoned waterlogged mine, the effect of additional head of water must be considered by the permit applicant in the design of internal and outcrop barriers. For this purpose, the accuracy of maps of the abandoned mine must be verified by additional borings or by the use of geophysical survey techniques when determined necessary.
6. The width of all outcrop barriers as determined from the design computations must be plotted on the topographic map and included in the permit application. The seam elevations along the outcrop line, location and elevations of springs and seeps must also be plotted on the topographic map. Methods to conduct the water flows safely from seeps downstream of the barrier must be incorporated in the permit.
7. Where multi-seam mining is proposed, the permittee must demonstrate that outcrop barriers in the upper seam are underlain by solid coal barriers in the lower seam, except as provided under item 1.b or where the stability analysis shows that partial mining can occur and that remaining pillars in the lower seam will support the outcrop barriers in the upper seam. The permittee must demonstrate that developmental maps for multi-seam mining include information relating to proposed underground barriers, where mining has already occurred and where it is planned.
8. The permit applicant must demonstrate that procedures for the prevention of buildup of hydrostatic head beyond the designed water level is assured by drilling relief wells or using angled boreholes into the hillside at a point in the overburden for direct passage of mine water to the surface are included in the permit. However, the uses of these methods which result in gravity discharge from acid producing coal seam are prohibited. Alternatively, pumping of water from deep mine workings to the surface may be included in the permit package. Where such procedures for prevention of the buildup of water beyond the designed water level are used, the permittee must demonstrate that appropriate water treatment methods are included in the permit.
9. Applications that proposes underdrainage mining and/or where the Secretary has determined the application has an elevated risk of blowout or other adverse offsite impacts applicant must provide monitoring plans to include measurements on hydraulic head, quality and quantity of water discharged from workings and verification of outcrop barriers on a regular basis, as determined by the reviewer and/or the inspector. This information shall be used by the permittee to perform

an analysis of surface and groundwater quantity and quality that will be prior to granting bond reduction. This analysis must be submitted at least 180 days prior to submittal of initial release request. The analysis will include an assessment of the data to show that material damage has been prevented. The analysis can include an evaluation of any trends which may exist in the available data that which demonstrate the elevated risk of blowout or other adverse offsite impacts have been minimized and material damage have been prevented.