PREMINING PREDICTION OF ACID DRAINAGE POTENTIAL FOR SURFACE COAL MINES IN NORTHERN WEST VIRGINIA

by

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ABSTRACT

Premining prediction of postmining drainage quality is required by law but the method most often used has proven unreliable. In this study postmining drainage geochemistry of 75 surface coal mines in Monongalia and Preston counties was measured and compared to geochemical, hydrogeologic, and mining parameters to identify more reliable premining predictors.

Postmining drainage chemistry is significantly dependent upon coal overburden lithology. Net alkalinity (alkalinity minus acidity) of drainage shows a significantly decreasing trend with increasing volumetric percentage of sandstone in the overburden; such drainage is also significantly decreased in net alkalinity for mines with sandstone (as opposed to shale) as the immediate roof rock. No mine sampled for drainage in this study is producing drainage with positive net alkalinity if it has greater than 63% sandstone in overburden or if it has sandstone roof rock. Sandstone percentage is significantly and inversely related to both total and net acid-base neutralization potential in coal overburden.

Both total and net acid-base neutralization potentials of overburden are significantly and directly related to net alkalinity of mine drainage. No sampled mine is producing drainage with negative net alkalinity if it has greater than 40 tons of calcium carbonate equivalent of total acid-base neutralization potential or greater than 30 tons of calcium carbonate equivalent of net acid-base neutralization potential per thousand tons of overburden. Conversely, no mine with less than 20 tons per thousand tons of total neutralization potential or less than 10 tons per thousand tons of net neutralization potential is producing drainage with positive net alkalinity. Total sulfur (and hence maximum potential acidity) in the tested overburden for the study area bears very little relation to drainage quality and even extremely low sulfur overburden often produces acid because of a lack of accompanying neutralizing minerals. The greatest average sulfur content for overburden of the tested mines was only 0.85%; sulfur content is likely to be more strongly related to drainage quality where higher sulfur contents exist.

Mines with the final highwall structurally updip of the backfill usually produce drainage of poorer quality than the reverse. Surface mining of old underground mines does not significantly improve drainage quality, and such surface mines have poorer drainage quality

than average. The highest sulfate, alkalinity and acidity concentrations are found in watersheds with the highest percentage of areas mined.

Reclaimed and unreclaimed surface mines produce anomalously high drainage alkalinity in small zones in the Upper Freeport coal field of northern Preston County. The zones have anomalously high percentages of shale as opposed to sandstone in the overburden. The locations of such shale "islands" are determined by the conditions of the paleoenvironment of deposition. Paleoenvironmental mapping and analysis can be used to aid regional or site specific premining predictions of postmining drainage chemistry.