Field Predictors for TDS Generation Potential from Appalachian Mine Spoils[1]

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Surface mining for coal in the Central Appalachians contributes total dissolved solids (TDS) to headwater streams, especially below larger mines and associated valley fills as rainwater percolates through blasted mine spoils. The objective of this study was to characterize the TDS generation potential of a range of surface soils and associated geologic strata from the Central Appalachian coalfields and to relate those properties to simple field indicators, such as color or rock type. We hypothesized that these indicators could accurately predict TDS generation potential. Thirty-three vertical weathering sequences were sampled from eight surface mines throughout the Central Appalachian coalfields, for a total of 204 individual samples. No differences were found among sites in overall saturated paste specific conductance (SC; used as a proxy for TDS) levels, but significant geochemical differences existed among samples. Surficial soils and sandstones were yellowish-brown in color and much lower in SC, compared to underlying grayish to black sandstones, shales, and mudstones. Samples generating exothermic reactions with 30% H_2O_2 produced higher SC levels. In conclusion, the mine spoils studied varied widely in TDS generation potential. The simple field indicators presented here, such as color, weathering status, rock type, and H_2O_2 reaction can provide valuable guidance for identifying TDS risk in the field which would greatly improve operator's ability to actively minimize TDS release. We recommend using soils and weathered, yellowish-brown sandstone layers as a source of low TDS spoils whenever possible. Underlying unweathered bedrock layers should be treated as "potentially high TDS spoils". The H_2O_2 field test is useful for identification of TDS risk. Particularly high risk spoils include gray to black mudstones and shales, coals, and coal associated shales, mudstones, and clays directly associated with coal seams. We recommend hydrologically isolating these spoils using techniques similar to those used historically for acid-forming materials.

Additional Key Words: Specific conductance, weathering, overburden, coal, peroxide, color.

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