STATISTICAL SUMMARY OF GROUND-WATER-QUALITY DATA FROM SELECTED MINED AREAS IN THE POWDER RIVER BASIN, WYOMING[1]

David L. Naftz and M. W. Martin[2]

U.S. Geological Survey
Cheyenne, Wyoming

The U.S. Geological Survey, in cooperation with the U.S. Bureau of Land Management, conducted a study of ground-water quality in selected mined areas in the Powder River basin of Wyoming during 1984 through 1986. Water-quality samples were obtained from 144 wells completed in either the coal aquifers (premining water) or spoil aquifers (postmining water) at 10 surface coal mines. The purposes of the study were to: (1) Evaluate possible changes in ground-water quality as a result of mining; and (2) estimate the distribution of variance for selected chemical constituents at the between-mine, within-mine, and within-well levels.

Analytical data for more than 650 water-quality samples were statistically analyzed. With the exception of selenium and nitrate, concentrations of other constituents in the water did not exceed the recommended criteria for livestock use in more than 10 percent of samples from either coal or spoil aquifers. Comparison of median concentrations between samples from coal and spoil aquifers indicated a decrease in the fluoride concentrations and an increase in the sulfate and dissolved-solids concentrations. Water from wells completed in the coal aquifers is dominantly a sodium bicarbonate or calcium magnesium sulfate type. Water from wells completed in the spoil aquifers is dominantly a calcium magnesium sulfate type. Plots of specific conductance versus time did not indicate any noticeable trend for samples from spoil aquifers; however, the plots did indicate annual fluctuation of specific conductance in samples from some wells, possibly because of variations in annual recharge from precipitation to spoil aquifers.

The results of the nested analysis of variance for the ground-water-quality data indicate that a significant component of the total variance is at the within-mine level for most constituents analyzed. Conventional F-tests (.05 probability level) indicate no significant variances for selected constituents at the between-mine level, but do indicate statistically significant variance at the within-mine level.

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[2]Hydrologists, U.S. Geological Survey, Cheyenne, Wyo.