FLOODING OF ABANDONED UNDERGROUND PITTSBURGH SEAM COAL MINES

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Coal mining in the Pittsburgh seam began in the late 1700's. Of the more than 1,200 underground Pittsburgh seam mines in the basin, only 12 remain active today. The rest are closed and either flooded, flooding, or free draining. Approximately 4,991 square miles have been mined; 1,941 square miles are currently flooded. The volume of water in these flooded mines is estimated at 1.36 trillion gallons.

In the last 20 years many large mines have closed and are either flooded or flooding. Throughout the basin, 100,400 gallons per minute currently discharges from closed mine workings. This number is expected to increase over the next decade as some of the flooding mines fill and begin to discharge. These discharges have a chemical load of 21,800 tons of iron, manganese, and aluminum oxides per year. Twenty-three percent of this water is treated, removing 8,600 tons per year (about 39%) of metal precipitates. The rest (13,200 tons per year) is untreated. Sixty-one percent of the iron (12,000 tons per year), 56% of the manganese (760 tons per year), and 58% of the aluminum (450 tons per year) are untreated and enter the Monongahela and Ohio drainages.

Most of the mine water comes from very old closed mines for which mine operators no longer have responsibility. Nearly all post-1977 mine closures with a discharge are being treated by mine operators at 14 treatment plants. Operation of four treatment plants has been assumed by the Pennsylvania Department of Environmental Protection (PADEP) due to operator insolvency or bond forfeitures. At least two new discharges associated with bond forfeiture properties are expected to occur over the next several years. At one of these, PADEP and a local mining operation have collaborated to intercede and pump/treat water before surface breakout occurs.

Mine water quality improves with time in flooded mines. Early mine-water discharge is highest in dissolved solids and metals, and lowest in pH. After a number of years of flow, the water chemistry will decrease in metal loads and increase in pH, generally resulting in net-alkaline discharges with elevated iron. Several very old high volume discharges have been identified in which the water quality is suitable for discharge without treatment.

In future, mine waters of this basin may be suitable for direct use, with and locally without chemical treatment. This aquifer is currently the most productive groundwater source in southwestern Pennsylvania/northern West Virginia. In time, it may become a usable water resource for some applications.