

Topic UGM-4

White Paper Topic: Treatment Methods for Large Volume Underground Mine Discharges

Development Team: Chuck Cravotta; Paul Ziemkiewicz, Terry Ackman, Dan Koury

Date: October 21, 2005

Problem Definition

- Large volume discharges associated with abandoned coal mines in the northeastern U.S. can be dominant sources of contaminant loading and water supply to streams.
- Large volume discharges can be difficult to treat passively or actively because of high costs for treatment, limited applications of technologies developed for small volume discharges, and limited availability of land for treatment.
- Large volume underground mine discharges (below drainage) commonly have lower concentrations of acidity and other dissolved solutes than small volume discharges (owing to dilution), but loading rates can be comparable for small and large volume discharges.
- Based on detention time (function solely of flow rate), a large area would be indicated for treatment of a large discharge compared to a small discharge.
- Based on acidity or alkalinity loading rate (function of flow and chemistry), relatively smaller area per unit volume may be indicated for a large discharge compared to a smaller, more concentrated discharge.
- Methods or design protocols are needed that involve short detention time, enhance contaminant attenuation, and/or produce small volume of sludge.

Course of Action:

- Various treatment systems constructed (or proposed) for large volume discharges need to be characterized and evaluated for efficiency—contaminant load removed or alkalinity produced per unit area or unit time—and cost effectiveness.
- Corresponding protocols or test methods for design of efficient and cost-effective treatment need to be developed and evaluated.
- Methods that accelerate contaminant removal such as heterogeneous iron oxidation, ozonation, and other innovative approaches that utilize hydraulic power need to be evaluated and compared with conventional active and passive treatment approaches.
- To increase cost-effectiveness of treatment, methods and opportunities should be explored on possible uses of the treated effluent for industrial or other applications and recovery and use of sludges or other constituents.

Because area may not be available for treatment and/or contaminants may be derived from surface sources, alternative remedial methods including in-situ treatment and/or reducing infiltration to underground mines also should be evaluated and considered in economic analysis.