Treating Mine Drainage in Batch Using BOLTS (Batch Operating Limestone Treatment System) Limestone Beds Can Lower Treatment Costs¹

Griffin Burt*, Jared Oakes, Tim Danehy, Buck Neely, Cliff Denholm, William Strosnider, Julie LaBar, James Eckenrode, and Travis Tasker²

Abstract: There are approximately 5,000 miles of acid mine drainage (AMD) impacted streams in Pennsylvania alone, requiring various types of treatment systems to improve water quality. The most common are active and passive treatment systems, which use oxidation, alkalinity generation, settling, among other options to treat AMD. One unique system is a passive treatment system in Portage, Pennsylvania utilizing a novel limestone bed design that allows batches of AMD to be treated for a set hydraulic retention time (HRT). This system treats the Puritan Mine Discharge which has an average flow of 150 gallons per minute and contains a mean 20 mg/L of iron, 15 mg/L aluminum, an acidity of 200 mg/L, and a pH of 3.5. At the site, the Puritan Discharge first flows into a holding pond that stores the AMD until a limestone bed has completed treating a volume of the AMD for a set HRT. Once the holding pond is full and the limestone bed is empty and ready to accept new raw AMD, a float switch is triggered, allowing the limestone bed to fill via a relatively rapid influx. Once the limestone bed is full, the influent valve to the limestone bed closes and treats the AMD for a set HRT. After treating for the set HRT, the water is flushed from the limestone bed and into a sedimentation basin. This process repeats once the holding pond has enough AMD to refill the empty limestone bed. During high flows of AMD, the holding pond has an additional piping system that connects to a separate flushable limestone bed that treats AMD in a traditional flow-through design where the AMD flows into a limestone bed and is flushed every 24 hours to remove precipitates. We hypothesize that treating AMD in the novel BOLTS (Batch Operating Limestone Treatment System) method in comparison to the traditional flow-through configuration can treat AMD more effectively with smaller limestone volumes. We tested this hypothesis by monitoring the influent and effluent water quality from the two differently designed limestone beds at the Puritan Discharge. After monitoring for several months, acidity balances were performed to determine which treatment method was the most effective.

Additional Key Words: Mine water treatment.

- 1. Poster presented at the National Meeting of the American Society of Reclamation Sciences, Duluth, MN. June 12–16, 2022. Published by ASRS; 1305 Weathervane Dr., Champaign, IL 61821.
- 2. Griffin Burt (*presenter), Jared Oakes, undergraduates, James Eckenrode, Engineering Faculty, and Travis Tasker, Assistant Professor in Environmental Engineering at Saint Francis University, Loretto, PA 15940; Tim Danehy and Buck Neely, BioMost, Inc., Mars, PA 16046: Cliff Denholm[,] Stream Restoration Inc., Mars, PA 16046: William Strosnider Director, Baruch Marine Field Laboratory, University South Carolina; Julie LaBar, Assistant Professor of Environmental Science, Centenary University.