

The U.S. Geological Survey - Leetown Science Center and the Colorado School of Mines have developed a remediation process for the treatment of metals in circumneutral mining influenced waters. The process involves treatment with a pulsed limestone bed (PLB) system, followed by co-precipitation of metal-carbonate impurities. The PLB system is resistant to armoring through the action of intermittently pulsing fluids through beds of limestone. This imparts significant alkalinity to the water, especially when CO_2 has been added to enhance dissolution of the limestone. Then, product water is directed through an inclined channel containing limestone where co-precipitation of metal carbonates occurs, resulting in the removal of additional impurities, such as Zn, Cd and Mn. The maximum pH in the channel reaches 8.3, which is suitable for direct discharge into surface waters. The selectivity of the process results in lower reagent consumption and sludge volumes than would be expected with conventional lime or caustic treatment. The process was tested on four different hard-rock-mine-drainage effluents, and process performance and effluent composition were determined. If the water has only significant concentrations of zinc and minor concentrations of manganese, then removal of 90% or more of the zinc is achieved. If the water has significant Mn concentration (≈ 50 mg/L) and minor Zn concentration, then removal of manganese is much more difficult and only after significant processing can the concentration of manganese be lowered to below 5 mg/L. Sludge volumes generated by the process are significantly smaller, only 10% of those generated by hydroxide precipitation.