

MULTI-COMPONENT PASSIVE TREATMENT SYSTEM: A CASE STUDY¹

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Abstract: In late 1999, an effective passive system was designed and installed through a public-private partnership effort to treat a 30-gpm abandoned mine discharge containing high dissolved metal concentrations on an old 120-acre, surface clay and coal mine within Ohiopyle State Park, PA. This multi-component passive treatment system was constructed in six weeks and consists of an Anoxic Collection System, Anoxic Limestone Drain (ALD), Settling Pond #1, Vertical Flow Pond (VFP), Settling Pond #2, Aerobic Wetland, and Horizontal-Flow Limestone Bed (HFLB). In theory, the high concentration of dissolved iron (155 mg/L) in the discharge would consume the alkalinity (190 mg/L field) generated by the ALD. The iron solids would be retained in Settling Pond #1 and the effluent with the remaining dissolved iron would then enter the VFP, which would generate sufficient alkalinity to neutralize the acidity generated as the iron precipitated in Settling Pond #2 and the Aerobic Wetland and to ensure a net alkaline final effluent. Although the calculated residence time was more than 20 days for Settling Pond #1, a range of 10 to 40 mg/L of particulate iron flowed from Settling Pond #1 into the VFP. Dye testing indicated that, although constructed properly, residence time was only a few hours, indicating that the acceptable method for calculating residence time was not applicable. Baffle curtains, a standard practice used in conventional treatment systems, were installed to increase residence time and promote settling. These baffles have successfully decreased the particulate iron concentration in the effluent from Settling Pond #1 by 50 to 75%. After passing through the entire system, the total iron concentration is about 1 mg/L. There is a total decrease in loading of an estimated 31,000 lbs/yr of acidity and 11,000 lbs/yr of metals.

Additional Key Words: acid mine drainage, baffles, field alkalinity, passive treatment

¹ Poster presented at the 19th Annual National Meeting of the American Society of Mining and Reclamation, Lexington, Kentucky, June 9-13, 2002.

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