

10+ Year Passive Treatment System Performance Evaluation¹

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Abstract: The North Fork Montour Run Passive Treatment System³ was installed in two phases to treat acidic, iron- and aluminum-bearing coal mine drainage. The anoxic limestone drain constructed in 2004 as part of the mine drainage collection and conveyance system situated underneath Pennsylvania Turnpike Route 576 continues to produce alkalinity despite the presence of aluminum. Six additional treatment components were installed in 2008 that include two parallel Jennings-type vertical flow ponds (JVFPs) and were designed to last 15 years. The JVFPs were designed to treat a maximum/average 110/68 gal m⁻¹ flow and 374/100 lb d⁻¹ acid load. After 12 years the system was overwhelmed during the record-setting rainfall experienced in 2018 when the 58-inch annual precipitation was 19.7 inches (51%) above normal. The JVFPs experienced inflow up to 228 gal m⁻¹ and an acid load of at least 778 lb d⁻¹, and the final treated system outflow was measured in April 2018 to be acidic for the first time. Despite these extreme flow conditions, the entire system was able to neutralize over 602 lb d⁻¹ of acid. Alkaline system effluent was restored in June 2018 even though the inflow to the JVFPs was 149 gal m⁻¹ and contained 395 lb d⁻¹ of acid. As the system was overwhelmed both chemically and hydraulically, the maximum performance that can be expected from this seasoned passive treatment system was quantified. Additional data was collected in subsequent years including April 2020 and March 2022. With one year remaining until the system will reach the 15-year design life, sampling conducted in March 2022 documented a flow of about 180 gal m⁻¹ (63% over maximum design) and an acid load entering the JVFPs of 239 lb d⁻¹ (77% of maximum design). Despite these above maximum flow conditions, the effluent of the system was alkaline (-87 mg/L acidity as CaCO₃) and contained total and dissolved iron and aluminum concentrations below 1 mg/L.

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³ Work reported here was conducted near 40.474444, -80.277778 information available at: <https://www.datashed.org/index.php/project-north-fork-montour-run>