

Performance Evaluation of the North Fork Montour Run Passive Treatment System¹

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Abstract: The North Fork Montour Run Passive Treatment System installed in two phases to treat acidic, iron- and aluminum-bearing coal mine drainage was evaluated for both chemical and hydraulic performance in 2018, the wettest year on record in Pittsburgh, Pennsylvania, USA. 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 (VFPs). The VFPs were designed to treat the discharge for 15 years based on a maximum/average $6.9/4.29 \text{ l s}^{-1}$ flow and $140/56 \text{ kg d}^{-1}$ acid load. The record-setting 147 cm annual precipitation was 50 cm (51%) above normal and the VFPs experienced inflow up to 27.4 l s^{-1} and an acid load of at least 303 kg d^{-1} . While the final treated 12.4 l s^{-1} outflow was measured in April to be acidic for the first time in a decade, the system was able to neutralize 201 kg d^{-1} of acid. Alkaline system effluent was restored in June even though the inflow to the VFPs was 9.4 l s^{-1} and contained 179 kg d^{-1} of acid. The areal acid load reduction as measured at the approximate water surface ranged from $12 \text{ g m}^{-2} \text{ d}^{-1}$ to $81 \text{ g m}^{-2} \text{ d}^{-1}$. Hydraulic head at each VFP was measured on several occasions with a driving head of 0.99 m needed pass up to 14.8 l s^{-1} . Air lock within the underdrain piping appeared to impede flow on at least one occasion when the discharge from one of the VFPs was increased from 2.8 l s^{-1} to 9.7 l s^{-1} after briefly opening the drain valves. Areal hydraulic load ranged from $6.7 \text{ l s}^{-1} \text{ ha}^{-1}$ to $134.1 \text{ l s}^{-1} \text{ ha}^{-1}$. As the system was overwhelmed both chemically and hydraulically, the maximum performance that can be expected from this seasoned passive treatment system was quantified.³

Additional Key Words: Acid mine drainage, sizing criteria, public-private partnership.

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3. Work reported here was conducted near $40^{\circ}28'28''\text{N}$, $80^{\circ}16'40''\text{W}$.