

# Passive Treatment of Manganese-Bearing Postmining Discharge<sup>1</sup>

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**Abstract:** After reclamation of a surface coal mine in Washington County, Pennsylvania, USA a postmining polluttional discharge required treatment to meet permit effluent requirements. A passive treatment system was constructed in 2019 to replace a hydrated lime pump-and-treat active treatment system. Average[maximum] raw discharge characteristics include: 0.79[3.85] Lps (12.6[61.0] gpm), 236[350] mg/L acidity as CaCO<sub>3</sub>, 14.5[20.6] mg/L total iron, 17.0[24.3] mg/L total aluminum and 34.3[42.3] mg/L manganese. Permit effluent limitations required bimonthly sampling, in which pH is to be maintained between 6.0 and 9.0, alkalinity greater than acidity, and average monthly maximum metal concentrations of 3.0 mg/L total iron, 2.0 mg/L total aluminum, 2.0 mg/L total manganese. After system startup in November 2019 all regulated parameters were treated to within compliance limits except manganese. Initial manganese removal was less than desired until five months after system startup when effluent manganese concentrations dropped from 28.6 mg/L on April 28, 2020, to 0.5 mg/L on May 23, 2020. As the weather continued to warm, manganese removal decreased prompting an organic-based treatment component to be taken offline July 8, 2020. Since August 21, 2020, the passive treatment system has produced compliant effluent with average[maximum] manganese concentrations of 0.1[0.8] mg/L. Aspects of the project to be presented include design, startup, and operational considerations along with monitoring data.

**Additional Key Words:** Manganese removal, Horizontal Flow Limestone Bed (HFLB), AMD treatment, acid mine drainage, coal mining, Jennings-type Vertical Flow Pond (JVFP).

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  3. Work reported here was conducted near 39° 59’ 14.8” N; 80° 1’ 59.6” W.