

# Evaluating the Water Quantity and Quality of Mine Drainage Discharges in a Hydrologically and Topographically Challenging Location<sup>1</sup>

N.L. Shepherd\* and R.W. Nairn<sup>2</sup>

**Abstract:** Artesian net-alkaline mine drainage (MD) discharges from underground abandoned lead-zinc mining operations in the Picher mining field have been contaminating Tar Creek for over 40 years<sup>3</sup>. Although two existing passive treatment systems (PTS) have been successfully treating MD that historically contaminated Tar Creek, the greatest MD contributions originate further upstream, near Douthat, Oklahoma and remain untreated. The intersecting ground elevations and nominal head elevations of the mine pool at Douthat result in highly variable flow rates from multiple discharges, including boreholes and mine shafts. The objective of this study was to evaluate the water quality and quantity of these MD discharges to determine if passive treatment was a viable option. Regular water quality sampling occurred from 2018 through 2021 at five discharges. Weirs with pressure sensors were installed to estimate flow rates at 15-minute time intervals at the three largest discharges. The combined median flow rate was 4,046 lpm with a maximum calculated flow rate of 154,000 lpm. The peak flow rates only occurred for short periods of time, typically <37 hours. The flow weighted average totals metals concentrations of the five discharges were 0.022 mg/L Cd, 22.6 mg/L Fe, 0.045 mg/L Pb, and 5.76 mg/L Zn. The study concluded that despite highly variable flow rates, the water quality and quantity of the Douthat discharges is treatable via PTS, in part because the existing PTS remediate MD with greater metals concentrations and treatment wetlands with designed flow rates exceeding the median and maximum flow rates have been successfully implemented elsewhere.

**Additional Key Words:** Tri-State Mining District, Tar Creek, Passive Treatment.

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  2. Nicholas L. Shepherd (\* presenter), PhD candidate, and Robert W. Nairn, Professor, Center for Restoration of Ecosystems and Watersheds, School of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK 73019.
  3. Work reported here was conducted near 37°57'30" N, 94°50' 42" W.