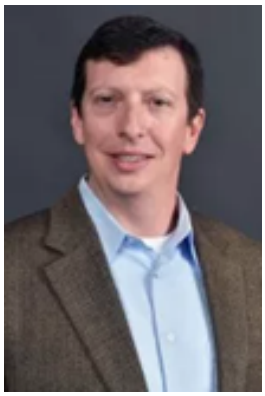
ENVIRONMENTAL FLUID DYNAMICS SEMINAR SERIES

Per- and Polyfluorinated Alkyl Substances (PFAS) Cycling Within Michigan: Contaminated Sites, Landfills and Wastewater Treatment Plants

Tuesday, February 15, 11.00 -12.00, DeBartolo Hall 102



Professor (Donald) Matt Reeves
Presidential Innovation Professor
Department of Geological and Environmental Sciences
Western Michigan University

Dr. Matt Reeves specializes in applied and theoretical investigations of fluid flow, heat and solute transport in porous media. His research has been applied to various problems, including climate change impacts on water resources, environmental fate and transport of contaminants (nitrate, PFAS, radionuclides, and road salts), geologic waste disposal, geothermal energy, and surface water - ground water interaction. He directs WMU's 6-week field intensive hydrogeology field course and was recently awarded the WMU Presidential Innovation Professorship which provides seed funding to test several of his PFAS research ideas.

Abstract: Concentrations of Per- and Polyfluorinated Alkyl Substances (PFAS) from public and private sources in Michigan compiled for wastewater treatment plants (WWTPs) (influent, effluent, biosolids), contaminated sites, and landfill leachates reveal complex cycling within the natural and engineered environment. Analysis of 171 contaminated sites in Michigan by source release indicate four dominant PFAS sources account for 75% of the contamination. Diverse chemical signatures were observed for leachates collected from 19 landfills (mostly type II municipal) with the dominant PFAS encompassing both long- and short-chain compounds. Analysis of PFAS carbon chain length as a function of landfill age shows the transition of C8s in leachate from older landfills to C4s and C6s in younger landfills, consistent with the phasing out and replacement of C8s. PFAS mass flux in leachate for landfills studied range between 5 – 2,000 g/yr and are highest for active landfills, which generate greater leachate volumes and contain fresh PFAS wastes. Detailed study of 10 WWTPs with industrial pretreatment programs indicate numerous chemical transformations across the plants that yield effluent PFAS concentrations as much as 19 times greater than influent, attributed to transformations of unmeasured precursors in the influent to measured, stable PFAS in the effluent. Estimated mass of discharge of (mostly unregulated) PFAS from WWTPs to receiving waters range from 40 g/yr to 128 kg/yr.