

# Evaluating the impact of leaking sewers on urban public supply wells using geochemical, microbiological, and geomechanical methods

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Approximately one third of the U.S. population uses public supply wells as their drinking water source and recently a greater focus has been placed on assessing the risk of contaminants entering these wells. A variety of field and laboratory methods can be used to better understand the primary mechanisms that control the transport of near-surface contaminants into bedrock multi-aquifer systems. This will allow researchers to develop effective methods for assessing well vulnerability and the public health risk from this water.

At an urban field site containing a sandstone aquifer system, fractures may have an important role in the transport of sewer-derived wastewater contaminants. Data from pressure transducers placed in monitoring wells located at varying depths and distances from a pumping well suggest that geomechanically-derived groundwater pressure changes propagate rapidly through fractures to influence wells hundreds of meters from the pumping well. The pattern of pressure change propagation can be used to better define fracture connectivity in the aquifer system. These connected fractures may serve as preferential flow pathways that allow contaminants to rapidly move through the subsurface and reach the public supply well.

Time sequenced groundwater sampling for chemical and microbiological wastewater indicators is another useful tool for characterizing transport within an aquifer system. The use of polymerase chain reaction methods allows for the detection of human enteric viruses at extremely low concentrations in groundwater. There is an apparent connection between recharge events (rainfall or snowmelt) and increased flow in sanitary sewers. Based on limited data, these increased wastewater flows appear linked with virus detection in groundwater at short times after these events. In order to accurately assess the vulnerability of public supply wells to near-surface contaminants it is important to utilize a variety of field and laboratory methods.

*Lt. Col. Christopher Gellasch is a hydrogeologist and career Army officer currently serving as an assistant professor and the Environmental Sciences Graduate Program Director at the Uniformed Services University of the Health Sciences in Bethesda, MD. He received his Ph.D. in Geology from the University of Wisconsin-Madison, M.S. in Geological Sciences from Indiana University, and a B.S. in Geology from Eastern Michigan University. His research combines aspects of hydrogeology, environmental engineering, and public health to determine the most likely pathways for near-surface contaminants to migrate through the subsurface and impact public supply wells.*

*The views expressed are those of the author and do not necessarily reflect the official views of the Uniformed Services University of the Health Sciences, the U.S. Army, or the Department of Defense.*

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**Seminar for EMU students and faculty:**

**Monday, March 28, 2016  
4-5 p.m.  
156 Science Center**