Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.24574

# Mobilization of Naturally Occurring Contaminants during Managed Aquifer Recharge

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Managed aquifer recharge (MAR) is increasingly used to alleviate temporal disparities in water supply and demand caused by climate change and population growth. MAR enhances local water supplies by capturing and storing excess water in aquifers for later recovery during dry periods. While MAR can provide numerous potential benefits to water supply, introduction of recharge water via infiltration or injection can alter the native groundwater quality. Water quality shifts during MAR pose a particular challenge for sites recovering water for drinking water purposes. Specifically, artificial recharge can perturb the ambient geochemical and hydrological conditions of the receiving aquifer causing mobilization of toxic, naturally occurring contaminants from sediments to groundwater. Arsenic poses a particular threat to MAR projects due to its ubiquity in soils and sediments globally and its toxicity to human and ecosystem health at trace concentrations. Using experimental, field, and modeling analyses, we present a case study of geochemical and hydrological pathways of arsenic mobilization during MAR via both infiltration and injection of advanced recycled wastewater in Orange County, California, United States. Findings demonstrate how a strong understanding of the fundamental processes controlling arsenic mobilization can be used to inform management strategies, including modifying recharge water chemistry to limit adverse geochemical interactions during MAR. Case studies of arsenic mobilization from Orange County and other MAR sites globally were synthesized to develop statewide guidance on site selection and implementation of aquifer storage and recovery projects in Texas, United States. Guidance focuses on strategies to improve geochemical compatibility of recharge water with receiving aquifers in order to limit the mobilization of naturally occurring contaminants during MAR. We conclude by outlining implications and strategies for water management to protect water quality and promote the viability of MAR as a freshwater enhancement approach.