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Qian Zhang, Ph.D.

Senior Environmental Scientist/Geologist

Dr. Zhang is a geologist and environmental scientist with a focus on geochemistry and hydrology. She has expertise in reactive transport modeling (focusing on water-rock-air interactions), dynamic fluid flow simulation, geo-cellular modeling, and coal combustion byproducts (CCBs) analysis. She has applied her expertise to develop transient or steady-state groundwater models to evaluate the fate and transport of various contaminants, including chlorinated solvents, per- and polyfluoroalkyl substances (PFAS), and metals at manufacturing sites, coal ash basins, and Superfund sites. She is also an expert in life cycle assessment (LCA) and has received a certificate in LCA from MIT. Prior to joining Gradient, Dr. Zhang conducted doctoral research at Indiana University, where she investigated the long-term impacts of CCB utilizations at mine reclamation sites using a combination of analytical and numerical simulation methods. She also worked on joint projects for the US-China Clean Energy Center and Indiana Geological Survey on carbon utilization and storage in saline formations and coal beds, using geo-cellular modeling and reservoir simulation.

Areas of Expertise

- Reactive Transport Modeling
- Coal Combustion Byproducts Analysis
- Carbon Utilization & Storage
- Geochemistry
- Groundwater Hydrology
- Life Cycle Assessment

Education

- Ph.D., Geological Sciences, Indiana University
- M.S., Environmental Sciences/Geological Sciences, Ohio University
- B.S., Environmental Sciences, Sichuan University

Selected Projects

Contaminant Fate and Transport Modeling: Assisted in developing and modifying a complex transient groundwater flow model, including geological log reviews, site history reviews, and data management. MODFLOW/MODPATH was used to identify the impacts of flow and contaminant migrations from historical operations and releases.

Emerging Contaminants Analysis: Evaluated potential sources of PFAS contamination at public drinking water systems through literature review and data analysis. Conducted numerical simulations to investigate PFAS migration through the highly variable unsaturated zone.

Coal Ash Impoundment Modeling: Revised and conducted transient groundwater flow and transport modeling using MODFLOW/MT3D, related to constituents of interest (COIs), including boron and arsenic, from multiple surface impoundments. Model simulations evaluated potential impacts to groundwater resulting from surface impoundment operations in order to support cost allocation and insurance recovery.

Forensic Data Analysis: Performed a forensic analysis of metal contamination from multiple point sources at an industrial site. The analysis was used to delineate the signatures of metal contamination from different sources and provide a scientific basis for cost allocation.

Geochemical Data Analysis: Conducted geochemical data analysis to track post-suspension groundwater quality change, which assisted remedial operations and maintenance activities at a Superfund site.

Contamination Source Analysis: Performed extensive site reviews and data analysis to estimate the contribution of multiple sources of polychlorinated biphenyls (PCBs) in several populated areas. The information was used to support re-constructing the history of contaminant applications and disposals.

Selected Publications

Zhang, Q; Lopez, DL. 2019. "Use of time series analysis to evaluate the impacts of underground mining on hydraulic properties in groundwater of Dysart Woods, Ohio." *Mine Water Environ.* 38:566-580.

Zhang, Q; Ellett, K; Rupp, A; Mastalerz, M; Karacan, O. 2017. "Regional- to reservoir-scale evaluation of CO_2 storage resource estimates of coal seams." *Energy Procedia* 114:5346-5355.

Zhang, Q; Branam, T; Olyphant, G. 2017. "Development and testing of a model for simulating weathering and trace elements release from fixated scrubber sludge utilized in abandoned coal mine reclamation site." *Int. J. Coal Geol.* 169:92-105.

Zhang, Q; Hind, G; Branam, T; Erika, ER; Olyphant, G. 2016. "Geochemical characterization of engineered coal-combustion byproducts (CCBs): Occurrence and mobility of trace elements, implications for interactions with acidic and ambient groundwater." *Fuel* 177:304-314.