

From Laboratory To The Field: Intermediate Scale Testing, A Necessary Step.

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Abstract. Fundamental processes associated with water flow and transport and fate of chemicals, both dissolved and in separate phase, that occur at the microscopic pore scale will affect the large-scale evolution of plumes in the subsurface. However, the ultimate transport and fate that define the spatial and time distribution of plume concentrations are significantly dependent on both the physical and chemical heterogeneity of subsurface formations. In attempting to understand, study and model the field behavior, the question always arises on how to transfer the pore-scale or the representative elementary volume scale observations and characterization data to the field scales, incorporating the information on multi-dimensional flow and heterogeneity. In most cases, field systems are difficult to study due to their inherent complexity, inadequacy of characterization data, expense, and infeasibility in controls. Controlled experiments conducted in intermediate-scale laboratory test tanks even though difficult, is a necessary step in up-scaling the information from the laboratory to the field. Intermediate scale tank testing offers many advantages over complex and generally expensive field-testing. Testing conducted in laboratory settings provides for better control, accurate characterization and higher precision achievable in data collection. The art and science of designing successful intermediate scale experiment require in-depth understanding of fundamentals, good engineering, understanding of capabilities and limitations of modeling tools, careful planning and patience. The author will share the knowledge gained and lessons learned from more than twenty years of experience in conducting such experiments involving water flow, solute transport, non-aqueous phase liquid behavior, site characterization and remediation.

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