BUSTED BUTTE: ACHIEVING THE OBJECTIVES AND NUMERICAL MODELING RESULTS

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The Unsaturated Zone Transport Test (UZTT) at Busted Butte is a mesoscale field/laboratory/modeling investigation designed to address uncertainties associated with flow and transport in the UZ site-process models for Yucca Mountain. The UZTT test facility is located approximately 8 km southeast of the potential Yucca Mountain repository area.

The UZTT was designed in two phases, to address five specific objectives in the UZ: the effect of heterogeneities, flow and transport (F&T) behavior at permeability contrast boundaries, migration of colloids , transport models of sorbing tracers, and scaling issues in moving from laboratory scale to field scale.

Phase 1A was designed to assess the influence of permeability contrast boundaries in the hydrologic Calico Hills . Visualization of fluorescein movement , mineback rock analyses, and comparison with numerical models demonstrated that F&T are capillary dominated with permeability contrast boundaries distorting the capillary flow.

Phase 1B was designed to assess the influence of fractures on F&T and colloid movement. The injector in Phase 1B was located at a fracture, while the collector, 30 cm below, was placed at what was assumed to be the same fracture. Numerical simulations of nonreactive (Br) and reactive (Li) tracers show the experimental data are best explained by a combination of molecular diffusion and advective flux.

For Phase 2, a numerical model with homogeneous unit descriptions was able to qualitatively capture the general characteristics of the system. Numerical simulations and field observations revealed a capillary dominated flow field. Although the tracers showed heterogeneity in the test block, simulation using heterogeneous fields did not significantly improve the data fit over homogeneous field simulations. In terms of scaling, simulations of field tracer data indicate a hydraulic conductivity two orders of magnitude higher than measured in the laboratory. Simulations of Li, a weakly sorbing tracer, indicate less retardation than predicted from laboratory batch measurements.