Overview of Modeling to Evaluate Risk and Maximize Predictability at Complex Sites

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The U.S. Department of Energy Environmental Management (DOE EM) has a number of waste sites and subsurface contamination problems that are complex. Modeling has been used as an integrative tool to help assess these waste sites, address the long-term behavior of contaminants, and evaluate remediation alternatives. Several examples of modeling for the 300 Area of the Hanford Site are provided. Groundwater flow and uranium transport in the 300 Area were modeled to evaluate a methodology for the combined estimation of conceptual, parameter, and predictive scenario uncertainties. Sponsored by the U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, this work used multiple models to represent major conceptual uncertainties at the site. Historical data and model calibration were used to evaluate the relative fitness of each alternative model for predicting future uranium transport. Subsequent laboratory and field investigations were conducted as part of a DOE Office of Science project and used to update the conceptual model of the 300 Area. A system-scale (plume scale) model, synthesizing all current knowledge, is being used to evaluate the potential impacts of planned remediation activities that involve injection and infiltration of polyphosphate for sequestration of uranium.