Characterization of DNAPL-Contaminated Sites - Past, Present and Future

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In natural subsurface systems, the delineation and even the detection of relatively insoluble, dense nonaqueous phase liquids (DNAPL) has proven to be extremely difficult. Over the last several years, a significant research effort in the federal complex has been focused on developing improved technologies and strategies for characterization and performance assessment at DNAPL-contaminated sites. As a result, innovative approaches and technologies for DNAPL characterization have been developed and applied at numerous federal and private sites. The innovative technologies include high resolution and hybrid geophysical techniques, tracer tests, and direct sampling and sensing methods. The field results show that each technology has inherent advantages and disadvantages and must be applied to appropriate problems. For example, partitioning or solubilizing tracer tests also probe a large subsurface volume and can detect small pockets of separate phase contaminants but the contaminants must be in the flowpath of the tracers. Direct sampling or sensing, particularly when applied with direct penetration tools, can offer positive identification of DNAPL at very high vertical resolution but low lateral resolution because the methods do not probe beyond the radius of the borehole. Although it has been documented that many of these innovative methods provide a significant advance in performance over conventional approaches, a single technology has not emerged that can be applied with confidence to characterize most sites. The unique features of a specific site will dictate and narrow the list of appropriate tools and the cost of the technologies will further constrain the selection. At most sites, the results from all characterization acitivities are used to develop to an evolving conceptual model of the site. The selection of technology and results from each application must contribute to the evolution of this conceptual model. This presentation will focus on the current status and appropriate application of state of the art DNAPL characterization tools and systems.