Using a Numerical Groundwater Model as a Decision-Making Tool for DNAPL Remediation

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In recent years, dissolved phase contaminant fate and transport model has gained more and more attention in the decision making process of selecting appropriate remedy for DNAPL contaminated sites. The modeling effort can serve as the basis of the technical effectiveness evaluation of the remedy selection process. The model can be used to simulate different remediation scenarios and answer the following under each option: 1) what will be the physical aspects of the plume with time, 2) how long will the contaminant plume persist, and 3) which options provide the most benefit in term of cost effectiveness and protective of the human health and the environment? However, due to the heterogeneous nature of the subsurface environment and the inherent complexity of numerical model itself, it presents a challenge in selecting an appropriate model that will suite the site-specific hydrogeological and geo-chemical conditions. This presentation discusses criteria for selection and application of the numerical models where DNAPL is present as the feeding source and sequential biodegradation of dissolved phase chlorinated solvent is occurring. To generate a unique solution under above conditions, the model must have the ability to track both the contaminant and the electron acceptor plumes, as well as the ability to simulate the interaction between the contaminant and electron acceptors under different kinetic scenarios. The application of two currently available models, RT3D and Sequential Electron Acceptor Model for 3D transport (SEAM3D) will also be discussed.