Decision Support Tool for Vadose Zone Remediation of Volatile Contaminants

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Background/Objectives. A recent guidance document on soil vapor extraction (SVE) optimization, transition, and closure includes a free spreadsheet-based analysis tool (the SVEET software) and supports site remedy decisions for SVE. The SVEET analysis tool facilitates estimating the impact of vadose zone contaminant sources on groundwater contaminant concentrations to help define performance goals or remedy closure for vadose-zone source remediation. SVEET needs only a small number of user inputs, which are often already available as part of existing site data, but which can be cost-effectively obtained, if needed. The original version of SVEET was limited in the range of site conditions it could address, and evaluating vapor intrusion (VI) issues required use of a separate tool (VIETUS).

Approach/Activities. SVEET software outputs are derived from results of rigorous simulations of three-dimensional, multi-phase contaminant transport under natural conditions conducted using the Subsurface Transport over Multiple Phase code on the Department of Energy's high-performance computing resources. These simulations include recharge-driven processes, vapor-phase processes, and mixing into the groundwater, all demonstrated to be important for estimating contaminant transport. To expand the capabilities of the SVEET software, additional numerical simulations were conducted using an updated model configuration.

Results/Lessons Learned. Recent updates include expanding the range of inputs for vadose zone thickness, source configuration, moisture conditions, and contaminant options, as well as extending the output to include estimates of shallow soil vapor concentrations for VI analyses (integrating the core elements of the VIETUS software). A series of examples depict how vadose zone and contaminant input parameter variations affect contaminant concentrations in groundwater and for vapor intrusion. These relationships are helpful in interpreting key controlling factors that need to be considered in setting vadose zone source remediation objectives. In addition, recent applications of SVEET has provided useful examples that will facilitate its use at other sites. The case study example uses the SVE guidance document and the SVEET software to justify and obtain regulatory approval for termination of SVE.