Evaluation of multi-component NAPL source zone screening models by numerical simulation

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Abstract Conceptually simple screening models of NAPL source zone behaviour have become a popular and useful tool for the prediction of source zone longevity and contaminant discharge at NAPL contaminated sites. Here, we evaluate two multi-component NAPL dissolution screening models against synthetic contamination scenarios, generated by detailed numerical simulations. We gradually increase the complexity of the synthetic scenarios and progressively violate the simplifying assumptions inherent in the screening models in order to assess the effects of these simplifications on the prediction of the mixed NAPL source zone lifespan and contaminant emission. Results indicate that for simple source zone configurations, one of the two screening models is able to closely predict the overall source lifespan, while the emission of highly soluble constituents may be underestimated at early and overestimated at late times. The second screening method predicts well the emissions of highly soluble compounds but underestimates the lifespan of the source. Discrepancies increase for more complex source zone configurations in heterogeneous aquifers.

Key words multi-component NAPL dissolution; source zone; screening models; numerical simulation; heterogeneity