

Estimates of Hydrocarbon NAPL Depletion from Compositional Change over Time

George DeVaul, Ph.D. (george.devaul@shell.com)
(Shell Global Solutions US Inc., Houston, TX, USA)
Ileana Rhodes, Ph.D. (ilrhodes@gsi-net.com)
(GSI Environmental, Houston, TX, USA)

Background/Objectives. There are significant challenges in assessing depletion rates for hydrocarbon releases to the environment, particularly for subsurface zones of non-aqueous phase liquids (NAPL). Existing methods are applied primarily, if not exclusively, in estimating total mass depletion. This paper presents a method for estimating depletion of both total bulk hydrocarbons and individual chemical constituents directly from measured changes in NAPL composition over time. Information on chemical-specific depletion is particularly useful in evaluating changes in environmental risk over time.

Approach/Activities. The relationship between measured changes in NAPL composition and trends in either mass in soil or volume-averaged concentration is developed. Methods for data evaluation and statistical analysis are presented and applied for several example data sets. Mean estimates and confidence limits are shown for both total mass and chemical constituents.

Results/Lessons Learned. The presented results include ranges of estimates for several examples. Similarities and differences in rates are shown for a variety of sites. The results also help illustrate the potential benefits of compositional analysis of NAPL samples over time.