

Estimates of Hydrocarbon NAPL Depletion from Compositional Change over Time

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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). The longevity of a hydrocarbon NAPL zone may be evaluated indirectly through measurement of constituent volatilization or dissolution rates from the NAPL, or measurement of biodegradation reactants or products entering or leaving the NAPL zone. Direct evaluation may include measuring changes in total in situ NAPL mass (or volume) over time.

Approach/Activities. This paper presents an alternate method for directly estimating depletion of both the total bulk hydrocarbon mass and individual chemical constituents based on measured compositional changes in the NAPL over time. The method is consistent with available forensic methods but does not rely on a priori selection of conservative biomarkers.

Results/Lessons Learned. Applied examples are shown using constituent-specific NAPL analysis results, collected over several decades, from multiple sites. Mean estimates and confidence limits on NAPL depletion rate are included.