Aging Petrol Spills

Petrol releases to the subsurface are difficult to age because of their volatile nature and variable aromatic content. Many factors have to be taken into consideration in order to build up as much evidence as possible to make an informed decision. A single age estimation is unlikely to be conclusive therefore several different approaches should be used. A sample of fresh petrol obtained directly from a retail pump is often necessary in order to establish a baseline for comparisons.

Several age estimating approaches and ratios can be used including:

- Kaplan approach – R_b = B+T/E+X using BTEX values.
- Schmidt approach – T/8 ratio using toluene and n-octane
- Chemical profiling including iso-butane, n-butane, iso-pentane and n-pentane
- nC_7/MCH ratio – using n-heptane and methylcyclohexane, where MCH increases with weathering.
- Knowledge of half-life of BTEX compounds.
- Ratios of benzene/toluene

In ground-waters, benzene diffuses most rapidly out of the free phase petrol and partitions into the water followed by toluene, ethylbenze ne and xylenes. The reverse occurs with BTEX components in soils. Calculating the age of petrol spills in soils and waters is only possible where sufficient concentrations are present.

Case Study

A major retailer had relinquished a petrol station several years ago and needed to prove the petrol in a monitoring well was less than 12 months old. The petrol in the well had been significantly weathered, and losses reported by various calculations suggested an average of 60-70% weathering. The cumulative BTEX ratio R_b (Kaplan) estimated the age of release to be 2-5 years. However by using a combination of various age estimating formulae and ratios, the presence of gases and proportions of BTEX, the age of release was considered to be recent and within 6 months. Illustrating that a single age estimating formula can be misleading.

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