

Data Collection and Interpretation to Support Screening Approaches for Vapor Intrusion Risk from Lead Scavengers

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Background/Objectives. Analysis of an extensive empirical database of concentration data in the vadose zone at petroleum hydrocarbon impacted sites has shown that significant attenuation of benzene and other petroleum hydrocarbons occurs in the vadose zone over the vertical screening distances in recent petroleum vapor intrusion guidance documents by the US EPA OUST and the ITRC. A data gap identified in these documents is whether the vertical screening distances can be applied to 1,2-dibromoethane (EDB) and 1,2-dichloroethane (EDC). These compounds were used as lead scavengers in leaded gasoline until 1996 (in USA) when use of leaded gasoline for on road use was banned. There are limited published data on concentrations of EDB and EDC in the vadose zone that are associated with leaded gasoline releases, as well as a lack of rigorous quantification of the biodegradation rates of these chemicals. The objective of this API study is to promote an improved knowledge base for developing vertical screening distances for EDB and EDC through existing literature on fate and transport, an empirical database, an improved analytical protocol and detailed field-based study. This study is complementary to work by Kolhatkar et al. (2017), which will provide a detailed analysis of empirical data and biodegradation rates.

Approach/Activities. Literature sources on fate and transport were reviewed and available temporal data on groundwater EDC and EDB concentrations were analyzed to evaluate attenuation trends. Environmental monitoring data from leaded gasoline impacted sites were requested from regulatory agencies and industry focusing on paired soil vapor and groundwater data. Relevant data of acceptable quality from sites from USA and Canada were added to an existing database and summary statistics and data trends and correlations were evaluated. The review was confounded by raised detection limits, which prompted identification of modified US EPA Method TO-14m soil vapor analysis method with reporting limit goals of 0.16 $\mu\text{g}/\text{m}^3$ for EDB and 3.6 $\mu\text{g}/\text{m}^3$ for EDC. A field site with elevated EDB and EDC groundwater concentrations was identified for a detailed field-based study.

Results/Lessons Learned. The data request effort is summarized with respect to summary statistics and trends, including groundwater attenuation trends, and detections of EDC and EDB in groundwater and soil vapor for paired data, which were limited. The interpretation of data from these sites presented the same challenge of raised detection limits as for previous database studies. Example datasets for select sites with vertical profile soil vapor data are illustrated. Based on the review of environmental monitoring data, a site was selected with historic release of leaded gasoline and elevated EDB and EDC concentrations in groundwater for detailed field-based study. The study will include collection of near-contemporaneous groundwater data and soil vapor data and to support improved attenuation estimates, high resolution vertical sampling of soil vapor, total petroleum hydrocarbon in soil and soil physical properties is planned.