



Do Soil PAH Guidelines Represent True Risk?

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Polycyclic aromatic hydrocarbons (PAHs) are widespread in the environment and come from a range of natural and anthropogenic sources. Federal and Provincial remediation guidelines specify soil concentrations of PAHs that are protective of human and ecological exposure to groundwater pathways, such as drinking water and freshwater aquatic life.

These soil guidelines are calculated based on the partitioning behaviour of a hypothetical petroleum-source between soil and porewater, which assumes that PAHs are only from petroleum sources and will partially dissolve in water. However, naturally occurring sources of PAHs, for example coal inclusions that are ubiquitous in the Western Canadian Sedimentary Basin, exhibit different partitioning characteristics than for a petroleum source of PAHs.

The PAHs in coal are strongly sorbed within the matrix and do not follow a standard organic carbon partitioning model as applied within Federal and Provincial guidelines. Thus, for these types of PAH sources, even if soil concentrations exceed groundwater-protective guidelines, the porewater concentrations will be substantially lower than the model predicts, reducing the true exposure to receptors.

Routine analytical testing cannot tell the difference between PAH sources, but forensic chemistry tools are available that can. This presentation will provide a review of the differences between petroleum and coal as sources of PAHs and how forensic chemistry can be used as a tool to clearly demonstrate the source type present at a site. It will also cover why there is a difference in the partitioning model, and why the assumptions in the soil to groundwater partitioning should be different for coal-derived PAHs than for petroleum-derived PAHs. If natural PAH sources are present and confirmed to pose no risk, the amount of soil requiring remediation may be dramatically reduced.

Lisa Kates

Dr. Lisa Kates is an expert in the fields of environmental science and forensic chemistry. She has advanced technical skills in environmental and analytical chemistry, the fate and transport of organic and inorganic chemicals, including chemical fingerprinting and source apportionment of chemical contaminants. Dr. Kates has worked in the environmental consulting industry since 2014, with experience working on a wide range of complex projects, such as supporting environmental management on a \$5B light rail transit project, differentiating sources of contamination for a variety of contaminants, including polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), and chlorinated organics, and working on major US EPA Superfund contaminated sites. In addition to her experience with site assessment and remediation, Dr. Kates has expertise in human health and ecological risk assessment, in particular working with First Nations on traditional food studies and subsoil salinity tool assessments. Dr. Kates is passionate about effective science communication to properly contextualize the occurrence of chemicals in the environment.