

Application of Different Measures of Bioavailability to Support the Derivation of Risk-based (Tiers 2 or 3) Remedial Benchmarks for PHC-Contaminated Sites

Gladys Stephenson

GL910651

The Canada-Wide Tier 1 Standards for Petroleum Hydrocarbons in Soil (CWS PHC) were released in May 2001, and have proven useful for managing many hydrocarbon-contaminated sites. The standards were re-evaluated by the Eco-contact Subgroup to the CCME PHC Soil Advisory Task Group and they examined the efficacy of the standards for managing PHCs in soil in light of new data and a re-evaluation of the existing data. Recommendations were made suggesting changes for the Tier 1 PHC standards in soil. There was recognition that application of the Canada-wide PHC soil standards to contaminated lands has significant limitations when applied to sites with weathered and aged hydrocarbons in soil. There are data to support

the suggestion that these Tier 1 values might be inappropriate for some sites with weathered and aged petroleum hydrocarbons and that Tier 2 or Tier 3 site-specific soil standards might be more useful for managing hydrocarbon contamination at these sites.

Tier 2 methods for deriving site-specific standards provide for modification of the Tier 1 standards based on site conditions as long as the level of protection for that site does not change. Alberta Environment has allowed three approaches for deriving Tier 2 site-specific benchmarks for protection of ecological receptors. The approaches include: 1) elimination of an exposure pathway because it is not applicable to the site; 2) elimination of receptors because they are not present at the site; and, 3) a site-specific toxicity post-remediation assessment to demonstrate that there is minimal risk associated with exposure of ecological receptors to the PHC residuals in soil at the site (Swatsky, 2007). The toxicity assessment comprises a minimal test species and methods battery that includes a chronic survival (28 or 35-d), growth and reproduction (56 or 63- d) test with earthworms and definitive (14 or 21-d) tests with a minimum of two plant species of which northern wheatgrass must be one of the species (Harris et al. 2007). This assessment is costly and takes a minimum of 3 months before results are generated for use in management decision making. If it were possible to apply a direct measure of bioavailability to soils that could then, in turn, be used to determine or predict the risk

associated with exposure to the PHCs in soil, then a powerful tool will be available for use in risk assessment and management of contaminated lands.