NATURE AND ESTIMATED TOXICITY OF POLAR COMPOUNDS IN GROUNDWATER AT SITES WITH BIODEGRADING PETROLEUM

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Work since the mid 1990s has shown that a large proportion of organics in groundwater measured as "TPHd/DRO" at sites with biodegrading petroleum are polar non-hydrocarbon compounds. Polar compounds occur primarily within and downgradient of the source area and within the area of aerobic and anaerobic biodegradation. They have been assumed to be biodegradation metabolites (primarily alcohols and organic acids, with possible phenols, aldehydes and ketones). Including polar compounds as TPHd/DRO has resulted in protracted site closures and misunderstanding of groundwater conditions. Some regulatory agencies have been hesitant to allow silica gel cleanup (SGC) of samples to separate hydrocarbons from the polar compounds because of a perceived uncertainty regarding the nature and toxicity of these polar compounds. This work addresses that uncertainty and provides: (1) information about the potential human toxicity of the major classes of polar compounds likely to be present in groundwater, compiled from numerous published sources; (2) analytical results from groundwater samples collected at multiple sites that (a) quantify specific polar compounds targeted due to potential toxicity concerns; and (b) tentatively identify various polar compounds present using two-dimensional gas chromatography mass spectrometry; and (3) conclusions about the potential toxicity of the mixture of polar compounds actually present.

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