

Using SESOIL to Evaluate Contaminant Release Timeframes in an Environmental Litigation Context

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The goal of this presentation is to demonstrate to attendees the application of the U.S. Environmental Protection Agency (USEPA) developed SESOIL model to analyze contaminant transport through the unsaturated zone to estimate, in conjunction with other environmental data and forensic techniques, contaminant release timeframes.

This presentation will provide the environmental forensic community with pertinent information by illustrating how a tool developed primarily for evaluation of environmental data in a regulatory context can be used to develop scientifically defensible arguments in environmental litigation matters.

SESOIL (SEasonal SOIL compartment model) is a one-dimensional vertical fate-and-transport model for the unsaturated zone, which is designed to simultaneously simulate soil water movement and contaminant transport. The model is based on mass balance and partitioning of the contaminant between dissolved, sorbed, vapor, and pure phases. SESOIL simulates long-term pollutant fate and migration in the unsaturated soil zone, considering: hydrologic cycle of the unsaturated soil zone; pollutant concentrations and masses in water, soil, and air phases; pollutant migration to the groundwater; and pollutant volatilization at the ground surface¹.

The SESOIL model was developed by the USEPA, and has been adopted by a number of federal entities (e.g. the U.S. Department of Energy) and state regulatory bodies (e.g. the New Jersey Department of Environmental Protection) for use in evaluating future impacts to groundwater from soil source zones. Based on this widespread regulatory acceptance, the SESOIL model provides a valuable, scientifically defensible tool that can be used in conjunction with other site specific data to evaluate fate and transport of contaminant travel times in the unsaturated zone in the context of environmental litigation. Specifically, assuming that the approximate date in which groundwater beneath an overlying column of soil was first impacted can be reliably estimated, SESOIL modeling analyses can be performed to provide estimated timeframes of contaminant release at or near the land surface, which is often an important aspect in environmental litigation matters.

A case study will be presented in which the SESOIL model was used in an insurance litigation case to estimate the approximate start date of a leak from an underground petroleum pipeline. Site specific data, including soil texture information provided by lithologic logs, soil concentration data from samples collected from vadose soils, and information obtained from other site investigation documents were used to define model inputs. The results of the SESOIL analyses were then compared with site groundwater quality data, including sample results for Benzene and the gasoline additive Methyl-tertiary Butyl Ether (MtBE), to estimate the approximate date of commencement of the pipeline release. Corroboration of the SESOIL model results by other lines of evidence from the site historical record, as well as other considerations that should be taken into account when utilizing SESOIL modeling methods for forensic purposes will also be discussed.

References:

1. Bonazountas, M., Hetrick, D.M., Kostecki, P.T., and Calabrese, E.J., 1997. SESOIL in Environmental Fate and Risk Modeling. Amherst Scientific Publishers, Amherst, MA.