

# Tracking Chlorinated Solvents in the Environment

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**Background/Objectives.** The abundant use along with the persistence of chlorinated solvents in natural environments resulted in a worldwide contamination legacy for years to come. Chlorinated solvents are among the most frequently detected groundwater contaminants. Due to their common use at many industrial sites and low amounts that can cause regulatory issues once spilled, multiple sources and successive release events are common and typically contribute to co-mingled contamination plumes we observe today. To successfully treat such plumes and insure fair cost recovery, it is essential to identify all contributing sources and release events, as well as evaluate degradation pathways. This presentation will provide an overview of the main available forensic techniques and illustrate their use to track chlorinated solvents in the environment through representative case studies.

**Approach/Activities.** The forensic techniques to be overviewed include both classic and emerging fingerprinting techniques such as chemical, isotopic and tree-ring fingerprinting, as well as age-dating methods based on signature chemicals (e.g., additives/stabilizers, impurities) and atmospheric tracers (e.g., radioisotopes, anthropogenic gaseous compounds such as chlorofluorocarbons or freons).

**Results/Lessons Learned.** Both real and hypothetical case studies will be presented to illustrate various uses of forensic techniques, including:

- - Evaluation of multiple sources at a PCE site based on routine historical groundwater analyses;
- - Establishing if monitored natural attenuation (MNA) is an effective remedial approach at chlorinated solvent sites based on compound specific isotopic analysis (CSIA);
- - Age-dating of a major TCE/PCE groundwater plume using tree-ring fingerprinting;
- - Establishing if shallow releases at an industrial facility contributed to a deeper regional TCE/PCE groundwater plume using atmospheric tracers;
- - Age-dating TCE releases based on signature chemicals associated with manufacturing process

Hints for the use of the overviewed techniques to build successful site strategies will be provided.