

## Assessing NSZD for Creosote DNAPLs

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**Background/Objectives.** Research on natural source zone depletion (NSZD) processes at petroleum, light nonaqueous-phase liquid (LNAPL) sites has led to the development of several industry-accepted methods for quantifying natural LNAPL depletion rates in the subsurface. Like petroleum LNAPLs, coal tar and wood creosotes are composed of complex mixtures of hydrocarbon compounds. Unlike petroleum LNAPLs, creosotes are denser than water and are classified as dense nonaqueous-phase liquids (DNAPLs). Creosotes are subject to the same natural depletion mechanisms (i.e., volatilization, dissolution, and biodegradation) as petroleum hydrocarbons and methods that have been developed for quantifying NSZD rates at petroleum LNAPL sites are applicable for creosote DNAPL sites.

**Approach/Activities.** NSZD assessments were completed at a former tie treatment facility where creosote is present in the subsurface related to historical wood treating operations. NSZD rates were assessed using a multiple lines of evidence approach to evaluate and quantify NSZD rates. The lines of evidence included 1) collection of groundwater data to assess NAPL depletion in the groundwater saturated zone; 2) measurement of carbon dioxide flux at ground surface, 3) Measurements of oxygen utilization and carbon dioxide production from nested soil gas probes, and 4) temperature profiling using existing wells and buried thermistors to identify thermal anomalies associated with NSZD.

**Results/Lessons Learned.** Preliminary results of the assessment indicate that NSZD rates are significant compared to active remediation approaches for creosote. The NSZD study will be described with a focus on highlighting similarities and differences in NSZD evaluations for petroleum LNAPLs and creosote DNAPLs. The results of the evaluation will be presented along with a discussion on the lower bounds of what can be detected using current NSZD measurement methods.