

## Cumulative Effect of NSZD through Compositional Analysis

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**Background/Objectives.** Natural Source Zone Depletion represents the natural attenuation capacity of the subsurface to reduce LNAPL sources over time. Multiple methods have been developed to calculate the instantaneous rate of biodegradation but few have been able to directly identify the cumulative effect NSZD has induced.

**Approach/Activities.** Hydrocarbons released to the subsurface whether a crude oil or a refined gasoline are comprised of hundreds of compounds. Each of these compounds exhibits different partitioning behavior as well as substrate preference by microbes. This results in NSZD changing the composition of the LNAPL over time where it is possible to estimate the fraction lost as a function of a single compound as documented by CRC Care guidance. This discussion will provide the results of two dozen samples collected over 17 years at a crude oil release and some recent results from a legacy PHC-impacted site in Alberta. The results will be related to the weathering behavior currently documented in literature as well as other NSZD related publications indicating NSZD as a plume stability mechanism.

**Results/Lessons Learned.** The resulting behavior model can be used to directly identify the cumulative compositional effect NSZD has achieved at various locations within the plume. A discussion of alternative methods to help quantify the confidence of these estimates will be provided. The intent is to provide improved guidance on analysis methods and consideration when applying the compositional NSZD based methodology in addition to highlighting the cumulative losses of LNAPL.

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Elizabeth (Liz) Haack, Ph.D., P.Chem, is a Senior Environmental Consultant with Ecometrix, located in Mississauga, Ontario. She is an expert chemist and risk-assessor, with 20 years of combined research and consulting experience. Her focus is human and ecological risk assessment (HHERA), site assessment, remediation technologies, and water quality. She is a leader in evaluating how new technologies/approaches may benefit industry and implementing them.