

Use of Soil Heat Fluxes to Evaluate Continuous Natural Loss Rates of Subsurface LNAPL

Emily Stockwell and Tom Sale

Department of Civil and Environmental Engineering, Colorado State University

Abstract. Petroleum hydrocarbons, in the form of Light Nonaqueous Phase Liquids (LNAPLs), are commonly found beneath petroleum facilities. Natural loss rates of LNAPLs via anaerobic processes are emerging as a critical factor in making management decisions. Current approaches for determining natural LNAPL loss rates rely on measuring the efflux of CO₂ above LNAPL releases. These methods provide values measured over finite periods. Optimally, methods are needed that provide continuous loss rates through time. Herein, the hypothesis is advanced that thermal fluxes about LNAPL bodies can be used to estimate natural LNAPL loss rates. Continuous subsurface temperature measurements are currently being collected at various depths about an LNAPL body at four field sites. Ongoing studies are focusing on developing and testing mathematical models that convert thermal soil and climatic data to continuous estimates of natural LNAPL loss rates. Preliminary results using this thermal flux method indicate seasonal variations in natural loss rates and total loss rates on the order of thousands of gallons per acre per year, consistent with data acquired using current CO₂ efflux methods.