

CO₂ Traps: A New Tool to Monitor Natural LNAPL Loss Rates

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Abstract. Petroleum liquids, referred to as light non-aqueous phase liquids (LNAPLs), are commonly found beneath petroleum facilities. Frequent concerns at petroleum spill sites include expansion and/or lateral translation (i.e. stability) of subsurface LNAPL bodies. Ongoing research at Colorado State University is exploring natural rates of LNAPL losses and associated implications for management of LNAPL bodies.

Recent work at Colorado State University has focused on developing and validating a new tool to monitor natural LNAPL losses. Passive carbon dioxide absorption traps (CO₂ traps) have been manufactured and tested in the laboratory. These CO₂ traps have been deployed at grade above LNAPL bodies at nine field sites. Results of the CO₂ trap field studies to date indicate natural LNAPL loss rates on the order of 100s to 1,000s of gallons per acre per year (gal/acre/year). Similar LNAPL loss rates have been documented by researchers at Arizona State University (Gradient method) and the University of British Columbia (Chamber method).

Per previous research at Colorado State University (Mahler, 2010), LNAPL loss rates of the order of magnitude observed at the nine field sites can reduce expansion / lateral translation of LNAPL bodies. Furthermore, losses on the order of 1,000s of gal/acre/year can rival traditional engineered remedies. Lastly, observed LNAPL loss rates are raising new questions regarding the overall longevity of LNAPL bodies. Ongoing work includes a large scale laboratory validation study, analysis of temperature effects on loss rates, and continued collection of CO₂ trap data at field sites.