

SPRINKLER IRRIGATION: A VOC REMEDIATION ALTERNATIVE

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Abstract

A sprinkler irrigation system was tested to assess its efficacy for volatilizing organic chemicals in pumped groundwater. In field tests involving the analysis of more than 250 samples collected from beneath a spray irrigation system, removal rates of ethylene dibromide (EDB), 1,1,2-trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), and carbon tetrachloride (CT) in samplers placed 0.5 m above the ground exceeded 95% in the vast majority of cases, and approached 100% for the more volatile chemicals. As predicted by Henry's Law, CT, TCA, and TCE were significantly more volatile than EDB. Removal efficiencies of conventionally designed sprinkler irrigation systems were enhanced by using small aperture nozzles with impact pads designed to produce thin films of water. Droplet sizes produced by the various nozzle apertures and impact pad designs were measured using a phase, Doppler particle analyzer and found to be one factor controlling volatilization. As predicted by the Clausius-Clapeyron equation, higher air temperatures appear to be associated with slightly increased volatilization. Using specialized stratified water droplet collectors, it was determined that longer droplet trajectories increased volatilization.

Key words: volatilization, sprinkler systems, droplet size