

# Trichloroethylene Biodegradation in Large Undistributed Columns of Fractured Weathered Shale in East Tennessee

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A plume of trichloroethylene (TCE) contaminated groundwater was detected at the Oak Ridge Reservation (ORR) in eastern Tennessee adjacent to shallow waste trenches in a highly weathered and fractured shale. Monitoring wells at the site indicate a downgradient decline in concentration of TCE and the appearance of its daughter products (dichloroethylene, vinyl chloride, ethylene, and methane). This suggests that anaerobic and possibly aerobic biodegradation of TCE is occurring and is the first documented case of natural attenuation of TCE in fractured shale. A research program is currently underway to investigate factors influencing biodegradation of TCE in these materials. The study is being performed using large undisturbed column of fractured and weathered shale from a nearby-uncontaminated site. The experiment involves

slowly pumping groundwater containing dissolved phase TCE (100 ppb) through the undisturbed soil column for one year. This is intended to simulate conditions downgradient from the waste trenches or from a TCE spill. The influent and effluent is being monitored for TCE, daughter products, and micro-organisms. Conventional geochemical and microbial techniques, as well as molecular techniques are being used to investigate TCE biodegradation. The microbial community structure at the contaminated site was examined using <sup>16</sup>S rDNA analysis; this data will be used for comparison to the changes that occur in the column and assess the shifts in microbial community structure with the exposure to TCE. This research will help develop a better understanding of the potential for TCE biodegradation in these widespread soils.