



**Project Title:** “Vertical Profiling of Contaminants in Ground Water at the Raymark Superfund Site, Stratford, Connecticut”

**Investigators:** Cynthia J. Paul (USEPA/ORD/NRMRL/GWERD; Ada, OK 74820; 580-436-8647)

**Collaborators:** Dominic DiGiulio, USEPA/ORD/NRMRL/GWERD; Ray Cody, USEPA/Region 1.

**Introduction to the problem:** Vapor intrusion has recently become a major area of concern for EPA and ORD which has lead to the preliminary development of a Vapor Intrusion Program. It is important to evaluate VOC intrusion from ground water into the basements of residences and other buildings for risk assessment. The recent development of the EPA Vapor Intrusion Guidance Document has raised questions regarding sampling methodologies used to evaluate potential health risk from vapor intrusion into homes and buildings in the vicinity of contaminated sites.

**Background:** The Raymark Superfund site, located in Stratford, CT, manufactured friction products and other products containing asbestos, lead, PCBs and 60 other hazardous chemicals. This resulted in excessive soil and ground water contamination, including a dissolved-phase VOC plume, comprised primarily of chlorinated solvents and daughter products, which is migrating beneath approximately 200 houses down gradient of the site, thereby increasing the risk of vapor intrusion and potential health risks.

**Objectives:** 1) Evaluate the use of contaminant concentrations in groundwater to determine potential risk of vapor intrusion into adjacent residences and buildings, 2) Determine the best method for vertical profiling of VOC concentrations at contaminated sites to assess potential vapor intrusion into residences and building.

**Approach:** Field sampling will be conducted at the Raymark Superfund Site, Stratford, CT and other potential sites using discrete multi-level samplers (DMLS), passive diffusion bags (PDBs) and Geoprobe technology for collecting discrete level ground water and capillary fringe samples. For comparison purposes, ground water samples will also be collected using other traditional sampling devices and techniques. Pumps which will be used include a Grundfos submersible, bladder, and peristaltic. Low-flow purging and sampling techniques will be utilized when sampling with pumps. An inflatable well packer will also be utilized to seal off the air/water interface within at least two monitoring wells. The packer will not be used in wells with low water levels (<4 ft) because the additional length of the packer would potentially place the pump at the bottom of the well screen. One of the traditional pumps will be used to obtain samples while the packer is in place. The purpose of the packer is to determine if VOC concentrations are being lost up the well casing during purging and sampling. These values will be compared to samples collected in the same manner with no packer in place. Three to six wells will be sampled at the Raymark Superfund Site. If another site is located which has different contaminants of concern (i.e., petroleum hydrocarbons), additional sampling may be conducted in order to evaluate the various sampling techniques and devices for other contaminants of concern.

**Experimental Design** (if possible, state the hypothesis to be tested in statistical terms).

The main objective of this study is to evaluate the use of DMLS® units for vertical profile sampling to determine VOC concentrations in the capillary fringe and upper portion of the water column within monitoring wells. Additionally, wells will be sampled using different sampling devices and techniques in order to determine if it is possible to obtain representative VOC concentrations from this subsurface zone. The data obtained will aide Federal and State Agencies and other environmental professionals in assessing contaminated waste site where the potential exists for indoor vapor intrusion. The data will show whether this potential can be determined by sampling monitoring wells in the vicinity of homes or

buildings, or where additional sampling (i.e., indoor air, subslab, etc.) should be conducted to properly evaluate each location. Additionally, the comparison of several different sampling devices and techniques will provide information for Federal and State Agencies and other environmental professionals to use in establishing sampling programs following the EPA Vapor Intrusion Guidance. Results of this study should determine which methods achieved the most representative samples for these VOCs (TCE, 1,1,1-TCA, and 1,1-DCE) and other contaminants.

**Accomplishments to date (August 2003):** Completed two field sampling studies comparing different sampling devices for ground water collection. Data are currently being evaluated to compare concentration differences for TCE, 1,1,1-TCA, and 1,1-DCE. Comparisons are being made for data collected using the DMLS, PDB, and Geoprobe for vertical profiling. These data are being compared to data obtained using peristaltic, bladder, and Grundfos pumps (with and without a packer) in three 2-inch diameter monitoring wells at the Raymark Superfund site in Stratford, CT. Involvement in this project lead to an invitation to participate in the EPA Sponsored Indoor Vapor Intrusion Seminar Series in San Francisco, CA, Dallas, TX, and Atlanta, GA as well as an invitation to give a presentation at the Indoor Air Quality Problems and Engineering Solutions Specialty Conference and Exhibition in Raleigh, NC.

**Near future tasks:** Additional sampling at different sites in order to evaluate these sampling techniques in different geological environments and potentially with different contaminants (i.e., petroleum hydrocarbons).