Effects of Remediation and Background Indoor Air Sources on Indoor Air in a Commercial Facility

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Background/Objectives. A key piece of many vapor intrusion (VI) investigations is understanding the influence of background indoor air sources on indoor air concentrations. USEPA and other authors have published studies that evaluated potential indoor air background concentrations in residential homes. Data on commercial buildings is much more limited and background indoor air sources may be associated with the off-gassing of raw materials/products and not specifically labeled chemicals or products. As a result, the source of chemicals in indoor air is often very difficult to identify based on inventory alone.

In addition to products stored in a building, indoor air concentrations could be influenced by groundwater remediation systems that influence vapor-phase conditions beneath a building. In this paper, a case study will be presented that evaluates the influence of an ozone (O_3)/soil vapor extraction treatment system for chlorinated VOCs (CVOCs) on indoor air concentrations in a building used as a warehouse for printed materials. The remediation system consisted of eighteen O_3 sparge points and six SVE points and was designed to destroy VOCs in place as well as physically move them to the vapor phase for recovery and treatment. During system operation, an indoor air monitoring program (weekly photoionization detector (PID) monitoring and monthly Summa canister sampling) was implemented to proactively detect potential increases in CVOC concentrations in indoor air. When CVOCs were detected above screening levels during the monthly indoor air sampling, an additional investigative approach was developed to find the source of the chemicals and determine if it was associated with the remediation system or the materials stored in the warehouse.

Approach/Activities. A step-wise sampling and evaluation approach was taken to investigate the presence of CVOCs in indoor air in the warehouse. The first step was to identify and seal any floor entry points in the warehouse. One of the wells installed for the O_3 sparge system was determined to not be properly sealed. The second step was to compare indoor air concentrations with the remediation system on and off. Finally, a portable gas chromatograph (GC)/PID (the Frog-4000™) was used to identify any additional floor cracks or other pathways and to screen the print materials being stored in the warehouse. Although no products were identified during the building inventory, based on the steps taken to seal cracks, the printed materials were suspected of contributing to the indoor air concentrations. Through several rounds of indoor air sampling and use of the GC/PID, sufficient information was collected to evaluate the influence of materials stored in the warehouse on indoor air concentrations.

Results/Lessons Learned. Summa canister data were useful to initially identify a potential indoor air issue; however, in order to pin point the specific source of CVOCs in indoor air, real-time analysis was necessary. The portable GC/PID was able to identify entry points including a floor channel that was previously not known to be a vapor migration pathway. In addition, the real-time data testing demonstrated that the materials stored in the building were a major source of CVOCs into indoor air, although CVOCs are not listed on any packaging or materials stored in the warehouse. Based on these data results, the indoor air sampling program was suspended (in agreement with the regulatory agency) as the CVOCs present in indoor air were determined to be related to materials and not the O_3 remediation system.