# A Field Study to Validate a Newly Developed Flow Controller Used to Monitor Vapor Intrusion

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**Background/Objectives.** Vapor intrusion (VI) can be impacted by seasonal, temporal, and spatial variabilities which can create challenges when performing risk assessments on exposures to volatile organic compounds (VOCs) in indoor air. Recently, a new long-term capillary flow controller (AURA$^{TM}$) for canister sampling has been developed to allow for a broader temporal range and more representative collection of VOCs in both occupational and residential environments. The internal capillary design of the flow controller reduces air flow rate into a canister, making it possible to collect a single air sample over an extended period of time (14 days). The flow controller was initially tested in a laboratory setting where it yielded high accuracy and precision relative to already commercialized diaphragm short-term flow controllers and thermal desorption (TD) tubes (MARKES; Carbopack X). The goal of this study is to field validate the sampling capabilities during 14 day intervals while also assessing seasonal impacts on the performance of the long-term capillary-canister sampling device.

**Approach/Activities.** Four 14-day field studies, with three completed to date, under different temperatures, humidity levels, and wind velocities were conducted. A location with a known history of VI occurrence, which includes; toluene, tetrachloroethylene (PCE), and trichloroethylene (TCE), was chosen for this study. Evacuated canisters were placed side by side at 4 indoor locations along with multiple TD tubes to collect the most representative air samples. A canister using a short-term flow controller was collected every 24-hr period for 14 days. Co-located thermal desorption tubes collected samples for 7 and 14 days. A set of 2 canisters using the attached Aura$^{TM}$ flow controllers collected samples for the entire 14-day duration. Canister samples were analyzed on a gas chromatograph/mass spectrometry (GC/MS) unit while tubes were analyzed on a TD-GC/MS. Additional, temperature and relative humidity probes were set in place to measure environmental data every 5 minutes. Average VOC concentrations of each specific compound from the 14-day samples were compared to the concentrations of the 24-hr samples and TD tube samples.

**Results/Lessons Learned.** TCE was the predominant VOC detected at each of the four indoor locations while toluene and PCE were detected in the mid to low part per trillion ranges. 95% accuracy and precision was seen when quantifying TCE relative to the 24-h canister for 7 out of 8 scenarios. Heavy rainfall events lead to significant spikes in TCE levels, while slight changes were observed after drops in temperature. TCE concentrations were higher during the second sampling event when the average temperature was slightly warmer. TD tubes tend to be inconsistent throughout both sampling campaigns. The long-term flow controller is expected to continually perform within the successful criteria compared to the diaphragm flow controller. This should be an effective sampling technique which can help enhance a risk assessment by eliminating over and under estimations while reducing uncertainties in temperature and seasonal variability.