

Quality Assurance of Real-Time VOC Measurements Using AROMA- VOC

Hong Cheng Tay (nta237@uky.edu), Nader Rezaei (naderrezaei@uky.edu), and Kelly G. Pennell (kellypennell@uky.edu) (University of Kentucky, Lexington, KY, USA)

Vapor intrusion is a nationwide problem where foundation cracks and building slab imperfections have long been considered as primary intrusion pathways into indoor spaces. More recently, sewer connections and other building infrastructure connections have been shown to increase the potential for vapor intrusion at a site. There is a need for improved characterization techniques, including real-time monitoring of chemical concentrations in these complicated transport pathways. A range of sampling techniques and analytical methods (e.g. TO-15A, passive sampling, real-time monitoring, etc.) are used at sites depending on different environmental conditions and site assessment needs. Real-time chemical monitoring provides considerable advantages and is the focus of this research.

In the present work, a Quality Assurance Project Plan (QAPP) is developed for a real-time vapor phase analytical instrument, AROMA-VOC. AROMA-VOC is manufactured by Entanglement and detects concentrations of volatile organic compounds (VOCs) within parts-per-billion (ppb) and parts-per-trillion (ppt) range. The core of the instrument uses technology of cavity ringdown spectroscopy coupled with thermal desorption to identify and quantify chemical concentrations of interest. This technology provides an alternative to other real-time devices (e.g., GC/MS), but performance specifics of instrument has not been well described. The QAPP describes the sensitivity and intensity of the instrument.

Calibration curves of the instrument have been generated in this study. AROMA-VOC exhibits high repeatability of calibration curves for eight different chemicals with r-squared values higher than 0.98. The r-squared values have demonstrated the method used to generate samples and analyzed samples producing consistent errors. A series of parameters are established, including precision, trueness, recovery, specificity, limit of detection (LOD), etc. The framework of the project plan will be similar to U.S. Environment Protection Agency (US EPA) established QAPP making AROMA-VOC more user-friendly for vapor intrusion investigations.