Automated Continuous Vapor Intrusion Monitoring and Response for Evaluating Mitigation and Remediation Effectiveness

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Background/Objectives. When vapor intrusion mitigation is implemented, it becomes essential to be able to confirm that risk reduction objectives are being met. Selected confirmation approaches often do not include comprehensive chemical assessment, and instead rely upon limited sampling and mechanical or pressure related observations. This applies to air filtration, vapor barriers, soil vapor extraction and sub-slab depressurization mitigation options. When aggressive remediation technologies such as thermal treatment combined with soil vapor extraction are employed, not only is it essential to confirm that remediation objectives are being met, but any potential fugitive emissions must be rapidly detected and site personnel immediately notified so that response measures can be implemented. Responses can include system adjustment as well as emergency building evacuations. For instance, when acute risks posed by Trichloroethylene occur, there is a need to respond to exposures before a duration of concern has transpired. Using high-frequency automated continuous chemical monitoring techniques, practitioners have demonstrated that they can prevent exposures through automated alerting and engagement of ventilation controls while also confirming that mitigation and remediation objectives have been met. This presentation will describe multiple projects where automated continuous monitoring systems have been deployed to evaluate mitigation and remediation systems, to immediately respond to acute risks, and to help manage complex remediation projects in an adaptive manner.

Approach/Activities. Continuous automated monitoring platforms were deployed to track dynamic volatile organic constituent concentrations at sites undergoing mitigation and remediation. More specifically, a multiplexed laboratory grade gas chromatograph was modified to automatically collect and analyze vapor samples from up to 16 site locations per analytical instrument. The system has been integrated with telemetry, GIS and geospatial mapping algorithms for automatically generating intuitive time stamped analyte concentration contour images, time series charts, risk exceedance alerts and engagement of controllers through a Cloud-based visualization and response platform. The system has been deployed to automatically track the distribution of TCE, PCE, vinyl chloride and other volatile organic compounds of concern as well as pressure trends.

Results/Lessons Learned. Continuous data collection, processing and automated visualization have resulted in more confident conclusions regarding mitigation and remediation performance. More specifically, continuous monitoring was used to demonstrate whether mitigation objectives were met, to prevent acute contaminant exposures through rapid response, and to help optimize mitigation and vapor treatment components associated with complex remediation projects. In addition, it was revealed that mitigation performance can be dynamic and can fluctuate with climatic influence. Furthermore, it is possible for sub-slab depressurization systems to *increase* indoor risks by capturing subsurface contaminant vapors from outside the building perimeter.