Correlation and Applications of Indoor Air Mitigation System Influent from the CDOT MTL Site, Denver, Colorado

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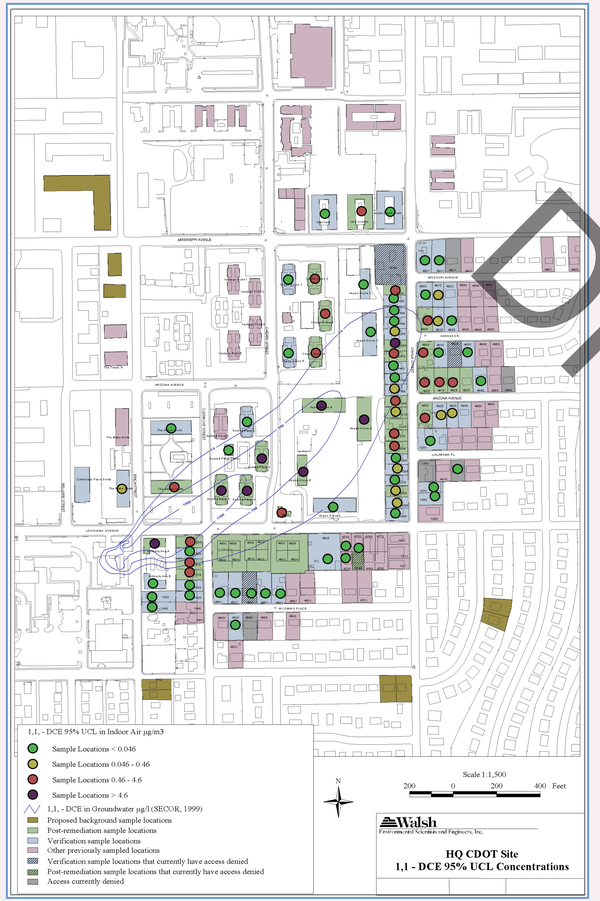
Abstract

Over a period of approximately five years, quarterly indoor air mitigation system influent (or exhaust) and groundwater data have been acquired for single family residences and apartment building complexes over the former CDOT MTL chlorinated solvent plume in Denver, Colorado. The plume is dominated by 1,1-dichloroethylene (1,1-DCE), with subsidiary trichloroethylene and breakdown products. The apartments are part of multi-building complexes built slab-on-grade. Most of the mitigated single family residences have basements, and a few have crawl spaces. The mitigation systems in the apartment buildings are soil vapor extraction systems consisting of: perforated horizontal extraction wells 6-8 feet below slabs, activated carbon vessels in series, and positive displacement vacuum blowers permitted to discharge to the atmosphere. Those in the single family homes are typical sub-slab or sub-membrane depressurization systems (i.e., radon systems). System influent samples from the combined sub-slab influent beneath the apartment buildings were collected as a grab sample in Summa canisters from before, between and after carbon columns. System exhaust from the single family homes was collected as Summa canister grab samples from the system vent pipe (generally before the fan). Time series analysis of the groundwater and system influent data for 1,1-DCE shows good correlation over the five year time span, with both increasing and decreasing trends in different portions of the plume. The system influent/exhaust data has a number of applications including: Air Pollution Emission Notices; timing of carbon filter change-out for the apartment buildings; prediction of time frame for system shut-down, particularly at locations remote from groundwater monitoring wells, based on correlation with pre-mitigation sub-slab and indoor air concentrations; and measurement of actual mass flux of VOCs compared to model predictions.

Site Plan with 1,1-DCE Groundwater Contours



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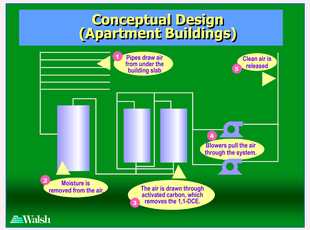
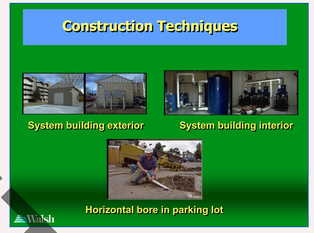
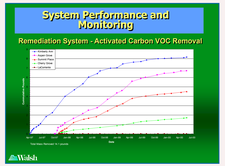
Vapor Mitigation Systems

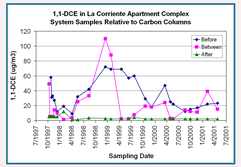




Correlation and Applications

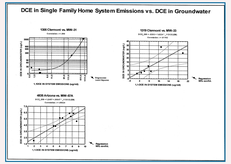
- Total VOCs (mass flux) were found to be less than APEN criteria.
- Individual VOCs (mass flux) were found to be less than HAPS criteria.

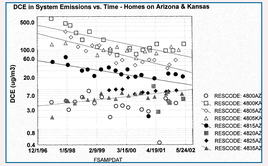




- Influent to 1st carbon column peaked in 1999.
- Effluent from the 1st carbon column indicated replacement was required in early 1999.
- Effluent from the 2nd carbon column remained in compliance

- Emissions from radon-type mitigation systems correlated well with groundwater concentration (for 1,1-DCE).
- Groundwater concentrations may be inferred from system emissions where wells are not available.





- System emissions trends may be used for shutdown decisions.
- Groundwater trends may be inferred from system emissions where wells are not available.