Vapor Intrusion Fact Sheet
Soil Gas Sampling Protocol

The Illinois EPA’s Tiered Approach to Corrective Action Objectives (“TACO”) regulations (35 Ill. Adm. Code 742) requires the evaluation of the indoor inhalation pathway at sites where volatile chemicals are present. Volatile chemicals are defined as chemicals with a Dimensionless Henry’s Law Constant of greater than 1.9 x 10^{-2} or a vapor pressure greater than 0.1 Torr (mmHg) at 25°C. For purposes of the indoor inhalation exposure route, elemental mercury is included in this definition. As part of the indoor inhalation pathway evaluation, soil gas samples may be required to determine compliance with remediation objectives. There are two types of sampling: exterior or near slab soil gas samples collected outside a current structure or in areas where a future building will be located; and sub-slab soil gas samples collected directly underneath a building (through the foundation of the building). Exterior or near slab soil gas samples are used in Tiers 1 and 2, while the sub-slab samples may only be used in Tier 3.

This fact sheet will provide guidance on the collection of exterior or near slab soil gas samples in accordance with 35 Ill. Adm. Code 742.227.

Soil Gas Sampling

Soil gas samples should be collected in areas above where volatile chemical contamination in the soil or groundwater has been identified. Soil gas samples must be collected from a depth at least three feet below the ground surface or building foundation, but above the saturated zone. No soil gas sampling should take place within 48 hours after a rainfall event of ½ inch or greater, in standing or ponded water areas and where soil is constantly watered by an irrigation system.

Utilities should be identified to assess possible man-made pathways. A direct push method should be used to advance a heavy-gauge decontaminated steel probe, with an expendable tip, to the desired depth. Once the desired depth (greater than three feet below ground surface or building foundation) is reached, connect the 1/8 to ¼ inch outside diameter post-run tubing of either Teflon® or nylon to the expendable point holder. Pull the rods up three to six inches to create a cavity to collect the soil gas sample. Seal the rods at the surface with bentonite, clay, or use a water dam to prevent air from entering around the rods. Purge the tubing of three volumes prior to the collection of the soil gas sample. A helium tracer gas (or another tracer gas or other leak apparatus detection system approved by the Illinois EPA) must be used during the sampling to confirm there are no leaks around the soil gas sampling train. It may be beneficial to conduct a shut-in test on the sampling train prior to purging or sampling. If using Tedlar bags or Summa canisters, they must be certified clean by the laboratory prior to sample collection. The holding times for soil gas samples are no more than 30 days for Summa canisters and no more than 48 hours for Tedlar bags. For light sensitive or halogenated volatile chemicals, the sample containers must be opaque or dark-colored. Samples in transparent containers can be protected from light degradation either by placing the containers in a dark receptacle (such as a box) or by wrapping the container with aluminum foil. For example, glass PUF casings may be wrapped with foil.

Soil Gas Analytical Methods

Close coordination with the analytical laboratory is necessary to ensure that the Reporting Limits (RLs) are equal to or lower than the Remediation Objective (RO) for the site. This may not always involve the collection of soil gas samples in a summa canister or the analysis of those soil gas samples by a TO method. Not all of the volatile chemicals listed in TACO can be collected in a summa canister and not all of the volatile chemicals can be analyzed by Method TO-15. Another collection and analytical method may provide the required detection limit for a lower cost. The size of the sample container should be based on the project target levels (remediation objectives for the site) and the laboratory’s sample volume needs.

Do I have to submit a work plan for soil gas sampling for sites in the Site Remediation Program and RCRA Corrective Action Program?
A work plan describing the collection of soil gas samples and the location of the sampling points should be submitted for review prior to completing the work. The Illinois EPA should have ample time to review the work plan and provide comments prior to the commencement of the work. If soil gas sampling work is completed without Illinois EPA approval of the work plan, the Illinois EPA reserves the right to deny the results or request additional samples be collected from other locations.

**Do I have to submit a work plan for soil gas sampling for sites in the Leaking Underground Storage Tank Program?**

Soil gas sampling plans should be included in the site investigation plans required by 35 Ill. Adm. Code 734. See the Leaking UST Program’s Site Characterization fact sheet for further information.

**Do soil gas samples have to be analyzed by an accredited laboratory?**

Yes. Illinois has not accredited any laboratories for soil gas analysis at this time; however, you can use a laboratory accredited by one of the states with whom Illinois has a reciprocal agreement under the National Environmental Laboratory Accreditation Program. Those states with reciprocal accreditation are California, Florida, Kansas, Louisiana, Minnesota, New Hampshire, New Jersey, New York, Oregon, Pennsylvania, Texas, Utah and Virginia.

**How do I interpret soil gas sampling results?**

The soil gas sampling results from the analytical laboratory may be reported in units of parts per million volume (ppmv), which is not equivalent to the units of mg/m³ used for the remediation objectives in TACO. Modified J&E equation 3 must be used to convert ppmv to mg/m³ before comparing each sample result to the remediation objectives in Appendix B Table H or Appendix B Table I. This conversion depends on the molecular weight of the volatile chemical.

One source for molecular weights of volatile chemicals is the NIOSH Pocket Guide to Chemical Hazards.

This fact sheet is for general information only and is not intended to replace, interpret, or modify laws, rules, or regulations.

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