Division of Environmental Response and Revitalization
July 2019

Sampling to Evaluate Vapor Intrusion

Capabilities of the Site Investigation Field Unit (SIFU)

Overview

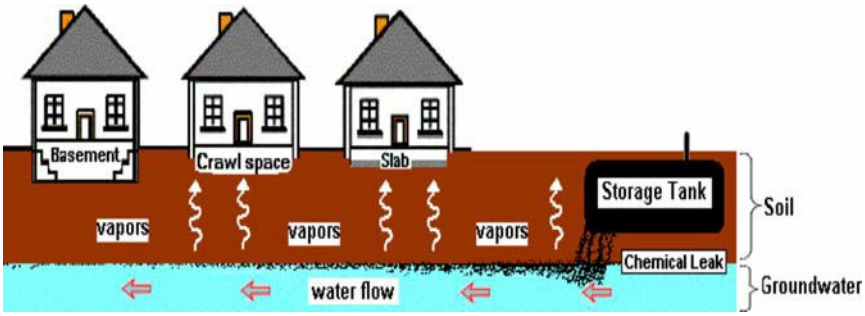
Vapor Intrusion is the upward migration of contaminants, in vapor phase, into structures and occupied buildings from underlying contaminated ground water or soil. Evaluating this potential exposure pathway is accomplished though vapor sampling of Soil Gas, Sub-Slab Gas or Vapors, and Indoor Air. Each of these distinctive sampling activities involves a step- wise process whereby sample screening, specific sample control, detailed documentation and laboratory analysis all combine to allow for holistically evaluating the vapor exposure pathway.

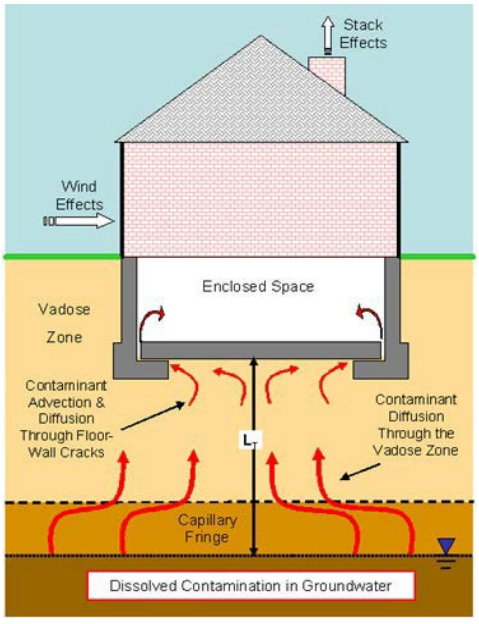
Site-specific vapor data is gathered after careful planning and giving consideration to the following:

- Chemical(s) of interest
- Hydrology
- Historical activities
- Land use
- Exposure Pathways
- Hydrogeological conditions
- Preferential Pathways
- Source areas
- Receptors
- Community Plans

Additionally, evaluation of current structural/building conditions and use is determined. All of these components help in the development of a conceptual site model (drawings, flow charts or images) – which allows for the collected data to support current risk-based modeling.

Examples of Conceptual Site Models



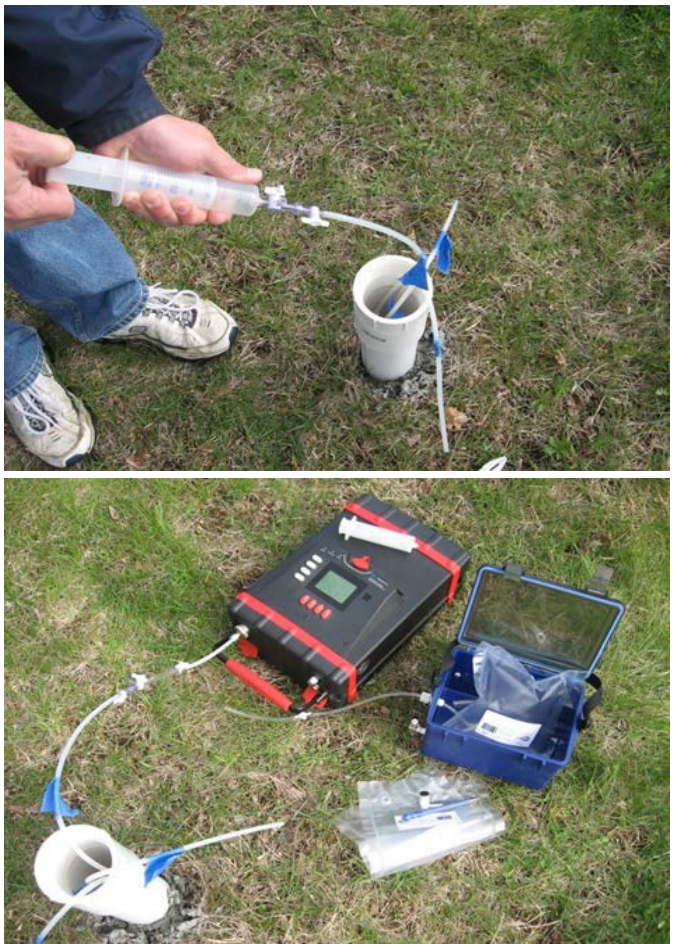


Sampling to Evaluate Vapor Intrusion

Soil Gas/Vapor Sampling

Soil Gas Sampling is the process by which soil vapors are collected directly from the ground. For this activity, a Geoprobe is used to advance and/or push sample tubing (Teflon tubing) to a specific depth in the ground. Depths for sample collection will vary, however, the primary zones of interest for soil gas sampling are typically just above the ground water and at a depth consistent with building sub-surface construction (basement, crawl space, or slab-on-grade). The soil gas port is then connected to a hand-held, direct-read instrument for initial contaminant screening purposes.

Field Log Sheets, specific to each sample location, are completed and include information such as site name, location, date and time, location where sample was collected, and specific depth and other field observations. The initial sample screening concentration is also recorded on this form. Once the initial data are recorded, a vapor sample is collected into a laboratory-supplied sample bag or laboratory- supplied sample canister. Once sampling is completed,
the tubing is removed, and the direct push hole is filled



The photos above show different methods for collecting an air sample from a soil gas sampling system. The tubing shown in the photos are set at different depths below ground surface in order to evaluate the actual migration of the soil gas.

Sub-slab Vapor Sampling

In order to evaluate whether vapors have reached a building, samples may be collected from beneath the home/building foundation. These are called sub-slab samples. Sub-slab vapor sampling enables evaluation of vapor conditions as they exist directly under the foundation of a home and/or building.

Sample collection for this purpose begins with home-owner/building management consultation. Locations for these sample "ports" are typically in areas that are out of the way and not in high traffic areas, such as under steps, or behind doors. A small hole is drilled through the concrete foundation. A sample port is then created with a semi-permanent, grouted installation, or removable Vapor Pin™.

A close-up view of a sub-slab sample port.

Sampling to Evaluate Vapor Intrusion

Once installed, these sample ports are allowed time to equilibrate – typically between 1 to 8 hours – before sampling. As with the soil gas samples, the sub-slab ports are connected to a hand-held instrument for screening of potential contaminants. Sample collection times vary based on pre-determined conditions and facility use. Residential samples, for example, may be collected for a time period of 8 to 24 hours.
Commercial buildings are typically sampled over an 8-hour timeframe (to reflect hours in a typical work day).

Sub-slab samples can be collected into the laboratory supplied bags, or evacuated canisters. Field log sheets are completed for each sample port/location. Once sampling is completed, all equipment is removed, and the sample ports are sealed with grout/cement to restore the floor to its original condition.

Collecting a gas sample from a sub-slab sample port.

Collecting a sub-slab gas sample into a canister for laboratory analysis.

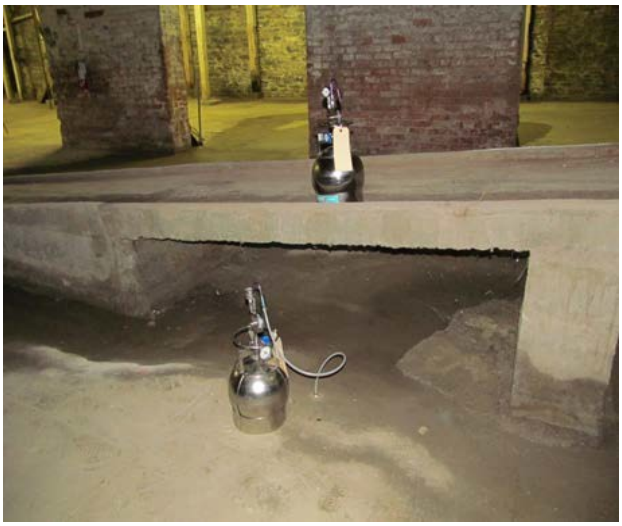
Sampling to Evaluate Vapor Intrusion

Indoor Air Vapor Sampling

Indoor Air Vapor Sampling is typically conducted at the same time as the sub-slab sample collection. Sample collection time periods are the same as for the sub-slab sample collection – 24 hours for residential buildings and 8 hours for commercial/industrial buildings. Prior to these samples being collected, a building or facility "walk-through" is conducted with the home-owner and/or facility maintenance personnel to evaluate whether there may be products in the building that could contaminate the sample such as chemicals, cleaning products, glues, paints, stains or even clothes that have just been returned from the dry- cleaner.
Cross-contamination can potentially affect the analytical results providing false positive results.

Laboratory supplied sample canisters are placed inside a building at pre-determined locations. These sample locations are primarily selected based on areas of use and receptor breathing zones.

Sample canister collecting indoor air for analysis.



Collecting an indoor air sample and a sub-slab sample in the basement of a building