

# Facts About...

## Vapor Intrusion

*The Land Restoration Program (LRP) is charged with assessing and cleaning up uncontrolled hazardous waste sites throughout Maryland to protect public health and the environment at sites contaminated by hazardous substances. Cleanups abate immediate uncontrolled discharges, ensure that contaminated soil does not pose a risk to public health and the environment, address groundwater contamination that may affect drinking water supplies or otherwise pose a risk to public health and the environment and address surface water discharges.*

### Purpose

This fact sheet provides general information on vapor intrusion issues. It is intended to supplement other technical guidance documents prepared by the Maryland Department of the Environment (MDE).

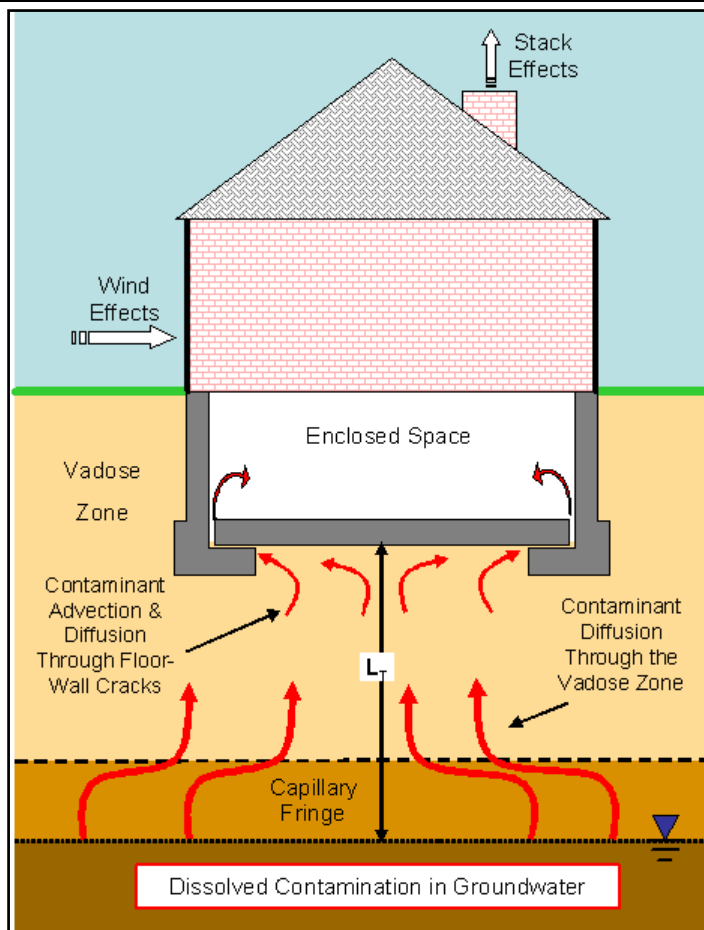
### What Is Vapor Intrusion?

Vapor intrusion is a way that chemicals in soil or groundwater can get into indoor air. Sometimes, chemicals are spilled on the ground at a factory, shopping center or gas station or leak from an underground storage tank. These chemicals can seep into the soil and groundwater. Some chemicals can also travel through soil as vapors or via the groundwater. These vapors may then move up through the soil and groundwater and into nearby buildings, contaminating indoor air. Homes in the same neighborhood and right next to each other can be affected differently by vapor intrusion.

Vapor intrusion is similar to how radon, a naturally occurring radioactive gas, can enter a home through cracks in the foundation. Vapor intrusion should be considered when there is a known source of soil or groundwater contamination nearby and conditions like soil type and depth to groundwater indicate a potential for vapor intrusion exists.

### What Chemicals Might Be Entering My Home?

Volatile organic compounds (VOCs) are one group of chemicals that easily become gases and can move through the soil and enter buildings. Some examples of VOCs are petroleum products such as gasoline, chemicals for dry cleaning and industrial products.



**Conceptual Diagram of Vapor Intrusion into Building**

Some VOCs are also found in products that may be in your home. Paints, paint strippers and thinners, cigarette smoke, aerosol sprays, moth balls, air fresheners, new carpeting or furniture, hobby supplies (glues and solvents), stored fuels and dry-cleaned clothing all contain VOCs and are more likely to be a source of VOCs in your home than vapor intrusion.

Vapor intrusion cases sometimes involve VOCs that have leaked from underground storage tanks. Leaks from underground gasoline tanks are usually accompanied by the smell of fuel.

### **What Are The Health Concerns With Vapor Intrusion?**

The health effects from chemical exposures vary based on the individual exposed and the chemical involved. When chemicals build up in indoor air (at levels high enough to cause a strong petroleum odor, for example), some people will experience eye and respiratory irritation, headache, and/or nausea. These symptoms are temporary and should go away when the person is moved to fresh air. Complicating the problem is that both household products and vapors entering homes from environmental sources can accumulate at levels of concern well below our ability to detect them with our senses. Usually, health officials are most concerned about low-level chemical exposures over many years, as this may raise a person's lifetime risk for developing cancer. The likelihood of indoor air contamination by vapor intrusion is low at most cleanup sites. Even though the risks are usually quite low, the MDE considers these risks to be unnecessary and avoidable and requires remediation to conservatively safe levels.

### **What Should I Expect If Vapor Intrusion Is A Concern Near My Home?**

If you live near a site with VOC contamination, such as a gas station or dry cleaner where petroleum or chemicals have contaminated soil or groundwater, you should expect that the potential for vapor intrusion is also being investigated. You may be contacted by the cleanup site owner or others working on the MDE investigation and cleanup with information about the project. Your cooperation and consent would be requested before any testing/sampling would be done on your property. You may ask the person contacting you any questions about the work being done, or you can contact the MDE cleanup project manager. Telephone numbers and Internet addresses for MDE are provided at the bottom of this fact sheet.

### **How Is Vapor Intrusion Investigated?**

In most cases, the potential for vapor intrusion can be ruled out by collecting soil gas or groundwater



#### **Sub-slab Gas Samples Collected**

samples near the contamination site. In some cases, sampling closer to your property and/or home may be necessary. MDE does not usually recommend indoor air sampling for vapor intrusion during the early stages of an investigation. Indoor air quality changes a lot from day to day. Therefore, sampling one day may not show a problem even though sampling a day later might show contamination. Since a variety of



#### **Indoor Air Samples Collected Using a Summa Canister**

VOC sources are present in most homes, testing will not necessarily confirm that VOCs in the indoor air

are from VOC contamination in soils or groundwater nearby. Often, soil vapor samples are taken from areas outside of the home to see if vapors are near the home. Samples may also be taken from beneath the home's foundation (called sub-slab samples), to see if vapors have reached the home. Due to the variability of indoor air samples, sub-slab samples may be more reliable in predicting and assessing indoor air problems.

### What Happens If A Problem Is Found?

If vapor intrusion is having an effect on the air in your home, the most common solution is to install a mitigation system similar to a radon mitigation system. This prevents gases in the soil from entering the home. A low amount of suction is applied below



the foundation and the vapors are vented to the outside. The system uses minimal electricity and should not noticeably affect heating and cooling efficiency. This mitigation system also prevents radon from entering the home, an added health benefit. Usually, the party responsible for cleaning up the contamination is also responsible for paying for

the installation of this system. The system typically should remain in place until the contamination is cleaned up and may remain in place permanently.

### Terms to Know

#### Advection

The rate of change of an atmospheric property caused by the horizontal movement of air.

#### Ambient Air Sample

An outdoor air sample that is representative of the air surrounding a home or building.

#### Breathing Zone

Defined as the area from 3 – 5 feet above the ground, lower if small children are present. Indoor air samples should be taken from this zone to insure that they are representative of the air being breathed in the building.

#### Chlorinated Compounds

These include chemicals such as PCE (also known by its chemical name tetrachloroethene) and TCE (also known by its chemical name trichloroethene) that are commonly used in dry cleaning and industrial operations. These chemicals can break down into others that may also be of concern for vapor intrusion. They do not readily biodegrade in subsurface soil and may require active remediation to remove.

#### Cracks

A fracture, often a narrow opening in the cement floor or foundation of a building that can provide a means for soil vapor to enter a home or building.

#### Diffusion

The process whereby particles of liquids, gases, or solids intermingle as the result of their spontaneous movement caused by thermal agitation and in dissolved substances move from a region of higher to one of lower concentration.

#### Indoor Air Sample

An air sample taken from within the living or workspace of a home or building that is used to determine the concentration of the chemical that may be inhaled.

## Preferential Pathway

A subsurface feature that exists below ground as a fracture, utility line, or pipeline through which soil gas moves more easily than through the natural soil.

## Soil Gas Sample

An air sample taken from the air in the soil pore spaces. Soil gas samples are used to characterize chemical concentrations in the soil.

## Sub-Slab Sample

An air sample collected immediately beneath a home or building with a basement foundation and/or a slab-on-grade. Sub-slab samples are collected to determine the concentration of chemicals in the soil vapor beneath a home or building because these chemicals may enter the building.

## Summa Canisters

An airtight, stainless-steel container, which is used to collect air, samples. Summa canisters are evacuated and used under vacuum to take indoor air, ambient air or soil air vapor samples.

## Vadose Zone

The unsaturated portion of the earth between the land's surface and the groundwater table.

## Vapor Intrusion (Radon) Mitigation System

A mechanical device(s) that applies a low amount of suction immediately below the foundation or the occupied space of the building and collects soil vapors which are then vented to the outside.

## For More Information

For vapor intrusion related questions, contact MDE at (410) 537 3437.

More information on this and related topics are available on the MDE website at:

[http://www.mde.state.md.us/Programs/LandPrograms/ERRP\\_Brownfields/forms/index.asp](http://www.mde.state.md.us/Programs/LandPrograms/ERRP_Brownfields/forms/index.asp).

Other sources of information about vapor intrusion are available at the websites listed below. Please be advised that MDE does not control information on external site links.

- U.S. Environmental Protection Agency:  
<http://www.epa.gov/correctiveaction/eis/vapor.htm>.
- Interstate Technology and Regulatory Council:  
<http://www.itrcweb.org/guidancedocument.asp?TID=49>
- Vapor Intrusion Links - An extensive list of useful links categorized by state and topics. Includes links for regulations, databases, and directories.  
<http://www.envirogroup.com/links.php>