

Virginia Voluntary Remediation Program Vapor Intrusion Screening Fact Sheet

1. Introduction

The purpose of this fact sheet is to provide project managers with guidance on screening sites that have the potential for vapor intrusion (VI) risk. The guidance is specific to the Virginia Voluntary Remediation Program (VRP). More detail on many of the topics related to site characterization and vapor intrusion that are broadly discussed here may be found in the document *Vapor Intrusion Pathway: A Practical Guidance* prepared by the Interstate Technology & Regulatory Council (ITRC) in January 2007. See http://www.itrcweb.org/gd_VI.asp.

2. Characterization Requirements for Vapor Intrusion Sites

The characterization requirements for site screening of VI sites described below would be typical for a site with a suspected release of a volatile compound; such as a dry cleaning facility. Requirements would vary for a manufacturing operation or other sources of VOCs. Keep in mind that these are minimum requirements. The project manager may require additional characterization based on site-specific conditions.

Soil

Since there are no soil screening criteria for VI, the collection of soil data is not a strict requirement for the VI screening process. However, soil data will need to be collected to satisfy basic VRP site characterization requirements, to provide information for oral and dermal exposures in the risk assessment, and in order to identify potential vapor sources during a site-specific VI evaluation.

Groundwater

The hydrogeology of the site will need to be characterized. The presence or absence of perched water tables will have to be addressed. Groundwater samples should be collected from at least three locations in the highest aquifer in the immediate vicinity of the suspected release(s). Groundwater can also be used to determine off-site exposures and risks; therefore samples from near the property boundary may be needed.

Soil Gas

Two to three soil gas samples are required in the vicinity of every suspected release area. Inside buildings, samples should be collected directly under the slab (i.e., subslab soil gas) near identified sources such as dry cleaning machine, drains, or storage areas. Outside of buildings deep soil gas sampling can be used. Exterior deep soil gas samples are collected above the capillary fringe at least 5 feet below the surface.

Indoor Air

We recommend sampling indoor air only if the results of screening indicate that there is the potential for unacceptable risk. This sampling would most likely occur as part of a site-specific VI evaluation which is briefly described below. The presence of background contaminants make the interpretation of indoor air samples challenging. The ITRC guidance document provides information on approaches to evaluating background. See sections 1.6.1 and 3.5.4 of the ITRC guidance. If subslab samples indicate an imminent and substantial threat, we do recommend expeditiously sampling indoor air especially if children are present.

Off-site Characterization

Generally, off-site characterization of the vapor intrusion pathway during initial vapor screening will be based on groundwater concentrations near the property boundary. However, because soil gas can migrate independently of groundwater, deep soil gas samples near the property boundary may be required when the suspected release is near the property boundary or maybe useful as a screening tool when groundwater exceeds the screening concentration.

Sampling and Analytical Methods

The ITRC guidance provides general guidance on sampling and analytical methods in Appendix D (Toolbox). See Appendix D.2 and D.3 of the ITRC guidance for sampling considerations for groundwater and soil respectively. Appendix D.4 of the ITRC guidance provides details on sampling and analytical methods for exterior soil gas investigation and Appendix D.6 provides guidelines on subslab sampling. Quality assurance considerations are addressed in Appendix E and some general soil gas collection issues are noted in the Regulator's Checklist for Reviewing Soil Gas Data (Appendix F). At a minimum, documentation must include vapor point construction detail, purge volume, sample volume, vacuum (before and after) and flow rate/collection time for each sample, if appropriate. Documentation must also be provided of the ambient site conditions at the time of sampling, such as temperature, humidity, barometric pressure and recent rain events prior to or during sampling

The EPA has draft guidance on collecting subslab vapor samples using summa canisters. See *Draft Standard Operating Procedure (SOP) for Installation of Sub Slab Vapor Probes and Sampling Using EPA Method TO-15 to Support Vapor Intrusion Investigations*.

3. Screening for Vapor Intrusion Contaminants of Concern

The following is guidance on how to use the DEQ Tier III VI-based screening criteria for Groundwater (Table 2.10), Deep Soil Gas (Table 2.11) and Subslab Soil Gas (Table 2.12). These screening criteria are based on the application of attenuation factors to risk-based indoor air concentrations that meet the VRP criteria for acceptable risk. The

attenuation factors originate from statistical analyses of empirical groundwater and subslab soil gas data and co-located indoor air sample results contained in the USEPA Vapor Intrusion Database (Dawson, Helen, 2007. Draft USEPA Vapor Intrusion Database Pilot Training. May 16). The groundwater criteria (Table 2.10) are based on an attenuation factor of 0.001. The deep soil gas criteria (Table 2.11) are based on an attenuation factor of 0.01. The subslab soil gas criteria (Table 2.12) are based on an attenuation factor of 0.03. For more information on how these attenuation factors were derived please contact VRP risk assessment staff.

Literature-based background IA concentrations of several VOCs exceeded risk-based indoor air concentrations; therefore, in these situations, the background IA concentration is used in lieu of the risk-based concentration. The selected background IA concentration is the 90th percentile of the background data compiled and presented in Table 4 of the U.S. EPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors (USEPA, 2008).

The following are the screening processes used to evaluate on- and off-site exposures:

On-Site Exposure

If a release of a volatile compound is suspected to have occurred within the boundaries of the VRP site, then subslab soil gas should be collected in any potentially affected buildings. If there are no buildings in the area of the release, follow the off-site exposure screening method below.

1. If the subslab soil gas data is above the Table 2.12 VRP Tier III screening criteria then a site-specific VI evaluation will be necessary (see ITRC 2007, Site Investigation Phase).
2. If the subslab soil gas is less than the Tier III screening criteria, it can be assumed that unacceptable vapor risks are not present for on-site buildings.

Off-Site Exposure

The general method for screening off-site exposure risks, or on-site VI risks where the use of subslab soil gas data is impracticable (e.g., no buildings are present in the area of the release), is:

1. If the appropriate groundwater concentration is below the Tier III groundwater screening criteria (Table 2.10), then no further vapor intrusion evaluation is necessary.
2. If the groundwater concentration is above the screening criteria, deep soil gas results may be used as a screening tool. Deep soil gas is soil gas collected above the capillary fringe and not less than 5 feet below the surface. It is preferred that deep soil gas is collected at a depth of at least 10 feet unless the capillary fringe is shallower. If deep soil gas concentrations are less than the screening criteria (Table 2.11) then further vapor intrusion may not be necessary.

3. If the deep soil gas concentrations are above the screening criteria, then a site-specific VI evaluation will be necessary.

4. **Site-Specific VI Evaluation**

If screening indicates that there is a potential risk from VI, then a site-specific VI evaluation must be done. For the site-specific VI evaluation the report must describe the characteristics of the site that may relate to VI. A conceptual model check list is presented in Appendix B of the ITRC Guidance (2007). This check list should be used to assist in development of the report. When additional sampling is proposed, it is suggested that a work plan be submitted. As a reminder, the VI pathway is only one of many possible exposure pathways present at sites. All relevant exposure pathways need to be considered in the risk assessment.