

Vapor Intrusion Pathway: A Practical Guideline

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**Prepared by
The Interstate Technology & Regulatory Council
Vapor Intrusion Team**

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EXECUTIVE SUMMARY

This guideline was developed by the Interstate Technology & Regulatory Council (ITRC) Vapor Intrusion Team and represents the combined effort of more than 100 professionals from state and federal regulatory agencies, consultants, industry, and stakeholders. It is a practical, easy-to-read, how-to guideline for assessing the vapor intrusion pathway. Supplemental information is contained in appendices and in a companion document, *Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios* (VI-1A) to assist the practitioner when using the guideline. Due to variations in policy among regulatory agencies, this document does not provide a single prescriptive approach for assessing the vapor intrusion pathway. Rather, the purpose of this guideline is to provide a generalized framework for evaluating the pathway and a description of the various tools available for investigation, data evaluation, and mitigation. The guideline is intended to be used in conjunction with any applicable federal or state vapor intrusion policy or guidance.

The ITRC *Vapor Intrusion Pathway* guidance series consists of two documents—this *Practical Guideline* and its supplement, *Investigative Approaches for Typical Scenarios*. This document, *A Practical Guideline*, consists of four chapters:

1. An overview of vapor intrusion
2. Preliminary screening of sites
3. Site investigation
4. Mitigation

Chapter 1 provides basic information on the vapor intrusion pathway. Although the document is written for the environmental professional who has some general knowledge of vapor intrusion, it is still important to discuss the essential key points that must be understood to investigate and mitigate the pathway. Thus, Chapter 1 touches on conceptual site models, multiple lines of evidence, background contamination, preferential pathways, and community outreach.

The framework of the document presents a 13-step approach that leads the investigator from Step 1 (Is there an acute exposure?) to Step 13 (Is mitigation warranted?), using a lines-of-evidence approach. The first seven steps (Chapter 2) apply to the screening of sites based upon preexisting conditions and data. The user is prompted to consider whether adequate data are available for screening, whether volatile and toxic compounds are present in the subsurface near buildings, and whether concentrations of these compounds exceed any applicable screening levels. Discussions on issues applicable to the preliminary screening process, such as development of screening levels and building design considerations, are included as appendices.

Unless the vapor intrusion pathway is determined to be incomplete during the preliminary screening steps, six steps follow that describe the vapor intrusion investigative process (see Chapter 3). The process begins with selection of an investigation strategy and development of a work plan, followed by execution of the work plan, and ending with an evaluation of the need for mitigation. Chapter 3 is augmented by detailed appendices (e.g., Appendix D. Toolbox), which

give a comprehensive treatment of the investigatory methods used for vapor intrusion assessments. Methods include groundwater sampling, active and passive soil gas sampling, slab soil gas sampling, indoor air sampling, and supplemental tools such as flux chambers and forensics. Summary tables, charts, and checklists facilitate the use of the methods described in the toolbox.

Chapter 4 provides a comprehensive treatment of mitigation strategies. This chapter begins with an overview of three general approaches to addressing vapor intrusion—site remediation, institutional controls, and building mitigation. While the chapter focuses on building mitigation, it does include discussions on the differences between site remediation and building mitigation. The chapter also provides a description of eight building mitigation approaches, each including technology selection, design and installation considerations, operation, maintenance, performance monitoring, and mitigation system closure. Summary tables comparing the various options and costs are included.

Appendices include checklists for conceptual site models and reviewing soil gas data, a discussion of building types, a toolbox of investigative methods, quality assurance considerations, guidance for development of screening levels, an indoor air survey form, and a discussion of community stakeholder concerns. An extensive reference list is also included.

To illustrate how to use this *Practical Guideline* document, the Vapor Intrusion Team has also prepared a companion document. *Investigative Approaches for Typical Scenarios* describes applicable approaches for evaluating the vapor intrusion pathway under the following scenarios:

1. An active service station in a residential neighborhood
2. A dry cleaner in a strip mall adjacent to a neighborhood
3. A large industrial facility with a groundwater plume under several hundred receptors
4. A vacant lot with proposed brownfield development over a groundwater plume
5. A vacant large commercial building with warehouse space and office space
6. An apartment building with a parking garage over contamination

The scenarios follow the step-by-step approach described in the guidance document, focus on the decision process and alternatives chosen, identify key issues about each scenario, highlight lessons learned during process, and describe the next steps to be followed.

The ITRC *Vapor Intrusion Pathway* guidance series provides the reader with a logical, flexible framework, the variety of tools and remedial approaches, and the practical rationale for developing an investigative strategy when assessing vapor intrusion. Working within the regulatory framework, this difficult and ever-evolving pathway can be properly evaluated and the risks associated with indoor air contamination from vapor intrusion effectively mitigated.