Starting Soon:
Vapor Intrusion Mitigation Training – Session 1

- Vapor Intrusion Mitigation Training Online Guidance Document, https://vim-1.itrcweb.org/.
- Download PowerPoint slides
  - CLU-IN training page at https://clu-in.org/conf/itrc/VIM-1/. Under "Download Training Materials."

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Advancing Environmental Solutions

Vapor Intrusion Mitigation

VIM-1, 2021

Session 1 (of 2)

Sponsored by: Interstate Technology & Regulatory Council (www.itrcweb.org)
Hosted by: US EPA Clean Up Information Network (www.clu-in.org)

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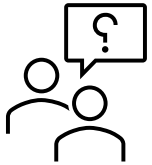
Housekeeping

- Recording for On Demand Viewing

- Course Information and Materials: https://clu-in.org/conf/itrc/vim-1/

- Technical difficulties? Use Q&A Pod



- Certificate of Course Completion

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- Network - All 50 states, PR, DC
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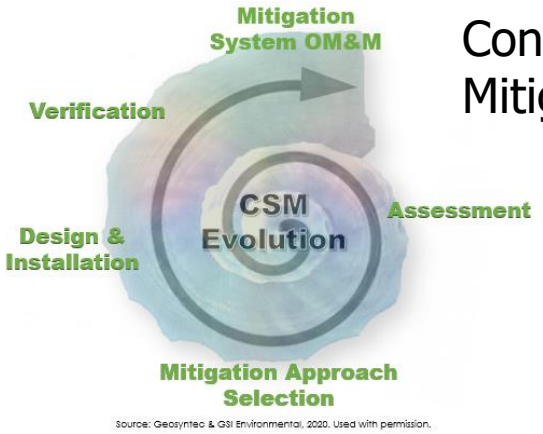
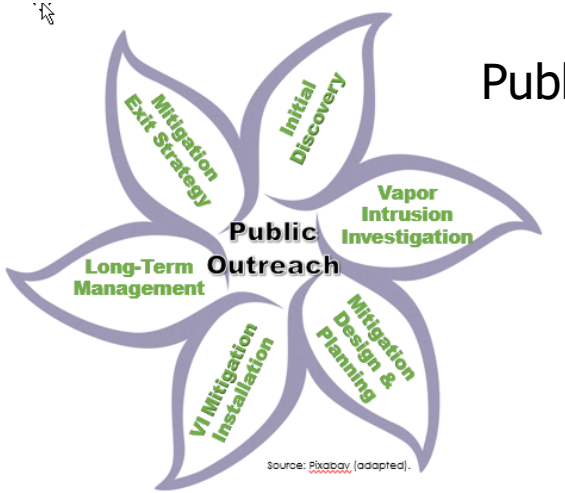
Today's Training Topics



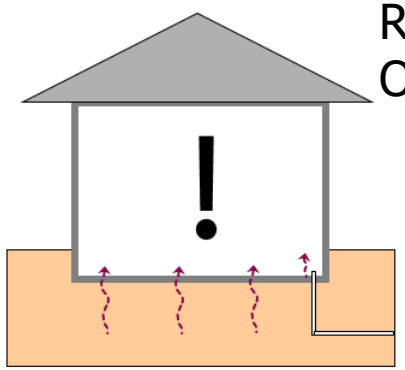
Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Conceptual Site Models for VI Mitigation

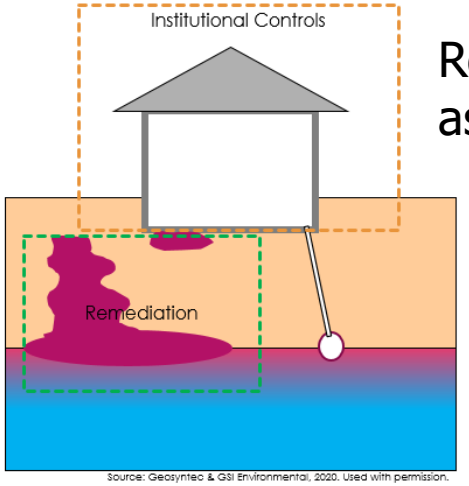


Source: Pixabay (adapted).

Public Outreach during VI Mitigation


Source: Barr Engineering, 2020. Used with permission.

Rapid Response and Ventilation Outreach Materials

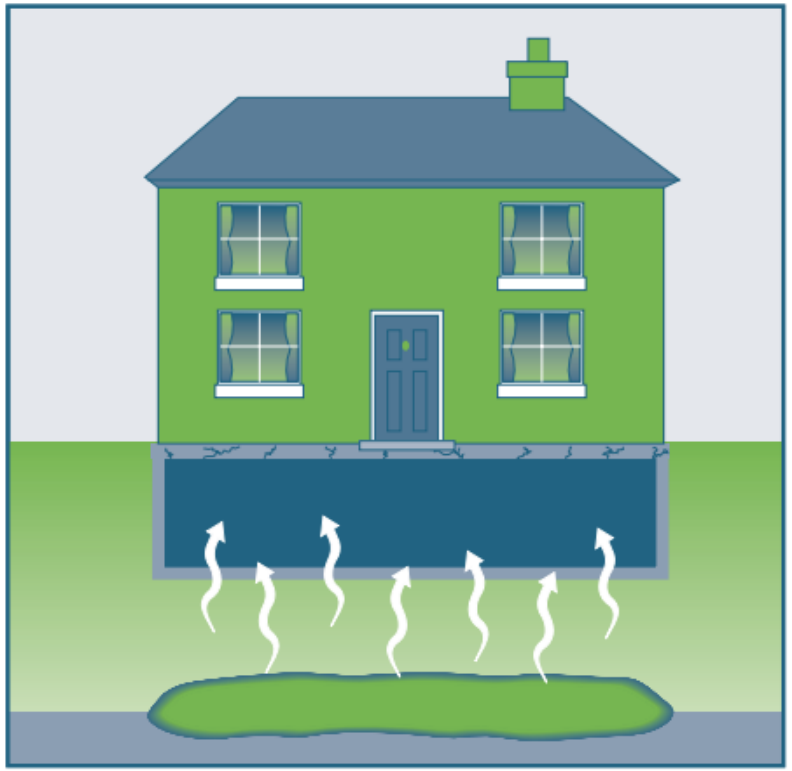


Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Remediation and Institutional Controls as VIM Outreach Materials

What You Should Learn

- Background on the VIM Training team
- Overview of available documentation
- How access the mitigation strategies information
- Identify the sections that will be discussed in today's session



Not Covered in the VIM Training

- Emergency response actions – Immediately contact first responders if
  - Reports of strong petroleum odors
  - Evidence of combustible, explosive, or oxygen-deficient conditions inside the building
- Methane mitigation or hazardous substances that have a high explosive potential
- Radon

Figure from ITRC Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management (2014).

Emerging Technologies Outreach Materials

Capture technologies and strategies that are not exclusively "mitigation" or "remediation"

- Aerobic Vapor Migration Barriers (AVMBs) create an aerobic biobarrier for petroleum vapors
- Placeholder for inclusion of emerging technologies in the future

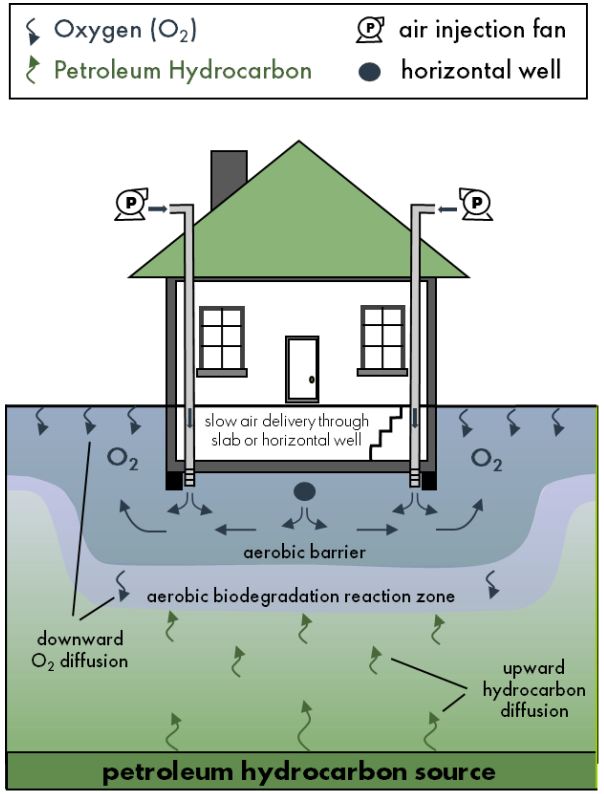
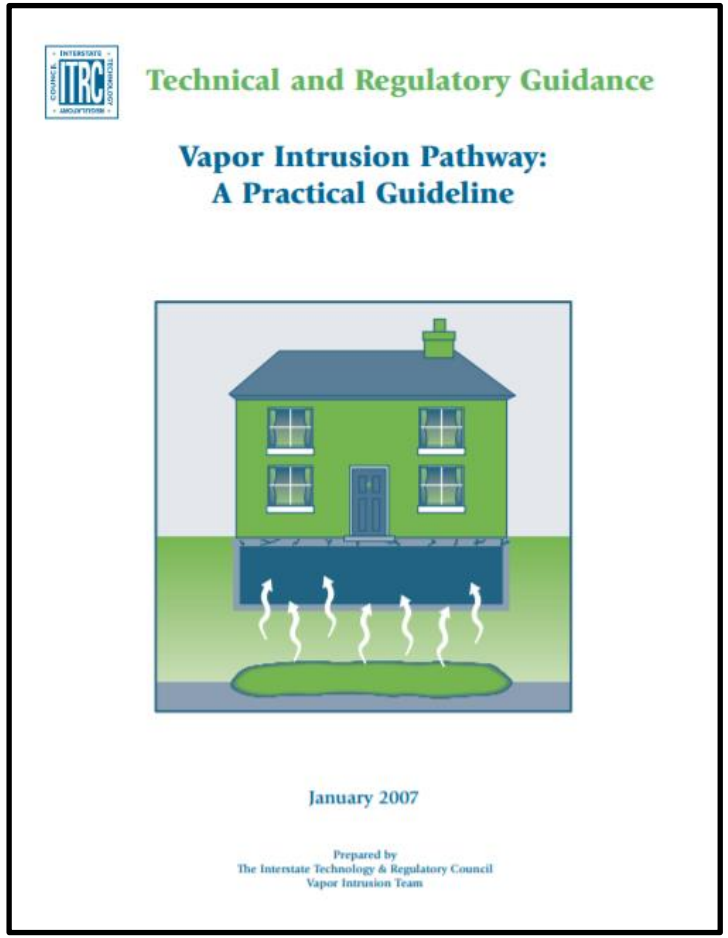


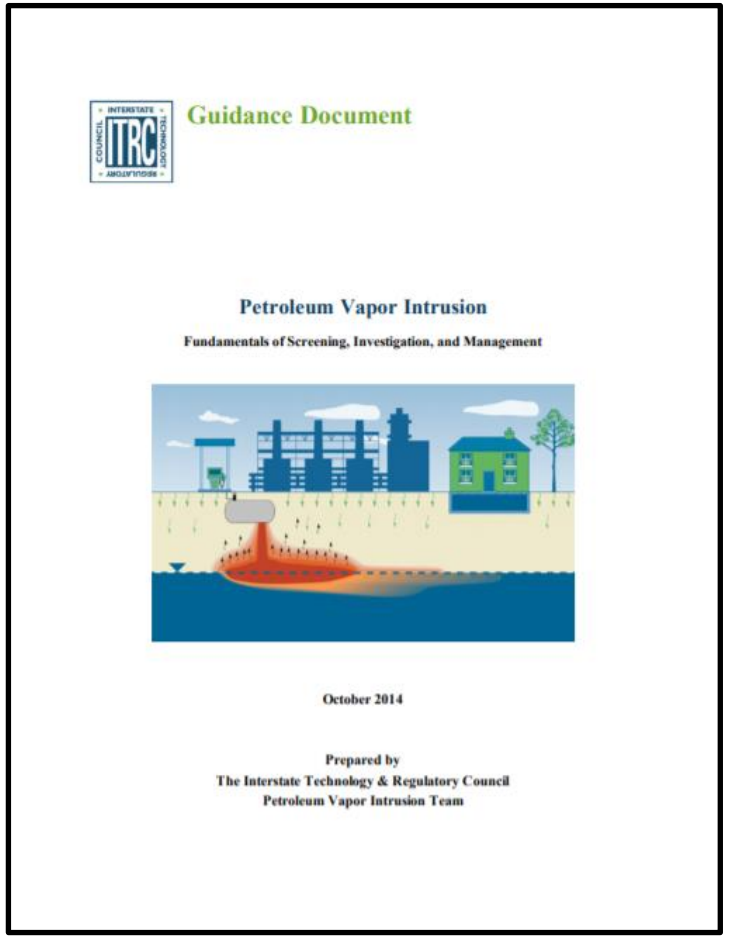
Figure 1 from the AVMB Technology Information Sheet.

Vapor Intrusion Mitigation (VIM) Training Team Background

- Previous ITRC guidance documents focused on investigative process
- Multiple requests for "…additional details and training on mitigation"



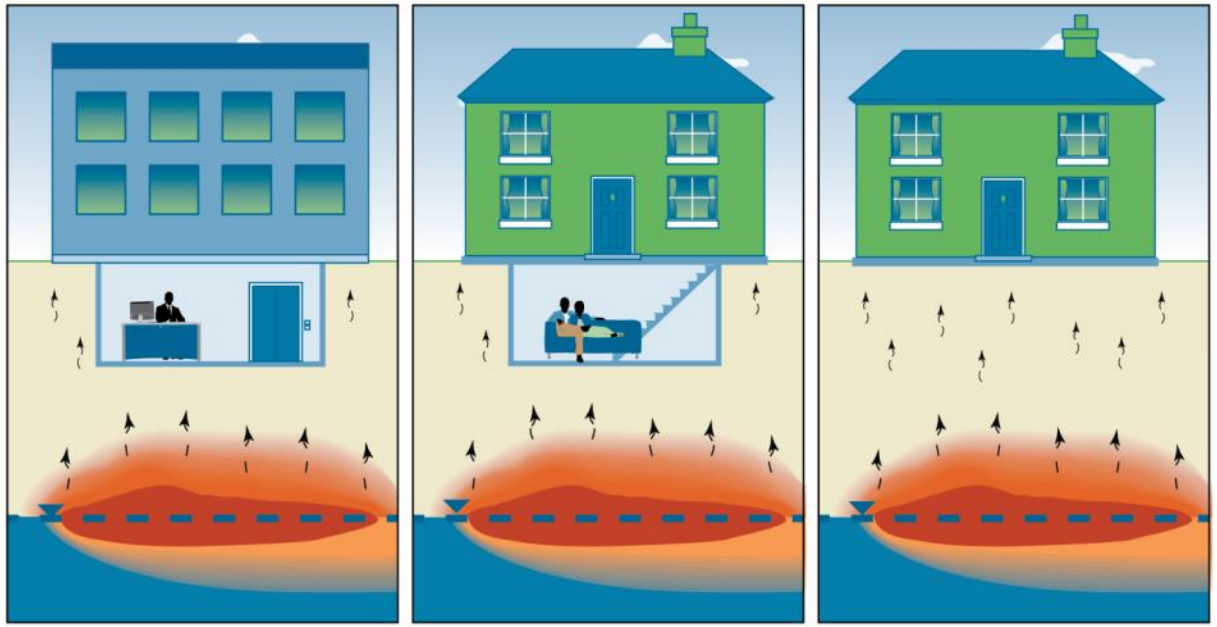
https://www.itrcweb.org/Documents/VI-1.pdf



https://www.itrcweb.org/PetroleumVI-Guidance/

What is Vapor Intrusion (VI)

- Contaminants in soil and groundwater can volatilize into soil gas
- VI occurs when these vapors migrate upward into overlying buildings and contaminate indoor air
- If present at sufficiently high concentrations:
  - These vapors may present a threat to the health and safety of building occupants

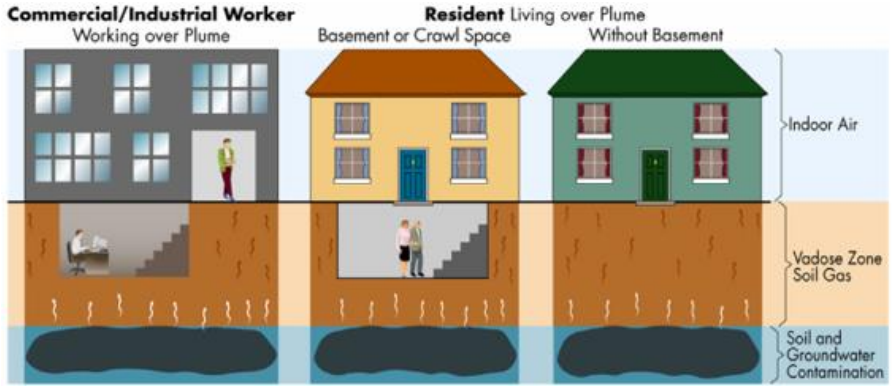


Source: ITRC Petroleum Vapor Intrusion Guidance (PVI-1, 2014)

Different Types of Vapor Intrusion

- Chlorinated Vapor Intrusion (CVI) which addresses chlorinated compounds

- Petroleum Vapor Intrusion (PVI) is a subset of VI that deals exclusively with petroleum hydrocarbon (PHC) contaminants

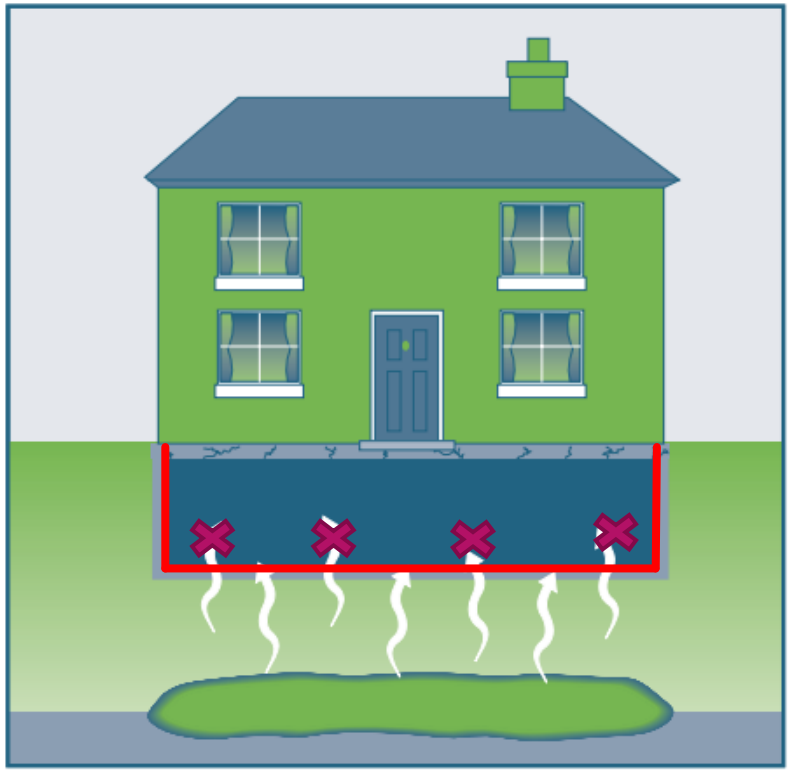


Source: ITRC Vapor Intrusion Pathway: A Practical Guideline (VI-1, 2007)

Source: ITRC Petroleum Vapor Intrusion Guidance (PVI-1, 2014)

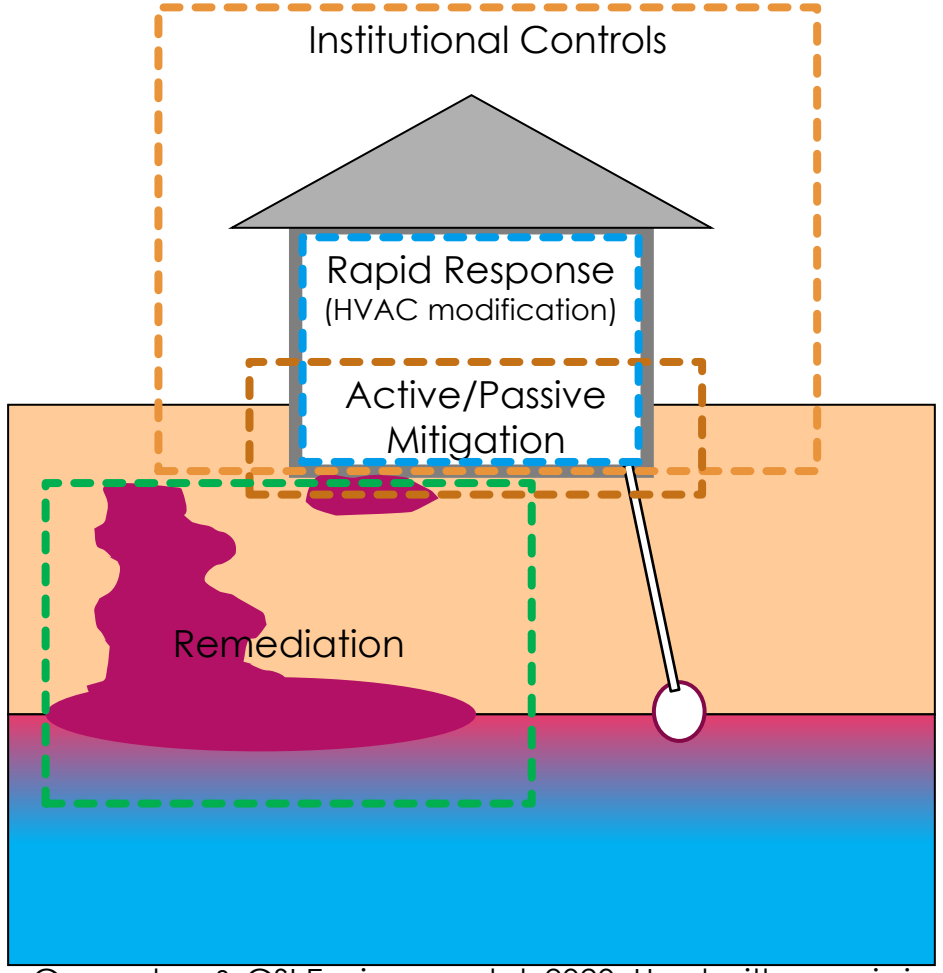
VI Mitigation (VIM)

- Implemented to reduce indoor air contaminants due to VI below applicable action or screening levels
- Accomplished by
  - Modifying the VI pathway to reduce the mass flux of contaminants entering the building
  - Reducing indoor air contaminant concentrations by removal or dilution



What is VI Mitigation (or Vapor Control)?

- VOC Vapor control can include
  - Source remediation
  - Active or passive mitigation
  - Rapid response
  - Institutional controls



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Steps in the VIM Process

Pre-System Installation

1. Assessment of Site Conditions
2. Technology Selection
3. Develop and Document System Design

System Installation

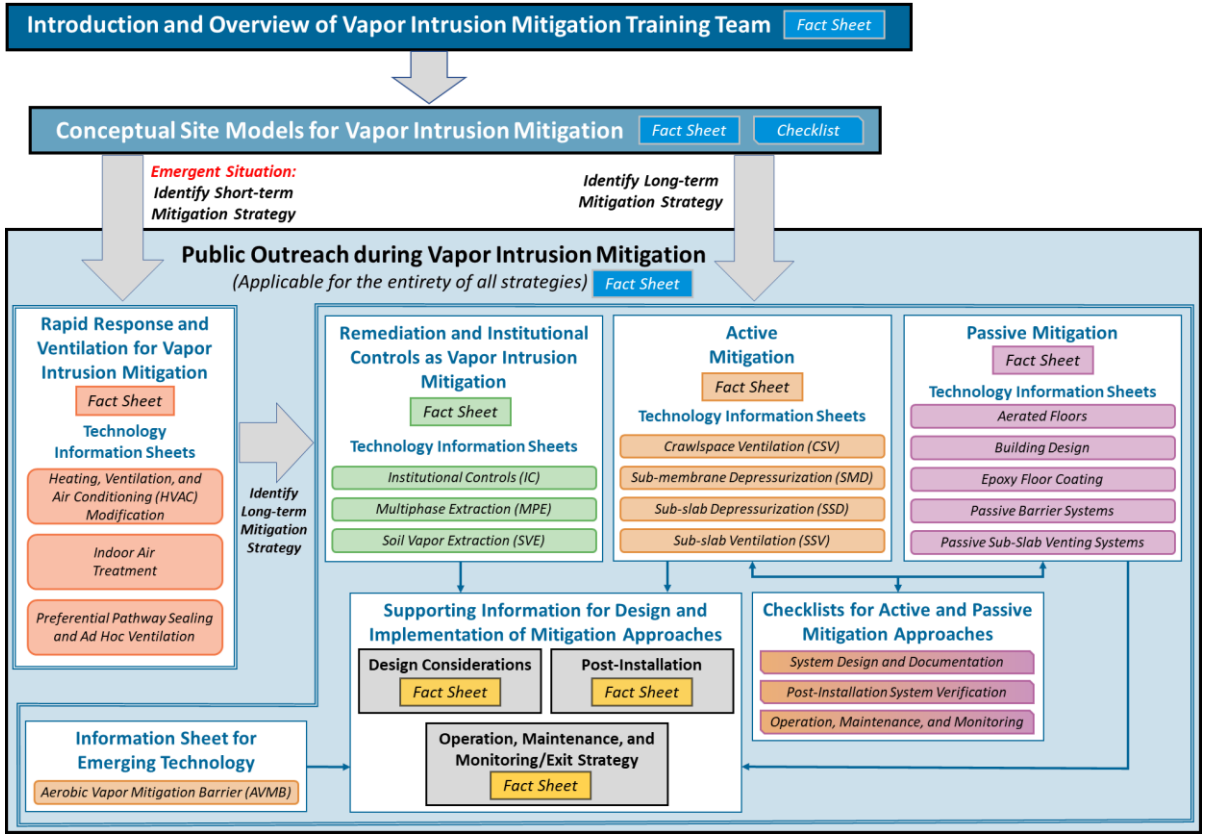
4. Pre-construction Meeting
5. Installation
6. Installation Oversight

Post-System Installation

7. System Verification
   a) Inspection
   b) Verification Sampling
   c) Confirming Performance QA/QC
8. Documentation
9. Operation, Maintenance, and Monitoring

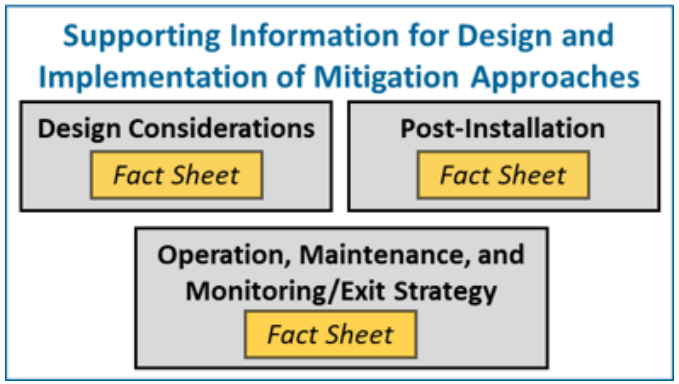
ITRC VIM Webpage

- Interactive Directory
- Fact Sheets
- Technology Information Sheets
- Flow Chart for VIM CSM Development (Figure 2-1)
- Considerations and impacts of various VIM approaches
- Checklists
- Additional information



https://vim-1.itrcweb.org/

Process Fact Sheet Rating System



Ratings provided by mitigation "type"

Category

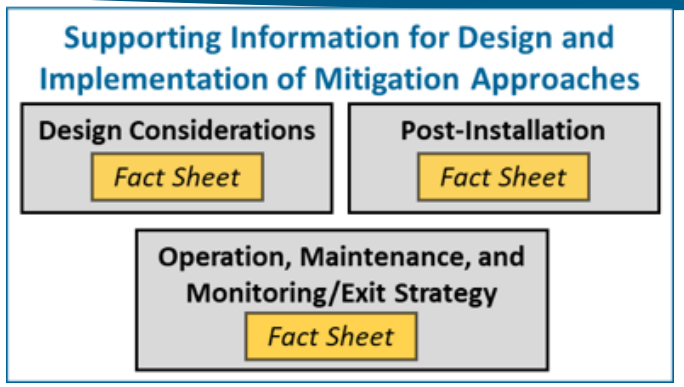
Principal consideration

Subject matter

Design consideration	Active approaches	Passive approaches	Remediation	Rapid response
VI CSM considerations				
Vapor source and concentration				
Vapor source and concentration	●	●	●	◐
Geology and hydrogeology				
Subgrade soil type	●	◒	●	◒
Depth to groundwater/high water conditions	●	●	●	◐

Key | High impact ● | Medium impact ◐ | Low impact ◒ | Not applicable —

Process Fact Sheet Narrative



Design consideration	Active approaches	Passive approaches	Remediation	Rapid response
VI CSM considerations				
Vapor source and concentration				
Vapor source and concentration	●	●	●	◐
Geology and hydrogeology				
Subgrade soil type	●	◒	●	◒
Depth to groundwater/high water conditions	●	●	●	◐

Key | High impact ● | Medium impact ◐ | Low impact ◒ | Not applicable —

Subgrade Soil Type: In most cases, the properties of soils immediately adjacent to the building (e.g., below the slab or next to foundation walls and footings) have the greatest impact on active mitigation technologies that require the movement of air and/or the propagation of vacuum below the slab. Soil type plays a major consideration for active mitigation strategies and makes some remediation technologies difficult to implement. For a more detailed description of methods to test and mathematically model the sub-slab permeability and transmissivity see (McAlary et al,, 2018 ▷). See Section J.2.5 of *Appendix J in the 2014 ITRC PVI document* (ITRC, 2014 ▷) for more information on the consideration of soil type in active mitigation.

Active Mitigation	**High Impact:** Permeability of the sub-slab fill material and underlying soil controls the pressure field extension (PFE) and air flow rates and, therefore, the degree to which sub-slab depressurization (SSD) and sub-slab ventilation (SSV) contribute to indoor air quality protection. This affects the spacing of suction points and fan size required to induce and maintain the negative pressure field beneath the structure.
Passive Mitigation	**Low Impact:** Passive mitigation systems typically incorporate a permeable layer beneath barriers and around vent piping in new construction. It may not be feasible to incorporate a permeable layer beneath an existing building. Therefore, passive venting systems function best in soils that are highly permeable when retrofitting an existing building.
Environmental Remediation Technology	**High Impact:** Remediation technologies require the characterization of soils beyond the subsurface to evaluate the effectiveness of the proposed technology. MPE and SVE are generally not applicable to low-permeability soils.
Rapid Response	**Low Impact:** Rapid responses typically include ventilation changes, indoor air treatment, or other efforts that are focused inside the building, therefore sub-slab conditions are not relevant.

Checklists

Conceptual Site Models for Vapor Intrusion Mitigation *Fact Sheet* *Checklist*

Checklists for Active and Passive Mitigation Approaches

- *System Design and Documentation*
- *Post-Installation System Verification*
- *Operation, Maintenance, and Monitoring*

Clickable Check Boxes

Category

Primary prompt

Prompt to record supporting information

Conditional (secondary) prompt

Editable Fields

3. BUILDING CONDITIONS AND USE

3.1. Is the building's heating system or heating, ventilating, and air conditioning (HVAC) system operating? ☑ Yes ☐ No ☐ NA

If yes, provide a summary below and explain in Section 5 if the HVAC system operation could impact the effectiveness of the mitigation system.

Hours/day of HVAC operation 12

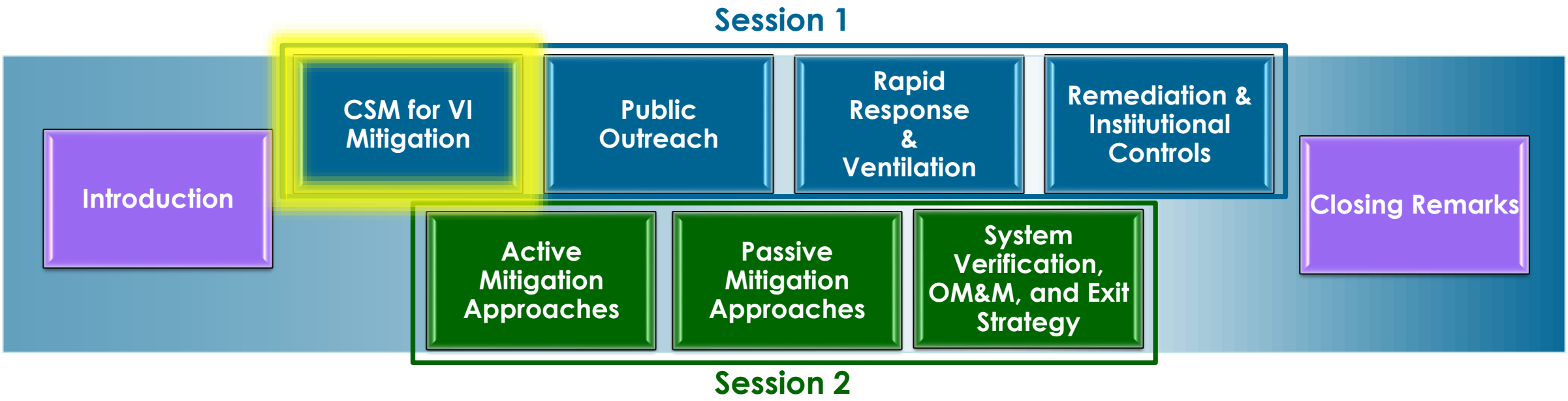
Climate controlled? ☐ Yes ☐ No ☐ NA

3.1.1. Is the building's heating system or HVAC system on during this OM&M event? ☐ Yes ☐ No ☐ NA

3.1.2. Is the building's heating system or HVAC system equipped with outside dampers? ☐ Yes ☐ No ☐ NA

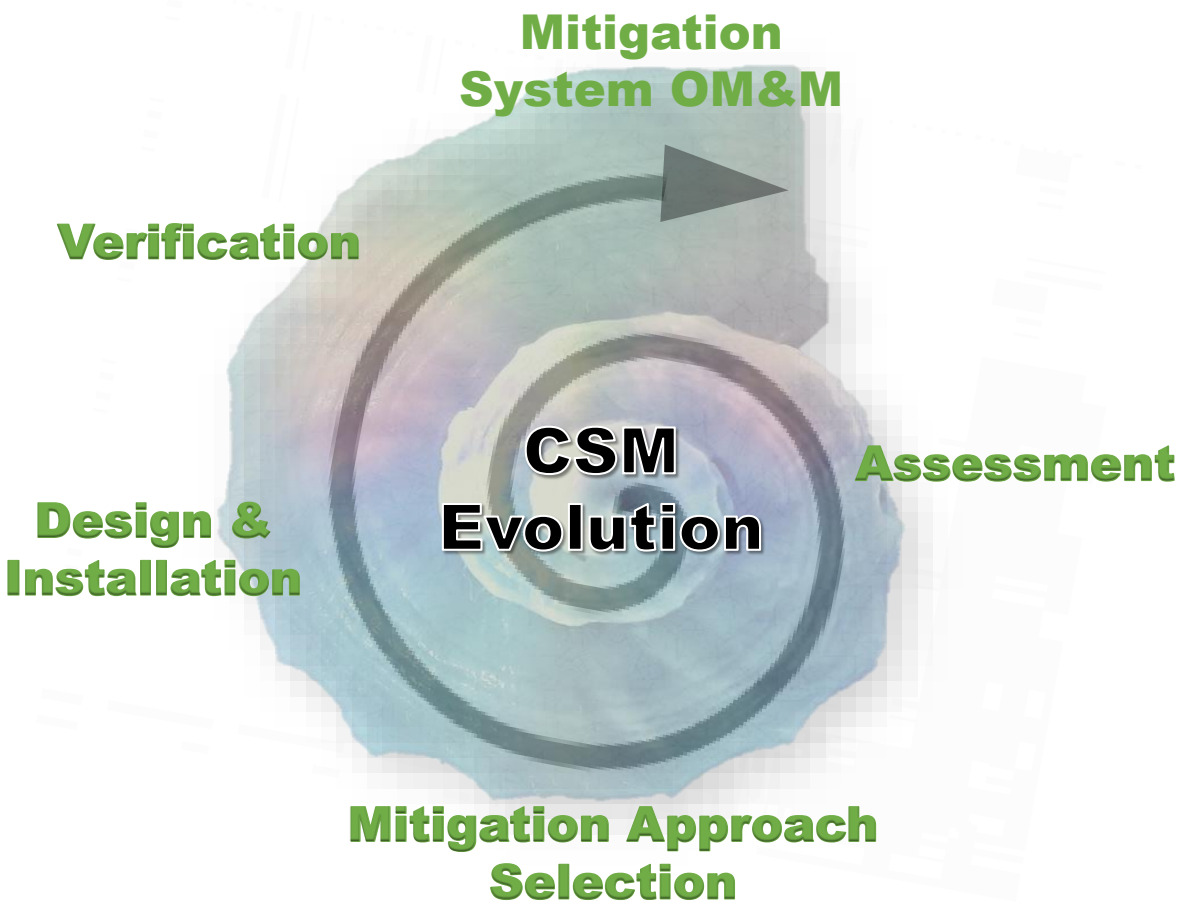
If yes, how many? _____ *% opened* _____

Coming Up Next…



Advancing Environmental Solutions

Conceptual Site Models for Vapor Intrusion Mitigation



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

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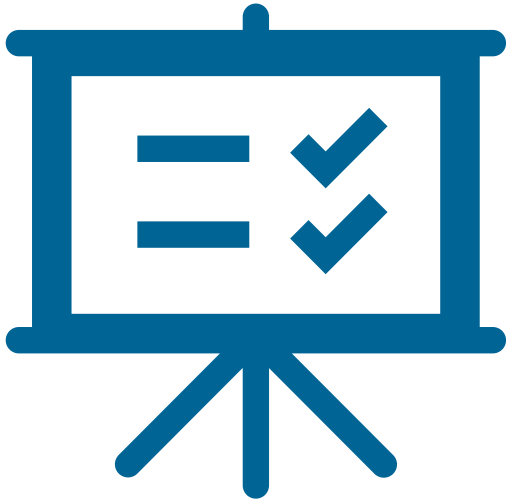
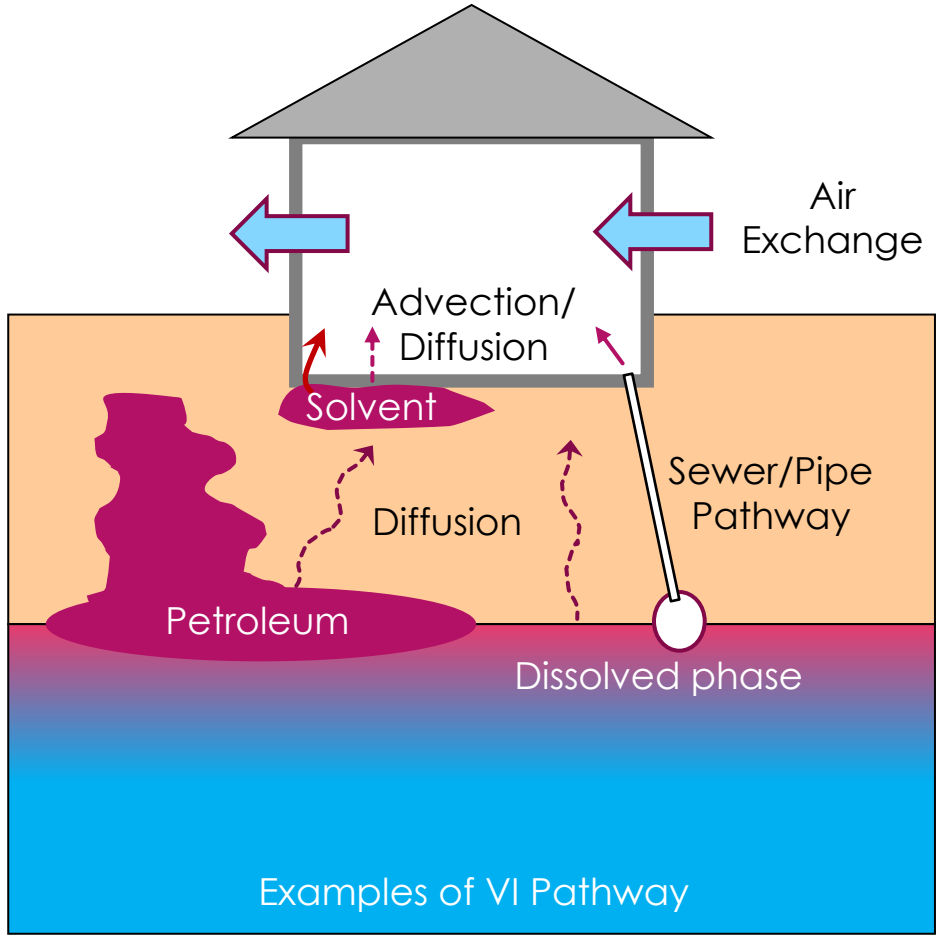
Objectives of Module

- Understand the importance of a VI "mitigation CSM"
- Identify data needed to enhance the CSM
- Use the enhanced CSM to evaluate mitigation options



What is a Mitigation CSM?

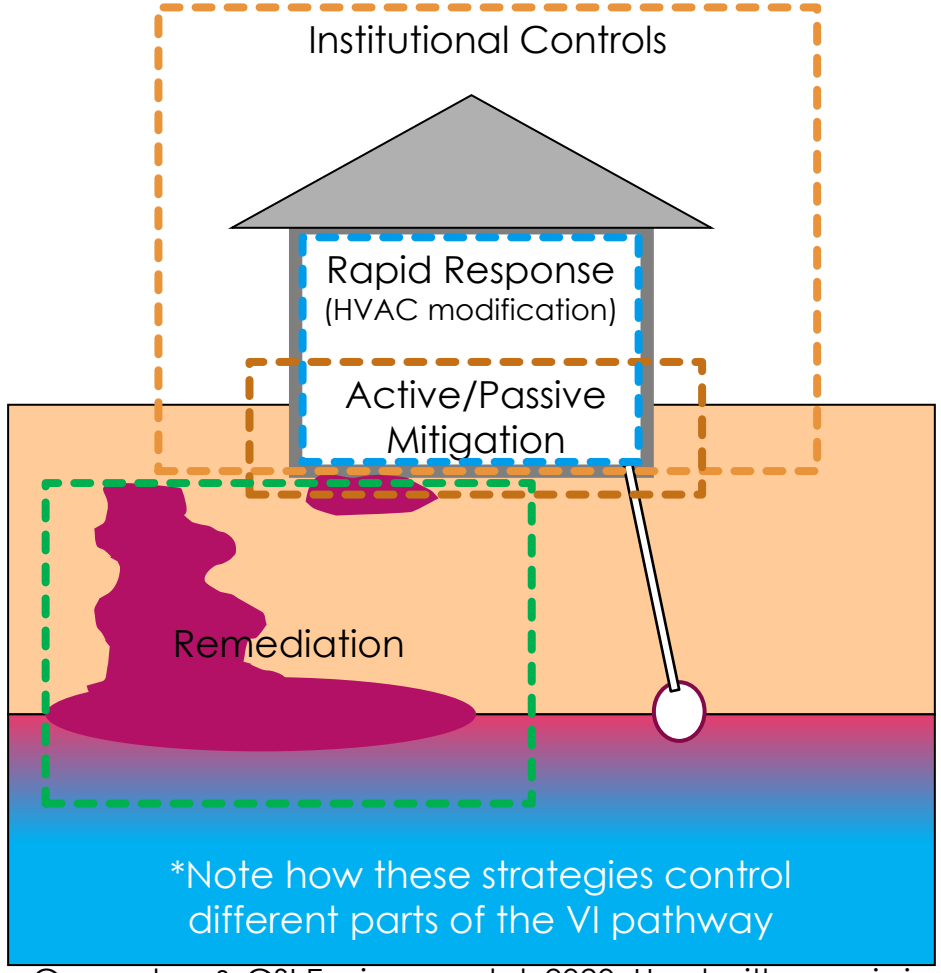
- The VI CSM describes the VI pathway
- Mitigation modifies the VI pathway to reduce potential exposure
- A "mitigation-grade" CSM has sufficient information to evaluate mitigation alternatives



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

How can we modify or control the VI Pathway?

- VOC Vapor control can include
  - Source remediation
  - Active or passive mitigation
  - Rapid response
  - Institutional controls

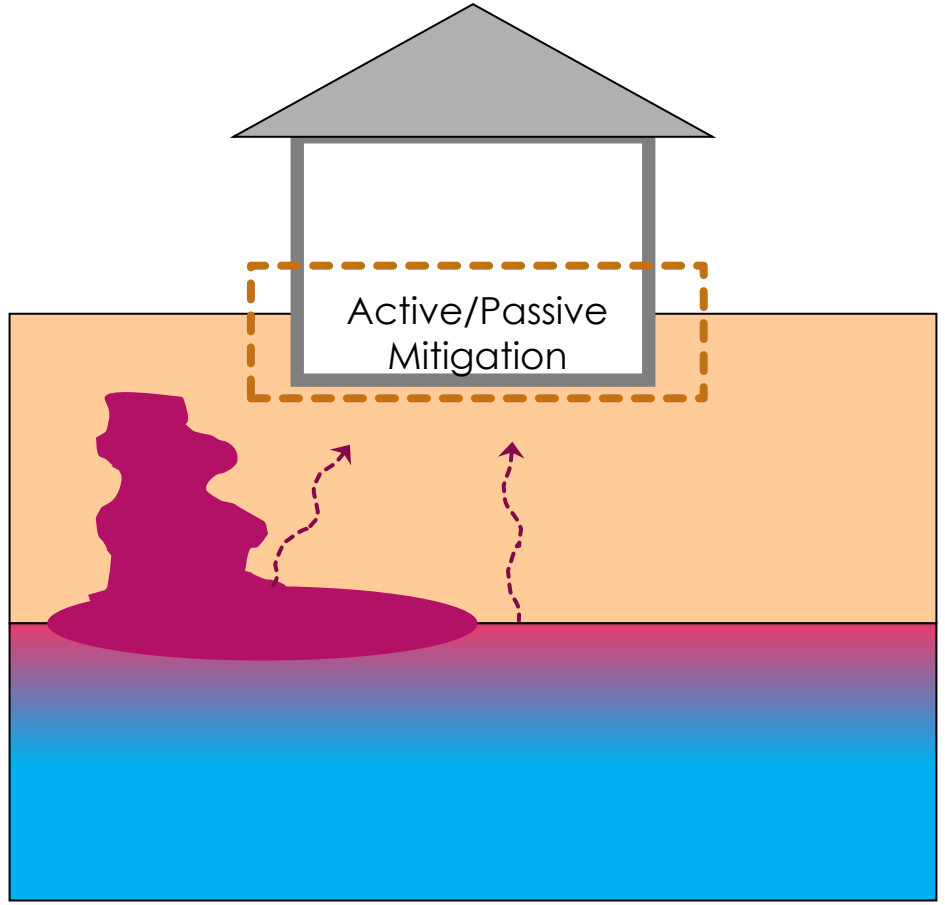


Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Example of additional information needed to evaluate mitigation options

Evaluation of active/passive mitigation options may require additional information concerning:

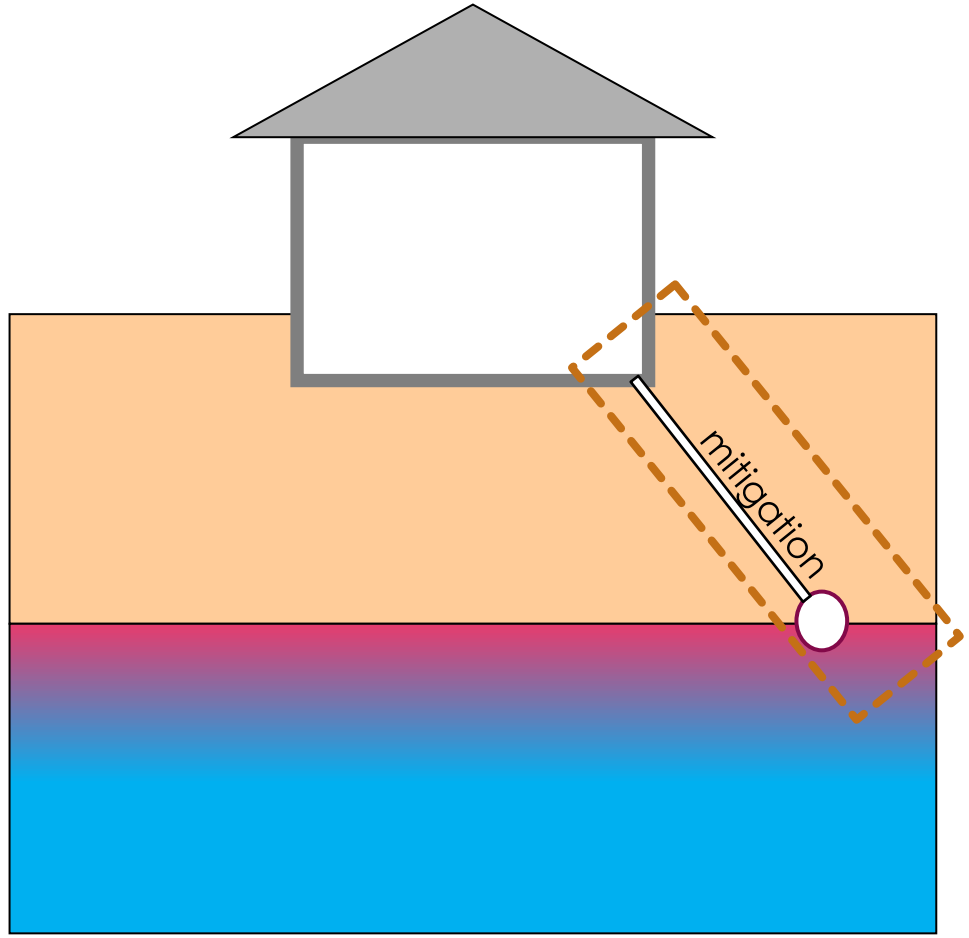
- Sub-slab VOC concentrations
- Sub-slab soil and moisture conditions
- Slab integrity
- Building features that block or short-circuit sub-slab air flow



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Preferential Pathway Considerations

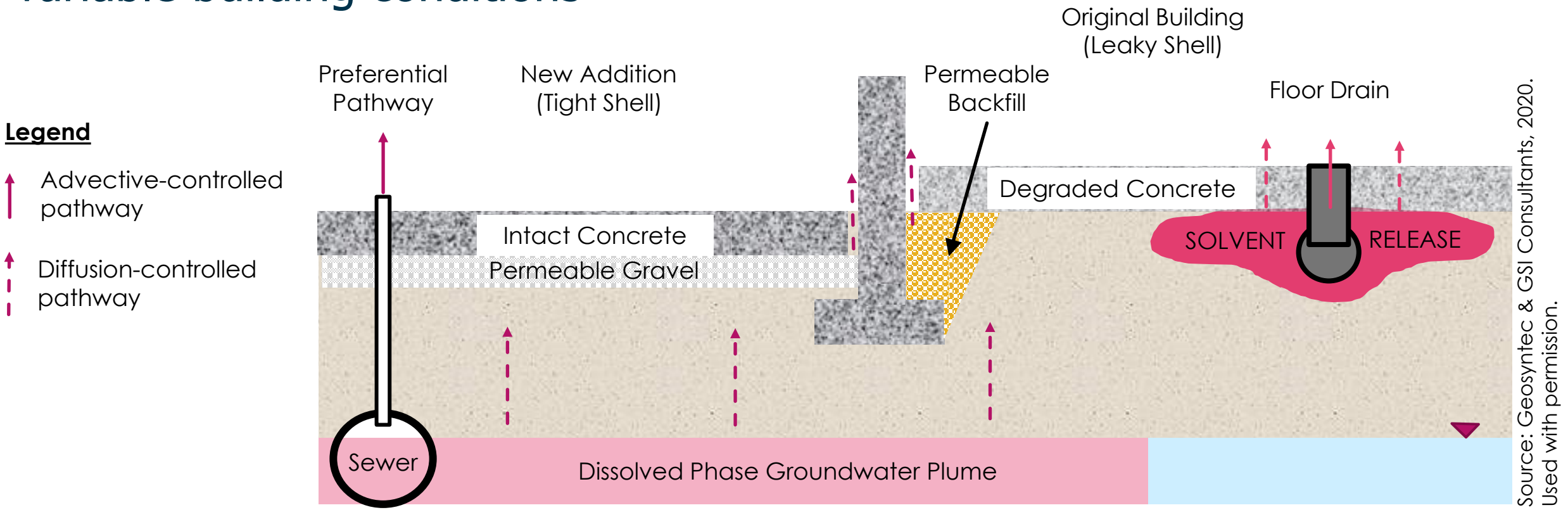
- The CSM should consider the potential for sewer/pipe preferential pathways
- Pathways that connect vapor sources to the building can dominate VI
- Mitigation options must control these pathways (potentially in addition to other pathways)



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

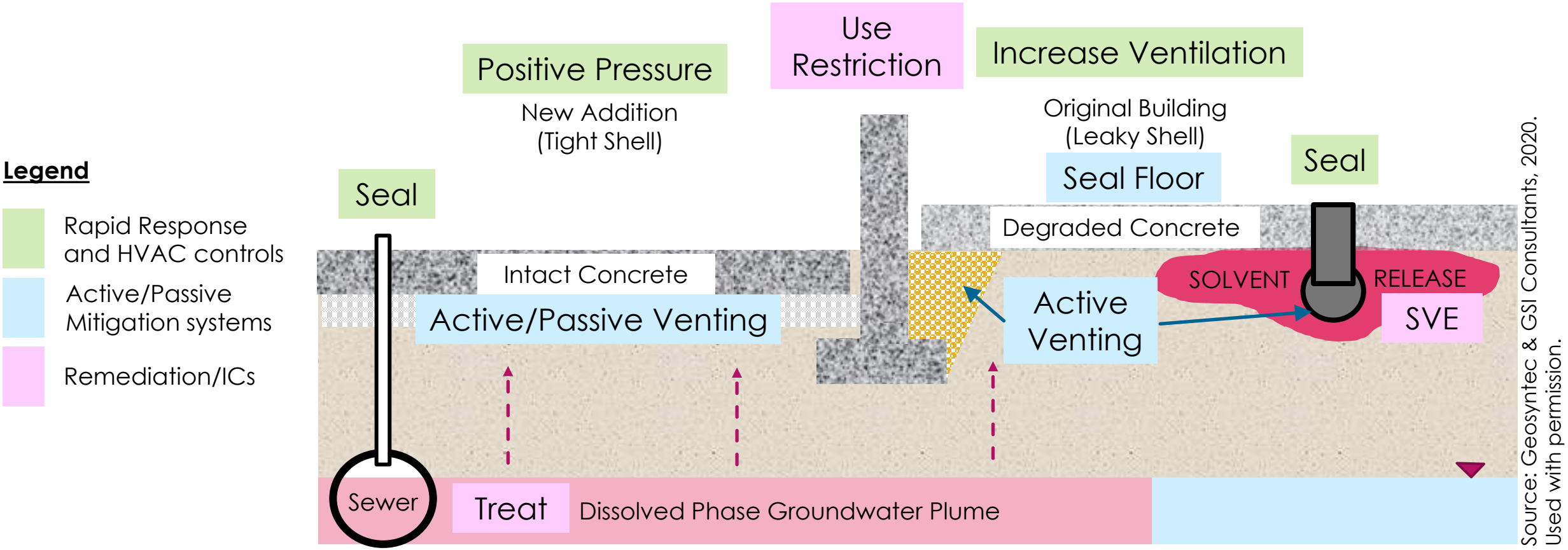
Large buildings may have multiple Mitigation CSMs

Example of building with multiple sources, variable pathways, and variable building conditions



Large buildings may have multiple VI pathways

Multiple Mitigation CSMs may require multiple vapor control strategies



Source: Geosyntec & GSI Consultants, 2020. Used with permission.

Knowledge Check

Poll Question

What is a component of the Mitigation CSM?

- Contaminant type
- Distance between VOC source and building
- Location and depth of sanitary sewers
- Condition of building slab
- All of the above
- None of the above

Image source: Pixabay

Knowledge Check

Poll Question

What is a component of the Mitigation CSM?

- Contaminant type
- Distance between VOC source and building
- Location and depth of sanitary sewers
- Condition of building slab
- ☑ All of the above
- None of the above

Source: Pixabay

CSM for VI Mitigation Flow Chart

Receptor

Transport

Source

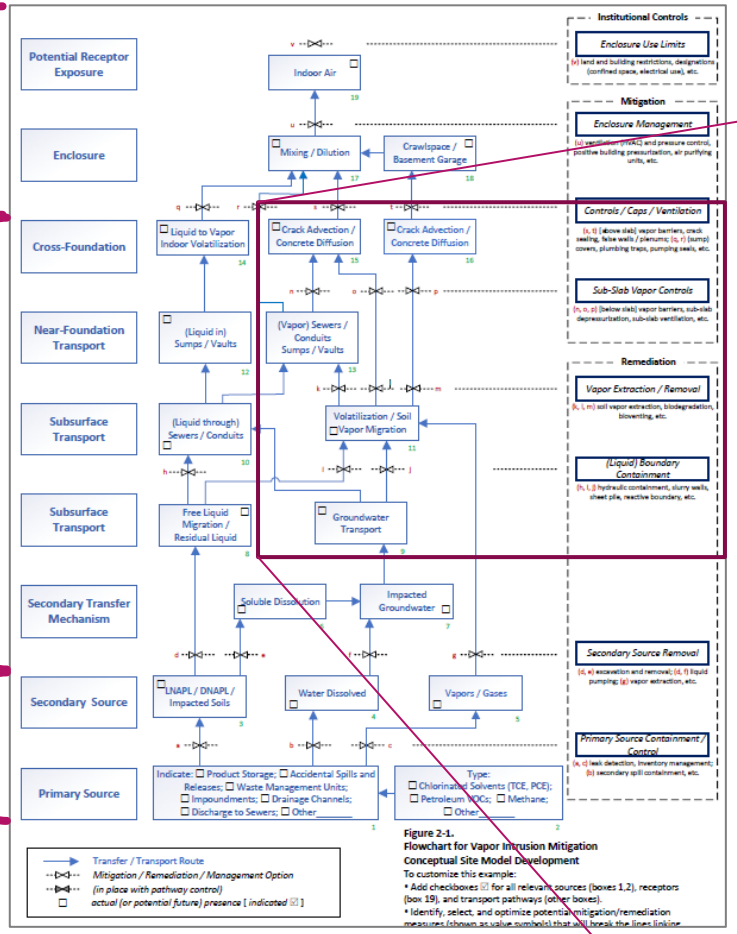
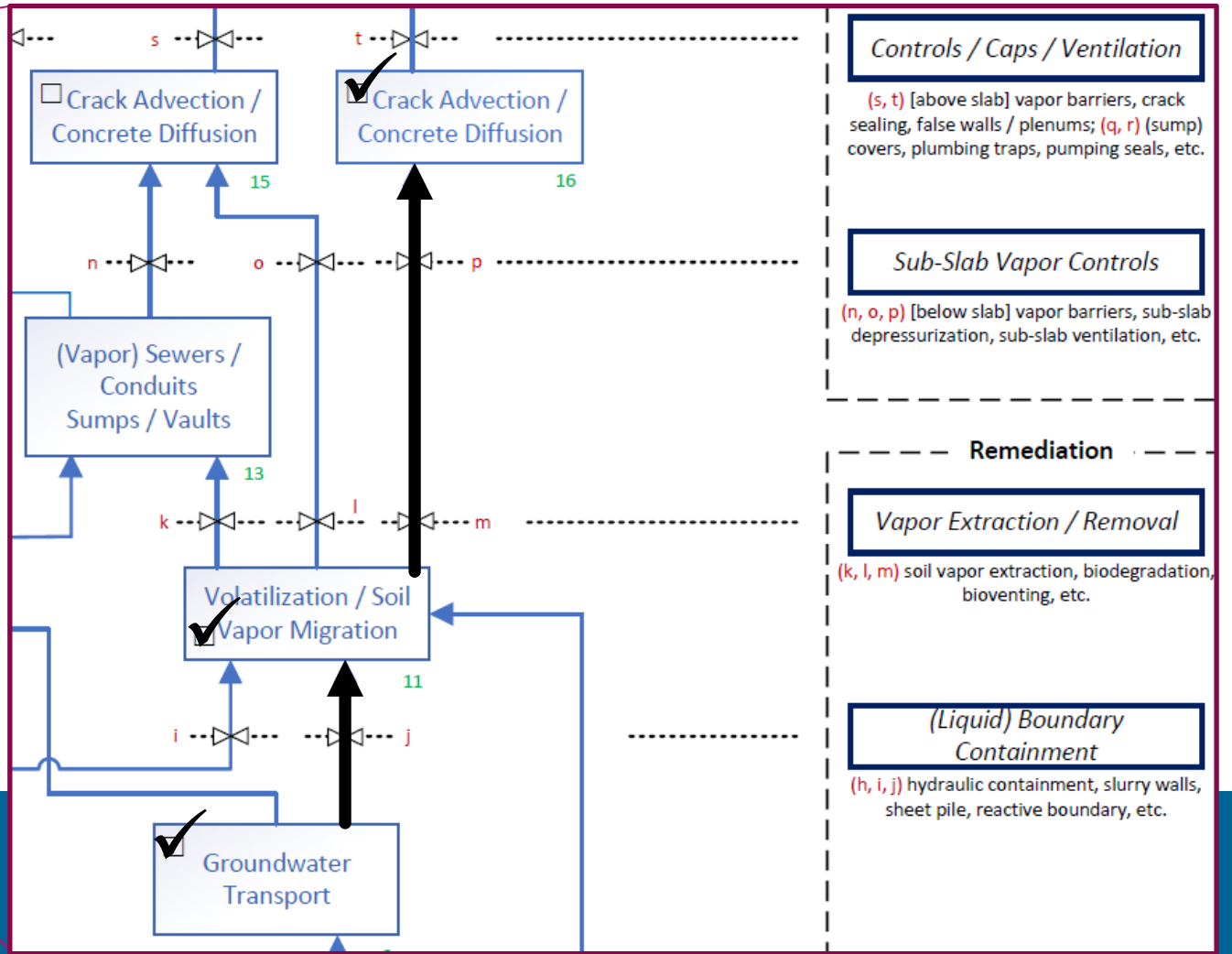


Figure 2-1 of the ITRC CSM Fact Sheet



CSM for VI Mitigation Checklist

- Supports a systematic site evaluation
- Helps verify understanding of important details
- Facilitates data gaps identification

Excerpt of "Building" Section of CSM Checklist

5. Buildings

*Locate and map out existing buildings, identify square footage, and identify areas for potential future construction if known. If multiple buildings are being evaluated, tabulation of the following for each building may be necessary. Also, building additions may need to be evaluated separately. Note that a detailed, building-specific evaluation may not be needed if the VI mitigation effort is focused on the COC source area or pathway outside of the **building envelope**. In the descriptions below, include references to site reports, as necessary, to support the discussion. Attachments to this checklist with, for example, copies of figures may also be provided.*

5.1 Structure

- Indicate current building use:

☐ Residential

☐ Non-Residential

If non-residential, could future use include residential? ☐ Yes ☐ No
☐ Unknown

Are land use controls (LUCs), use restrictions, institutional controls, or equivalent in place? ☐ Yes ☐ No

Note: If current or future site use is or could be residential, the most conservative state and federal regulations apply for technology selection and design.

- Indicate structure status:

☐ Existing construction

☐ New construction

☐ Potential future construction

https://vim-1.itrcweb.org/vapor-intrusion-mitigation-conceptual-site-model-checklist/

Knowledge Check

Poll Question

When is it important to verify and update the Mitigation CSM?

- During mitigation design and planning
- At the time of mitigation implementation
- During long-term management
- All of the above
- Never

Image source: Pixabay

Knowledge Check

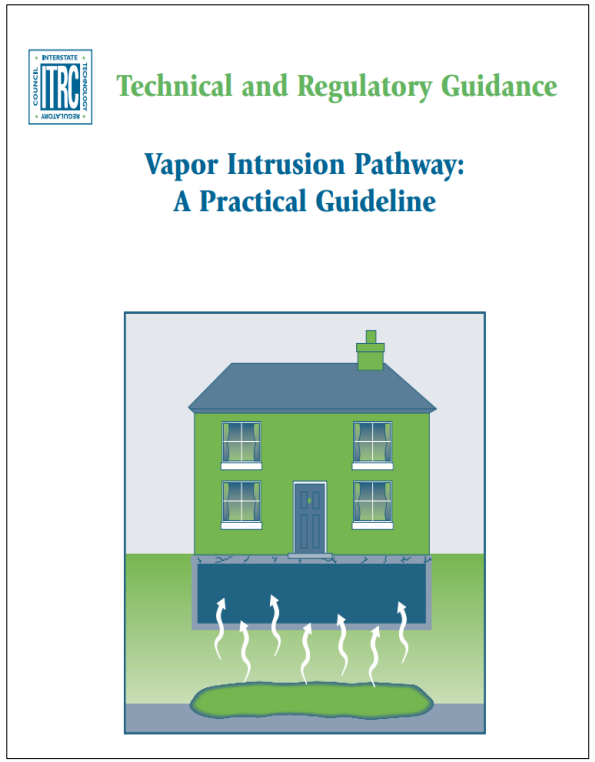
Poll Question

When is it important to verify and update the Mitigation CSM?

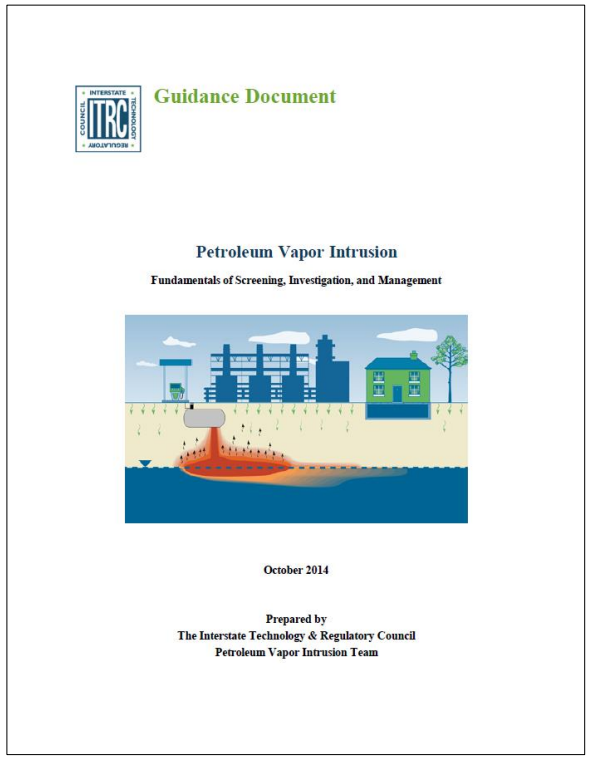
- During mitigation design and planning
- At the time of mitigation implementation
- During long-term management
- ☑ All of the above
- Never

Source: Pixabay

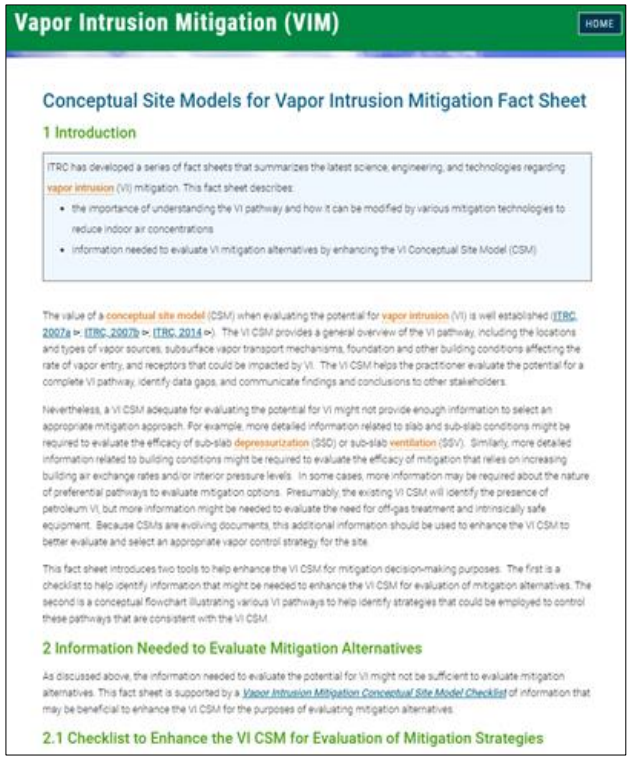
Additional CSM Resources



ITRC VI Pathway Guidance (2007)
https://www.itrcweb.org/Documents/VI-1.pdf



ITRC Petroleum VI Guidance (2014)
Appendix D (PVI CSM Checklist)
https://www.itrcweb.org/PetroleumVI-Guidance/



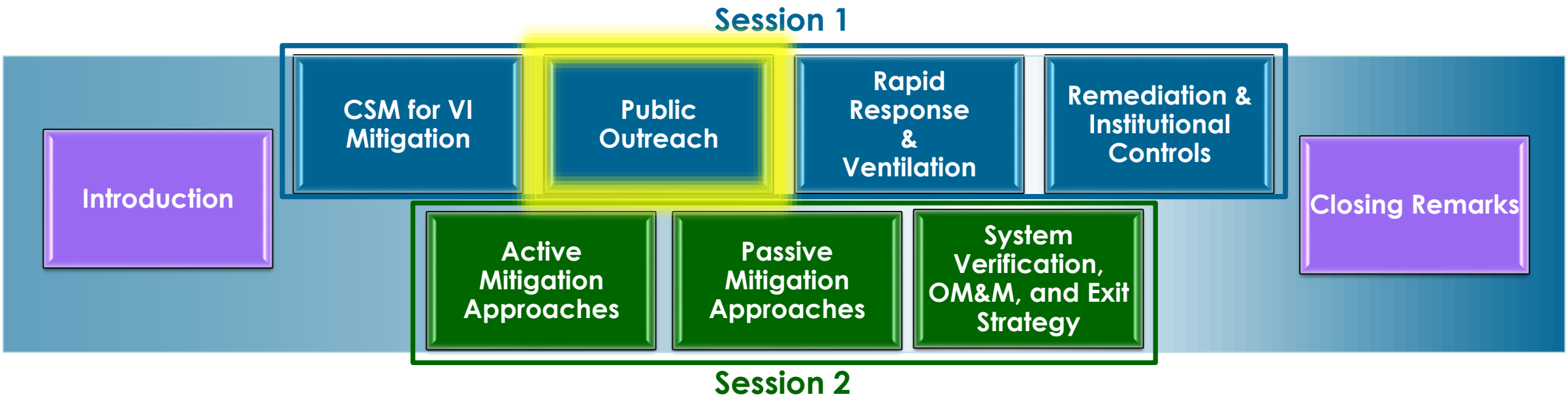
Fact sheet – Conceptual Site Models for Vapor Intrusion Mitigation (2020)
https://vim-1.itrcweb.org/conceptual-site-models-for-vapor-intrusion-mitigation-fact-sheet/

Summary

- VI CSM evolves throughout the life of a project
- "Mitigation CSM" helps to
  - Identify information needed to evaluate mitigation options
  - Support Public Outreach

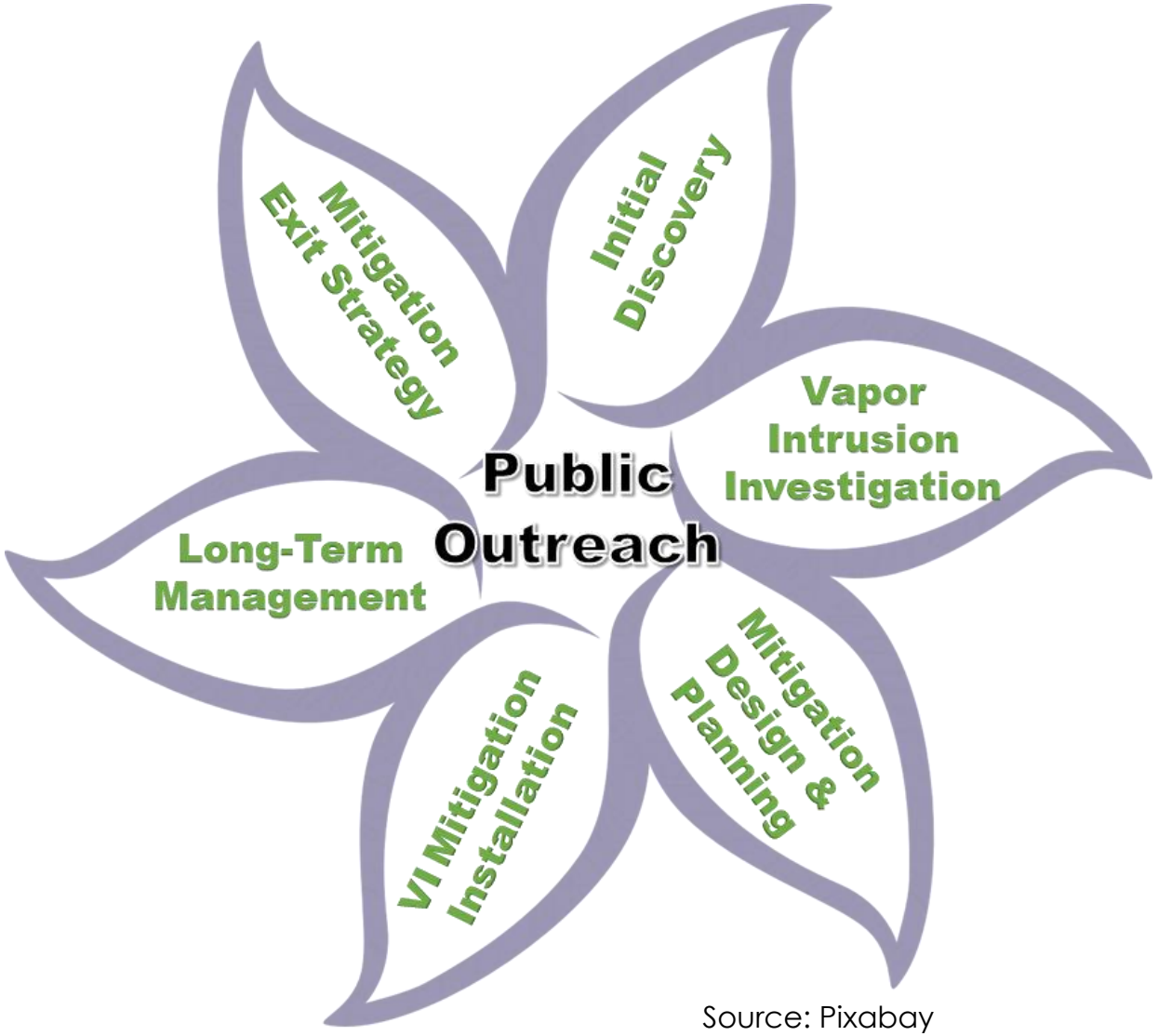
Source: Geosyntec & GSI Environmental, 2020. Used with permission.

Coming Up Next…



Advancing Environmental Solutions

Public Outreach During Vapor Intrusion Mitigation (VIM)



Source: Pixabay

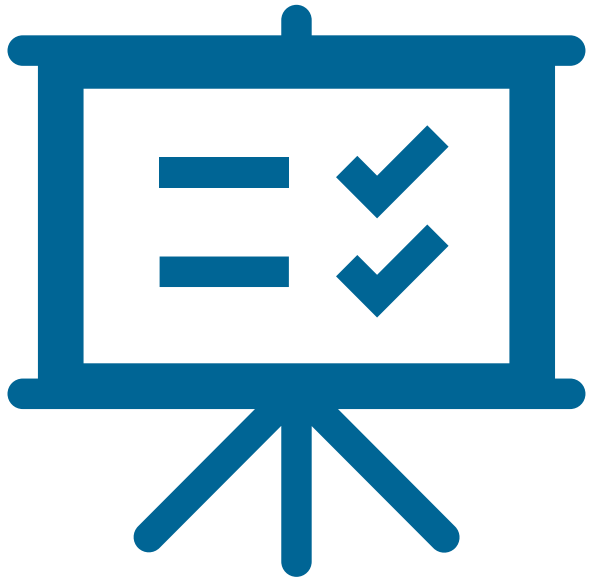
ECOS

ERIS ENVIRONMENTAL RESEARCH INSTITUTE OF THE STATES

Objectives of Module

Understand public outreach for VI mitigation:

- differs from other environmental matters
- continues through long-term management
- is diverse, iterative and everyone's job



Public Outreach During Vapor Intrusion

- VI work takes place indoors
- Topic is unfamiliar to the public
- It's about the air we breathe
- Mitigation involves modifications to a building

Key Components of Public Outreach for VI

- Consider outreach early and often
- Be transparent
- Maintain relationships
- Recruit partners (e.g., translators, community organizers)
- Listen

Communicating Vapor Intrusion is Complicated

Source: Wordclouds.com

- Unfamiliar words
- Numerous things to measure and compare
- Variability of results
- Background contributions from common consumer products

Communicating Vapor Intrusion Mitigation is Also Complicated

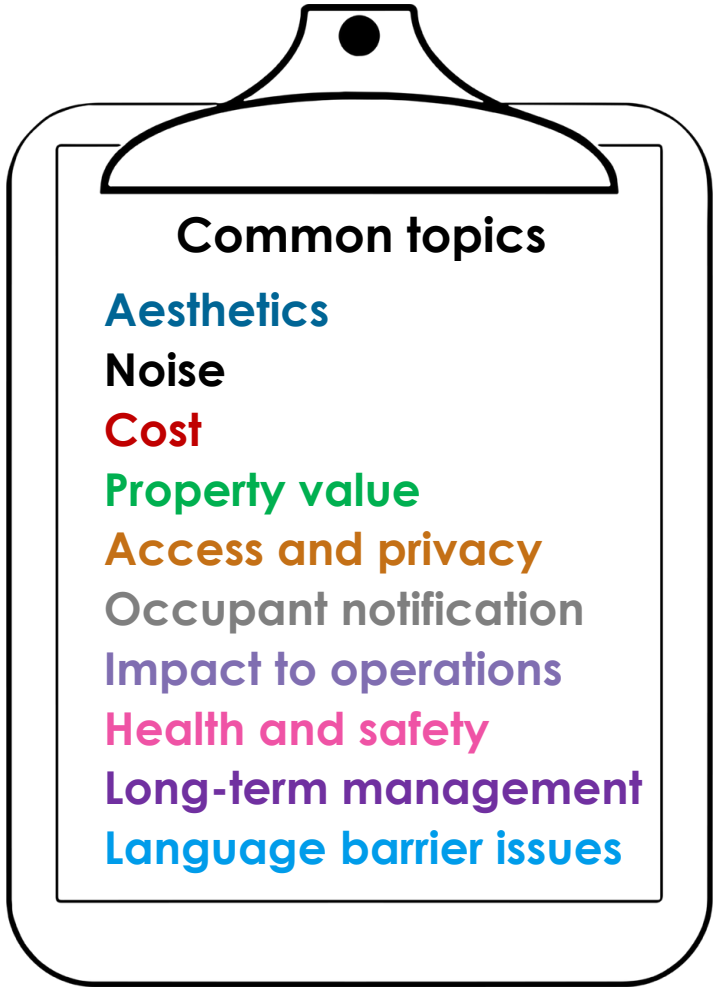
- Use analogies (e.g., radon mitigation)
- Address questions and concerns
- Rely on intermediaries/partners as needed

Questions from the Public

Source: Pixabay (adapted)

Multiple Communication Tools Needed

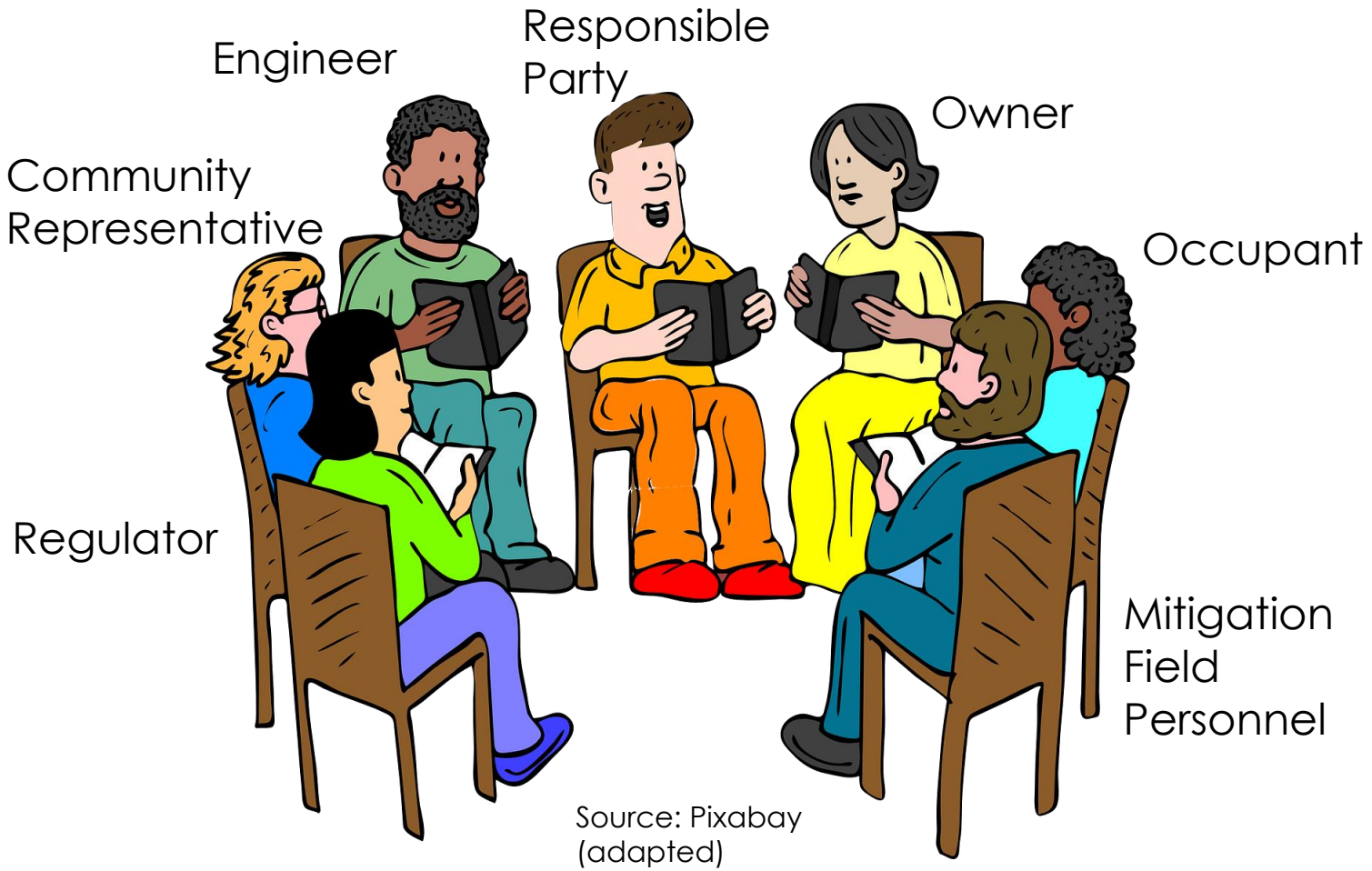
- Repeated conversations with same party
- Emphasize that mitigation protects building occupants
- Communicate by multiple methods
  - Group setting
  - Fact sheets
  - Social media
  - One-on-one discussions



Source: Pixabay (adapted)

Communication is Everyone's Job

- Every interaction and perception matters
- Every stakeholder plays a role in communication
- Be mindful of situations where the occupant is not the owner



Source: Pixabay (adapted)

Communication on Long-Term Management

- Long-term management is a key part of mitigation success
- Need a plan for communicating:
  - System issues
  - Remodeling work
  - Institutional/engineering controls at property transfer
- Provide labeling, contact information, and essential documentation
  - Retain a copy if lost or misplaced

Source: L. Levy, 2020. Used with permission.

Knowledge Check

Poll Question

When is it important to do public outreach?

- During VI investigation
- During mitigation design and planning
- At the time of mitigation implementation
- During long-term management
- All the above

Image source: Pixabay

Knowledge Check

Poll Question

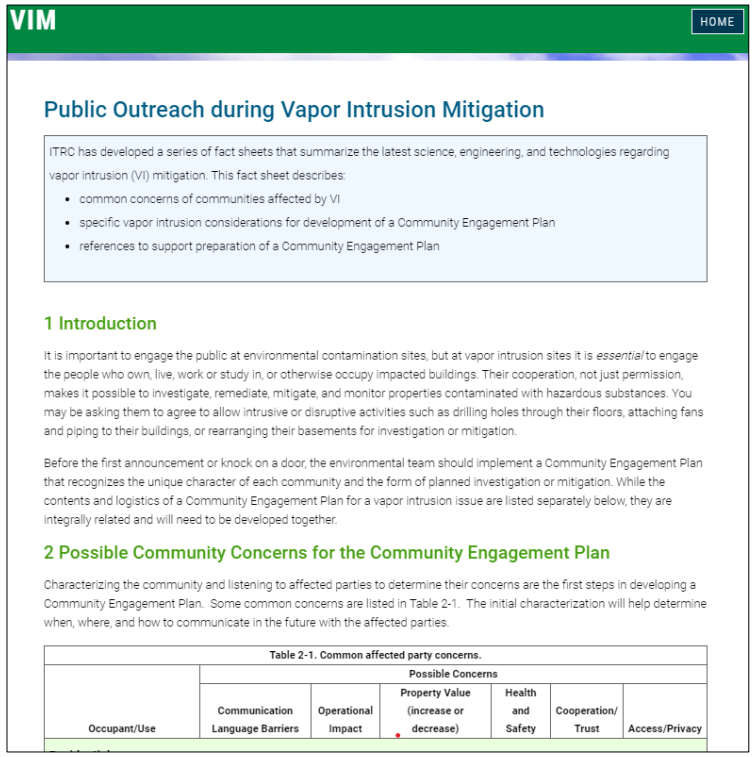
When is it important to do public outreach?

- During VI investigation
- During mitigation design and planning
- At the time of mitigation implementation
- During long-term management

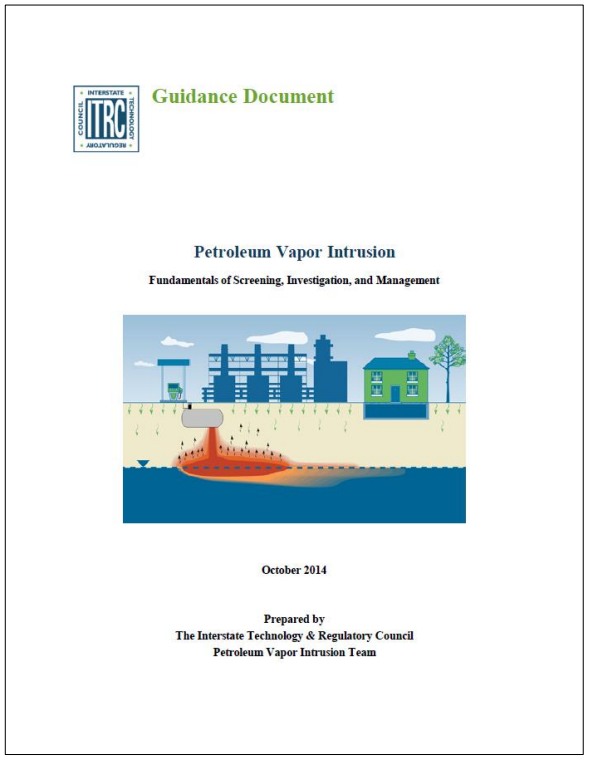
☑ All the above

Source: Pixabay

Additional Resources



Fact sheet – Public Outreach During Vapor Intrusion Mitigation (2020)
https://vim-1.itrcweb.org/public-outreach-during-vapor-intrusion-mitigation/



ITRC Petroleum VI Guidance (2014) Section 7 Community Engagement
https://www.itrcweb.org/PetroleumVI-Guidance/

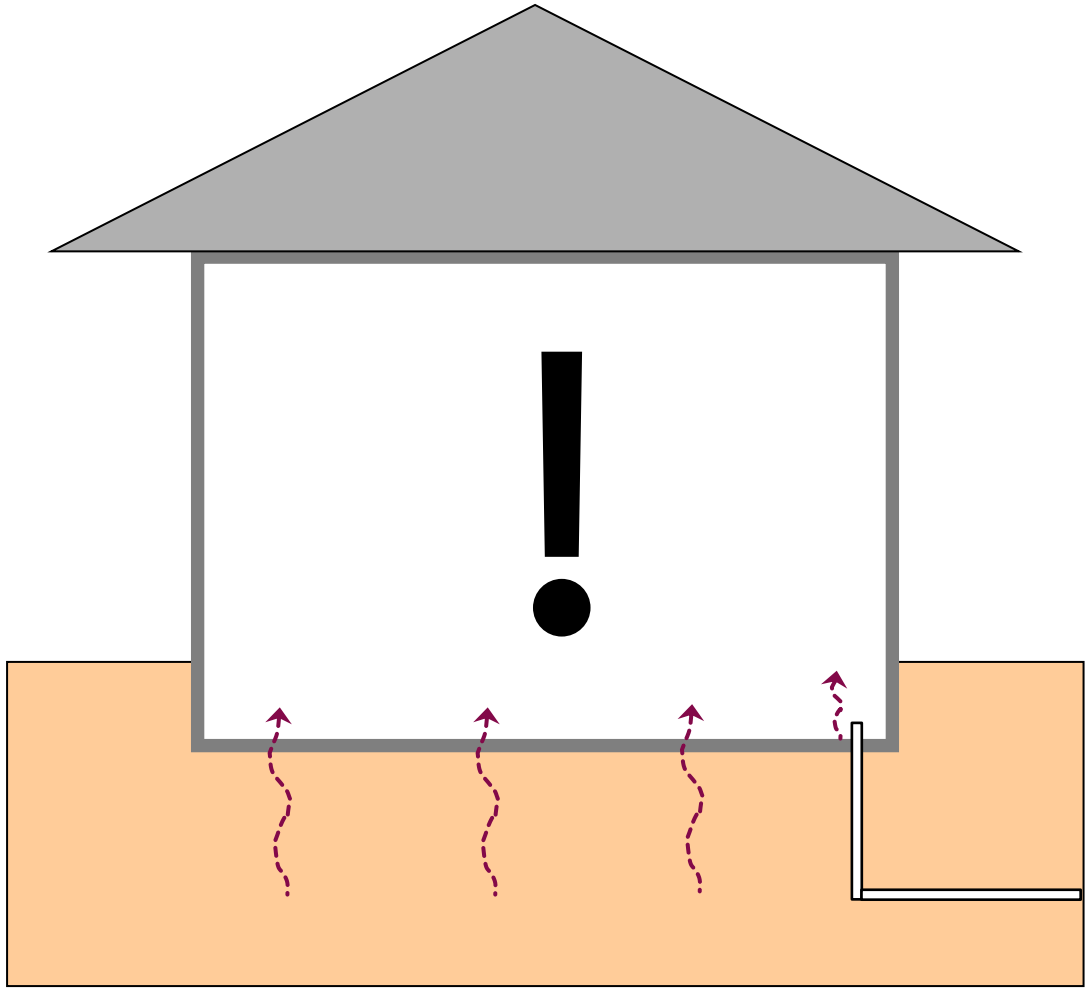
ITRC Risk Communication Toolkit (2020)
https://rct-1.itrcweb.org/

Question & Answer Break

Source: Pixabay

Advancing Environmental Solutions

Rapid Response for Vapor Intrusion Mitigation



Source: Barr Engineering, 2020. Used with permission.

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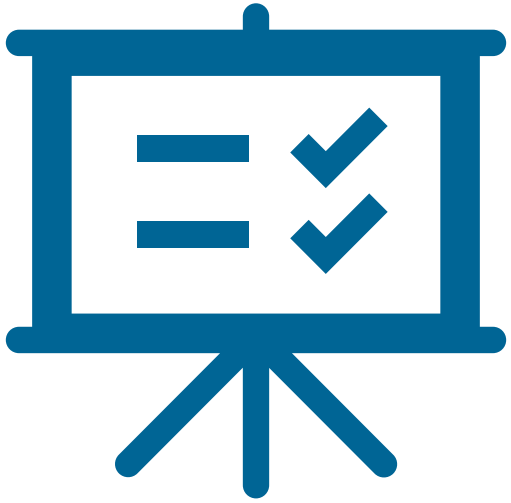
Objectives of Module

- Definition of rapid response for vapor intrusion mitigation
- Overview
- When to implement
- Administrative and engineering controls for rapid responses



What is Rapid Response?

- Mitigation implemented within days or weeks of vapor intrusion discovery
- Addresses acute public health risk
- Interim response action
- May be different from final response
  - Limited design effort
  - Different verification testing considerations
  - Limited OM&M

Other Terms for Rapid Response

imminent hazard response
urgent response
emergency response
expedited response
immediate response
accelerated response

What is not covered in these presentations

- Emergency response actions – Immediately contact first responders if
  - Reports of strong petroleum odors
  - Evidence of combustible, explosive, or oxygen-deficient conditions inside the building
- Methane mitigation or hazardous substances that have a high explosive potential
- Radon

Source: ITRC Petroleum VI Guidance (2014)

Knowledge Check

Poll Question

Which of these scenarios could warrant a rapid response?

A. Petroleum vapor intrusion has been documented in a vacant gas station

B. High levels of TCE have been detected in sub-slab soil gas at maternity clinic

C. TCE levels have been detected slightly above state vapor intrusion action levels at an occupied commercial building

D. Benzene has been detected at high levels in soil gas at a vacant lot planned for redevelopment

Image source: Pixabay

Knowledge Check

Poll Question

Which of these scenarios could warrant a rapid response?

A. Petroleum vapor intrusion has been documented in a vacant gas station

B. High levels of TCE have been detected in sub-slab soil gas at maternity clinic

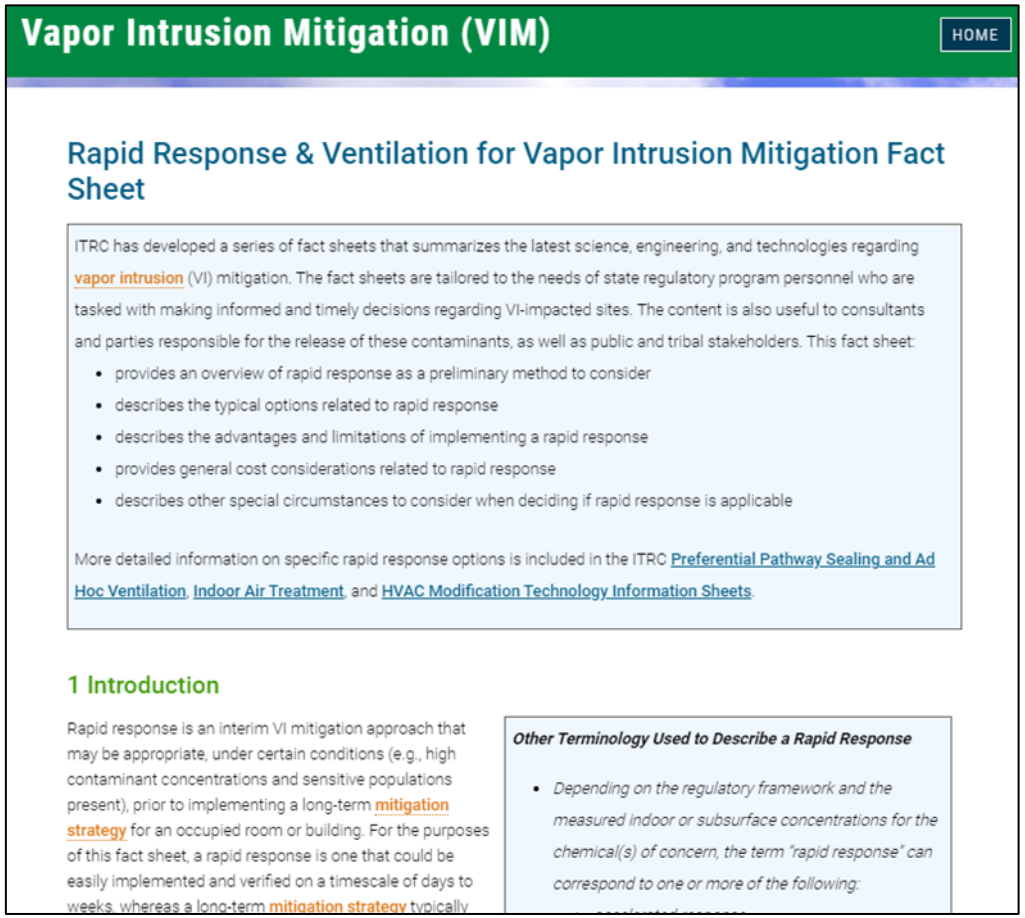
C. PCE levels have been detected slightly above state vapor intrusion action levels at an occupied commercial building

D. Benzene has been detected at high levels in soil gas at a vacant lot planned for redevelopment

Source: Pixabay

Rapid Response & Ventilation Fact and Tech Sheets

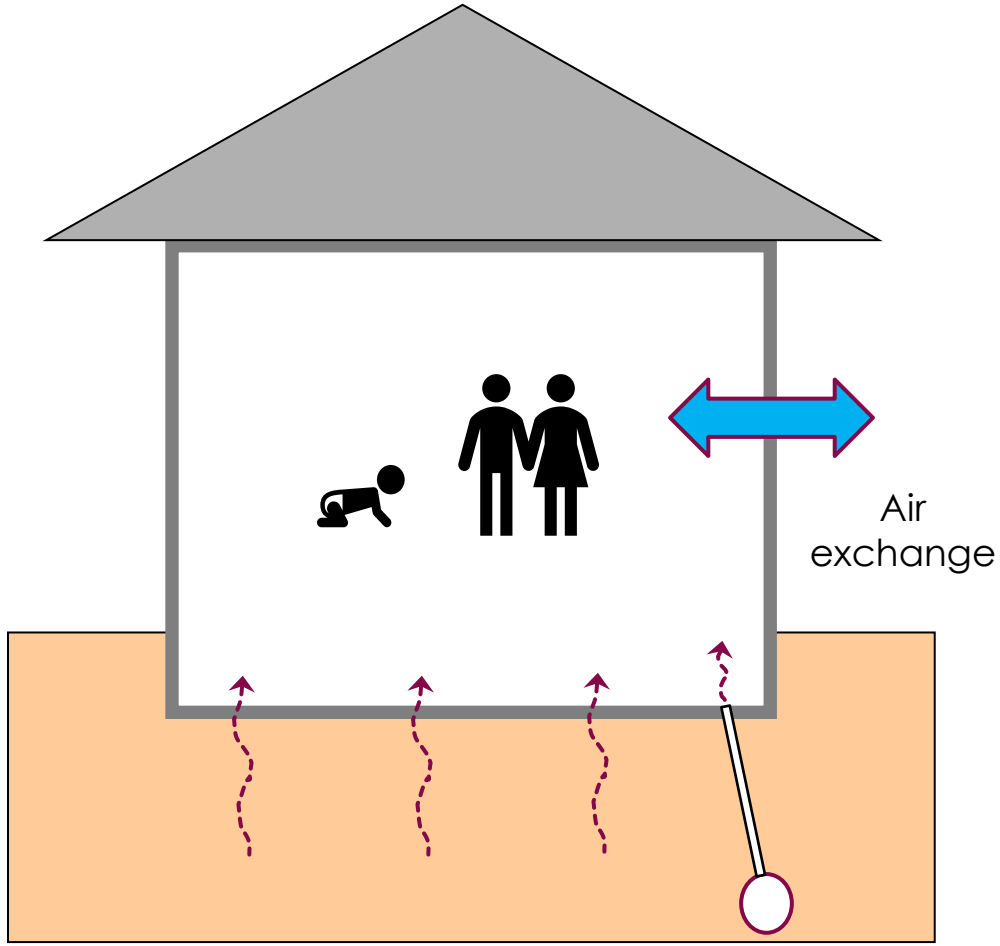
- Defines what is a rapid response and when to implement
- Lists administrative and engineering controls for rapid responses



https://vim-1.itrcweb.org/rapid-response-ventilation-for-vapor-intrusion-mitigation-fact-sheet/

Rapid Response Focused on Structure and Occupants

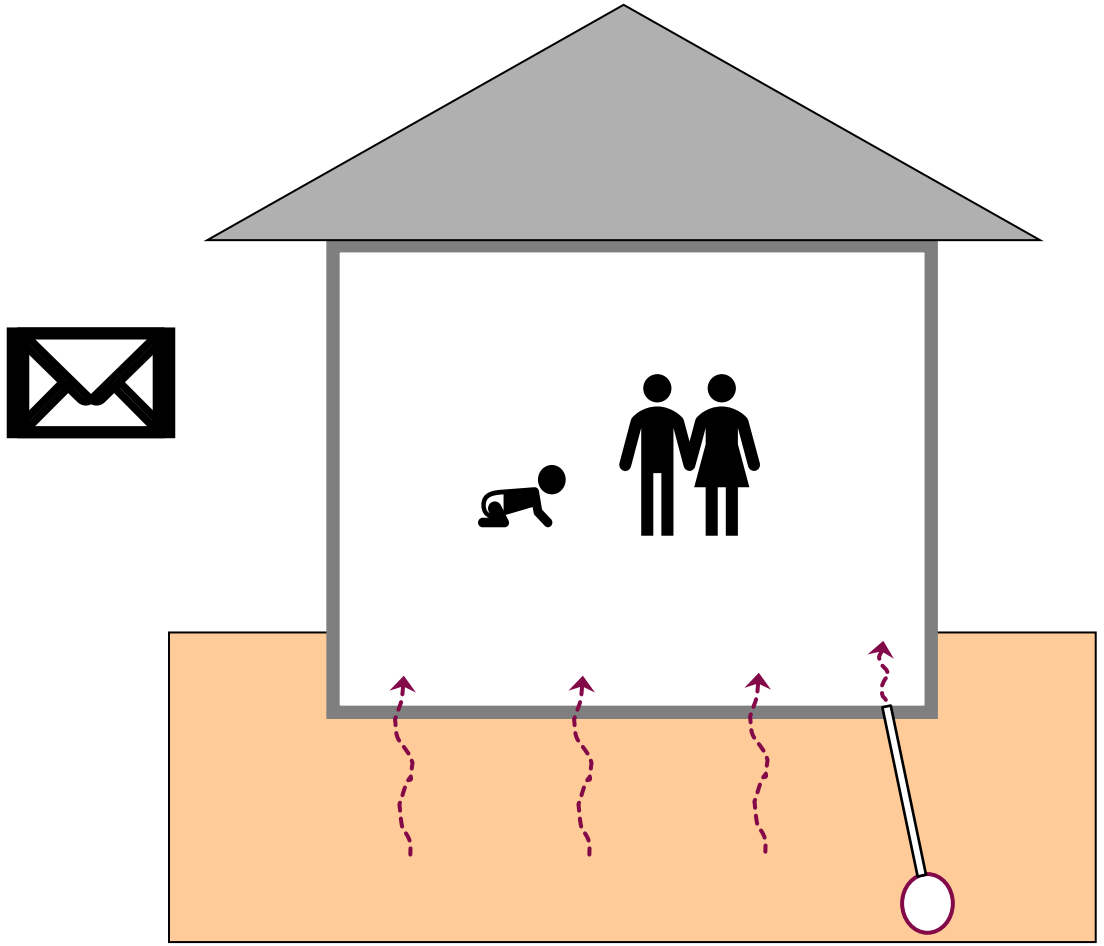
- Building occupants
- Preferential pathways
- Building pressure
- Air exchange rate



Source: Barr Engineering, 2020. Used with permission.

Categories of Rapid Response
Administrative Controls

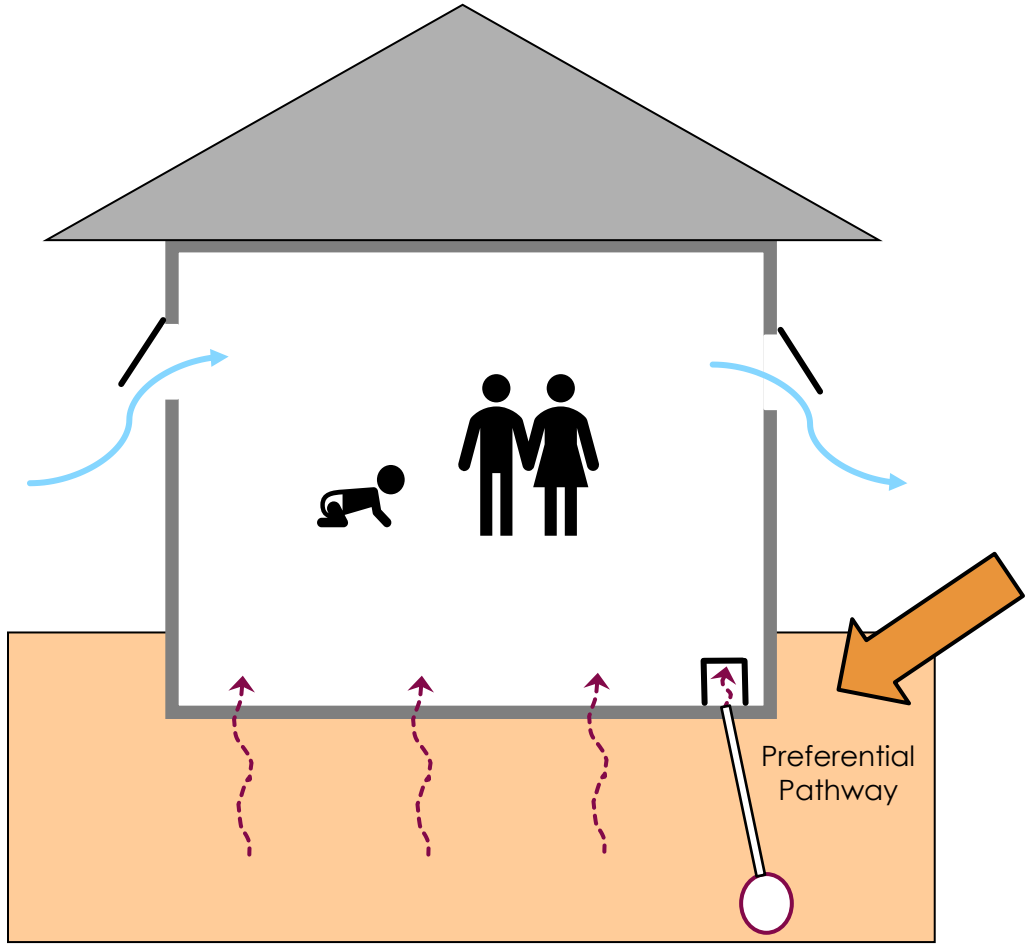
- Notification
- Relocation



Source: Barr Engineering, 2020. Used with permission.

Categories of Rapid Response
Engineering Controls

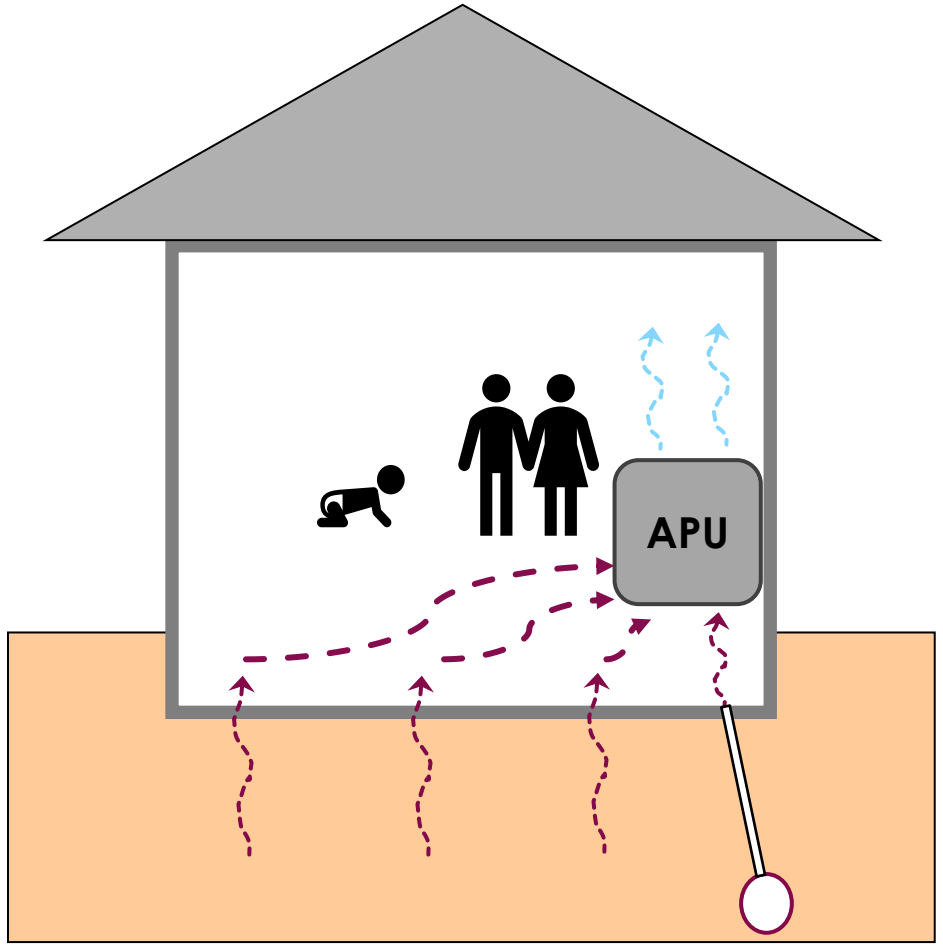
- Preferential pathway sealing
- Ad hoc ventilation



Source: Barr Engineering, 2020. Used with permission.

Categories of Rapid Response
Engineering Controls

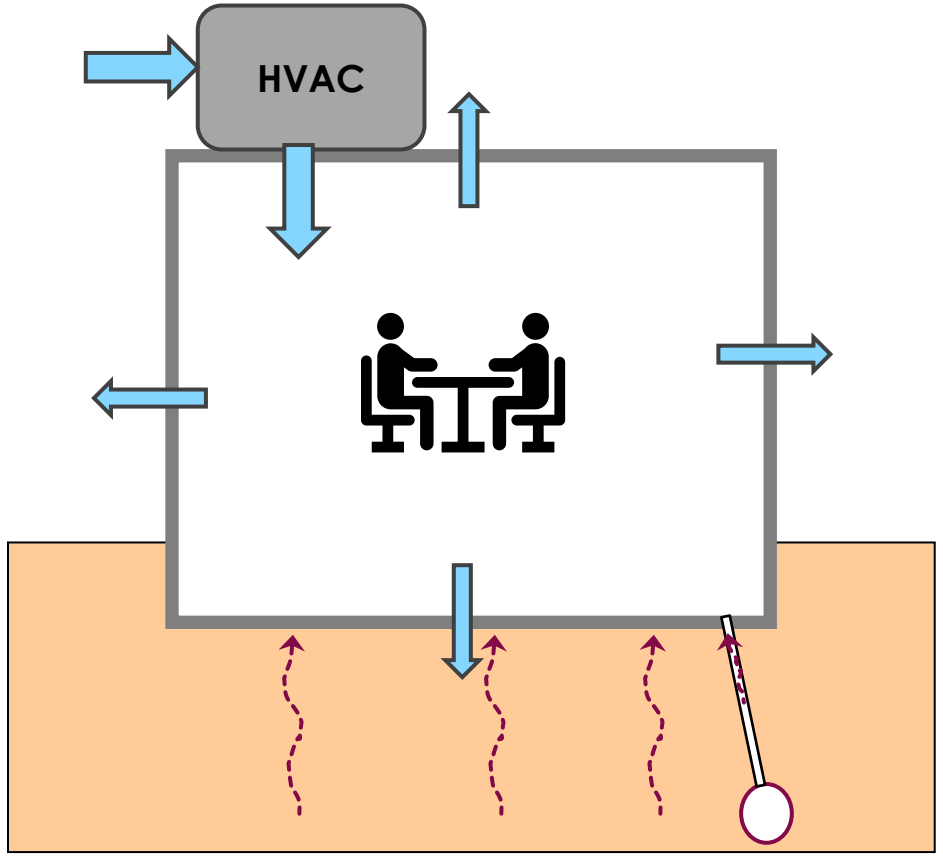
- Preferential pathway sealing
- Ad hoc ventilation
- Indoor air treatment



Source: Barr Engineering, 2020. Used with permission.

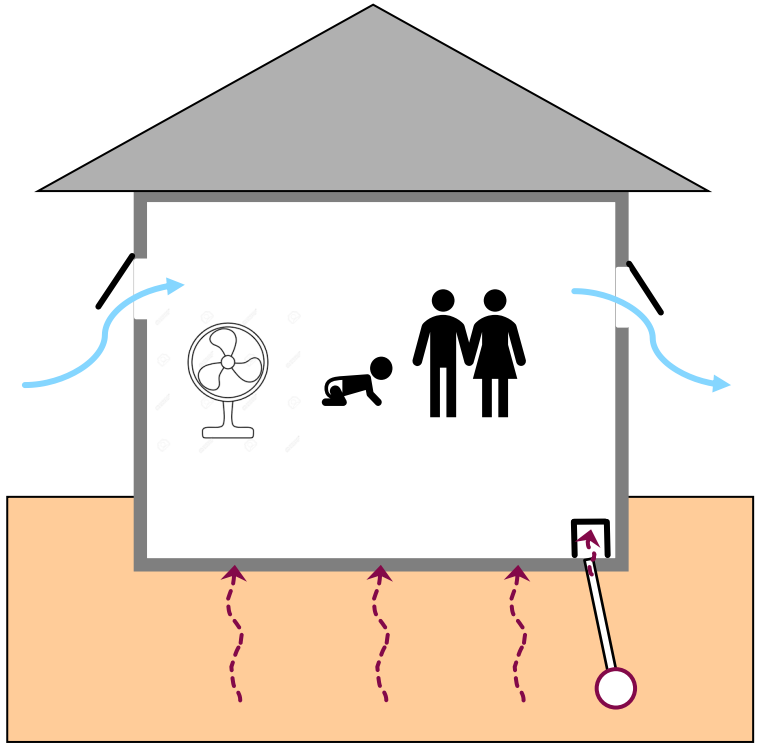
Categories of Rapid Response
Engineering Controls

- Preferential pathway sealing
- Ad hoc ventilation
- Indoor air treatment
- HVAC modification

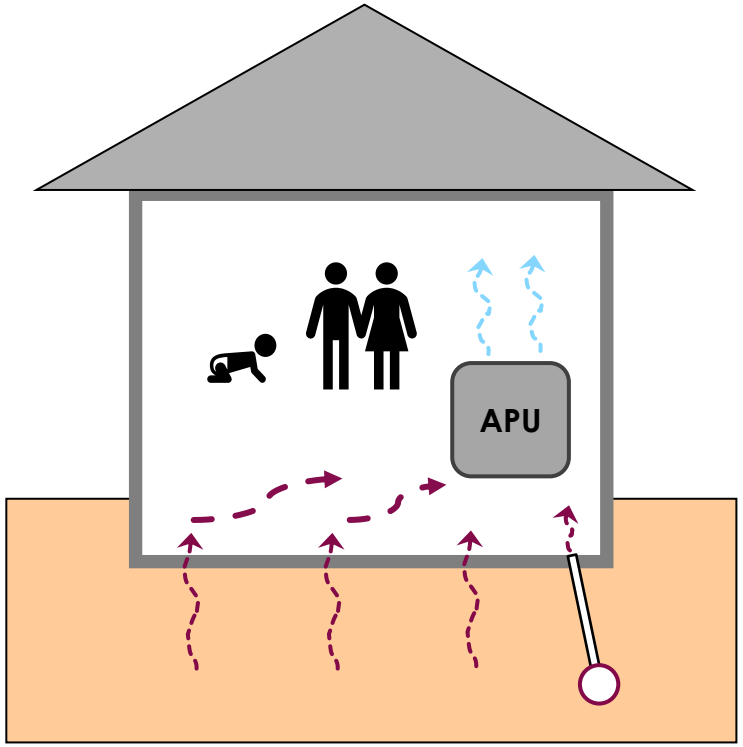


Source: Barr Engineering, 2020. Used with permission.

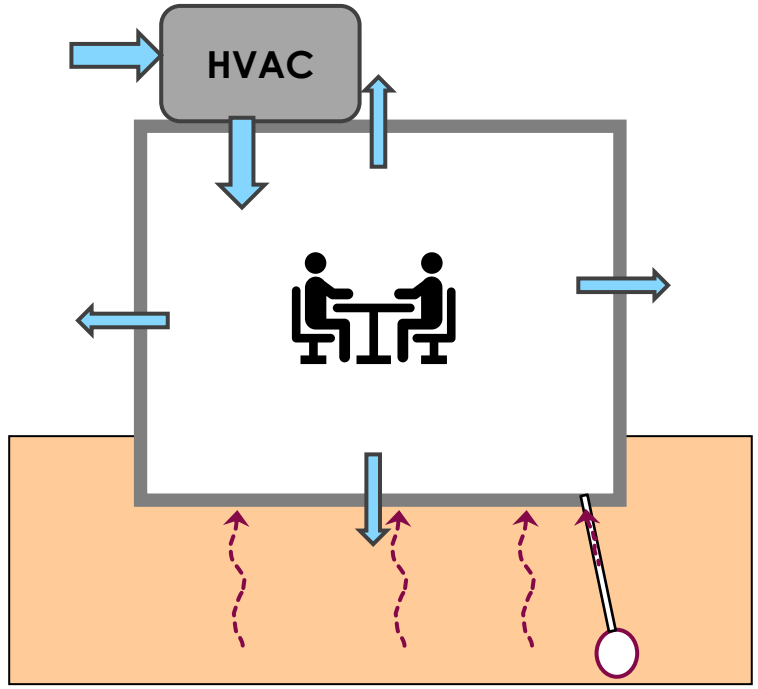
Rapid Response & Ventilation Technology Information Sheets



Preferential Pathway Sealing and Ad Hoc Ventilation



Indoor Air Treatment



HVAC Modification

Source: Barr Engineering, 2020. Used with permission.

Poll

Poll Question

Which of these administrative and engineering controls have you implemented or seen implemented? (Check all that apply)

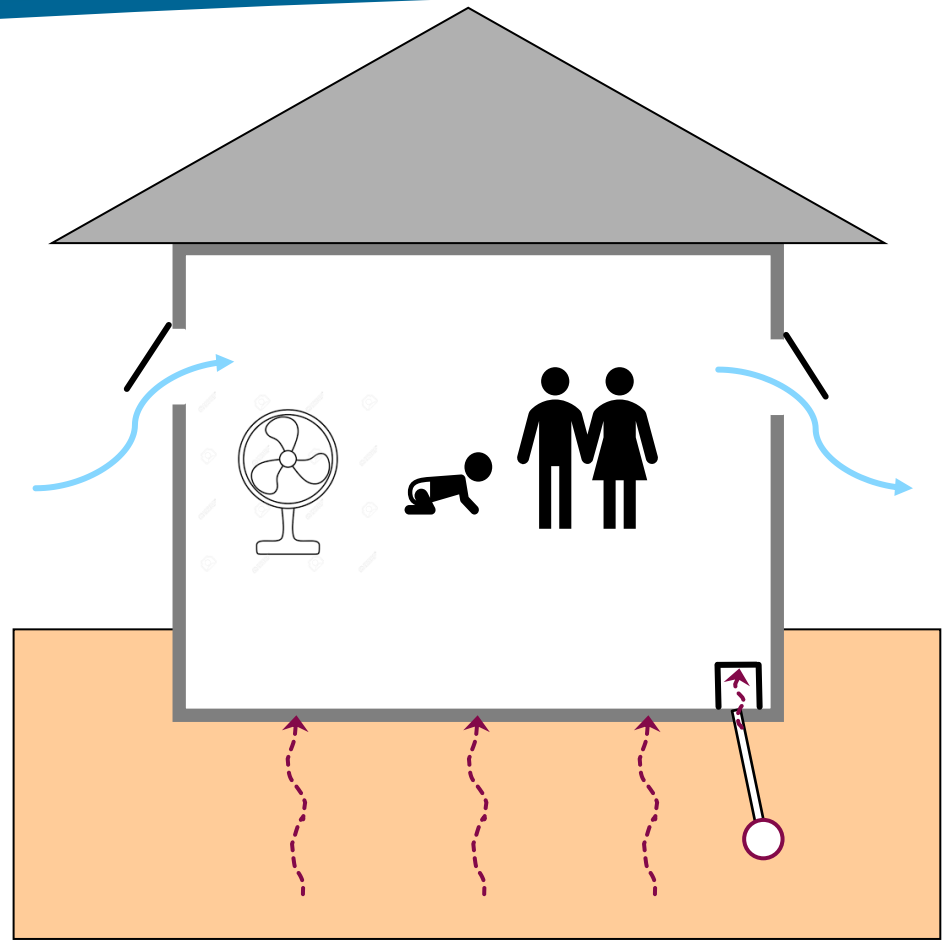
A. Notification
B. Relocation
C. Preferential Pathway Sealing and Ad Hoc Ventilation
D. Indoor Air Treatment
E. HVAC Modification

Source: Clipartmax.com

Tech Sheet – Preferential Pathway Sealing

Overview

- Advection vs. Diffusion
- Preferential pathway sealing blocks advection
  - Benefits long-term mitigation



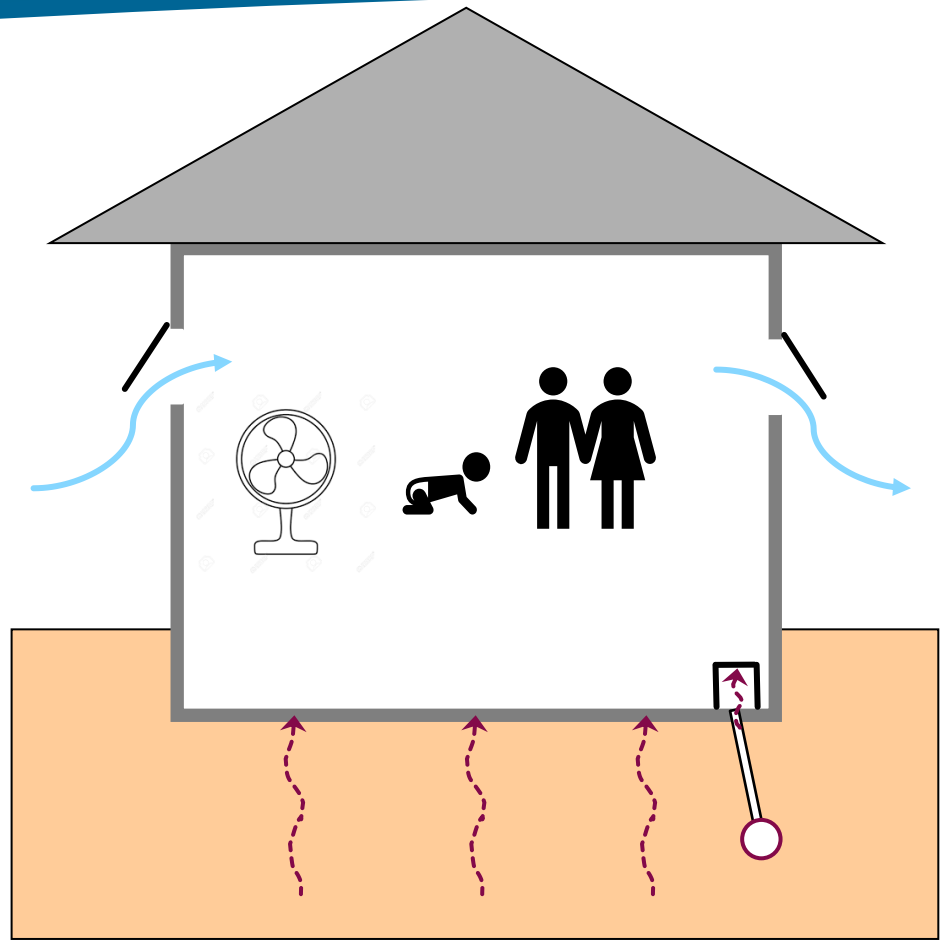
Source: Barr Engineering, 2020. Used with permission.

https://vim-1.itrcweb.org/preferential-pathway-sealing-ad-hoc-ventilation-tech-sheet/

Tech Sheet – Ad Hoc Ventilation

Overview

- Ad hoc ventilation = dilution
  - Weather dependent



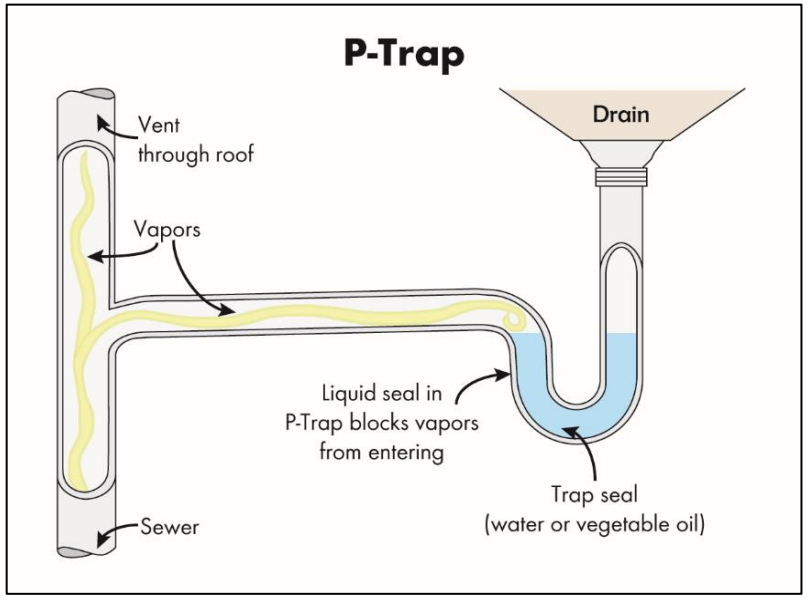
Source: Barr Engineering, 2020. Used with permission.

https://vim-1.itrcweb.org/preferential-pathway-sealing-ad-hoc-ventilation-tech-sheet/

Preferential Pathway Sealing
Components

Source: Sanborn, Head & Associates, Inc.

Sealant applied to floor gap



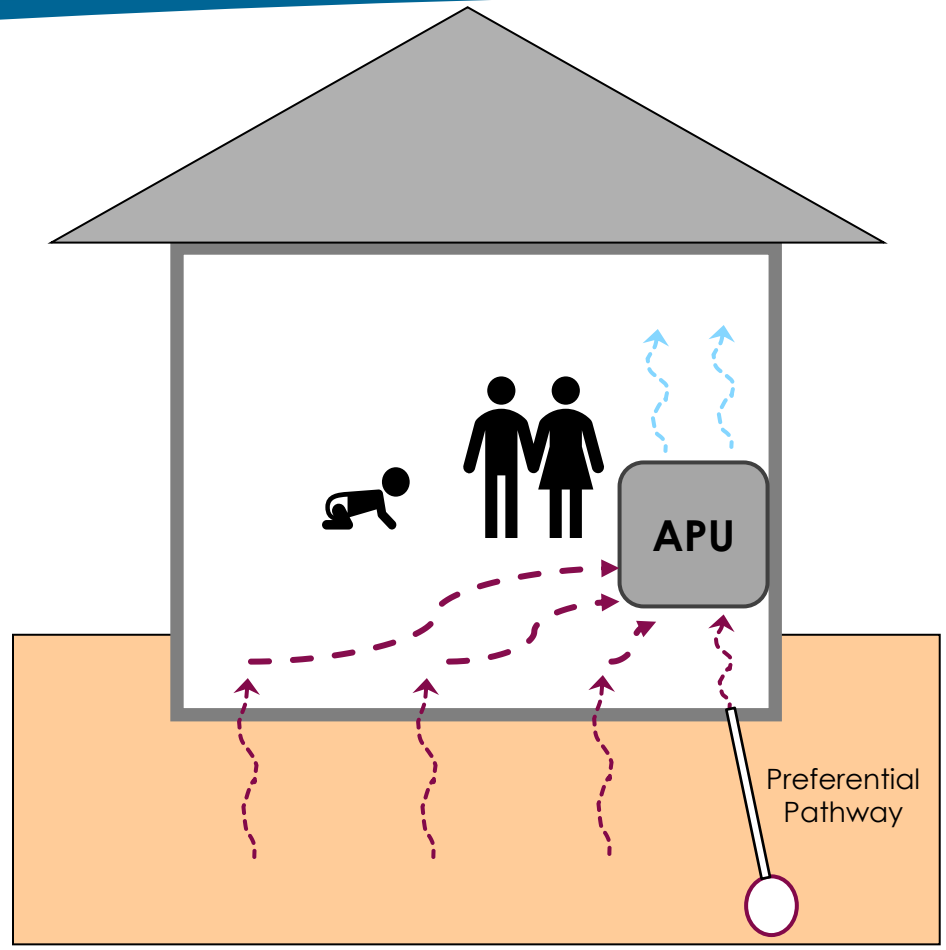
Source: Barr Engineering Co.

Source: Barr Engineering Co.

Add water to dry drain

Tech Sheet – Indoor Air Treatment
Overview

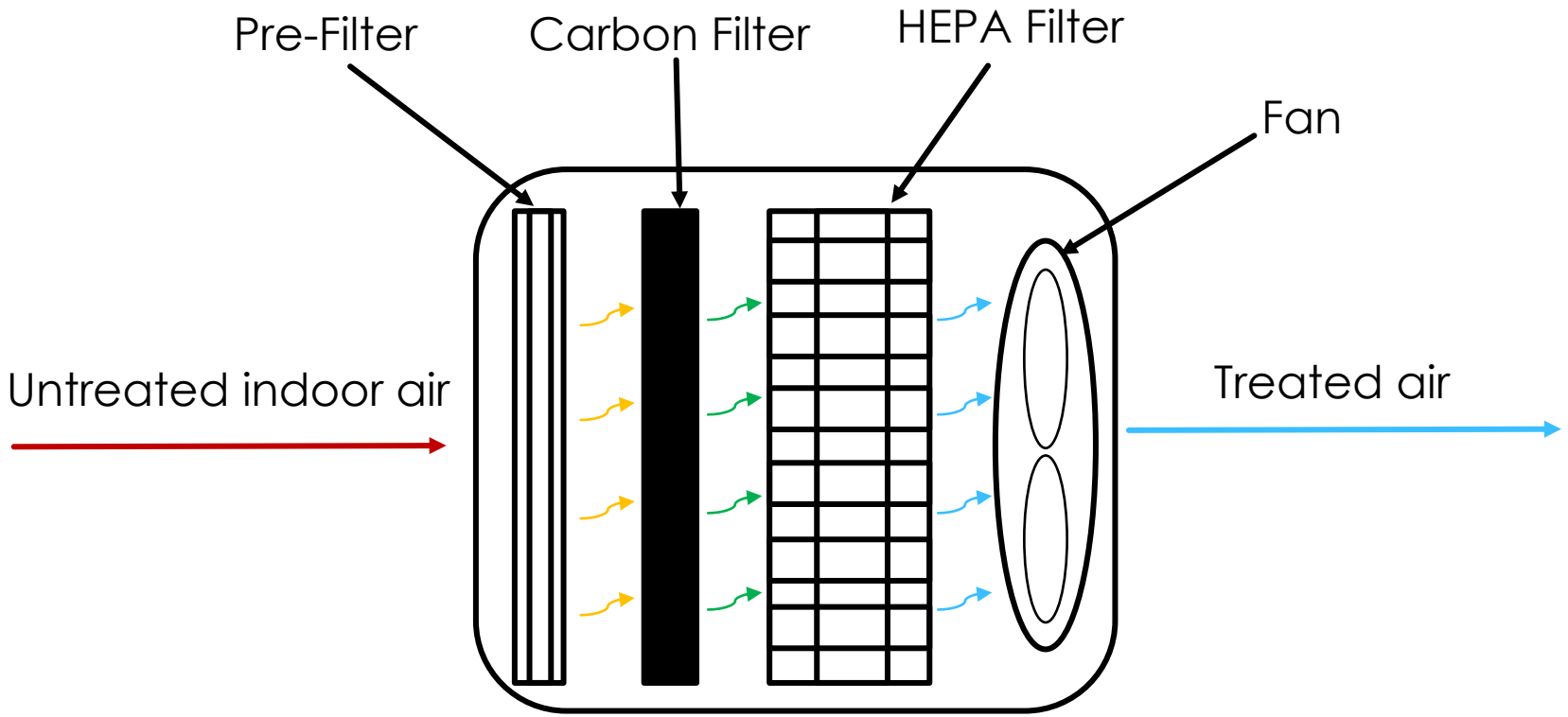
- Implemented via air purifying units (APUs)
- Treats air inside building
- Subject to human interference



Source: Barr Engineering, 2020. Used with permission.

https://vim-1.itrcweb.org/indoor-air-treatment-tech-sheet/

Tech Sheet – Indoor Air Treatment
Components



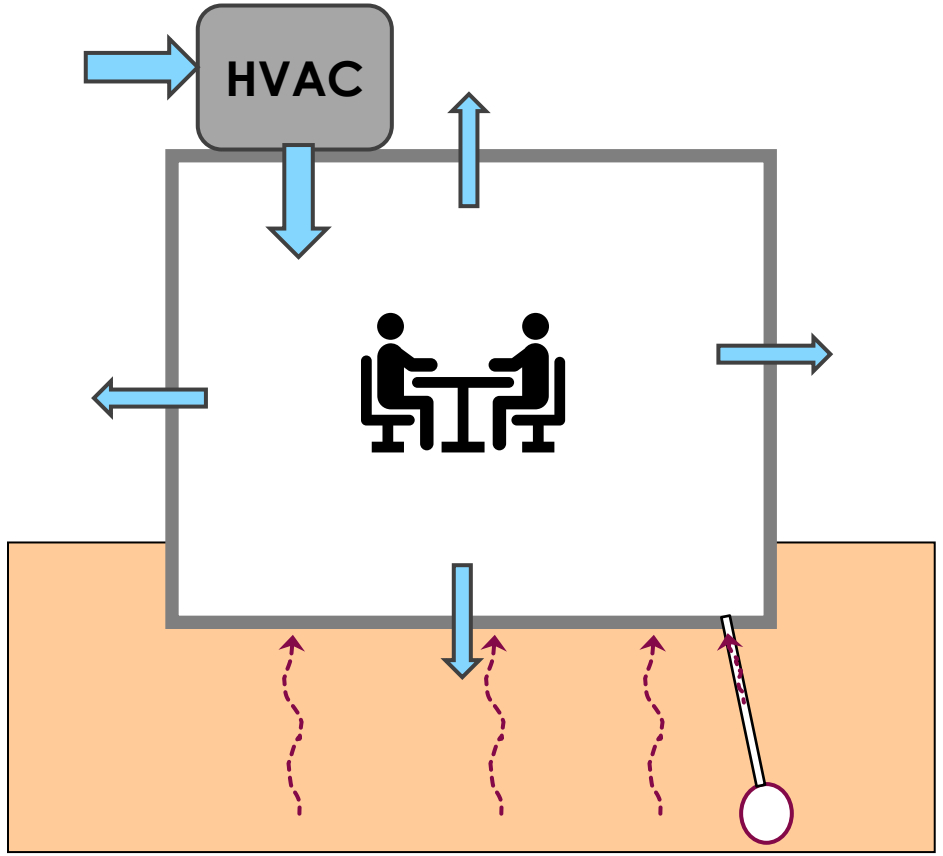
Example adsorption-based APU

Source: Sanborn, Head & Associates, 2021. Used with permission.

Photograph from Figure 1 of the Indoor Air Treatment Technology Information Sheet.

Tech Sheet – HVAC Modification
Overview

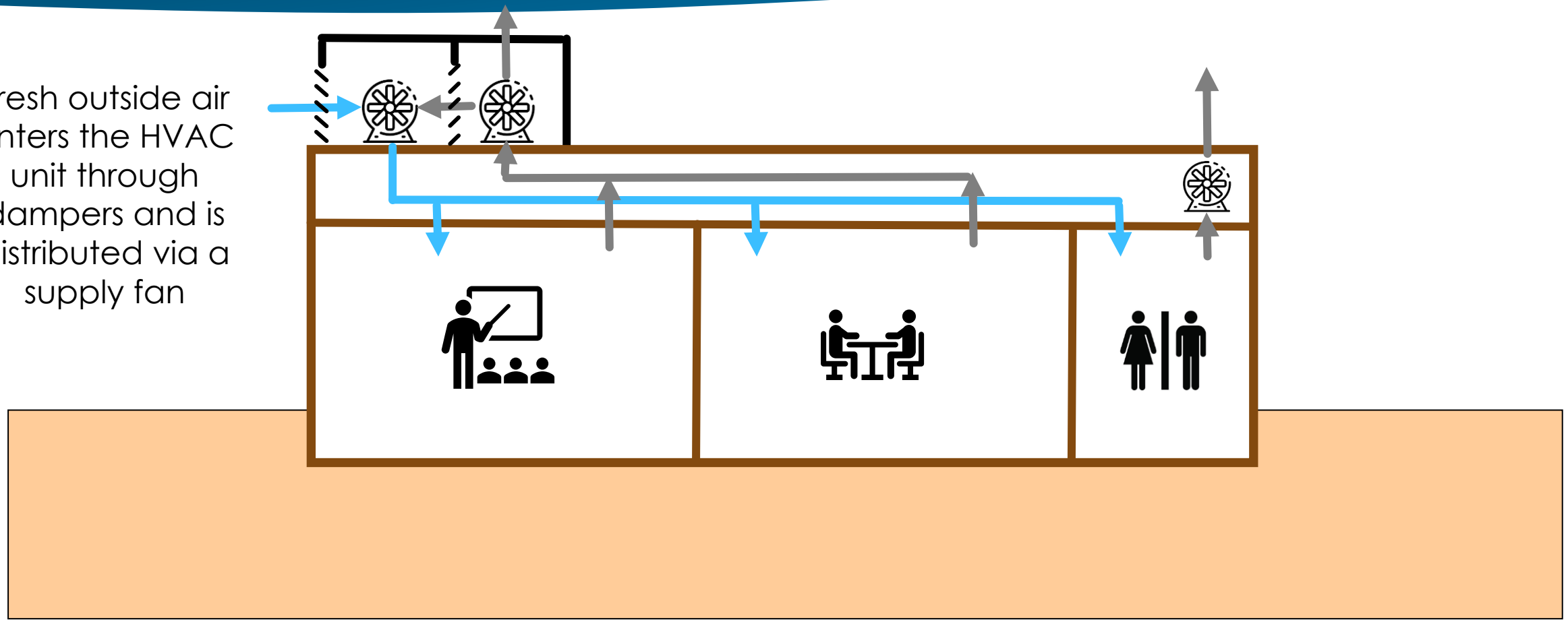
- Increase air exchange rate
- Increase building pressure
- Most suitable for commercial/industrial buildings
- Can supplement other mitigation methods



https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet/

Tech Sheet – HVAC Modification
Components

Fresh outside air enters the HVAC unit through dampers and is distributed via a supply fan

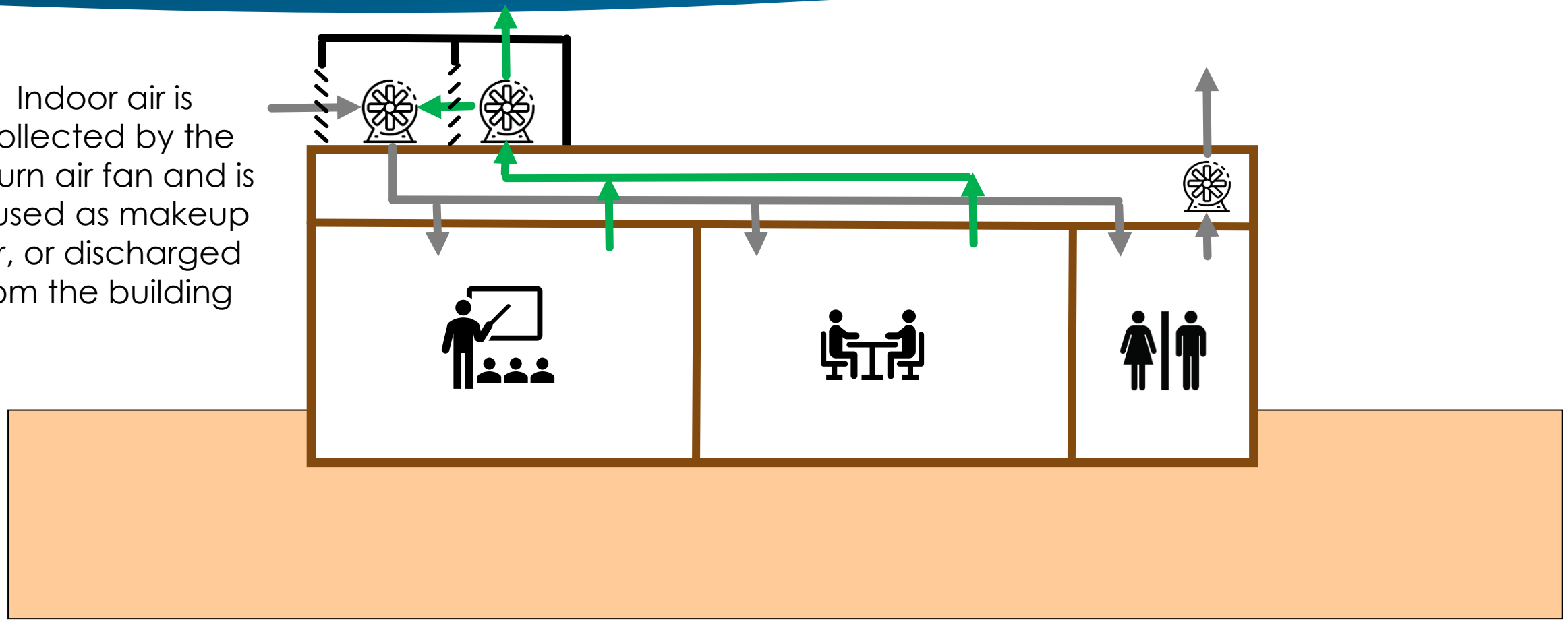


https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet/

Source: Sanborn, Head & Associates, 2020. Used with permission.

Tech Sheet – HVAC Modification
Components

Indoor air is collected by the return air fan and is reused as makeup air, or discharged from the building

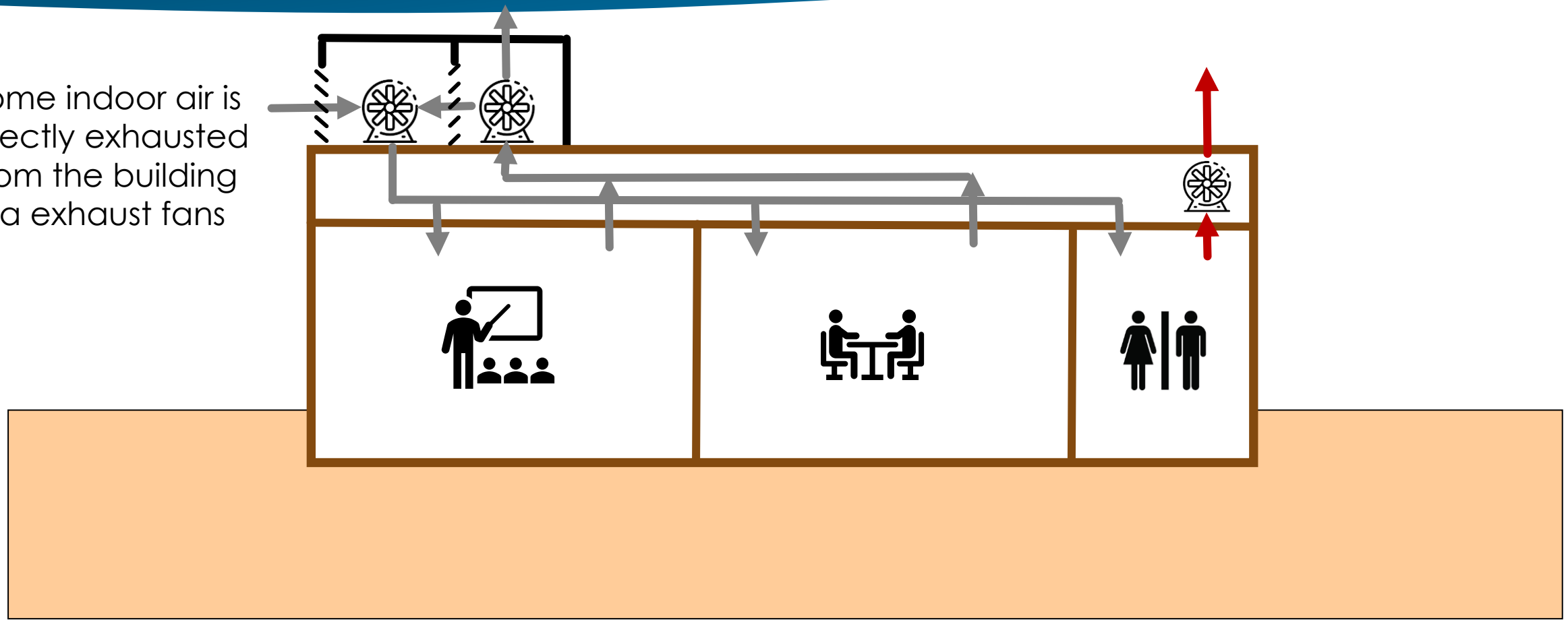


Source: Sanborn, Head & Associates, 2020. Used with permission.

https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet/

Tech Sheet – HVAC Modification
Components

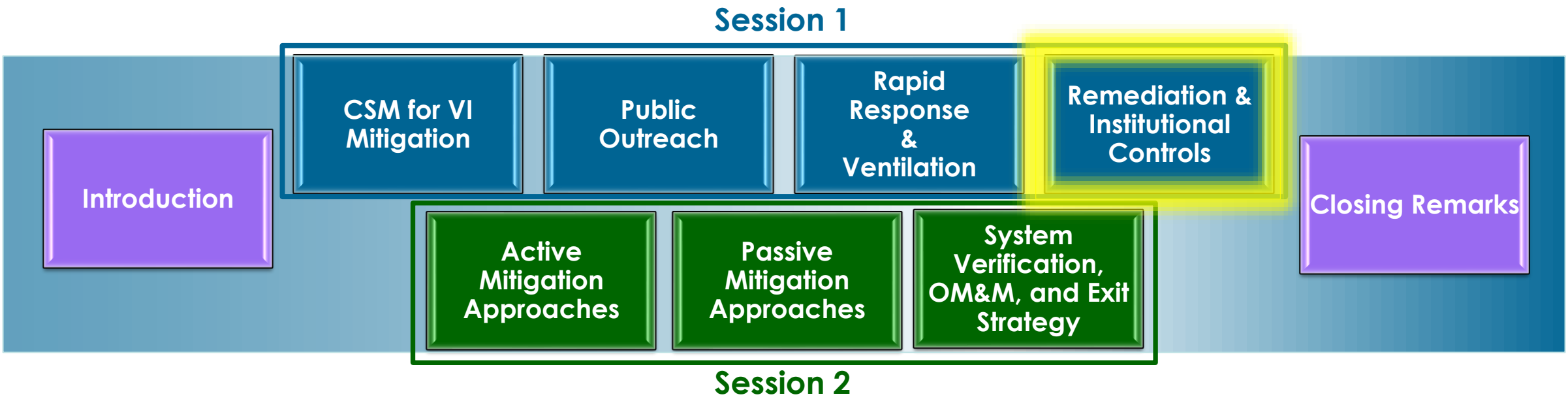
Some indoor air is directly exhausted from the building via exhaust fans



https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet/

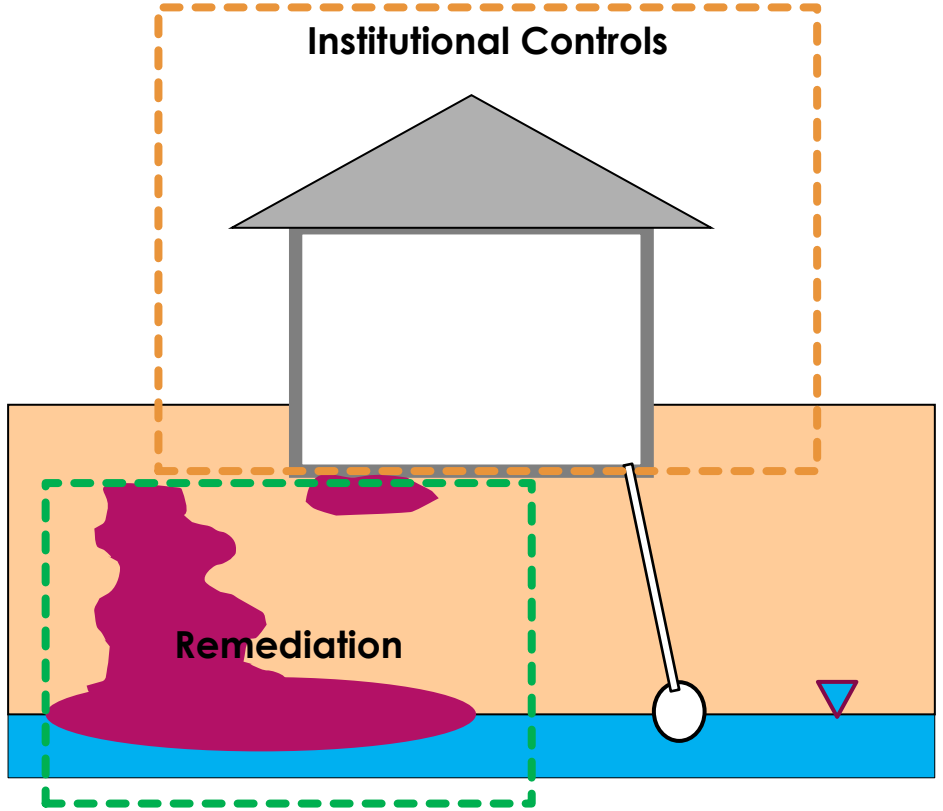
Source: Sanborn, Head & Associates, 2020. Used with permission.

Coming Up Next…



ADVANCED
ENVIRONMENTAL
SOLUTIONS

Environmental Remediation & Institutional Controls



Source: Geosyntec & GSI Environmental, 2020. Used with permission.

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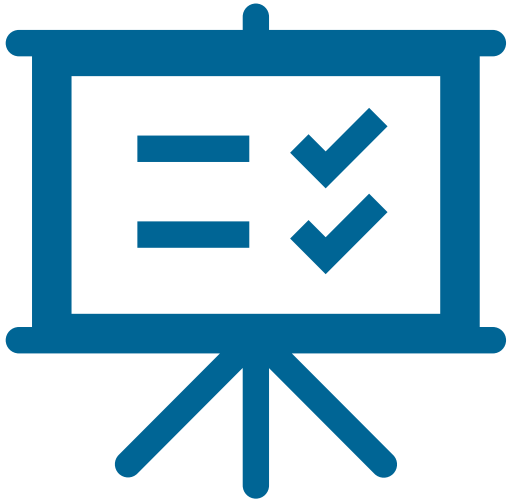
Objectives of Module

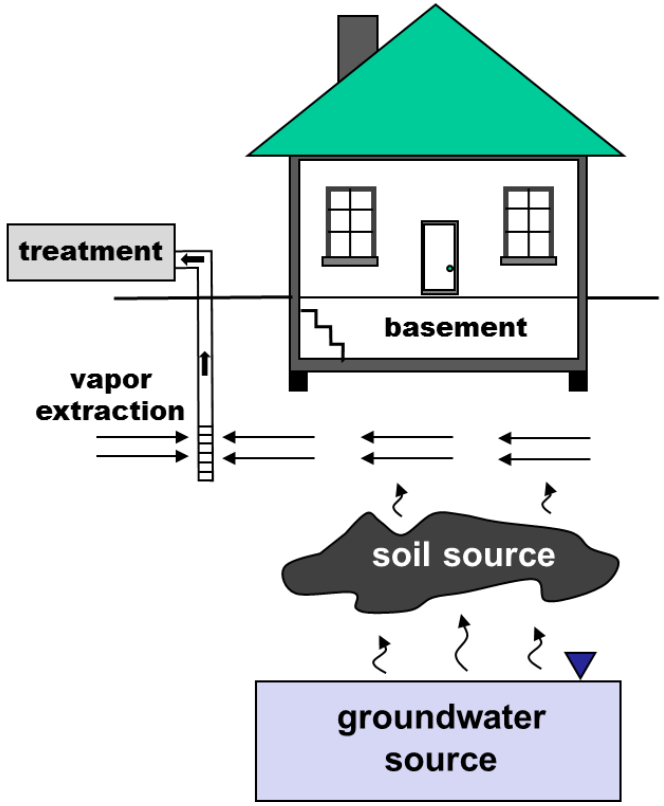
- Difference between remediation and mitigation
- Description of two soil vapor remediation methods that address vapor intrusion (VI)
- Introduction to institutional controls (IC)



Remediation vs. Mitigation

REMEDIATION

- Reduce mass in the source medium: soil, groundwater, or free phase
- Site-wide
- Longer-term installation, i.e., months



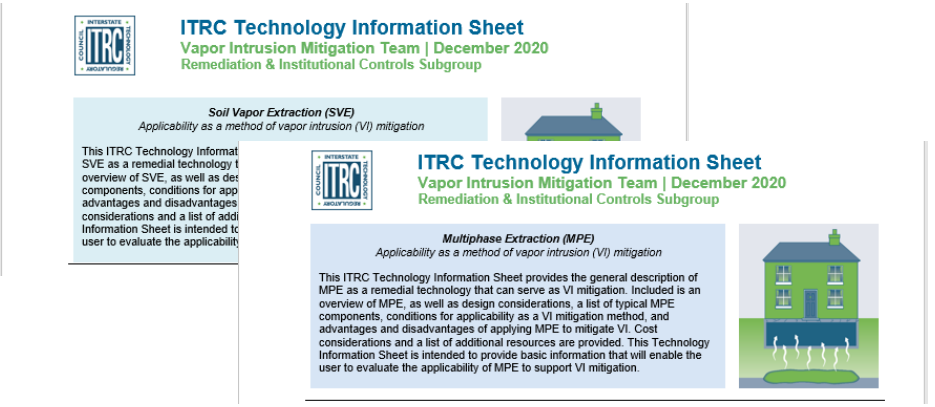
Source: Shell Global Solutions (US) Inc.
Used with permission.

MITIGATION

- Limit or prevent exposure at some point along the VI pathway
- Building-specific
- Shorter-term installation, i.e., weeks
- May also provide a remediation benefit

Remediation as Mitigation
Remediation Technologies for the Vadose Zone

- Targeted COCs: Hydrocarbon and chlorinated solvent vapors
  - Gas/vapor in the vadose zone, and exposure pathway drive the human health risk
  - Mitigation addresses the pathway, remediation can address both
  - Applicable remediation technologies: SVE and MPE



See SVE and MPE Tech Sheets.

https://vim-1.itrcweb.org/soil-vapor-extraction-sve-tech-sheet/

https://vim-1.itrcweb.org/multiphase-extraction-mpe-tech-sheet/

Tech Sheet – Soil Vapor Extraction (SVE)

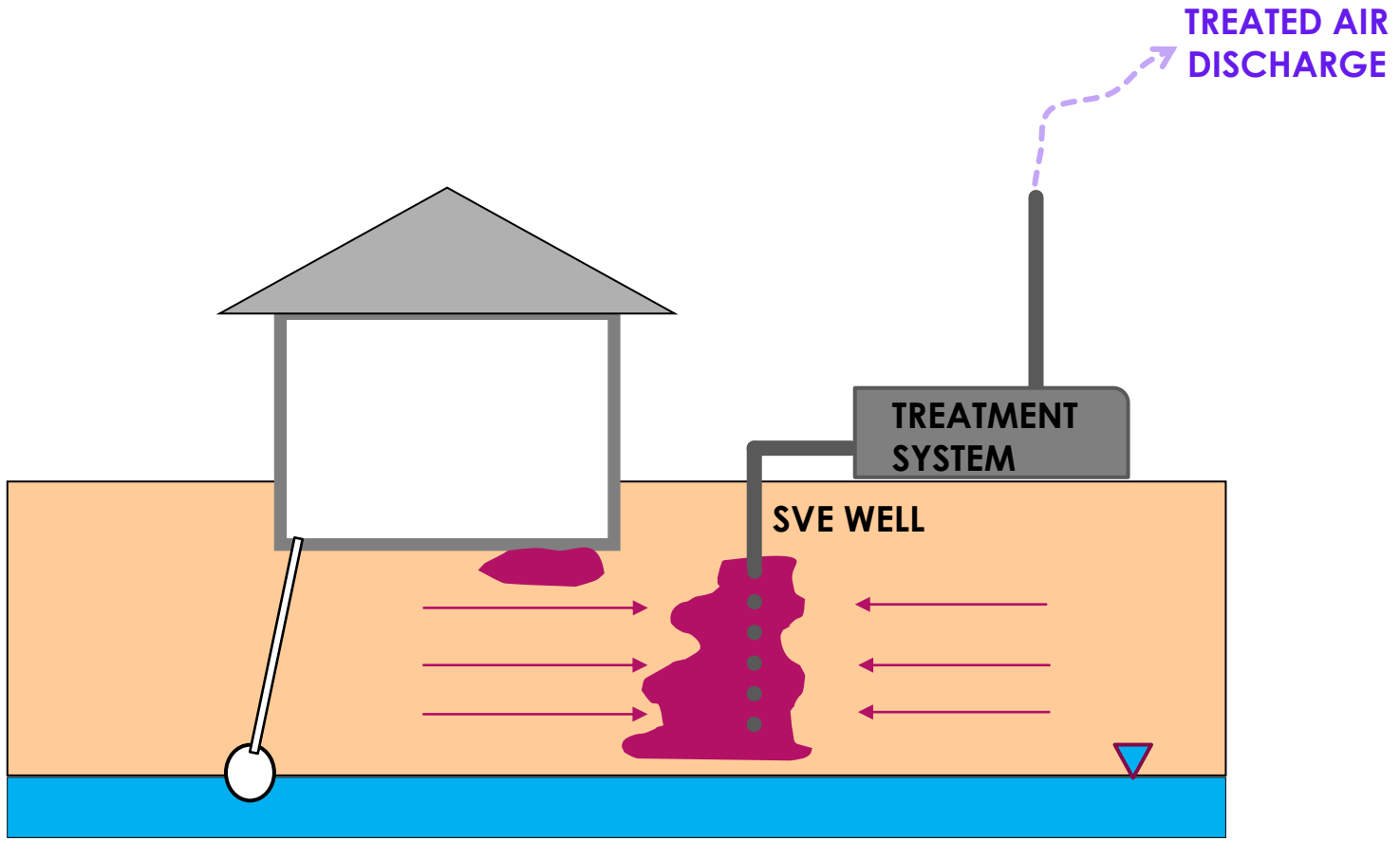


Figure 1 from the ITRC SVE Technology Information Sheet

- Targets only the vadose zone
- Intercepts soil vapors
- Creates sub-surface pressure gradient away from the building slab
- Performance typically evaluated based on current/planned site use

https://vim-1.itrcweb.org/soil-vapor-extraction-sve-tech-sheet/

Tech Sheet – Multi-phase Extraction (MPE)

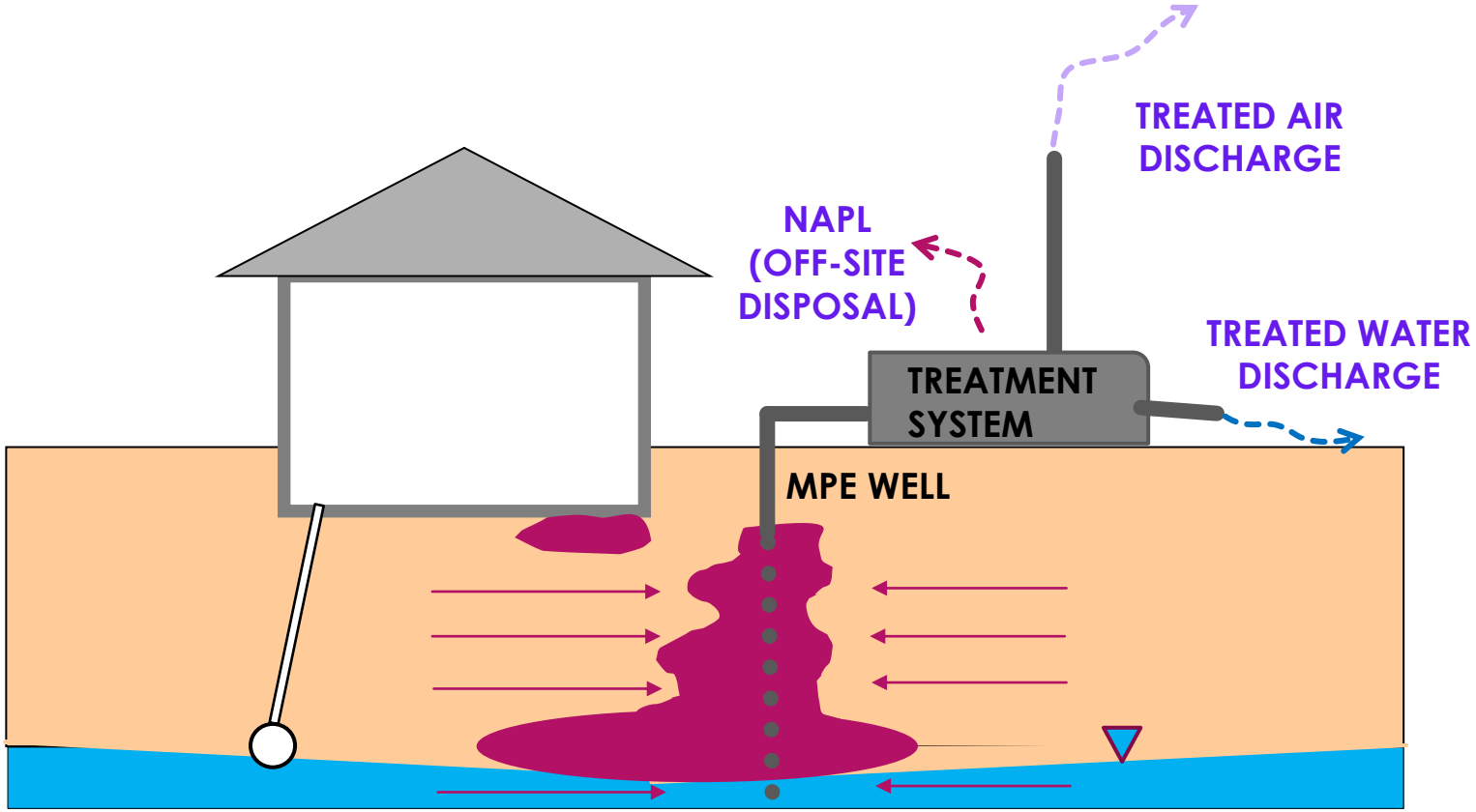


Figure 1 from the ITRC MPE Technology Information Sheet

- Targets vadose zone *and* saturated zone
- Intercepts soil vapors and withdraws water/free product (if present)
- Performance not linked to vadose zone thickness

https://vim-1.itrcweb.org/multiphase-extraction-mpe-tech-sheet/

Poll

Poll Question

Have you been involved with a site that has a deed restriction or land use control as part of VI mitigation strategy; if so, which? (check all that apply)

A. Construction requirements
B. Building type
C. Occupancy
D. Required active or passive vapor mitigation
E. Restrictions on groundwater use
F. Other

Source: Clipartmax.com

Tech Sheet – Institutional Controls (IC)

Source: ITRC Long Term Contaminant Management Using Institutional Controls Guidance

https://vim-1.itrcweb.org/institutional-controls-ic-tech-sheet/

- Long-term measures that provide:
  - Protection from exposure to contaminants
  - Assurance that VI mitigation system will be maintained
- Applied alone or in combination with other remedies

Government controls: Zoning ordinances, groundwater use or drilling limitations, land development regulations, etc.

Proprietary controls: Private agreement between landowner and outside party that "run with the land"

Enforcement mechanisms: Government agency-issued permits, administrative orders, etc.

Informational devices: Provide information about risks from site COCs

Knowledge Check

Poll Question

When might you consider implementing ICs?

A. Remediated site that includes a passive venting system
B. Remediated site that includes an active venting system
C. Potential future land development
D. All of the above
E. None of the above

Source: Pixabay

Knowledge Check

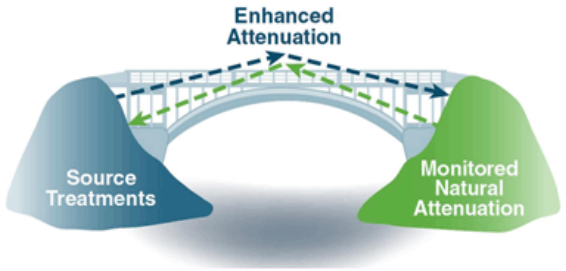
Poll Question

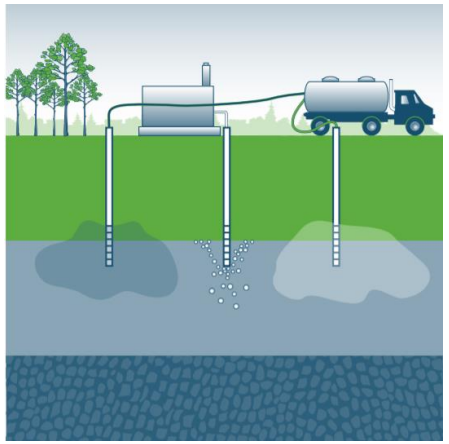
When might you consider implementing ICs?

A. Remediated site that includes a passive venting system
B. Remediated site that includes an active venting system
C. Potential future land development
☑ All of the above
E. None of the above

Source: Pixabay

Additional ITRC Resources





- "DNAPL Source Reduction: Facing the Challenge" (DNAPLs-2, 2002)
- "Enhanced Attenuation: Chlorinated Organics" (EACO-1, 2008)
- "Enhanced In-Situ Bioremediation of Chlorinated Solvents in Groundwater" (ISB-6, 1998)
- "In-Situ Chemical Oxidation of Contaminated Soil & Groundwater" (ISCO-2, 2005)
- "Evaluating LNAPL Remedial Technologies for Achieving Project Goals" (LNAPL-2, 2009)
- "Long Term Management Using Institutional Controls" (IC-1, 2016)

Thank you for attending!

Questions

- Email further questions on today's session to: training@itrcweb.org
- Feedback Form & Certificate of Completion:

  https://clu-in.org/conf/itrc/VIM-1/feedback.cfm
- Vapor Intrusion Mitigation Training:

  https://clu-in.org/conf/itrc/vim-1

Source: Pixabay