Advancing Environmental Solutions

ITRC Technical Resources For Vapor Intrusion (VI) Pathway Evaluation & Mitigation

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27 October 2025

INDOOR ENVIRONMENTS ASSOCIATION SYMPOSIUM, FT WORTH, TEXAS

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GSI Environmental Inc.

ITRC – Who we are

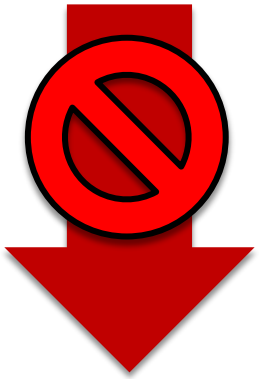
- A U.S.-based national coalition established in 1995 focused on developing tools and strategies to reduce barriers to the deployment of innovative environmental technologies.

- Membership from state, federal, tribal, and international government agencies, academia, private sector, and the public stakeholders

Learn More: https://itrcweb.org/who-we-are

ITRC – What we do

Innovative Technologies and Approaches



Barriers to use:
- Lack of knowledge/trust
- Differing procedures
- Pre-specified approaches
- Institutional resistance

Overcoming Barriers:
- Faster acceptance of solutions
- Quicker and better decision making
- Decreased compliance costs
- Harmonized state approaches

Mission:

Develop tools and strategies to reduce barriers to the deployment of innovative environmental technologies

ITRC - How we do it

ITRC Project Team Process

Project Teams

Current Project Teams

- Contaminants of Emerging Concern - Biologicals
- PFAS
- Vapor Intrusion (VI) Pathway Evaluation & Mitigation
- Managing Wastes from Energy Resources
- Green & Sustainable Chemistry
- Advanced Site Characterization Update
- Underwater Munitions Response Technologies

New 2026 Project Teams

- Phytotechnologies Update Team
- PFAS Treatment Technologies
- Petroleum Training Workgroup
- AI/ML in the Environmental Field

https://itrcweb.org/project-teams

Upcoming Webinar Trainings

October 23	Introduction to Hydrocarbons
October 28	Reuse of Solid Mining Waste
November 6	PFAS Introductory Training
November 13	Microplastics
November 18	Sediment Cap Chemical Isolation
November 20	Biological Contaminants of Emerging Concern
December 4	Pump & Treat Optimization

- ITRC's webinars provide an exchange of technical and regulatory information based on Teams' products
- **FREE** Registration
- All begin at 1:00 pm ET

Learn More: **https://itrcweb.org/online-training/**

ITRC Resources to Date

150+ Documents

https://itrcweb.org/guidance-documents

https://itrcweb.org/resource-guides/

In-Person Training

100+ Web-based Trainings

34 Training Videos

https://itrcweb.org/online-training

Over 200,000 Trained

https://clu-in.org/live/archive/

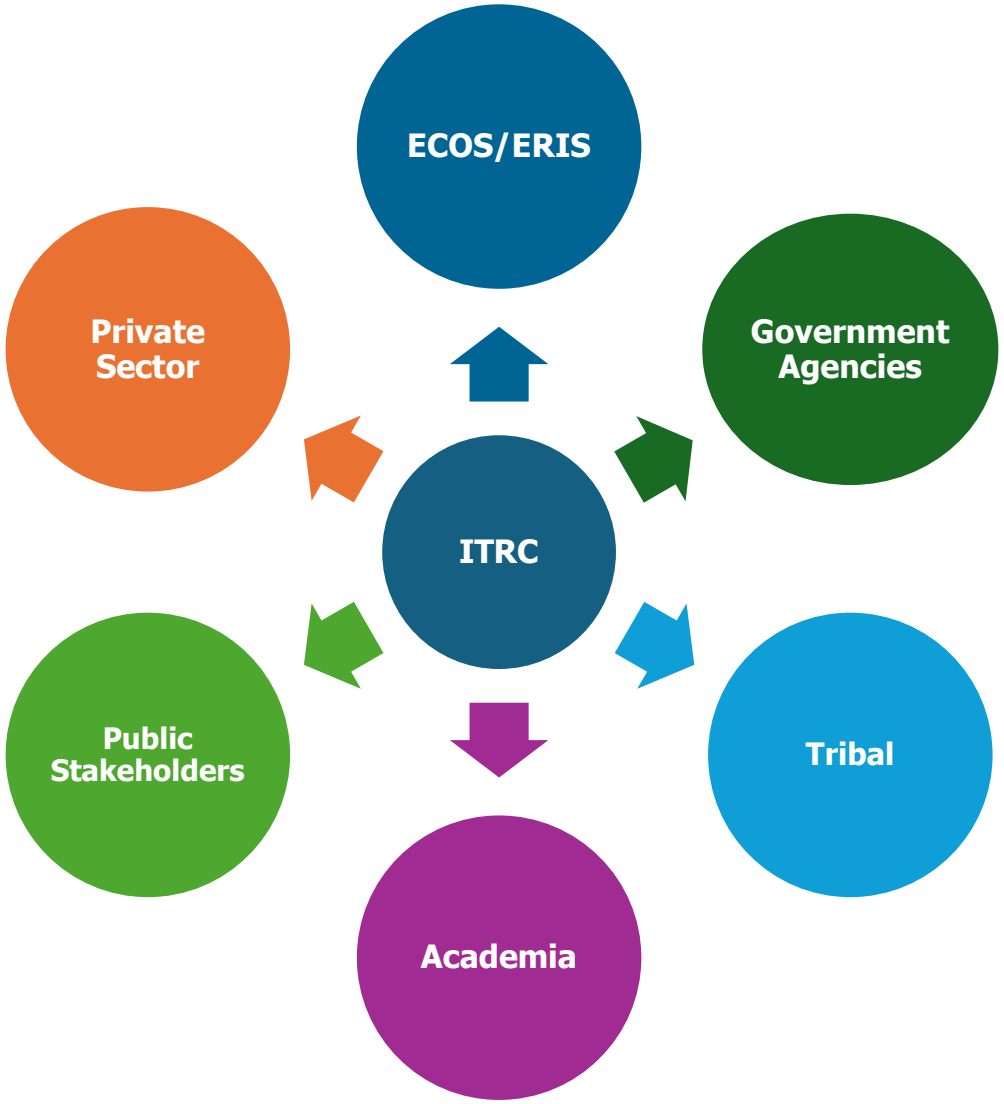
https://www.youtube.com/@itrc-environment

ITRC Membership

- **FREE** for government agencies, tribal, academia, and public stakeholders
- Private Sector participation through our **Industry Affiliates Program**.

- Learn from & network with a diverse group of environmental professionals
- Write & review documents; develop and deliver training
- Leadership & professional development opportunities

Learn More: **https://itrcweb.org/membership/**



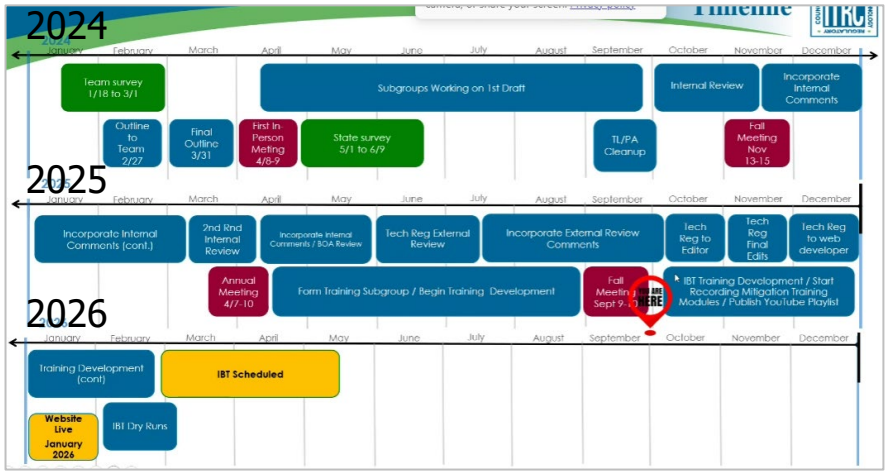
New Vapor Intrusion Guidance & Resources

- Updating several existing ITRC Vapor Intrusion resources with the latest technical and decision-making approaches
  - Vapor Intrusion Pathway: A Practical Guideline (2007)
  - Vapor Intrusion Pathway: Investigative Approaches for Typical Scenarios (2007)
  - Petroleum Vapor Intrusion (2014)
  - Technical Resources for Vapor Intrusion Mitigation (2020)

- Update and produce new ITRC training and educational materials

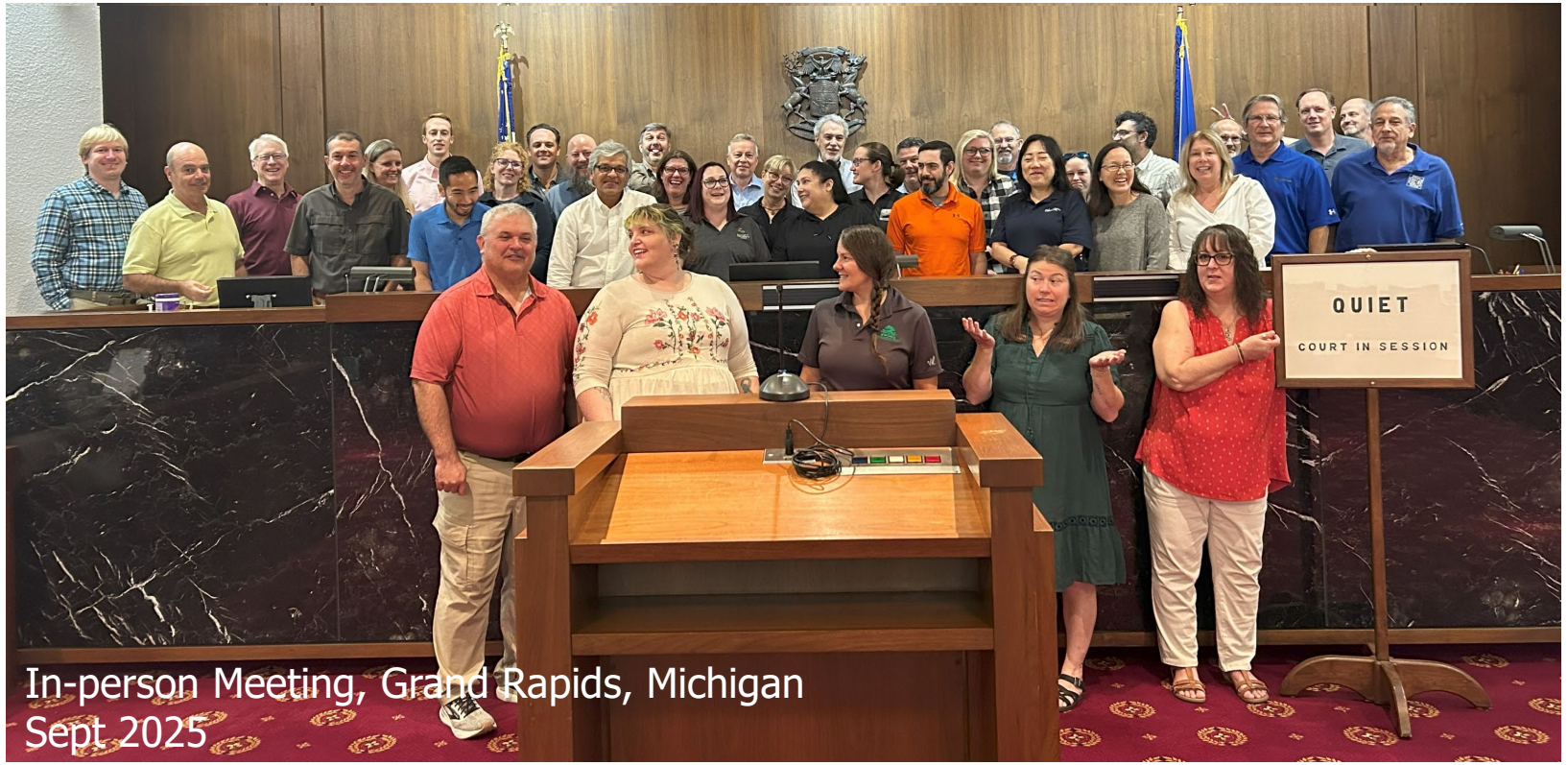
Update Process

- Goal: Develop comprehensive VI guidance document
  - Updated, integrated technical content
  - Added new content to reflect current research
    - e.g., conduit VI preferential pathways, mass flux-based screening
- 2-year process
- Team included more than 200 contributors
  - Diverse membership – States, Feds, IAP, etc.



External Review

- Final draft >860 pages
- Received ~1700 comments during External Review
- Completed review & responses to comments in Sept 2025
- Guidance is currently being finalized



In-person Meeting, Grand Rapids, Michigan
Sept 2025

New Vapor Intrusion Guidance & Resources

- Main Guidance Document Sections
  - Vapor Intrusion 101
  - Community Engagement
  - Conceptual Site Model (CSM)
  - Site Screening
  - Iterative Investigation Approach
  - Sampling and Analysis
  - Data Evaluation and Risk Assessment
  - Modeling
  - Mitigation
  - Vapor Intrusion Exit Points and Closure
- Appendices
  - State Practices Summary
  - Example Documents
  - Chemistry of Petroleum
  - Common Types of Petroleum Sites
  - Precluding Factors
  - Distance Based Screening
  - Overview of Vapor Intrusion Models
  - BioVapor Model
  - J&E Model
  - VIMS Construction Quality Assurance (CQA) Plan Outline
  - VIMS Stewardship Plan Outline
  - VIMS Curtailment Plan Outline

New Vapor Intrusion Guidance & Resources

- 35 New Fact Sheets
- 16 New Technology Sheets
- 7 New Checklists
  - Active Mitigation
  - Indoor Air Quality and Building Inventory
  - Passive Mitigation
  - Regulator Checklist for SV Samples
  - VIMS Operation, Maintenance, and Monitoring (OM&M)
  - VIMS Post-Installation
  - VIM Conceptual Site Model (CSM)

New Vapor Intrusion Guidance & Resources

Regulator's Checklist for Reviewing Soil Vapor Data

SAMPLE COLLECTION ISSUES

Active Soil Vapor Surveys

- ☐ Did the probe rod have an inert internal tube (stainless steel, Teflon®, nylon)?
- ☐ Was the probe adequately decontaminated between samples?
- ☐ Were at least three dead volumes of the probe purged?
  - ➢ *Avoid excessive purging, unless field screening (O_2, CO_2, photoionization detector, or flame ionization detector and tracer gas) was conducted to demonstrate the absence of atmospheric air intrusion.*
- ☐ Were samples collected deep enough to minimize air infiltration?
  - ➢ *At least 5 feet below ground surface unless special precautions are used to minimize purge volume and confirm the absence of atmospheric air*
- ☐ Did it rain shortly before the sampling event?
  - ➢ *Soil vapor sampling should be avoided following significant precipitation.*
  - ➢ *Generally, there is no consensus on how much rain can fall or how long you should wait. It depends on soil type, amount of rain, and previous soil moisture content.*
- ☐ Was a reliable method used to ensure the absence of atmospheric air leakage?
  - ➢ *Was the probe sealed at the surface and throughout the borehole annulus?*
  - ➢ *Was tracer compound used to demonstrate no leakage down or around probe and at all sample train fittings?*
- ☐ Were samples collected close to the surface (less than 3 feet below ground surface) repeated?
- ☐ Were the appropriate sample volumes collected?
- ☐ Were samples collected in appropriate containers for the contaminant(s) of concern?
- ☐ If canisters were used, was each canister certified clean or batch-tested?
- ☐ Were flow controllers and sample trains reused?
  - ➢ *If yes, they should be cleaned between samples.*
- ☐ Were vacuum pumps used in the sample collection?
- ☐ Were excessive vacuums required to obtain a sample?
  - ➢ *More than 10 inches of H_20 should be avoided.*
- ☐ Were samples collected upstream of the vacuum pump?
- ☐ Were samples analyzed on- or off-site?
- ☐ For canisters, were samples stored at ambient air temperature?
- ☐ Were samples analyzed within recommended holding times?
- ☐ If both on-site and off-site analyses were performed, do the results generally agree?

Passive Soil Vapor Surveys

- ☐ Were method and trip blanks analyzed?
  - ➢ *This is needed to show the absence of contaminants from laboratory or transportation back and forth to the site.*
- ☐ Were samplers left in the ground for consistent and sufficient time periods?
  - ➢ *This is generally a few days to two weeks.*
  - ➢ *Collect in the same sequence as they were deployed.*
- ☐ Were duplicate samples collected, and how do they compare?
- ☐ Are data used appropriately?
  - ➢ *For what purpose?*
  - ➢ *Were active soil vapor samples collected for comparison?*
  - ➢ *How well do passive and active samples compare?*
- ☐ Could measured values be from infiltration of contaminated atmospheric air or from an overlying surface (e.g., asphalt, dirty soil)?
- ☐ Are relative concentrations of compounds detected consistent with expectations from other media (soil vapor, groundwater, bulk soil)?

Flux Chamber Surveys

- ☐ Were the sample locations representative?
  - ➢ *Were they near vapor migration routes?*
  - ➢ *Were they from open ground, covered ground, cracked ground covers?*
- ☐ How long was the deployment time? Was it long enough to average temporal variations?
  - ➢ *Match indoor air defined collection times.*
- ☐ Was a sweep gas used? Was the outflow balanced to the inflow to ensure no leaks?
  - ➢ *If outflow is lower than inflow, sweep the gas exiting the bottom.*
  - ➢ *Pressure measurements are not adequate to test this.*
- ☐ Did the chamber concentration reach high enough values to influence the flux?
  - ➢ *Should be no more than 20% of risk-based maximum flux value.*
- ☐ What volume of vapor was collected from the chamber?
  - ➢ *Volume collected should be less than 20% of chamber volume.*
- ☐ How fast was it collected? Did it create advective flow from the subsurface or sides?
  - ➢ *How ... uld be less than 200 mL/min.*
- ☐ Was the chamber subjected to temperature extremes?
  - ➢ *Shield from direct sunlight.*
  - ➢ *Chamber surface must stay above dew point.*

Upcoming Vapor Intrusion Training

Live Training starts February 2026

Vapor Intrusion Mitigation (two-part series) *(Update!)*

Vapor Intrusion 101 *(New!)*

Vapor Intrusion 102 *(New!)*

Questions

Stay Updated on ITRC's Activities

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