



Department of  
**Environment &  
Conservation**

**TN Vapor Mitigation Guidance – One Year Later**  
Indoor Environments 2023 – Radon and Vapor Intrusion Symposium

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Ahmet Bulbulkaya

Division of Remediation

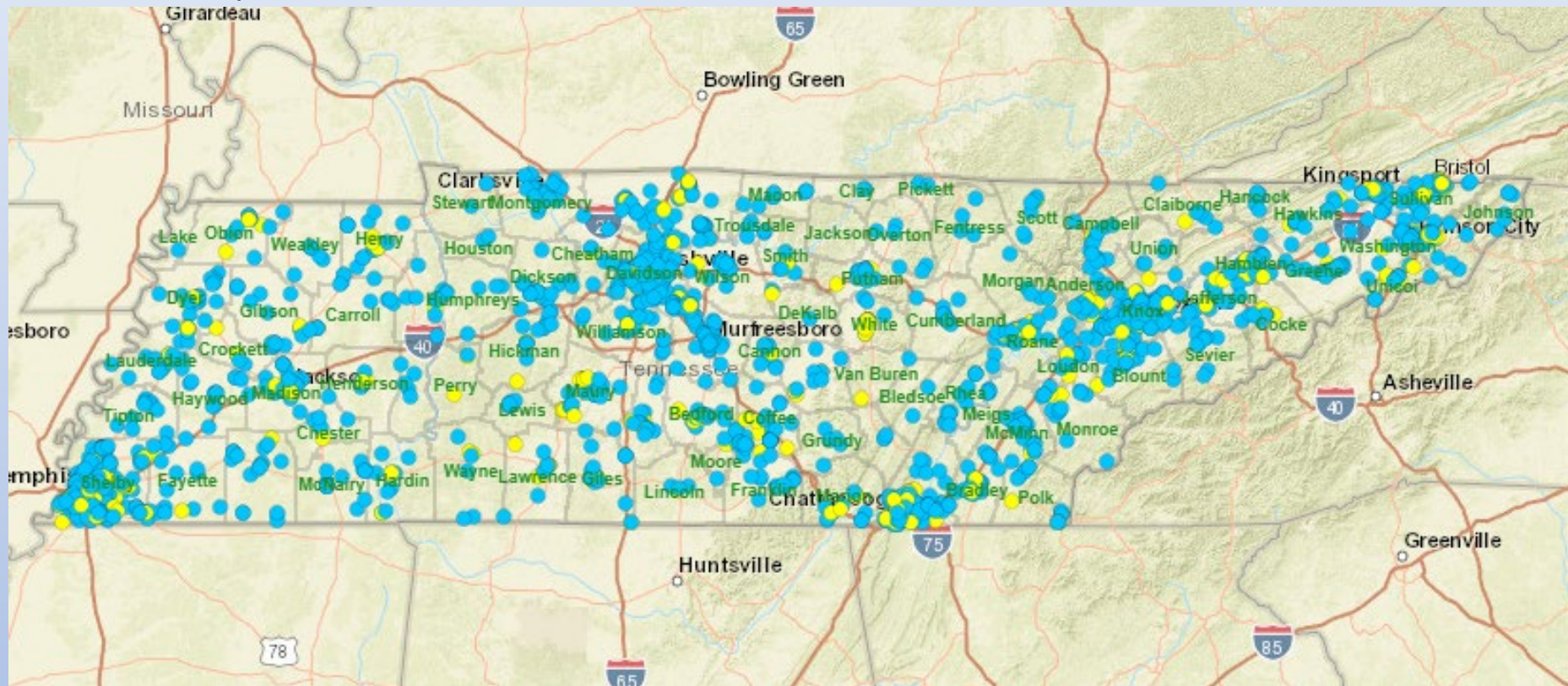
Tennessee Dept. of Environment and Conservation

# Division of Remediation

- The Division of Remediation identifies and investigates hazardous substance sites throughout the state.
- Use practical and effective remedies to stabilize, remediate, contain, monitor, and maintain these sites.
- These efforts minimize threats to public health, safety, and the environment.
- Hazardous Substance Cleanups in Tennessee
  - National Priority List Sites (National Superfund)
  - State Responsible Party Sites (State Superfund)
  - Dry Cleaner Environmental Response Program (DCERP)
  - VOAP/Brownfields
  - Oak Ridge Reservation

# Division of Remediation

- Hazardous Substance Cleanups in Tennessee
  - A total of 3,431 sites
  - 819 Open
  - 2,612 Closed



# VOAP Introduction

- Brownfield Projects Voluntary Cleanup Oversight and Assistance Program (VOAP) (TCA 68-212-224)
  - Established in 1994.
  - Voluntary Parties can enter into voluntary agreements for the investigation and/or remediation of brownfield sites or projects.
  - Upon completion of all terms and conditions of a voluntary agreement no further action will be required of the participant.
  - Became the predominant State program for addressing and developing impacted property and dealing with environmental liability.

# Brownfields Definition

**Brownfields** are abandoned or underused industrial or commercial properties where redevelopment may be complicated by real or perceived environmental contamination.

- Abandoned and former gas stations
- Former dry cleaners
- Former industrial facilities
- Legacy contamination of unknown origin

# VOAP Program

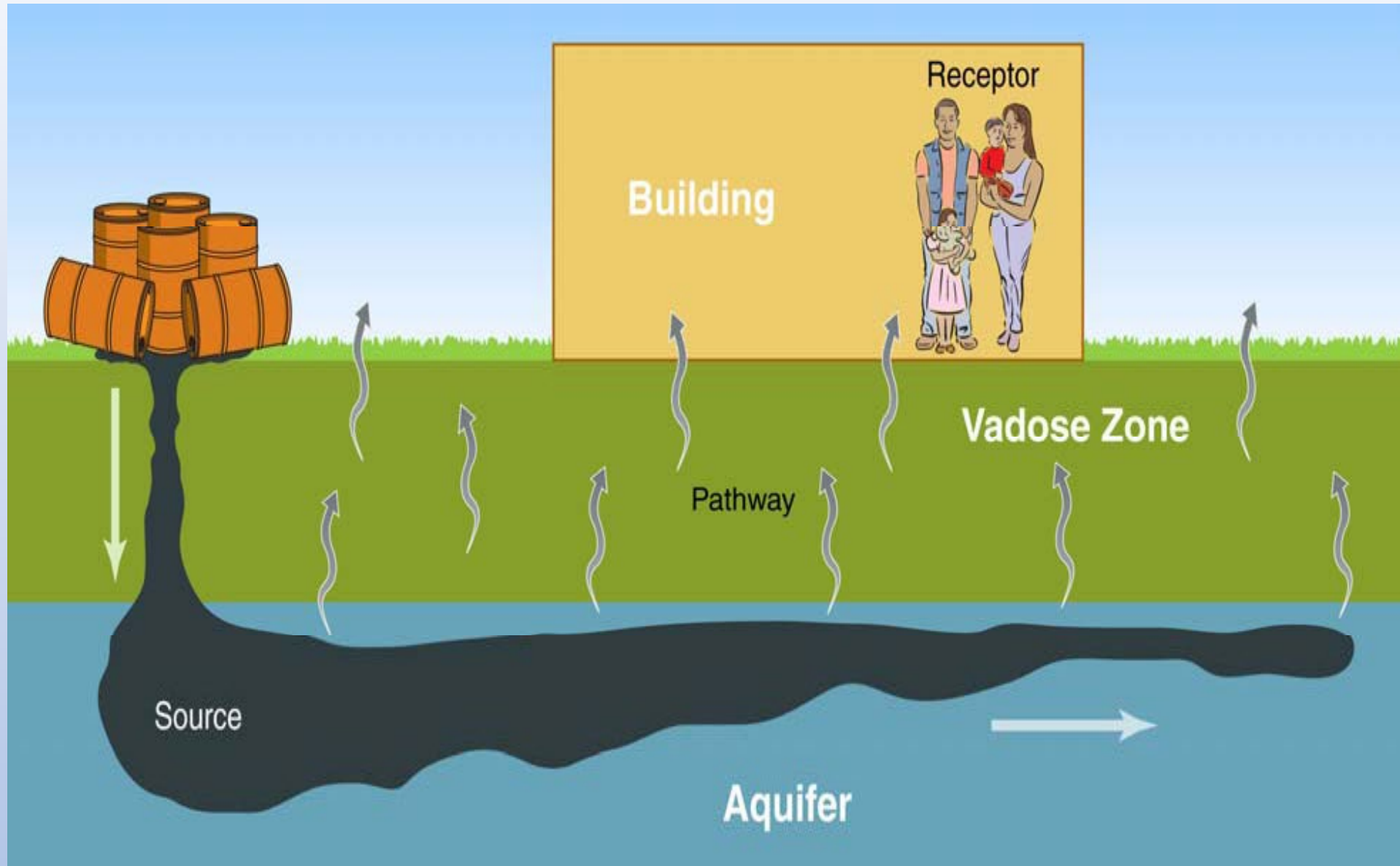
- As of May 2023, have 486 open VOAP sites active across the State
- Have closed 1,694 since program inception



# What is Vapor Intrusion?

- Vapor intrusion (VI) occurs when there is a migration of vapors from vapor-forming chemicals from any subsurface source into an overlying building.
- Vapor-forming chemicals may include:
  - Volatile organic compounds (VOCs), such as trichloroethylene and benzene
  - Select semi-volatile organic compounds, such as naphthalene
  - Elemental mercury
  - Some polychlorinated biphenyls and pesticides
- Chlorinated VOCs and petroleum related compounds (BTEX) most commonly encountered

# Generic Conceptual Site Model



Source: ITRC, 2007



# Collecting Indoor Air and Soil Gas Samples



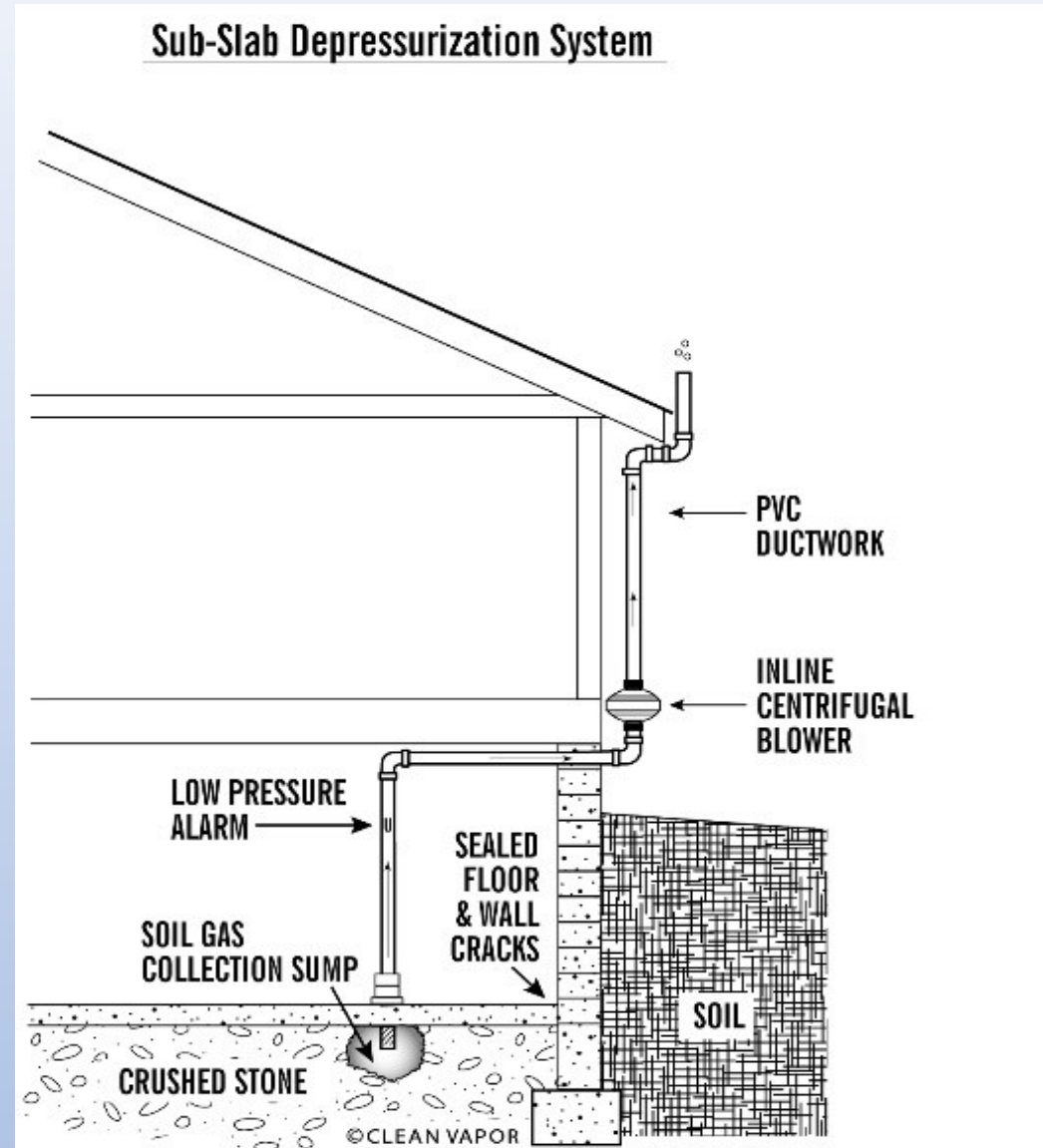
# Passive Samplers



# Passive Mitigation - Vapor Barrier in a Crawlspace



# Active Mitigation



# New Vapor Intrusion Guidance for the VOAP

- **Vapor Mitigation Guidance for Sites Enrolled in the Brownfield Projects Voluntary Cleanup, Oversight and Assistance Program (August 2022)**
- Why the VOAP Program?
  - Over 300 active VOAP sites across Tennessee
  - Brownfield Projects often are built on properties impacted by past use of VOCs
  - Vapor intrusion is the predominant risk pathway at most brownfield/VOAP sites

# Guidance Objectives

- Develop data-driven process for making mitigation decisions
- Process must be conducive to Brownfield redevelopment timelines
  - Streamlined process
  - Limited mobilizations, perhaps even just one
  - Data must be relatively easy to obtain
- Protect human health from vapor intrusion risks

# Key Concepts

- Soil gas data is used as the primary line of evidence to determine if a vapor mitigation system is required
- After a required system is installed, there will have to be a demonstration that it is working (Commissioning)
- Installed systems will function in perpetuity unless a demonstration can be made that they are no longer needed.

# Guidance Overview

Contains sections on:

- Scoping and Planning
- Sampling and Characterization
- Risk Analysis
- Vapor Intrusion Mitigation
- Post-Installation Performance Monitoring



# Sampling and Characterization

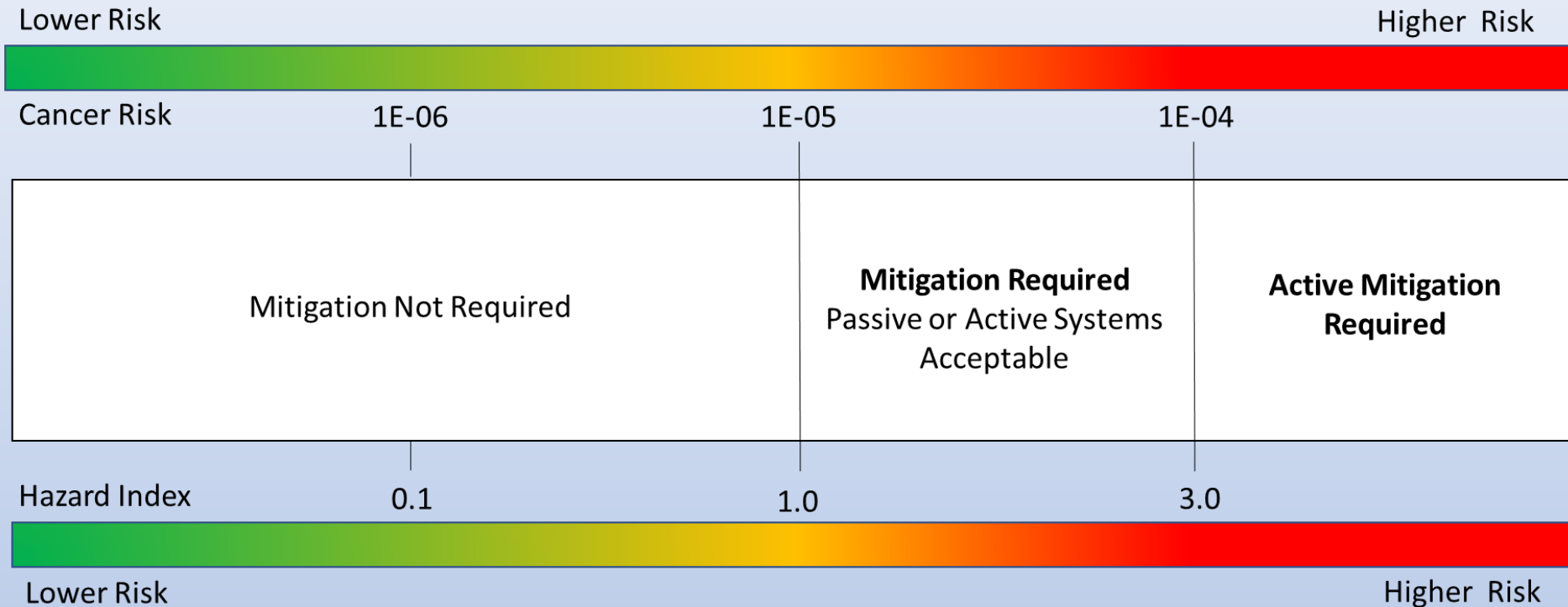
- Soil Gas – Sub-Slab or Exterior

**Table 3-1 Minimum Number of Sub-Slab Soil Gas (SSSG) Samples\***

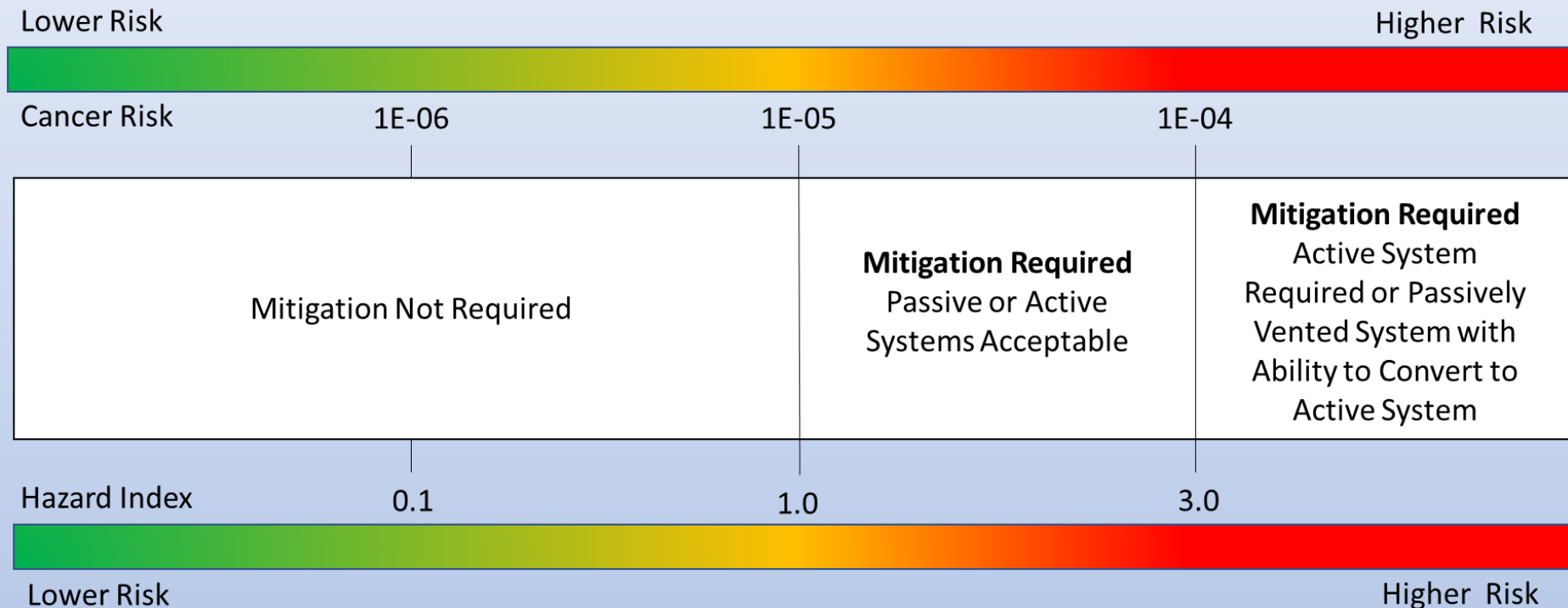
| <b>Square footage of building</b> | <b>Number of SSSG Samples</b>  |
|-----------------------------------|--|
| Up to 1,500                       | 2  |
| 1,501 to 3,000                    | 3  |
| 3,001 to 5,000                    | 4  |
| 5,001 to 10,000                   | 5  |
| 10,001 to 20,000                  | 6  |
| 20,001 to 100,000                 | One additional sample every 10,000 sq. ft.                                   |
| 100,001 to 250,000                | 14 minimum. One additional sample every 15,000 sq. ft. above 100,000 sq. ft. |
| 250,001 and greater               | 24 minimum. One additional sample every 18,000 sq. ft. above 250,000 sq. ft. |

(\*Note Table 3-1 is also basis for number of exterior soil gas samples in planned building footprint)

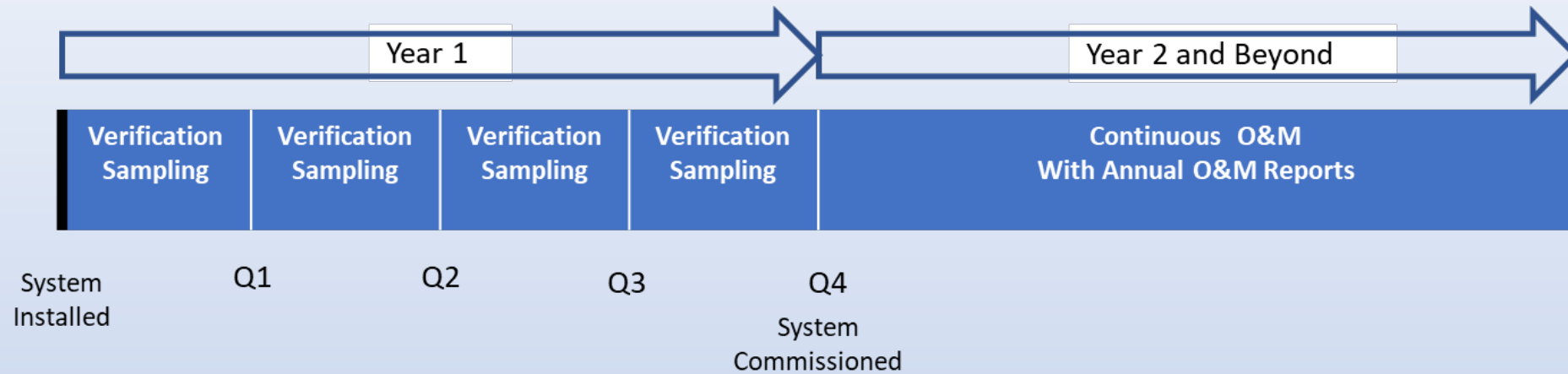
# Mitigation Criteria for Existing Buildings



# Mitigation Criteria for New Construction



# Indoor Air Verification Sampling



- Assumption is that mitigation will occur in perpetuity if source removal does not occur, however;
- Decommissioning can occur with TDEC approval based on a demonstration that conditions have changed and no longer pose an unacceptable risk

# Benefits of New Guidance

- Consistency Across the State
  - VI is now managed by project managers in a more consistent manner
  - Brownfield projects across the State have same degree of VI protectiveness
- Clarity on Data Needs
  - Data needed to address VI pathway at Brownfield sites is described
- Increased Transparency
  - All parties understand what to expect and understand DoR's decision process
- Provides an Efficient Process
  - Conducive to Brownfield redevelopment timelines

# Topics we are planning to work on...

- Additional Mitigation System Specifics on Discharge Points
  - Seeing evidence of short circuiting with active systems. Considering recommending that discharge points are extended higher than a foot above parapet and distance from any air intakes is increased > 10 ft.
- Confirmation Sampling – Alternatives to 4Qs of SUMMAs?
  - Issues with sampling 4 quarters of indoor samples w/ SUMMAs are recognized:
    - Disturb inhabitants
    - Indoor Air Background is vexing
- Decommissioning Guidance
  - Currently light on details. Working this out in a site-specific basis. Rebounding potential is key issue.
- Discuss situation where soil gas may not be relevant:
  - I.E., Soil gas in downtown Nashville when towers are being built with subsurface parking in bedrock



# In Conclusion...

## Contact Info:

- Ahmet Bulbulkaya
  - 615-532-0227
  - [Ahmet.Bulbulkaya@tn.gov](mailto:Ahmet.Bulbulkaya@tn.gov)
- Justin Meredith
  - 615-532-9304
  - [Justin.M.Meredith@tn.gov](mailto:Justin.M.Meredith@tn.gov)
- Guidance Available at:  
[www.tn.gov/content/dam/tn/environment/remediation/documents/vapor/rem-VOAP\\_VM\\_GUIDE.pdf](http://www.tn.gov/content/dam/tn/environment/remediation/documents/vapor/rem-VOAP_VM_GUIDE.pdf)