ENGINEERING CONSULTING SERVICES

VAPOR ENCROACHMENT AND DUE DILIGENCE

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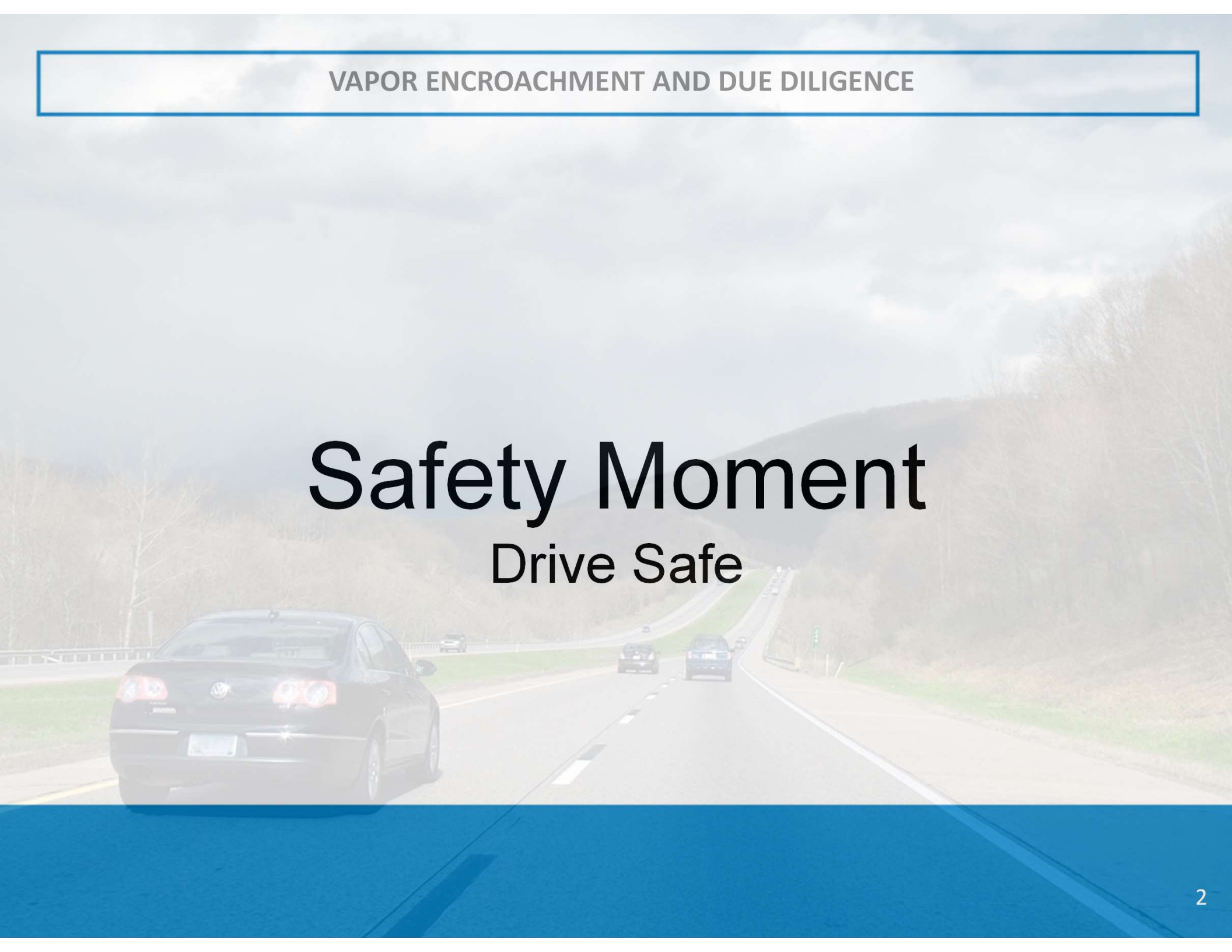

Safety Moment

Drive Safe

VAPOR ENCROACHMENT AND DUE DILIGENCE

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COURSE DESCRIPTION

A recent concern that has surfaced in environmental due diligence is vapor intrusion (VI) of harmful volatile compounds into existing or planned buildings as a result of contaminated soil or groundwater in close proximity to the property of interest. This course explores the ASTM Standard for evaluating properties with potential vapor encroachment (VE) and VI into the building environment, the potential legal and liability issues associated with these conditions, and how this evaluation process relates to environmental due diligence in real estate transactions for both raw land and improved property. Participants will learn contributing geologic and environmental factors affecting VE and VI, the potential mitigation strategies, and industry best-practices for screening and assessing sites for potential impacts and engineering solutions for mitigation of potential health hazards.

OBJECTIVES

- Discuss the ASTM Vapor Encroachment Standard and the steps needed to adequately evaluate a site for potential vapor contamination.
- Discuss how the vapor encroachment standard relates to the ASTM Phase I Environmental Site Assessment and how the study should be incorporated into the property due diligence process.
- Provide information on the legal and liability issues associated with vapor intrusion into buildings.

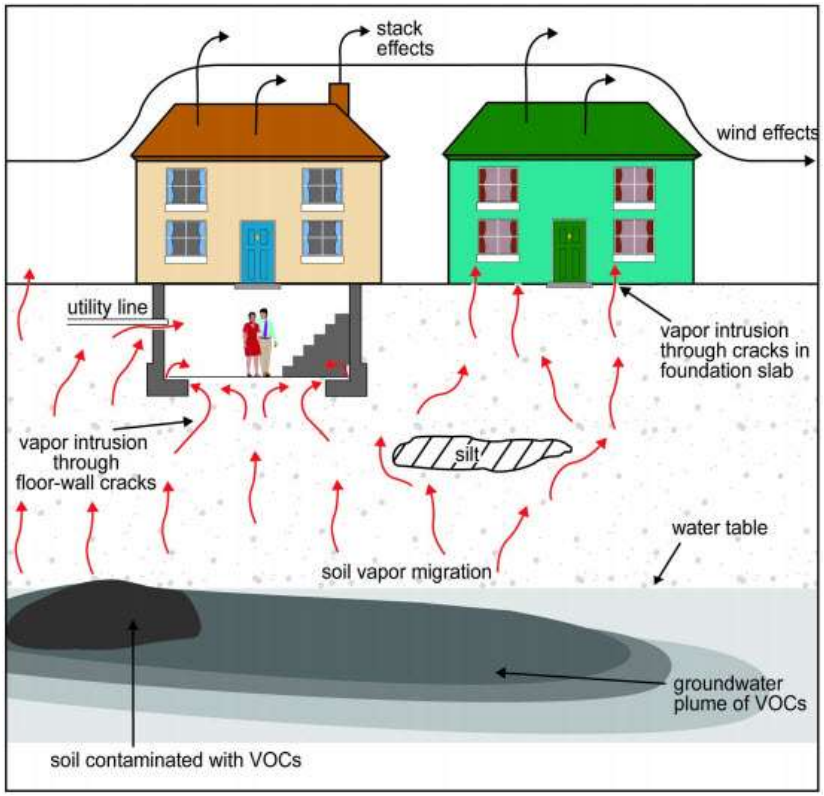
Definitions to remember:

- **COC** – Chemicals Of Concern – must be able to create vapors.
- **VES** – Vapor Encroachment Screening – process to assess COC vapors that may migrate to or near a property.
- **VEC** – Vapor Encroachment Condition - the presence or likely presence of COC vapors in the vadose zone (unsaturated zone) at a target property.
- **VI** – Vapor Intrusion – the act of COC vapors migrating into a building.

What Is Vapor Intrusion?

"Vapor intrusion occurs when there is a migration of vapor-forming chemicals from any subsurface source into an overlying building."

-EPA



VI CAN CAUSE LIABILITY CONCERNS…

Greenpoint Neighborhood - Brooklyn

- 17-30 million gal. released in 1950
- Lawsuits filed in 2005 for health effects of VI

OBJECTIVES

Discuss current practice in vapor encroachment screening and how it affects environmental due diligence

I Vapor Intrusion vs. Vapor Encroachment

II Tier I Screening

III Tier II Screening

IV Phase I ESA & Vapor Encroachment

V Vapor Encroachment and Due Diligence

ASTM VAPOR GUIDANCE GOALS

E2600-08 Standard Practice for the Assessment of Vapor Intrusion into Structures on Property Involved in Real Estate Transactions, March 2008

GOAL: "… good commercial practice for…a vapor intrusion assessment (VIA) on a property involved in a real estate transaction with respect to chemicals of concern (COC) that may migrate as vapors **into** existing or planned **structures** on a property…"

E2600-10 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions, June 2010 (2022 version now)

GOAL: "…provide practical guidance and a useful process for conducting a vapor encroachment screen (VES) on a property…involved in a real estate transaction…with respect to chemicals of concern (COC) that may migrate as vapors **onto** a **property** as a result of contaminated soil and groundwater…"

ASTM VAPOR GUIDANCE GOALS

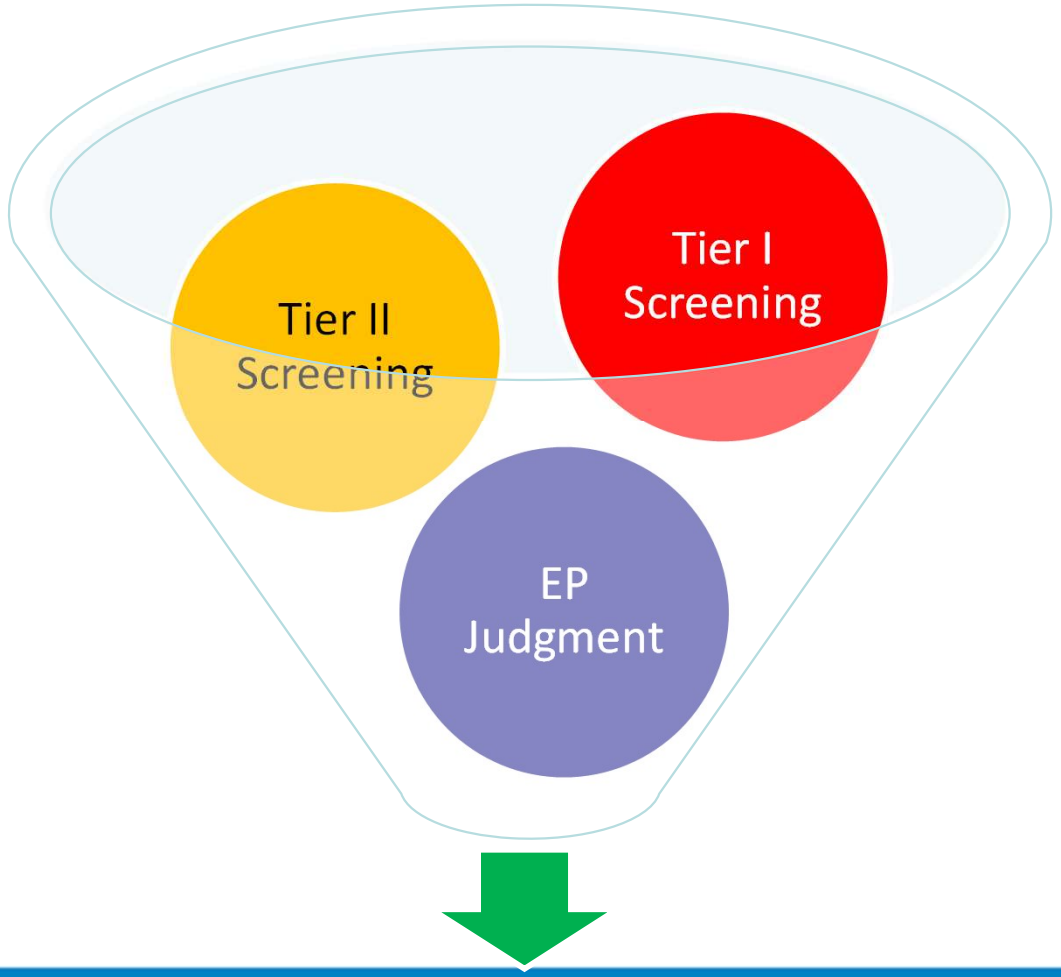
E2600-15 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions

GOAL: "… provide practical guidance and a useful process for conducting a vapor encroachment screen (VES) on a property…involved in a real estate transaction…with respect to chemicals of concern (COC) that may migrate as vapors **into the vadose zone of** a **property** as a result of contaminated soil and groundwater…"

E2600-22 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions

GOAL: "…provide practical guidance and a useful process for conducting a vapor encroachment screen (VES) on a property…involved in a real estate transaction…with respect to chemicals of concern (COC) that may migrate as vapors **into the vadose zone of** a **property** as a result of contaminated soil and groundwater…"

VES PROCESS

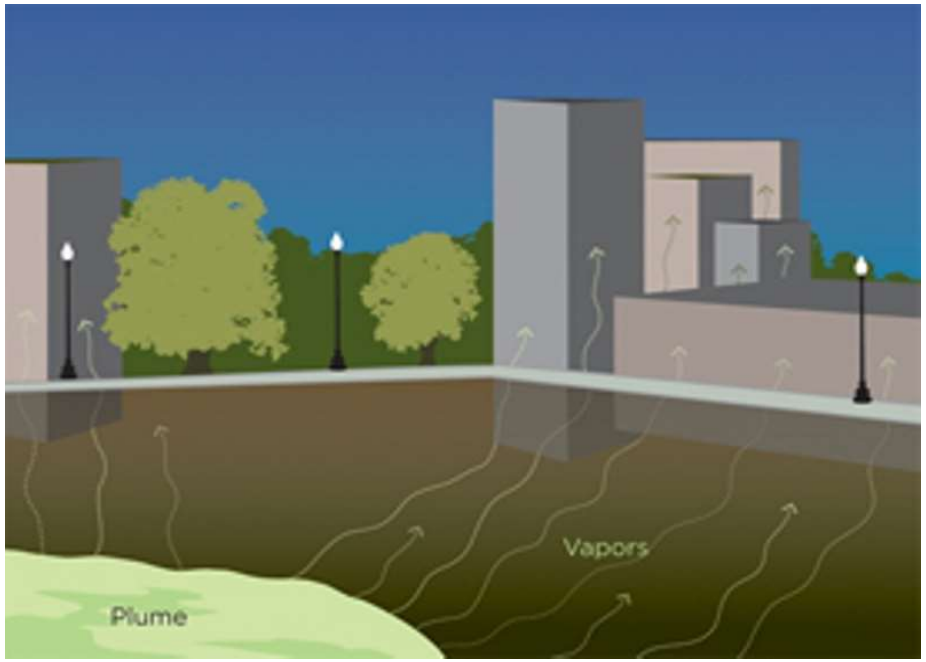


Does a VEC Exist at the Subject Property?

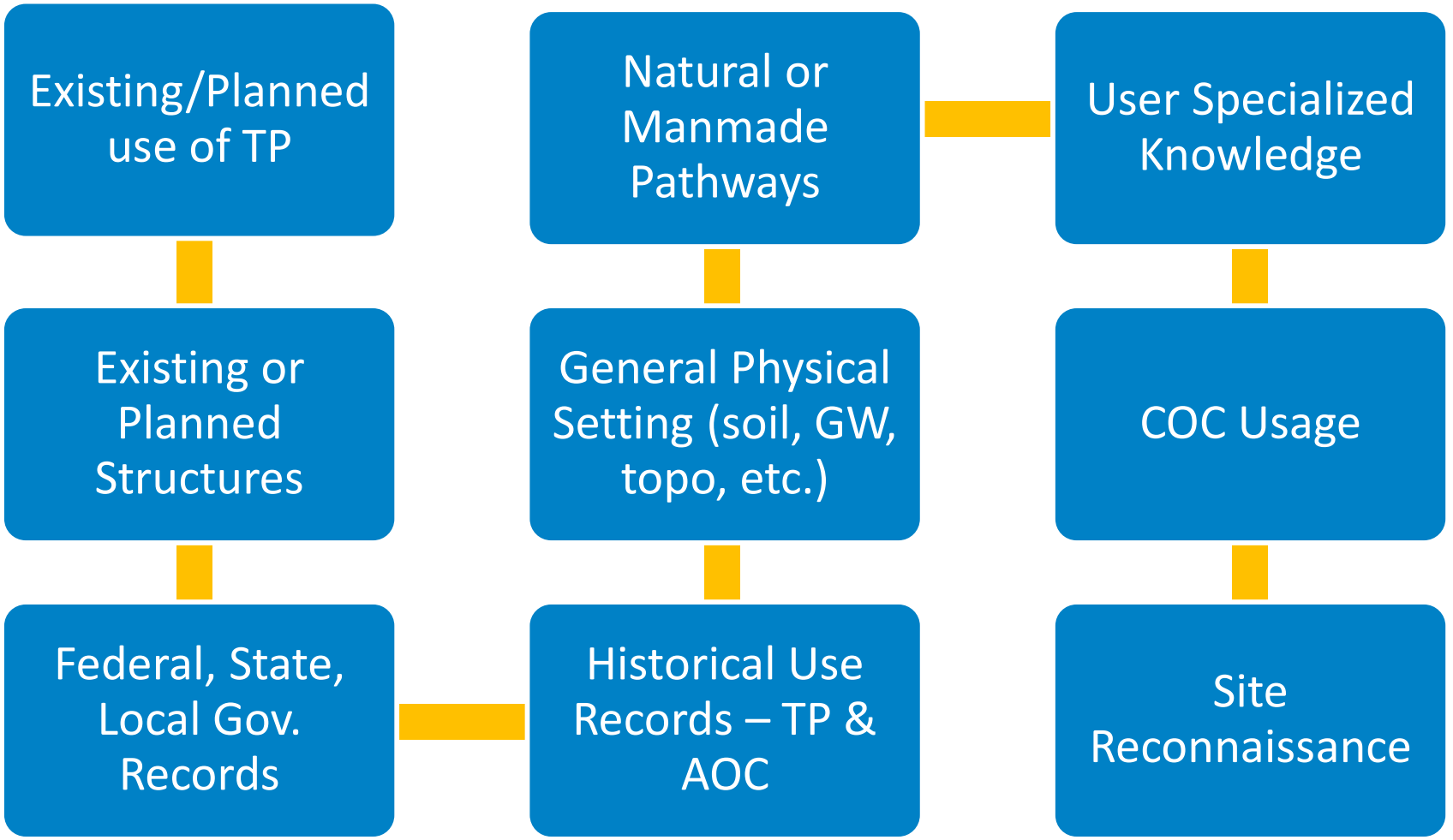
TIER I SCREENING

Uses Phase I ESA-type information to evaluate whether a VEC exists at a property.

Phase I ESA → Used to decide if Tier II needed



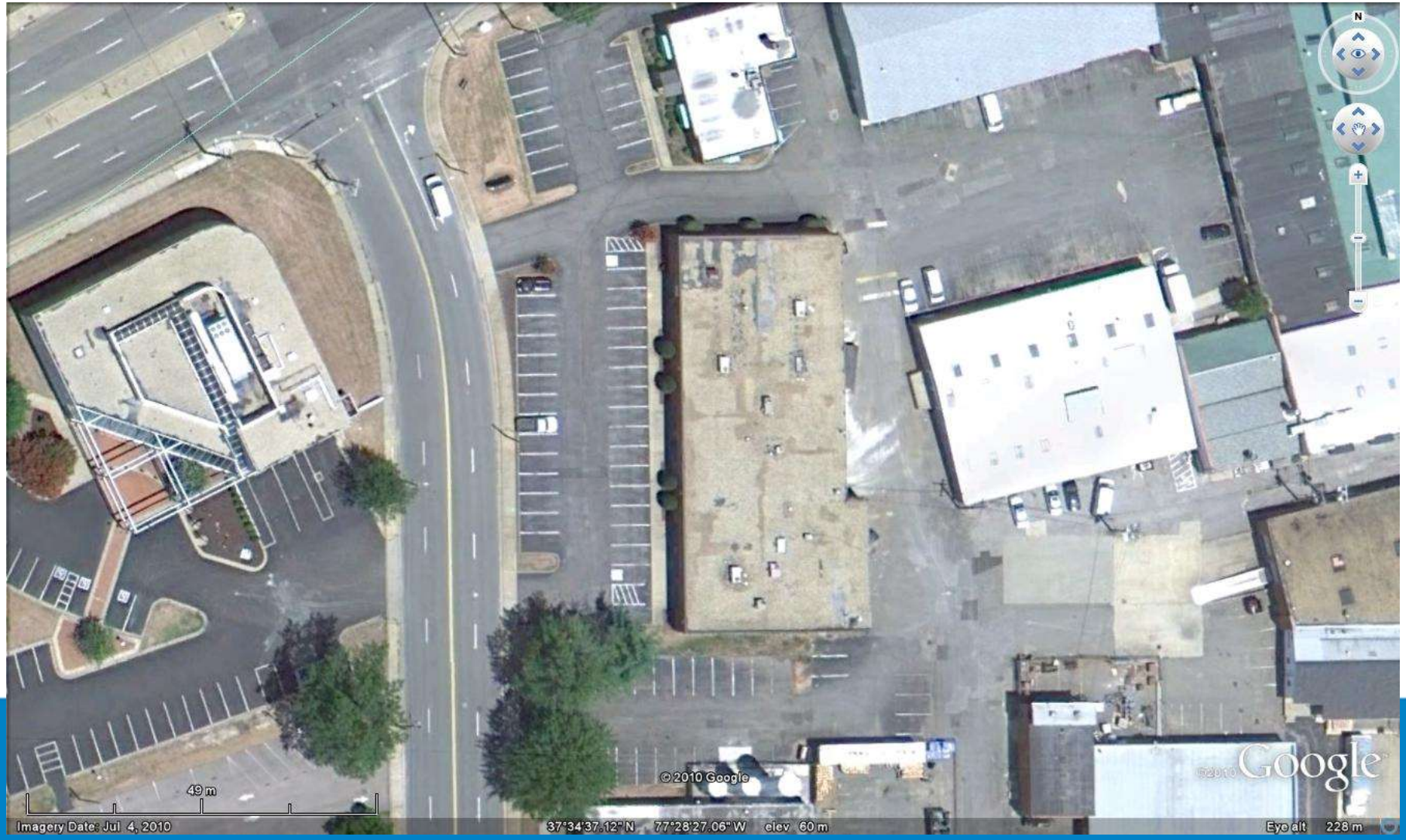
INFORMATION USED IN TIER I SCREENING



Is a potentially contaminated property located within the Area of Concern?

AREA OF CONCERN (AOC)

1/3 of a mile for COCs; 1/10 of a mile for petro. chemicals



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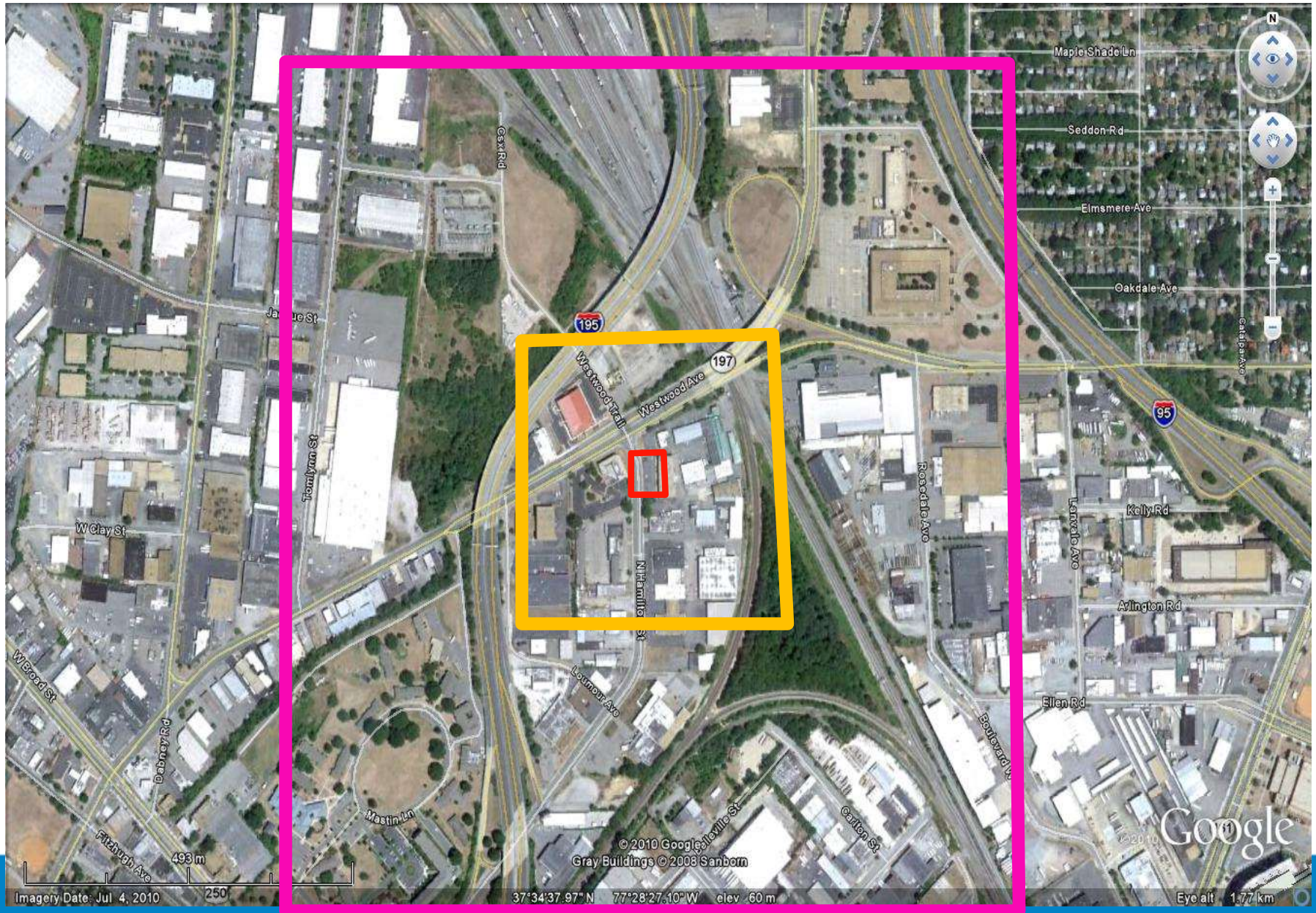
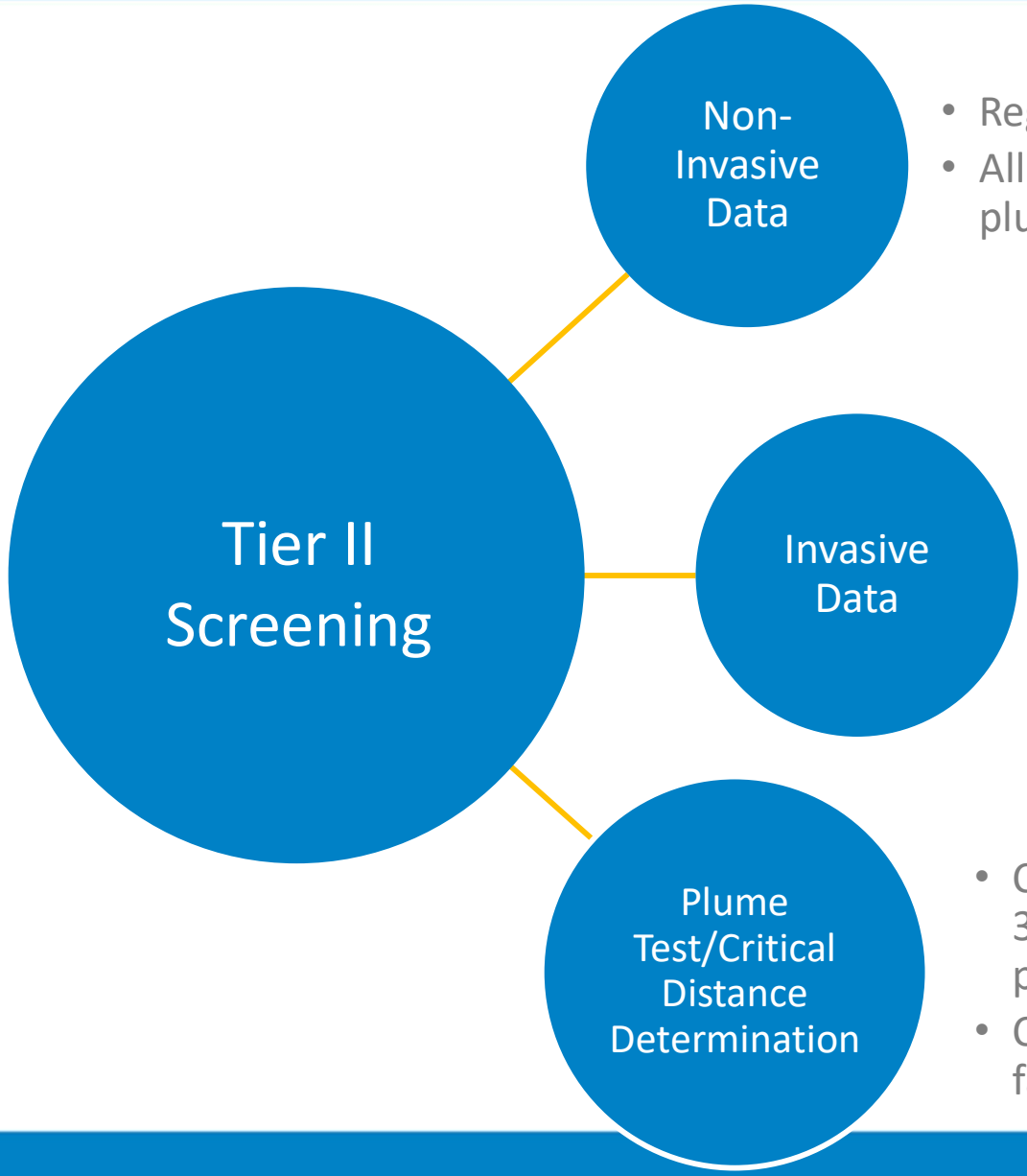


IF A CONTAMINATED PROPERTY IS LOCATED WITHIN AOC, EP SHOULD CONSIDER…

- Can AOC be reduced/altered? (GW flow – not definitive)
- Use of the TP – residential vs. industrial
- Type of COC – VOCs vs. SVOCs
- Location of contaminated property relative to TP
- Soil characteristics – grain size, moisture content, etc.
- Depth to GW
- Vapor conduits – utilities, karst terrain
- Cleanup status of properties

Consult with User to determine if Tier II necessary.

VAPOR ENCROACHMENT AND DUE DILIGENCE



- Regulatory file review
- Allows application of the plume test

- If regulatory files not available or if preferential pathways present
- Involves soil, GW or soil gas sampling

- Critical Distance: 100’ for COCs; 30’ for petro (100’ for free phase)
- Can be altered by EP (site factors, regulatory req’ts, etc.)

SHOULD VES BE INCLUDED IN PHASE I ESAS?

REC Definition (ASTM E1527-21 Standard):

"(1) the presence of hazardous substances or petroleum products in, on, or at a property due to a release to the environment; (2) the likely presence of hazardous substances or petroleum products in, on, or at the subject property due to a release or likely release to the environment; or (3)the presence of hazardous substances or petroleum products in, on, or at the subject property under conditions that pose a material threat of a future release to the environment.

Release Definition – a release of any hazardous substance or petroleum product shall have the same meaning as the definition of "release" in CERCLA 42 U.S.C. § 9601(22) Per CERCLA, the term "release" means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment…..

PH I STANDARD ALSO SAYS…

- we must use "…good commercial and customary practice in… conducting an environmental site assessment… with respect to the range of contaminants within the scope of CERCLA…"

Is not addressing VE at a site that may have a VEC not considered good commercial and customary practice?

- **Answer: YES**

Don't want to be in the situation to find out

IS A VEC A REC?

ANSWER: MAYBE

REC can only be determined in Phase I ESA

- If conducting a standalone VES, can only identify VEC

Is the VEC a *de minimis* condition?

- Does vapor pose a threat to human health or the environment?
- Regulatory enforcement triggers?

Situations where VECs may not be RECs…

- Depth to impacted GW greater than critical distance
- Distance from plume to nearest structure greater than critical distance
- GW concentration is below applicable regulatory screening level

VAPOR ENCROACHMENT SCREENS AND DUE DILIGENCE

How should we address vapor during the due diligence process & how does it affect development?

- Incorporate into our Ph I ESAs?
- Extra time needed?
- Pricing?
- Mitigation costs?
- Change property values?
- Future liability issues?

Summary

- We should evaluate vapor during the due diligence phase
- Mitigation is generally easy and inexpensive relative to potential liability
- Make decision pre-construction if possible
- Property you own may be impacted by recent or future release

Vapor Intrusion Mitigation Systems

When Is Vapor Intrusion Mitigation Needed?

When vapors from various sources have concentrations that exceed:

- Established Vapor Intrusion Screening Levels for VOCs and SVOCs
- Pose an explosive hazard such as concentration of methane between approximately 5% and 15%
- Above EPA established concentrations of radon (4 pCi/L)

What are the Sources of Vapor?

- VOCs/SVOCs (Petroleum/Solvents) – Due to releases from gasoline stations, dry cleaners, automotive repair shops
- Methane – From landfills
- Radon – Naturally occurring

Sampling Methods

Exterior

Sub-slab

Interior

Soil Gas Testing

Soil Gas Testing

Components of a Vapor Intrusion Mitigation System

- Sub-Slab Gravel Plenum
- Sub-Slab Collection Piping
- Sub-Slab Barrier
- Vent Risers & Exhaust – Passive/Active

Sub-Slab Gravel Plenum & Collection Piping

Sub-Slab Gravel Plenum & Collection Piping

Sub-Slab Gravel Plenum & Collection Piping

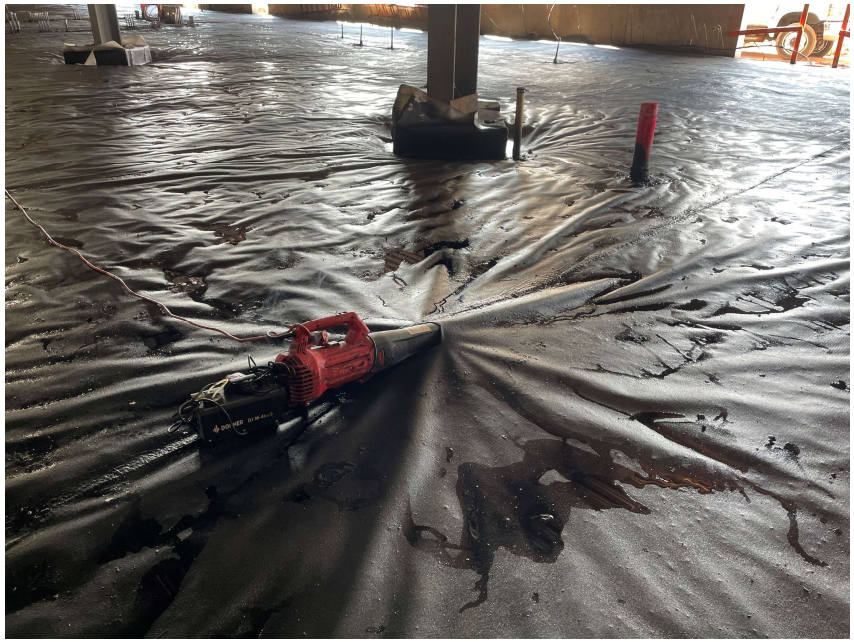
Vapor Barriers

Constituent	Recommended Minimum Barrier Thickness
Radon	6-mil
VOCs	30-mil
Methane	15-mil

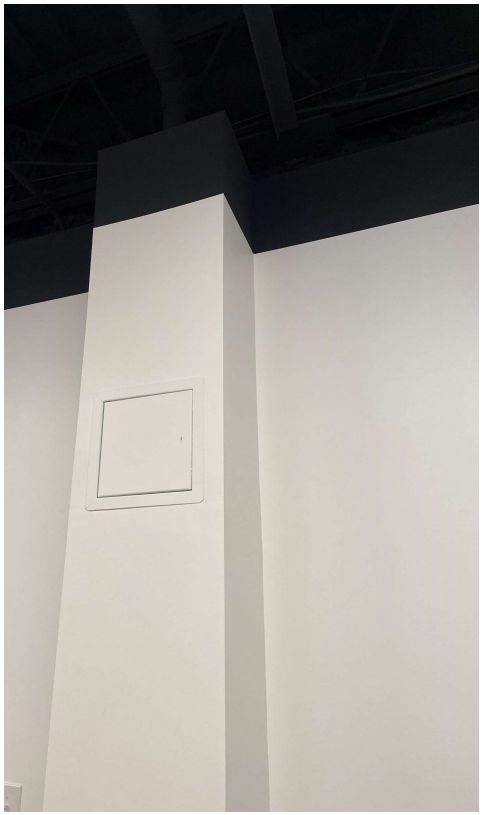
Vapor Barriers

Vapor Barriers – Penetrations

Vapor Barriers – Smoke Testing



Vent Risers



Exhaust

Exhaust

Costs

- Site Assessment to Obtain Data – estimate $10,000-$15,000 (varies depending on site)
- VIMS Design – estimate $10,000
- VIMS Materials & Installation Cost – estimate $5-$10 per square foot
- Recommended Installation Observations & Documentation – estimate $15,000 (dependent on size of building)
- Post-Installation/Pre-Occupancy Testing (verification system is working effectively) – estimate $15,000-$20,000 (dependent on size of building)

ANY QUESTIONS?

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