Soil Gas in Indiana

A Regulator's Perspective

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October 30, 2023

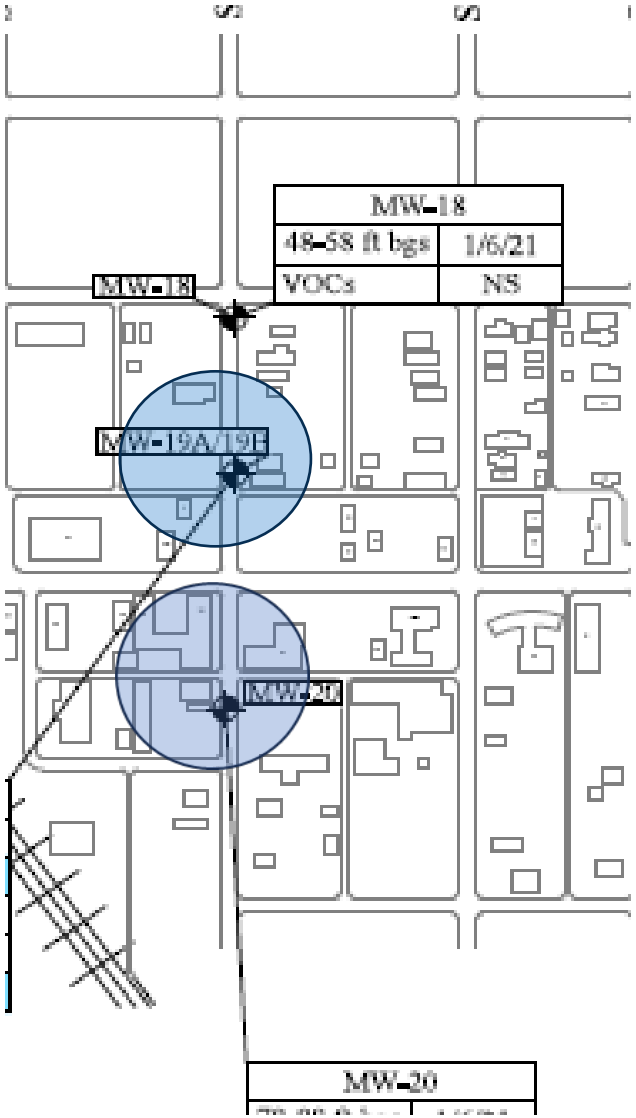
Presentation Outline

- Summarize Indiana's old guidance
- Summarize problems with the old guidance
- Summarize changes
- Talk about where Indiana is headed
- Hope for the future

Vapor Investigations- the way we were.

- Remediation Closure Guide- March 2012
- Groundwater vapor sources relied on Vapor Intrusion Groundwater Screening Levels (VIGWSLs)
- Soil sources were case by case basis
- Previously, exterior soil vapor was sampled when couldn't get access or when sewer backfill was thought to be an issue.
  - But mostly it wasn't.
  - Paired sub-slab sampling

Receptor Evaluation



- Map your wells with a VIGWSL exceedance
- Draw 100 ft buffer
- Investigate structures within the buffer zone via paired sampling

The way we were

- Soil sources were case by case basis
- Most of the ‘soil’ sources we investigated were under buildings
- Exterior soil gas was sampled mostly when couldn’t get access.

Scattered Pictures of Soil Gas

- Subslab/ Indoor Air when access is granted
- Soil Gas used when we access is denied
- Becomes receptor based soil gas plume delineation
  - Exterior soil gas does not necessarily equate to soil gas sub slab.
  - Most soil gas sampling was shallow to mimic building foundation

What's wrong with that?

- VIGWSL are not terribly predictive
  - Low groundwater concentrations in sandy South Bend vs high groundwater concentrations in clay formation
- Problems with soil gas sampling as a last resort
  - Shallow soil gas to mimic building foundation is not 'worst case'
    - Deep soil gas (> 5 ft bgs) is less variable
  - Not a complete picture of potentially mobile contamination at the site.
- Missed other sources because VIGWSL had a **number** so it was easier to focus on groundwater sources
  - Sewers
  - Many soil sources likely missed
- Mitigating risk- but not really cognizant of totality of vapor plumes

Missing soil sources of vapor

What's wrong with that: Indiana Statute requires risk and delineation

- Statute requires considering risk-based remedies
  - IC 13-25-5-8.5 VRP Statute
    - 13-12-3-2 extends to other programs
  - Statute requires reduction of risk to a level acceptable for the intended use of the property.
    - Must consider controls
  - Statute does not necessarily require a cleanup
    - Closure often occurs with successful exposure mitigation that reduces risk to an acceptable level
- But IC 13-25-5-7 states the nature and extent of contamination must be adequately characterized before selecting a remedy
  - Treat vapor like any other medium

Where we're headed
Soil gas delineation based on source

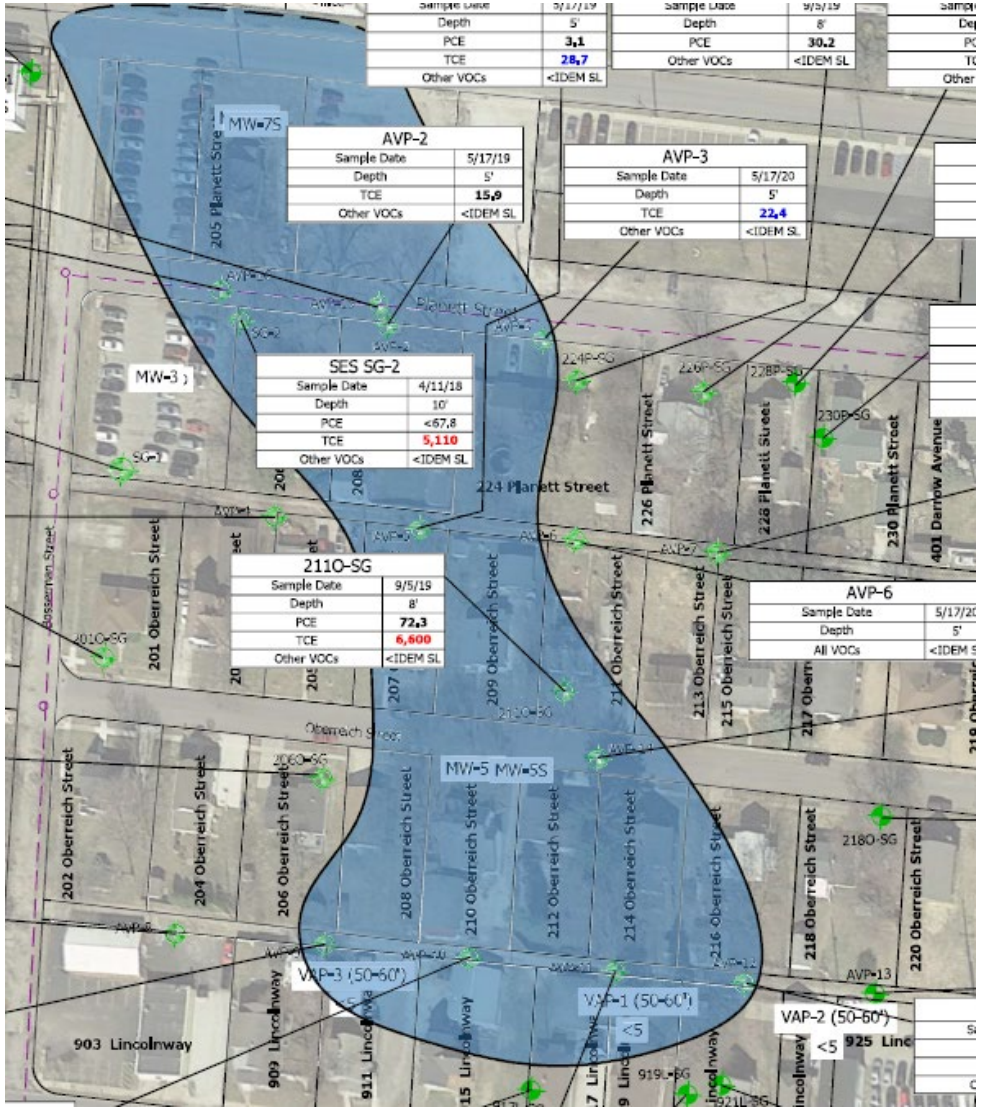
- Groundwater- sample soil gas near the source i.e. at the GW interface
  - Worst case scenario
  - If GW depth allows, also take a more shallow sample if you wish to demonstrate that attenuation is occurring
  - Continue delineating soil vapor laterally until no longer above soil vapor screening level
- Soil sources
  - Sample soil gas in areas of soil contamination
    - Areas around drains, storage areas, other soil contamination, under slabs etc.
  - Continue until no longer above soil gas screening level
- Initially at least three samples per source area and ANY exceedance of an unconditional soil vapor published level requires delineation of soil gas plume and investigating exposure to potential receptors

Soil gas published level based on indoor air with an attenuation factor applied.

Table 3-A: Vapor Attenuation Factors

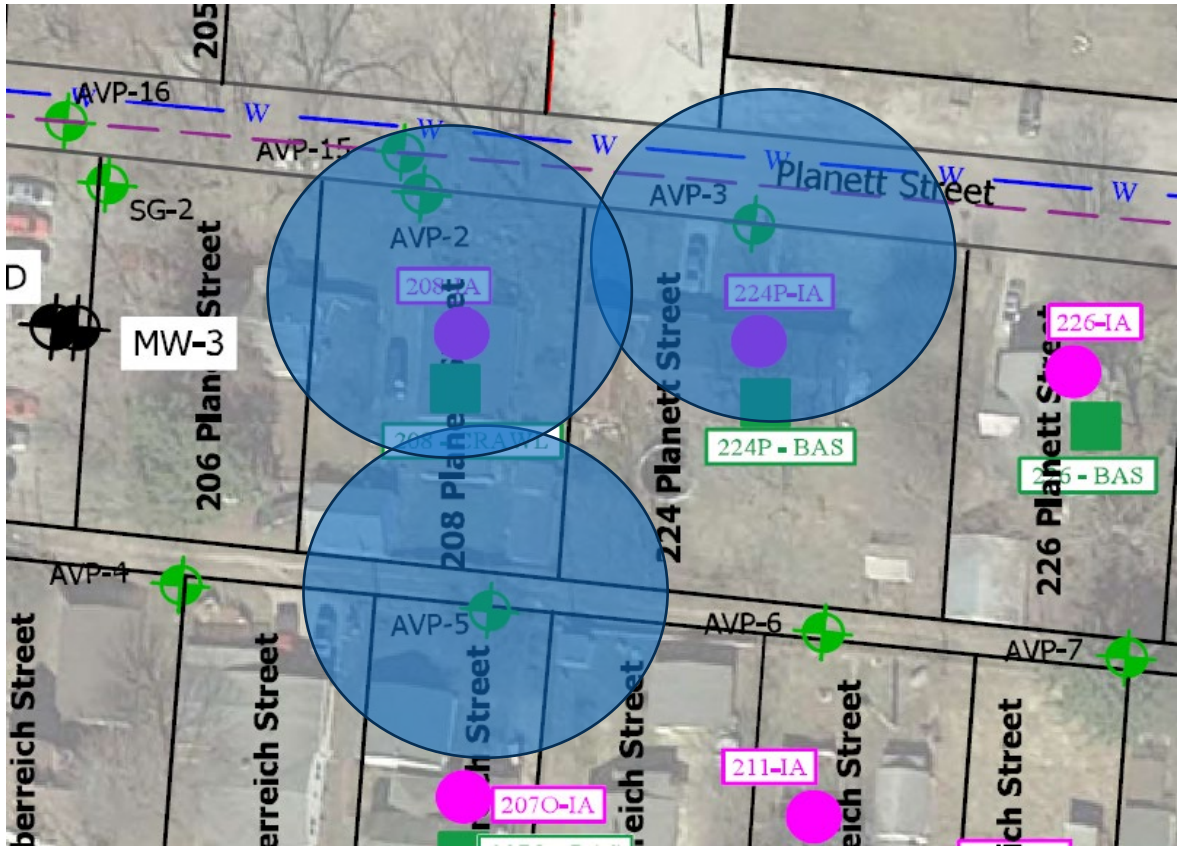
Medium	Building Type	Attenuation Factor	Suitable for:
Subslab soil gas	Residential or Commercial	0.03	Vapor remedy determination
	Large Commercial	0.003	
Soil gas exterior - shallow	Residential or Commercial	0.1	Delineation; investigation of indoor air in nearby structures; vapor remedy determination
	Large Commercial	0.01	
Soil gas exterior – deep	Residential or Commercial	0.03	
	Large Commercial	0.003	
Conduit vapor*	Residential or Commercial	0.03	
Crawl space air	Residential or Commercial or Large Building	1	Vapor remedy determination

Beautiful delineated soil gas plume



- If vapor source locations are known, collect three soil gas samples as close to the source as possible.
  - Sample at groundwater interface for groundwater sources
  - Around drains, storage areas, back door, areas of fill etc. for soil sources
- Map your plume (s).

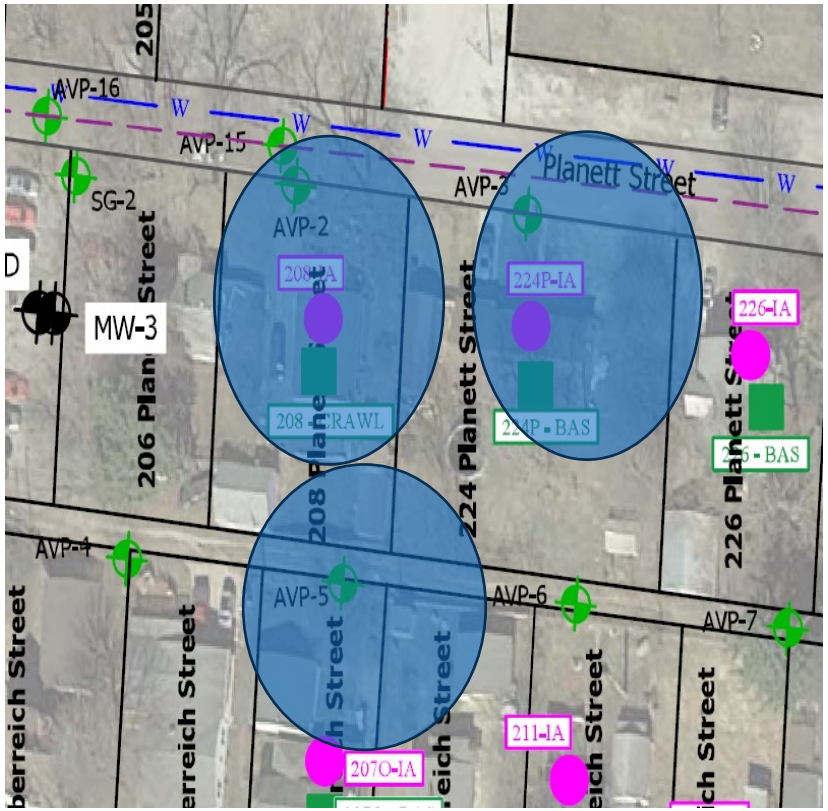
Receptor Evaluation



- Now the 100 ft buffer applies to the soil gas screening level exceedances.

End Result Looks Remarkably the Same

So why bother?



So- why bother if end result looks the same?

- Statute requires delineation before determining remedy.
  - Delineation by receptor evaluation doesn't meet our goal
- Now incorporating 'worst case' into decision making process for GW
  - Important for future risk evaluation
  - Soil gas gives clearer picture of severity of the problem
- Increased the focus on soil sources
- Easier to explain decision making to the public with a clearer picture of the issue
- Mapped soil gas plume helps decision making in areas with low access
  - Mapped soil gas is a stronger line of evidence instead of just a stop gap last resort.
- Leads more easily to 'soil gas' protective clean ups instead of groundwater or soil cleanups to fix the soil gas
  - Confirmatory sampling would be the soil gas- not the receptor & not the source

Pitfalls

- $oil gas $amples are in addition to groundwater samples
- Soil gas is often considered more variable
- Change is hard and slow

How's it working?

Change is slow, hard and also comes with a lot of questions

Why did you eliminate groundwater as a VI pathway

Can I still use the VIGWSL ?

What is near source

How do I investigate VI for groundwater

When do I need to take a sample?

How's it working?

- EPA immediately asked "why are you getting rid of groundwater to indoor air pathway?"
  - Folks love a number- now the number is gone
    - But the pathway remains
  - Expressed concern about high-risk receptor evaluation timing (next slide)
  - EPA has been great to work with.

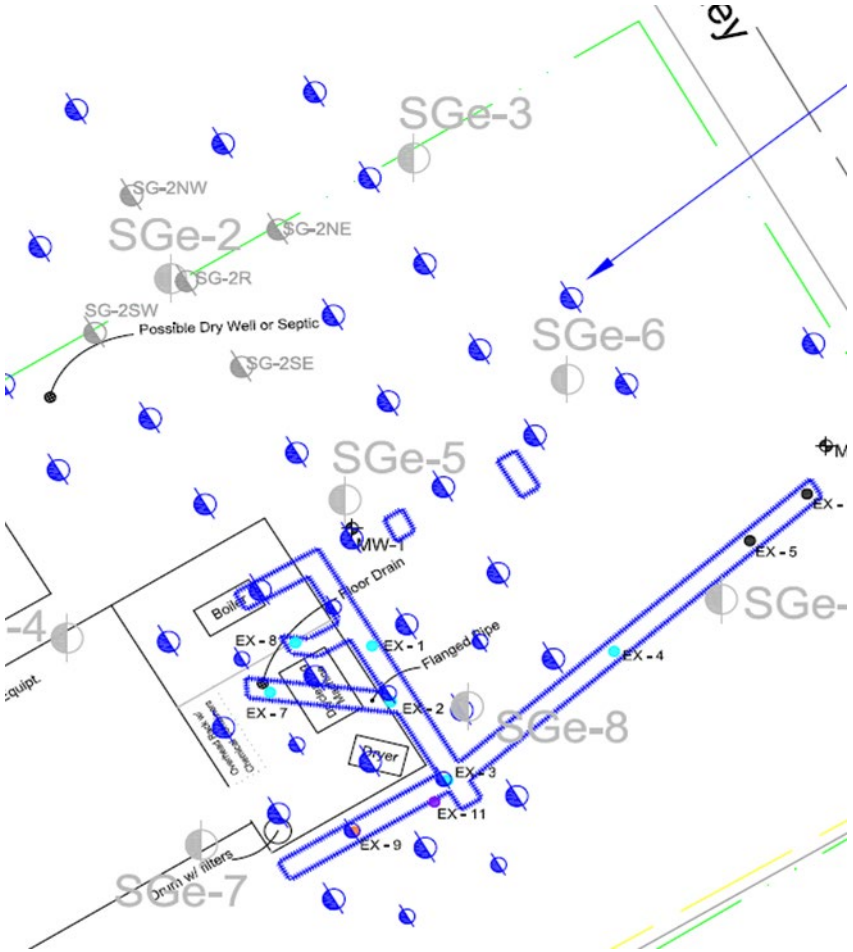
Immediate Action Worries

- Perception that delineation will cause delays in mitigation.
- Nothing prevents jumping to receptors during delineation.
  - Guidance states tasks do not need to be performed in order
  - Receptors evaluation and delineation can be performed simultaneously
- There is confusion between delineation and receptor evaluation.
  - They are now different.

How's it working?

- Still confusion on what is 'near source' particularly with groundwater.
  - At the groundwater interface is near source for groundwater.
  - Near source is considered worst case for the groundwater to indoor air pathway
- Still see most soil gas sampling in the right of way
  - Need lines of evidence that the 'right of way' is similar to areas that are 'not the right of way'
- Change is slow

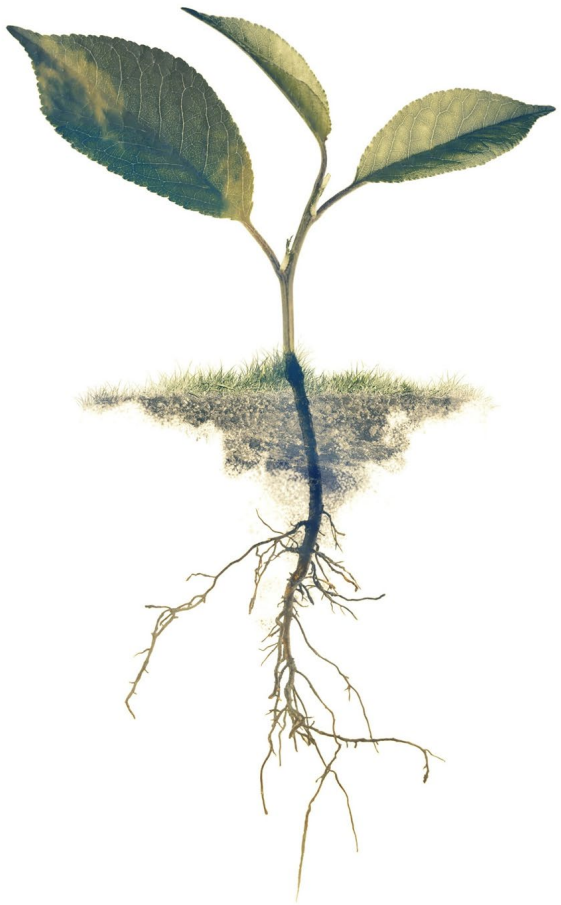
How's it working? How many samples is enough?



- 48 samples on ten foot spacing
- Others proposing far fewer
- Simultaneously investigating soil source and vapor plume
  - Spacing was used to determine hot spots for soil excavation

Hope for the future

- Hopefully more data is helpful
  - In combination with other guidance changes that more clearly outline sewer vapor investigations, new guidance should help in determining workable comprehensive solutions
- May be possible to delineate soil gas to the extent that alternative mitigation such as an area wide SVE might be effective and could be documented if necessary
  - We've seen some of these proposed
- Knowing what the soil gas plume looks like prior to remediation will help in determining vapor remediation performance metrics and success.



Conclusion

- We are no loner publishing VIGWSLS and are in the learning phase of soil gas delineation
- We’re seeing some slow but useful changes in submittals
- We have high hopes for health protective long term solutions that are also clearly explainable to the public and as cost effective as possible.

Thank you.

Visit **on.in.gov/survey** or scan the QR code to provide feedback.

We appreciate your input!