



# BLDI

Environmental Engineering

**Environmental Forensics: All Data is NOT Created Equal**

**Richard Spehar, PE and Joseph Berlin, PE, CP**

Detroit, MI

Grand Rapids, MI

Cincinnati, OH

# The Focus: Soil Sampling for VOCs

## Data Usage

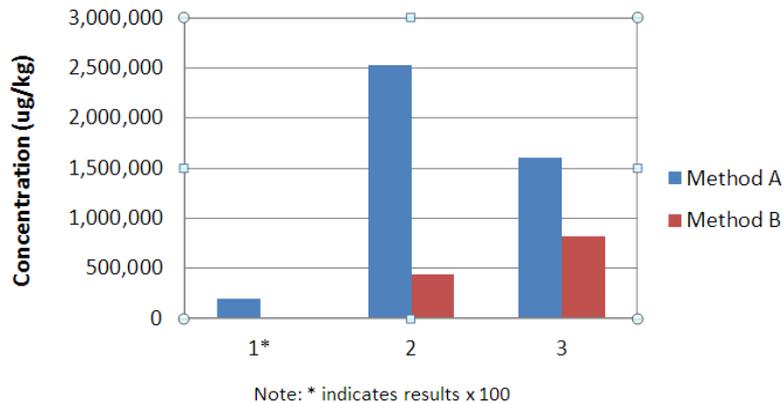
- Phase II ESAs
- Vapor Screening
- Site Characterization (RI/FS/CAP)
- Verify Cleanup
- Risk Assessment
- Environmental Insurance Underwriting/Claims
- Allocation/Segregation

# Data Validity - Historical

- Pre-5035 Soil Sampling (Bulk)
- Numerous studies found significant losses pre-5035
- Other sources of losses
- How much does it really matter?

1. Background
2. THE Problem
3. VOC Sampling
4. The Question
5. VOC Losses
6. Big Deal or Not
7. Consider
8. Closing

Plot of Data Set 1: BTEX + TMBs



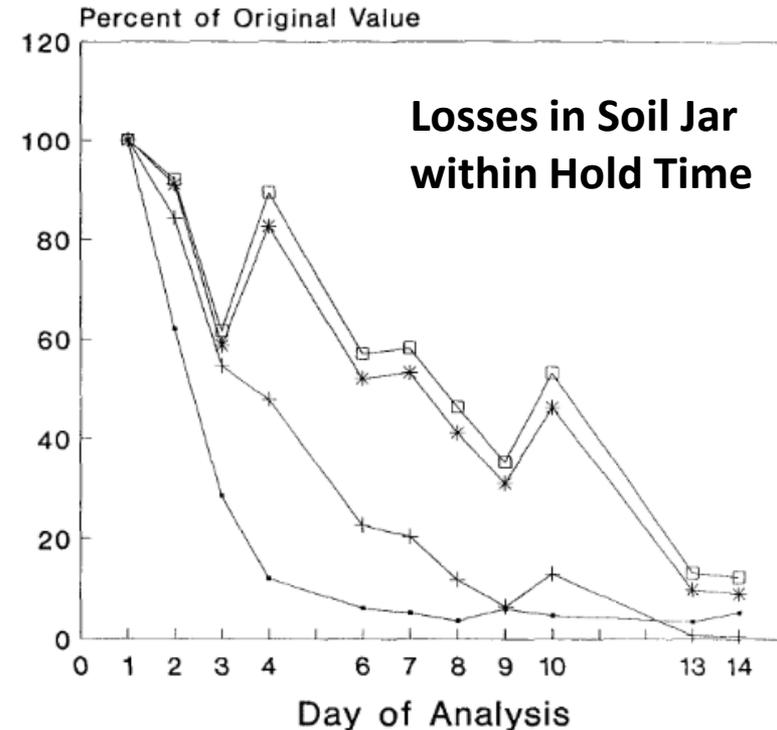
Note: \* indicates results x 100



# VOC Soil Sampling Practice

1. Background
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- USEPA
- Ohio
- ASTM
- Other



- 4.4 Preserve and containerize laboratory samples as soon as possible. Steps should be taken to minimize headspace screening, handling, or other manipulation of samples collected for laboratory analysis prior to sample preservation or containerization. For example, don't submit material from headspace screening for laboratory analysis, and don't allow soil cores to sit for an extended period prior to containerizing the sample.

# Sample Results - Variance Factors

## Common Industry Understanding

- Spatial
- Heterogeneity
- Temporal

## How about Consultant-specific?

- Sampling method
  - (Bulk/5035/Method B)
- Sample integrity
- Temperature

1. Background
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Sampling
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# Data Validity – Loss of VOCs

1. Background
2. **THE Problem**
3. VOC  
Sampling
4. The Question
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6. Big Deal or  
Not
7. Consider
8. Closing

- **Core Sleeve**
- **Disaggregation of Sample**
- **Use of Headspace Sample**
- **Temperature**
- **Sample Container Seals**
- **Lab Subsampling**
- **Biodegradation**
- **Extract/Analysis late in Hold Time**

1. Background
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# THE Problem - Observations on a Trend?

**Does the collection of the VOC  
5035 sample aliquot from a  
plastic baggie have a  
demonstrable difference on VOC  
laboratory results?**

**And, if so, what percentage of  
investigations use this method?**

# Proper VOC Soil Sampling (Method "A")

1. Background
2. THE Problem
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Sampling
4. The Question
5. VOC Losses
6. Big Deal or  
Not
7. Consider
8. Closing

- Open Core/Access Soil
- Scan (visual, olfactory, PID)
- Collect VOC Sample (5035)
- Collect Soil jar, Field Screen



1. Background
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# Method "A"



# Other VOC Sampling (Method "B")

- Entire Sample aliquot goes into baggie or other container
- Heat/agitate and screen aliquot
- **THEN** collect VOC sample (5035)
- **NOT** uncommon technique (12-40%)

1. Background
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6. Big Deal or Not
7. Consider
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1. The Problem
2. Background & Guidance
3. THE Question
4. VOC Sampling
5. Research
6. Big Deal or Not
7. Case 1
8. Status & Summary



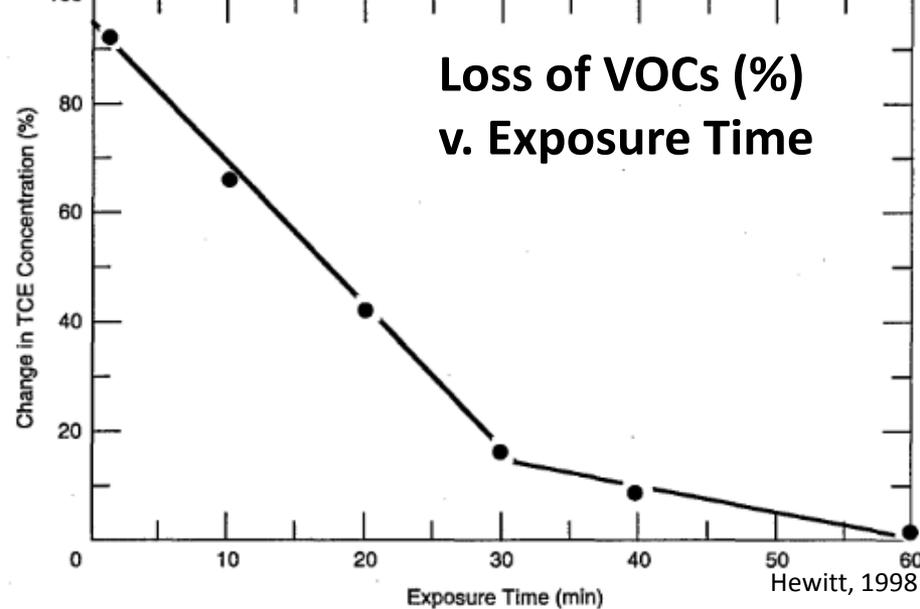
# Method "B"

# Scientific Question

If we rely on sampling,  
specifically VOC sampling, to  
assess the risk of a site, **how  
much does variance from the  
“standard” soil sample  
collection method (5035)  
impact our assessment?**

1. Background
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Sampling
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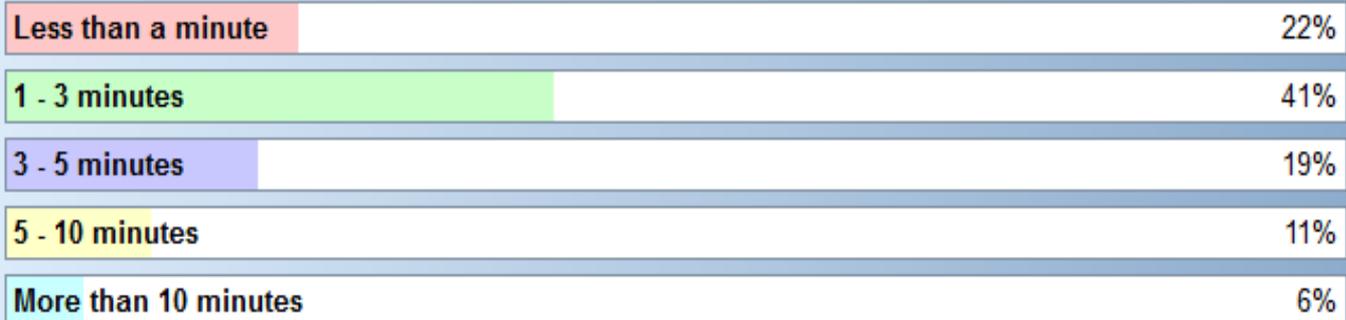
# And the Literature says...



1. Background
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How long does it take you to sample from  
the time you open a soil core?

Poll Results (single answer required): [Snap Poll at Training Session](#)



# Snap Survey Question No. 1

Anticipated difference in laboratory results, in percentage, using Method “A” v. Method “B”?

- A. Less than 20% difference
- B. 21% to 40% difference
- C. 41% to 60% difference
- D. Greater than 60%

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# A Little Taste...Variation on a Method and Result

## Collocated Soil Sample (A) and (A')

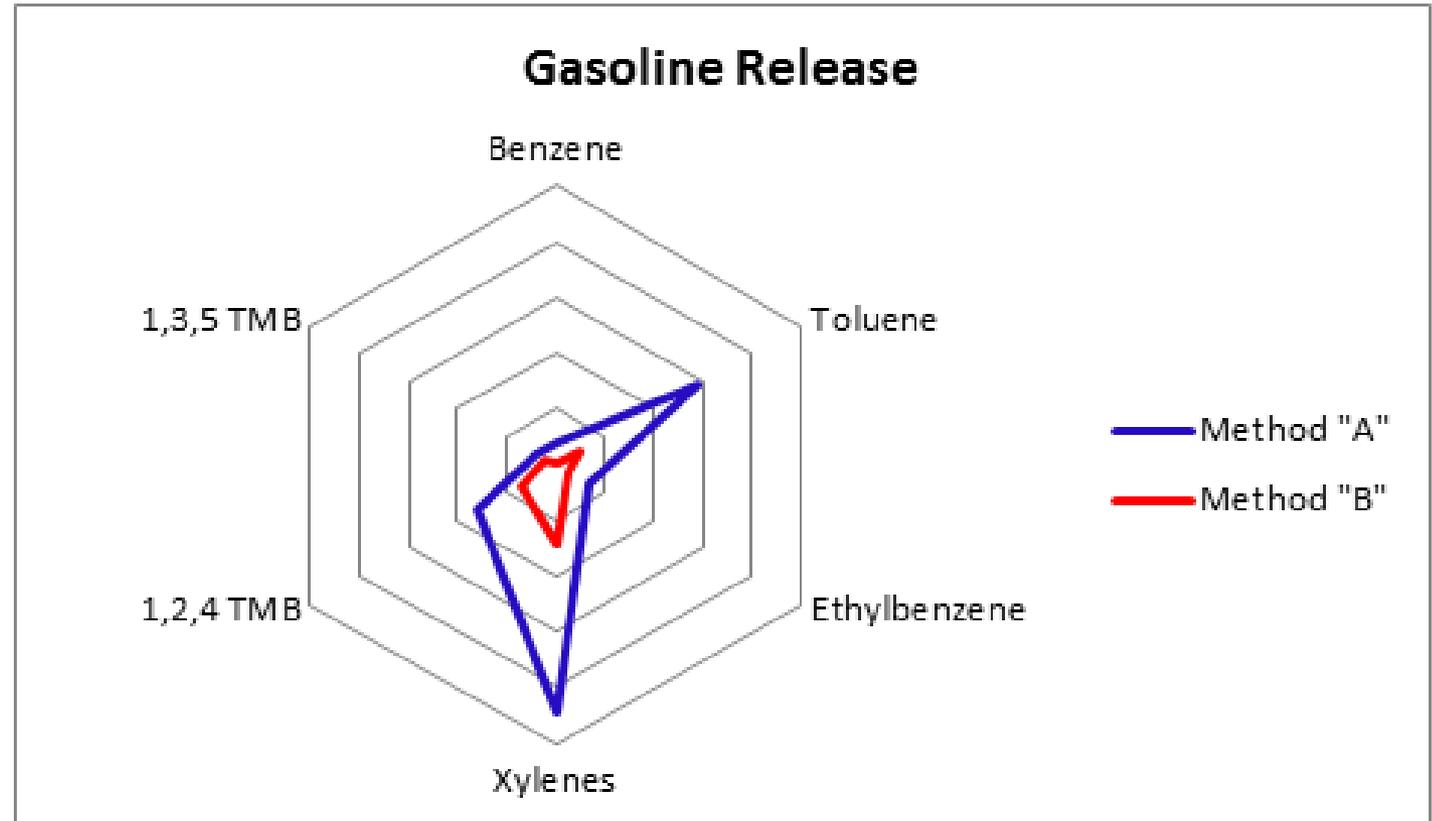
	Sample A	Sample A'
	Method "A"	Method "B"
<b>Benzene</b>	<b>81,000</b>	<b>1,500</b>
<b>Toluene</b>	<b>710,000</b>	<b>49,000</b>
<b>Ethylbenzene</b>	<b>150,000</b>	<b>32,000</b>
<b>Xylene</b>	<b>1,100,000</b>	<b>200,00</b>
<b>Trimethylbenzenes (TMBs)</b>	<b>553,000</b>	<b>181,000</b>

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# Losses – Gasoline

## Method “A” to Method “B”

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# Snap Survey

**Do you believe that there is a similar result for fuel oil/diesel fuel? Yes? No?**

**A. Yes**

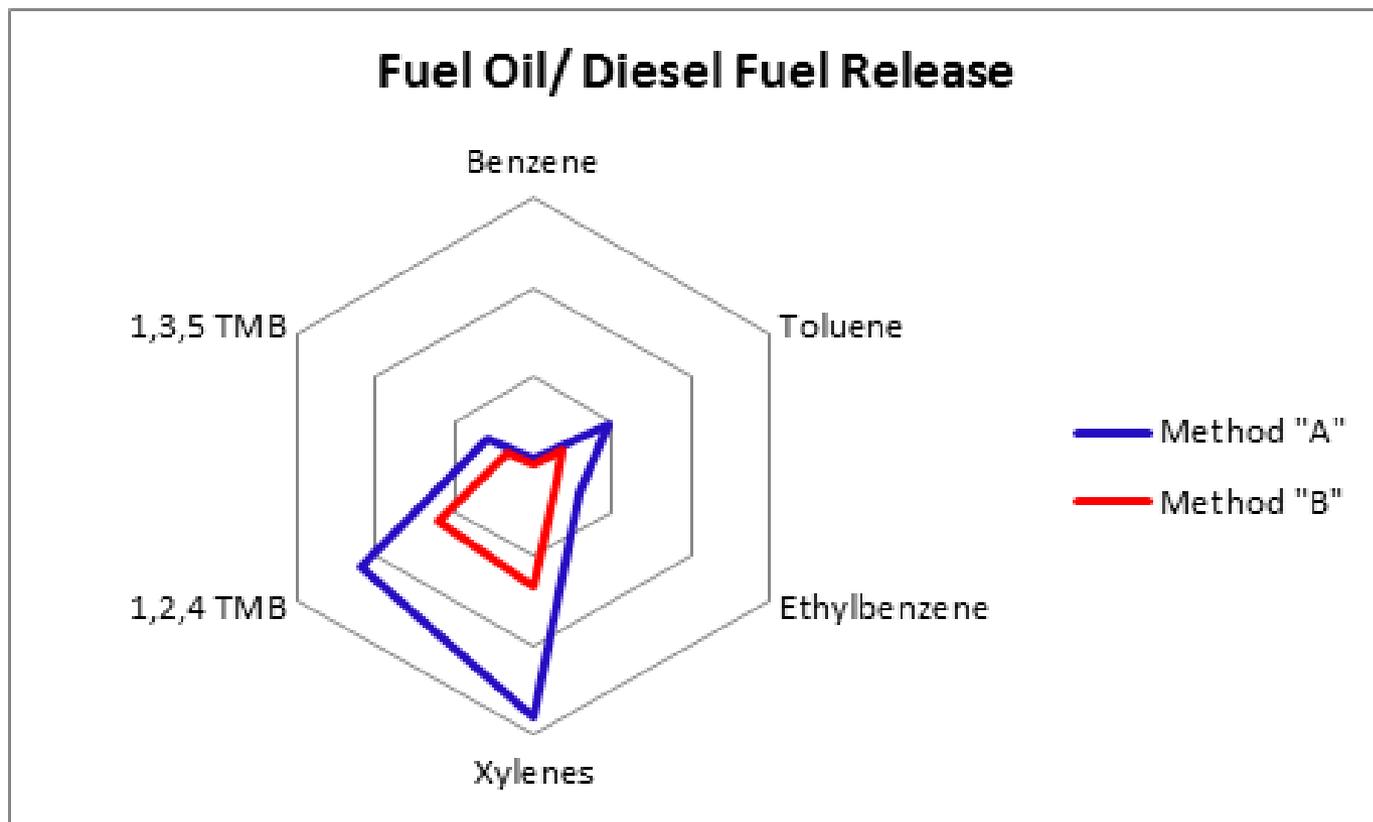
**B. No**

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# Losses – Fuel Oil/Diesel

## Method “A” to Method “B”

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1. Background
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# Big Deal or Not?

# Snap Survey

What percentage of the market commonly or predominantly uses Method “B”?

- A. Less than 10%
- B. 11% to 20% difference
- C. 21% to 30% difference
- D. Greater than 30%

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## Consider...

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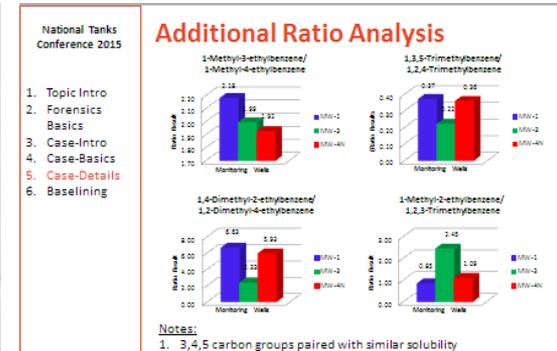
- Can use of Method “B” explain sample variance we often find?
- How does use of Method “B” data, knowingly or unknowingly, influence your CSM? REC? CREC?
- How does the not uncommon use of Method “B” influence understanding and recommendations regarding NFAs and site closures?
- **Keep thinking!**

# In Closing



- Non-compliant VOC sampling (Method “B” et al) **WILL** result in SIGNIFICANT sample variance from actual
- Consider the reliability of ALL VOC soil data
- Assess your own methods of VOC soil sample collection (any departure from BEST Practices)

# Follow Up



If you have any questions or comments please contact Rich Spehar, PE or Joseph “Joe” Berlin, PE, EP, CP ([jberlin@bldi.com](mailto:jberlin@bldi.com)) at our main office at 616-459-3737.

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