



Vapor Intrusion Sampling and Analysis

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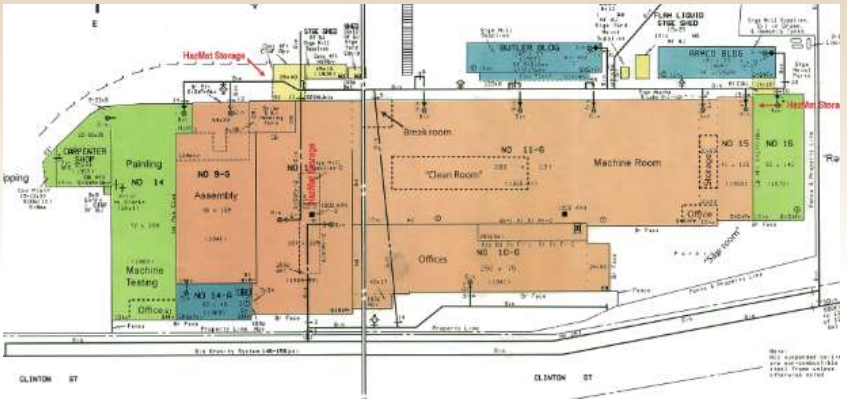
DQOs - Analytes of Concern

- Bryant Grinder Facility, Springfield
- Machine Manufacturing from 1909 to 2002



DQOs- Sampling Design: Planning for Variability with High Resolution Site Characterization

Soil gas probe

Machine Base

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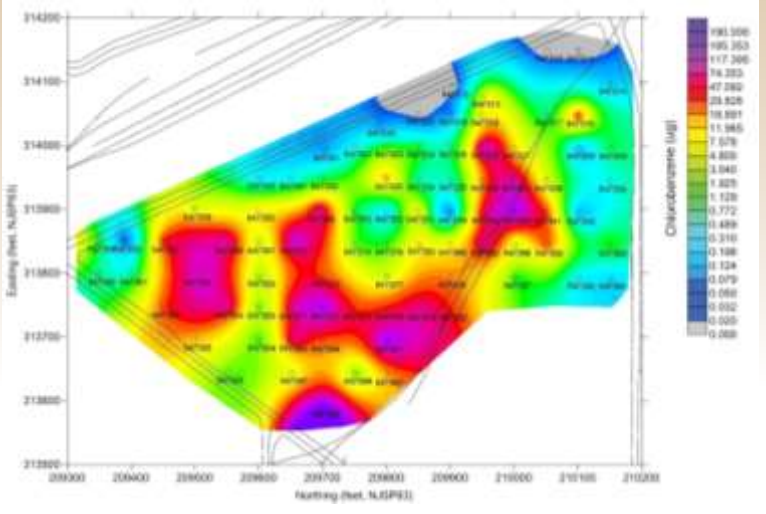
Soil Gas Variability

High Density, 80 points



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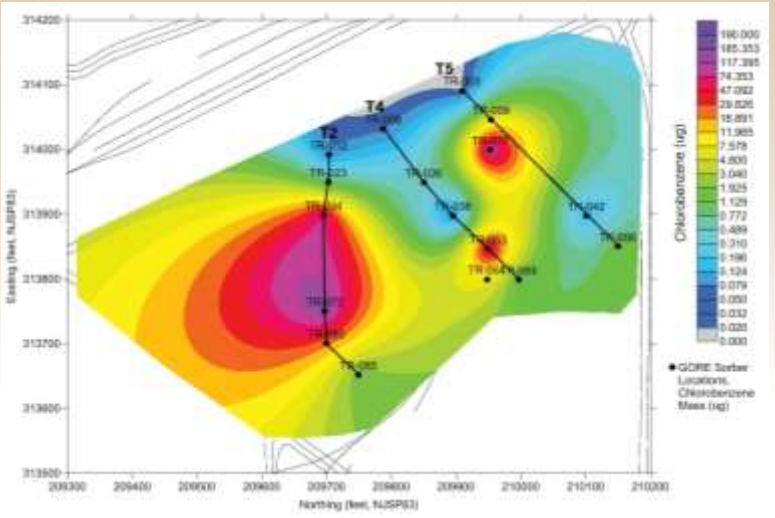
Low Density, 16 points



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DQOs – Select Detection Limits suitable for your Action Limits

Analyte	Target IA	Shallow Soil Gas	GC EPA 8021	GC/MS 8260 – Tedlar/ SPME	GC/MS EPA 8260 Tedlar/TD	HapSite GC/MS	GC/MS TO-15	GC/MS TO-15 Low Level
Vinyl Chloride	0.11	1.1	1-20	80	5-10	1.0	0.51	0.051
TCE	0.5	5.0	1-20	25	5-10	1.0	1.1	0.054
PCE	0.57	5.7	1-20	30	5-10	1.0	1.4	0.068
Benzene	1.18	1180	1-20	5	5-10	1.0	0.64	0.03
Naphthalene	0.3	3.0	??	5	5-10	1.0	2.6	NA

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DQOs – Precision and Accuracy

- Field Quality Control Samples
  - Field Duplicates (precision)
  - Matrix Spikes / Matrix Spike Duplicate (Precision and Accuracy)
  - Trip Blanks / Equipment Blanks (detect unwanted contamination)
- Laboratory Quality Control Samples
  - Laboratory Duplicates
  - Secondary Source Standards
  - Laboratory Blanks

These DQOs are meant to establish the defensibility of your data. Without these, your data may be held in question.

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Sample Collection

AMS Soil Gas Probe

AMS Retract-a-tip

Geoprobe Post-Run Tubing (PRT)

Geoprobe PRT Implant

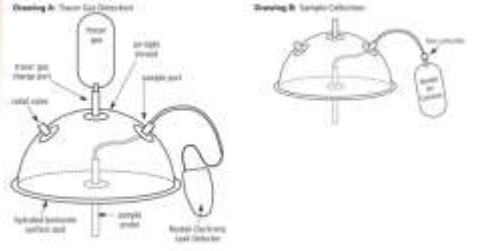
Sample Collection – Sub Slab

Standard Soil Gas Sample Port

Cox-Colvin Vapor Pin

Leak Testing

Cox-Colvin Vapor Pin with Water Dam



Restek shroud and leak detector

Shut-in Test Set-up

Up-Hole Collection

Field Sampling – Summary

- Keep in mind DQOs for study design
  - Biased/unbiased sampling
  - Sampling and analytical methods based on action levels
  - Sampling method also needs to contemplate site conditions
- High Resolution Site Characterization to Manage Variability
- Leak testing of the full sampling train is imperative

Onsite VI Analytical Techniques

Why do onsite analytics?

- Support Dynamic Work Strategies
  - Sampling guidance – locations added/subtracted
- Recognize/resolve issues early
- Reduce project costs due to day rate structure
- Data Can Be Used for Risk Evaluations

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Onsite VI Analytical Techniques

Onsite soil gas techniques can be defensible

- Not necessarily limited to screening level data
- Capable of complying with EPA 8000 QA/QC protocol
- If DQOs are met consistently throughout the project, data are defensible for the purposes of the study.

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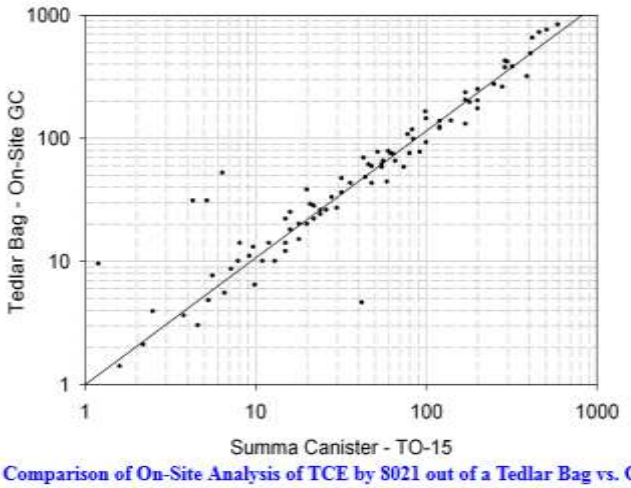
Tedlar/GC vs TO-15

FIGURE 2 - A



Comparison of On-Site Analysis of TCE by 8021 out of a Tedlar Bag vs. Off-site Analysis by TO-15 Out of a 6 Liter Summa Canister Collected by EPA-ORD at a Test Site

(DiGiulio et al. 2006b)

VI Analytical Techniques

Defensible Techniques – Field Guidance and Risk

- GC (PID/ElCD/ECD), EPA Method 8021
- GC/MS EPA 8260
- HAPSITE GC/MS
- TO-15 GC/MS (24-hr TATs)

Last three have sufficient sensitivity to meet most DQO's for VI assessments.

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VI Analytical Techniques

GC (PID/ELCD/ECD), EPA Method 8021

Suitcase Models

Bench Top Models

- Pros
  - Very portable
  - Least expensive – about $75/sample at 20/day
  - Limited range of target compounds
  - Can be sensitive – TCE at 1 ug/m3 with GC/ECD
- Cons
  - Generally less sensitive than GC/MS technique
  - Prone to interferences
  - Requires significant experience to operate

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VI Analytical Techniques

GC/MS, EPA Method 8260

Tedlar/SPME or Tedlar/Thermal Desorption

- Pros
  - Very sensitive, can reach most soil gas screening levels
  - Not as prone to interferences
- Cons
  - Less portable
  - Requires 24/7 power
  - More expensive – about $125/sample at 20 per day
  - Requires significant experience

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VI Analytical Techniques

Hapsite GC/MS

- Pros
  - Very portable
  - Very sensitive, can reach most soil gas screening levels
  - Not as prone to interferences
  - Training is easier than GC/MS, 8260 method – but still challenging
- Cons
  - Has reliability issues
  - Not very available
  - More expensive – about $125/sample

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VI Analytical Techniques

TO-15 GC/MS – SIM and Scan Modes

- Pros
  - Considered the gold standard
  - Most sensitive
  - Not as prone to interferences
- Cons
  - Sampling instrumentation (Summas) are prone to errors and contamination
  - Most expensive – approx. $480/sample for 24-hr TAT

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VI Analytical Techniques

Summary of Analytical Program and Techniques

- Make sure DQO's are solidified
- Appropriate selection of instrument/methodology
- Run more QC than usual
- Adequate experience needed

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