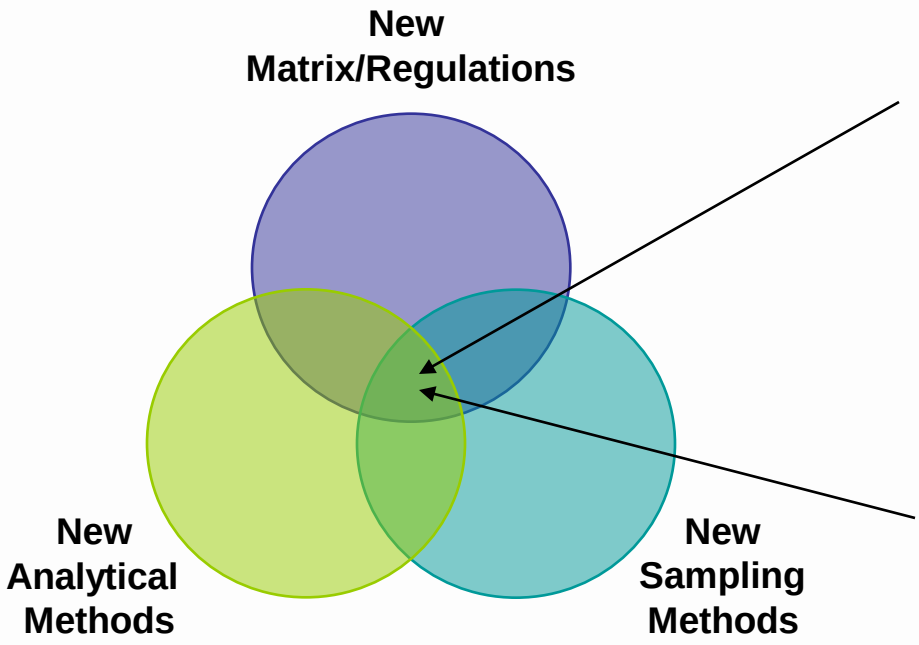
SAB Soil Vapour Forum
July 8, 2008

Overview of Soil Vapour Assessment From A Laboratory Industry Perspective

Where We Are ….. Want To Be



Soil Vapour Assessment Process:

Current State

- Uncertainty
- Growing Pains

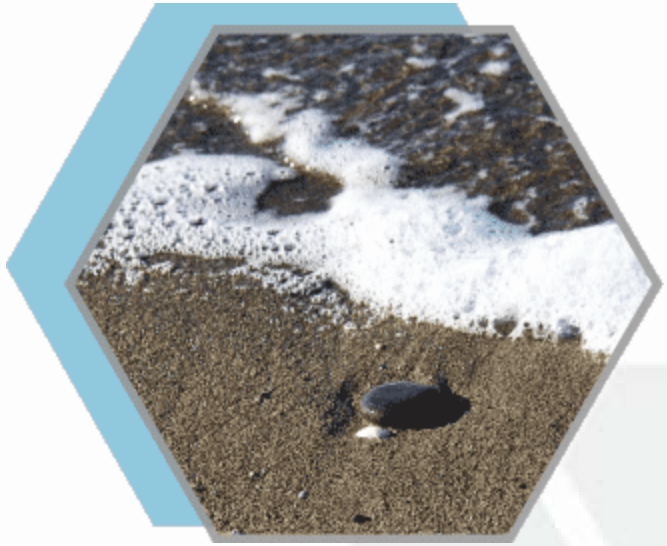
Future Goal

- Successful Projects
- Happy Clients & Regulators

Objective and Outline

Objective: Provide information and establish expectations with respect to the laboratory role in the soil vapour assessment process.

1. Analytical Methodologies
   - BCMOE Methods
   - GC/MS
   - Method Validation & QC
   - Variability
2. Laboratory-Consultant Logistics
   - Sampling
   - Analyte Packages
   - Project Set Up



Analytical Methods

BCMOE Soil Vapor VOC Methods:

1. **Volatile Organic Compounds in Air by Canister / GCMS – PBM**
   - Status = under review
   - Based on EPA TO-15, evacuated SS canister
2. **Volatile Organic Compounds in Air by Thermal Desorption Tube / GCMS – PBM**
   - Status = under review
   - Based on EPA TO-17, multi-bed sorbent tube and air pumps
3. **VOCs in Air by Solvent Desorbable Media & Miscellaneous**
   - Status = pending
4. **VPH in Air**
   - Status = pending

Analytical Methods

Instrumental Analysis:

- Gas Chromatographic Separation with Mass Spectrometry Detection (GC/MS)
- Scan mode vs. Selective Ion Monitoring (SIM) mode
- Matrix Effects – high samples, interferences, moisture management

Analytical Methods

How does the lab ensure the method is fit for purpose?

Method Validation (per BCMOE):

- Standards must be introduced to sampling device in the gas phase
- Accuracy – 70-130%
- Precision – RSD ≤ 30%
- Method Detection Limit – assessment of low level standards

- TD - Safe Sampling Volume (SSV)
  - SSV affected by media type, parameters, humidity
  - Published SSV values available in EPA TO-17 (suppliers?)
  - Most Ref Methods (EPA, NIOSH, MDHS) suggest <10L for broad scans
  - Validation of large sampling volumes in the absences of literature values?
    - SSV Study? Backup tubes? Surrogates?

Analytical Methods

How does the lab support batch data?

Method QC:

QC Element	Requirements & Control Limits
Calibration & Calibration Verification	5-point calibration curve Standards **must be** introduced to sampling device as gasses Internal standards **must be** used 2nd Source CalVer = 70-130%
Method Blanks (Sampling Device Proofing)	Less than reported DL
Lab Control Samples	60-140% recovery
Lab Duplicates	≤40% RPD
Surrogates	Option for TD Tubes

Variability

<u>Total Uncertainty</u> (U_T) is a combination of <u>Analytical Measurement Uncertainty</u> (U_A) and <u>Sampling Uncertainty</u> (U_s)

Analytical Measurement Uncertainty (U_A)

- Estimated up to 40%
- Increases as you approach DL

Sampling Variability (U_s)

- ????

Sample Collection

Soil Vapour Sampling ≠ Soil & Water Sampling

- Specialized Sample Collection Equipment
  - Expensive
  - Preparation: pump calibration & charging, clean sampling devices
  - Support equipment – tubing, splitters, flow controllers, connectors, etc
  - Sampling staff training
- Sampling Constraints
  - Maximum Flow Rate = 200 mL/min
  - TD – Maximum Sampling Volumes – MDL vs. SSVs
- Moisture Management
  - Can affect sampling efficiency, stability, analysis
  - Drying Tubes - Literature sources are scarce. Validation?

Analytical Test Packages

- What to test for?
  - Currently 114 (x) VOC compounds
  - PCOC defined by the client based on site history
  - Broad scan vs. targeted scans
  - Selection of most appropriate sample collection approach

Laboratory-Consultant Relations

Expensive Sampling Approach
(Time, Equipment, Analysis)
+
Higher Problem Probability
(Equipment, DLs vs. Reg. Limits, High Variability, Interferences)

=
Tension & Costs

Solution:

- Project Planning – lead time, communication with labs, sampling plans, sampling QC, etc.
- Realistic Expectations
- Contingency

Thank You

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