



The Impact of Sample Media on Soil Gas Measurements

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New Soil Gas Challenges

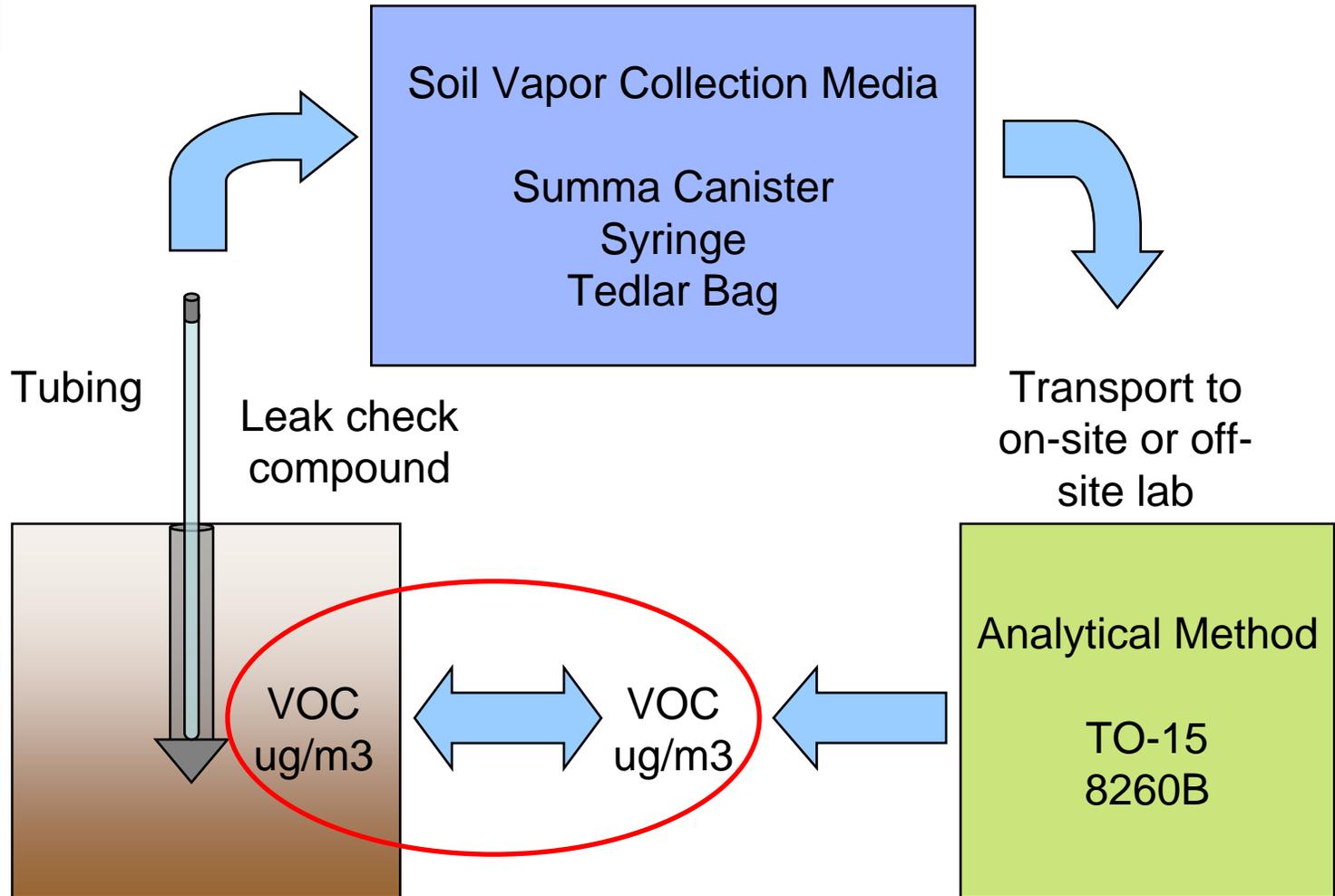
- Primary tool for VI investigations
- Used for health risk assessments
- Lower Reporting Limits
 - CHHSLs for shallow soil gas
 - 0.036 ug/L = 11 ppbv Benzene
 - 0.013 ug/L = 5 ppbv Vinyl Chloride
- Challenging Compounds
 - Naphthalene: low vapor pressure
 - 0.032 ug/L = 6 ppbv Naphthalene

FAQs from Data Users



- Why do I have {insert VOC} in my samples when I don't have {insert VOC} at my site?
- I have high levels of naphthalene in my water and soil data, but my soil gas is ND. What is going on?
- Why does my mobile data not match TO-15 results?

Soil Gas Measurements



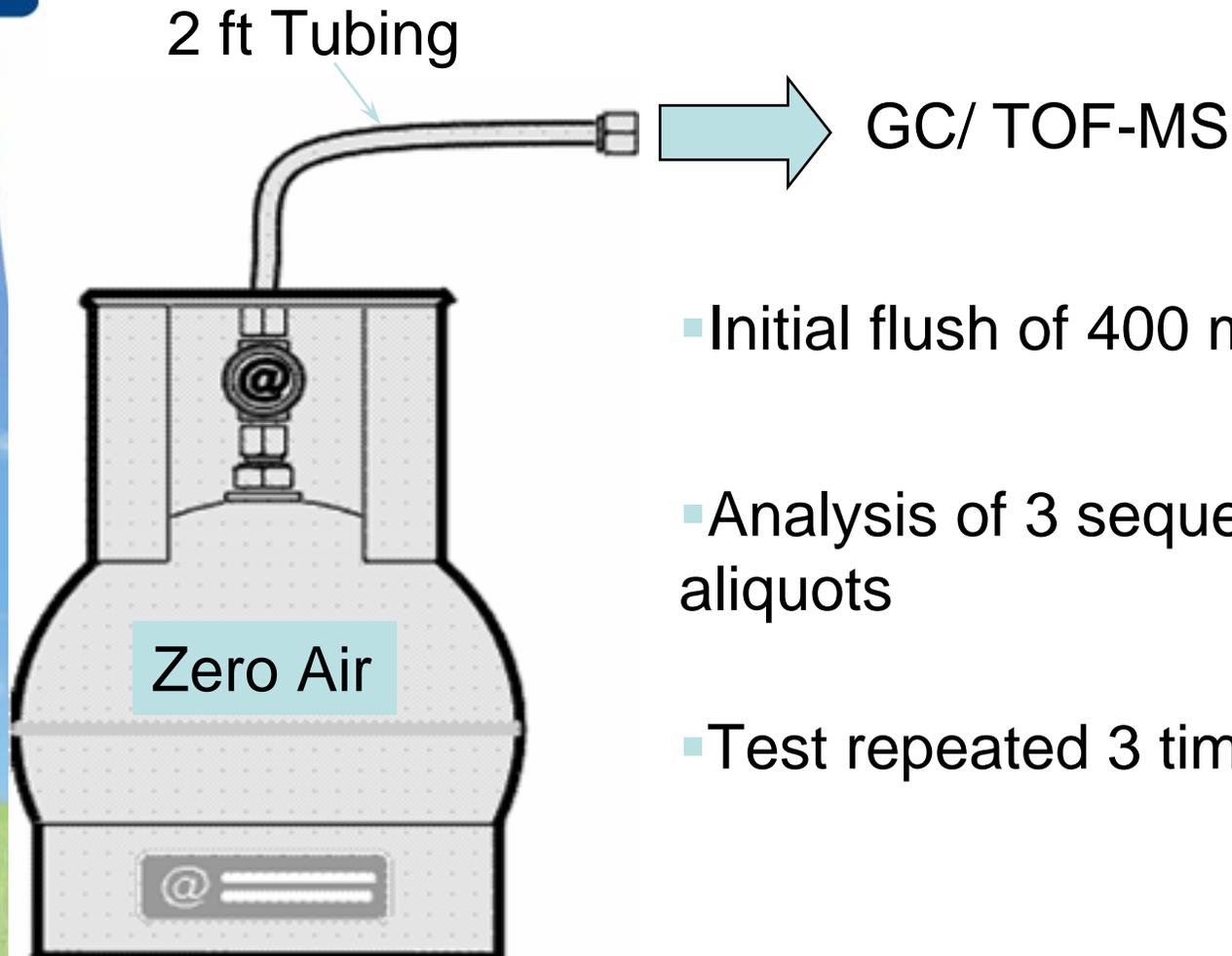
Tubing Evaluation



- Nylaflo[®]
- PEEK
- Teflon[®]
- LD Polyethylene



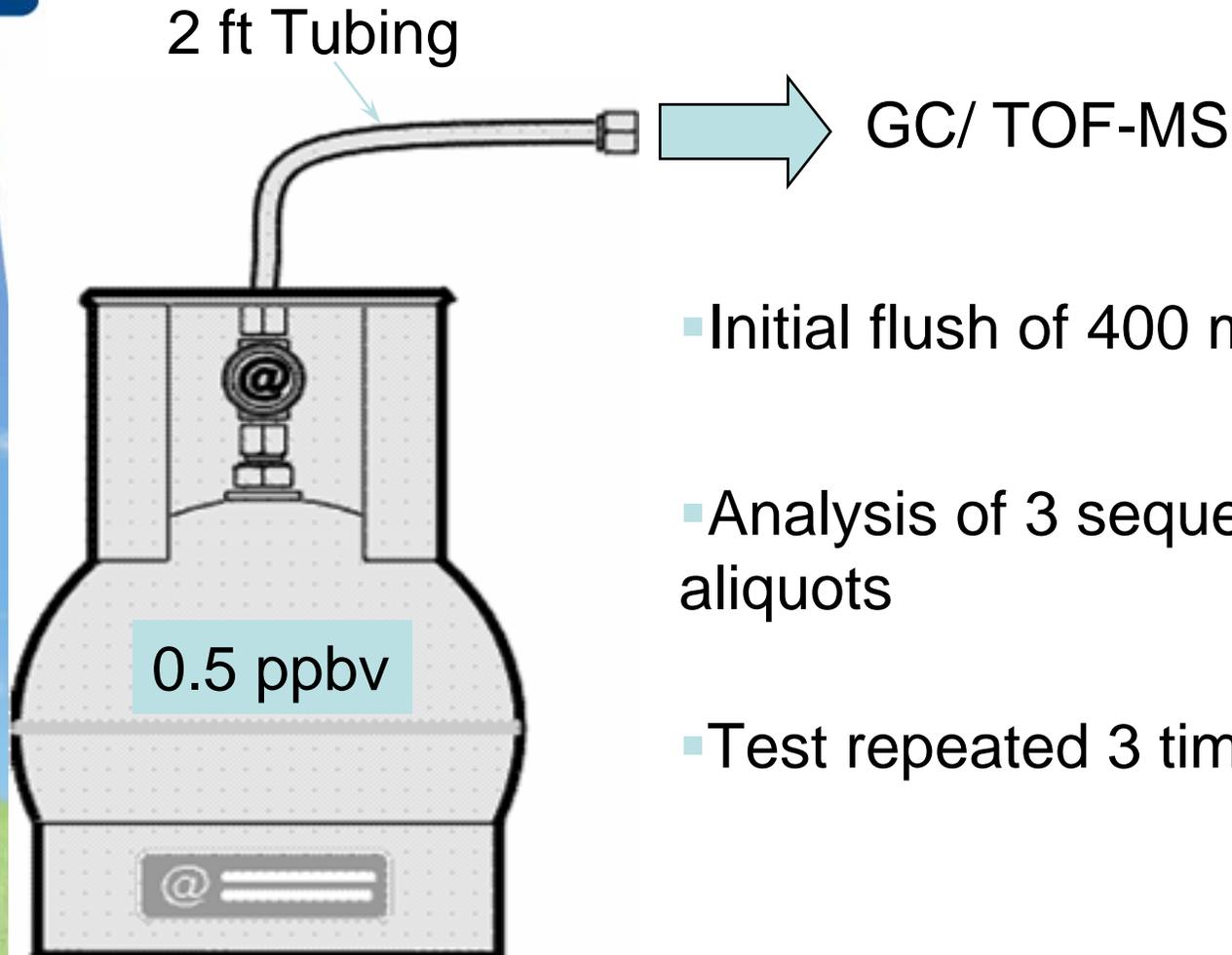
Tubing: Background VOCs



- Initial flush of 400 ml
- Analysis of 3 sequential aliquots
- Test repeated 3 times



Tubing: Reactivity



- Initial flush of 400 ml
- Analysis of 3 sequential aliquots
- Test repeated 3 times



Tubing: Background VOCs

- VOCs typically less than screening levels for soil gas
- Re-using tubing can be a problem
- Improper storage can increase VOC background
- Equipment or field blanks can help assess background contribution



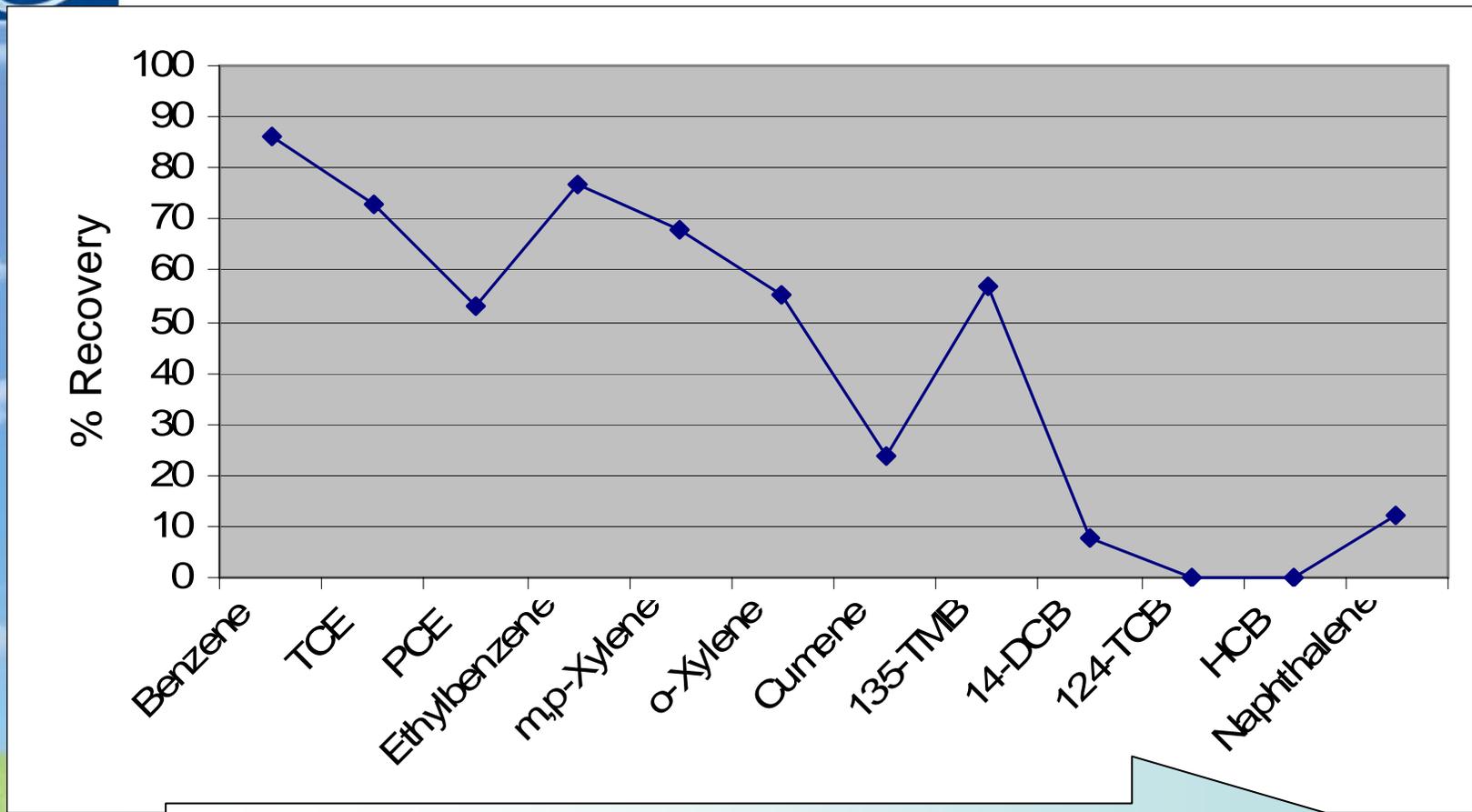
Tubing: Reactivity

- Nylaflo[®]
 - Low recovery for Naphthalene and 1,2,4-TCB
 - Data suggests active sites
- PEEK
 - Acceptable
- Teflon[®]
 - Acceptable
- LD Polyethylene
 - Unacceptable for VOCs with low vapor pressures



Tubing: Reactivity

LD Polyethylene Tubing Recovery

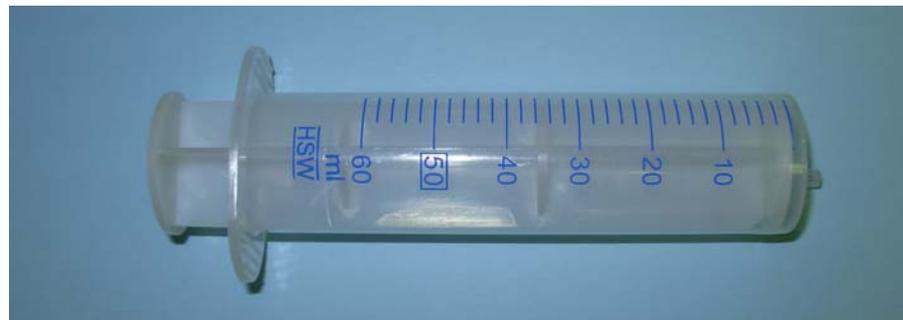


Decreasing Vapor Pressure



Sample Collection Media

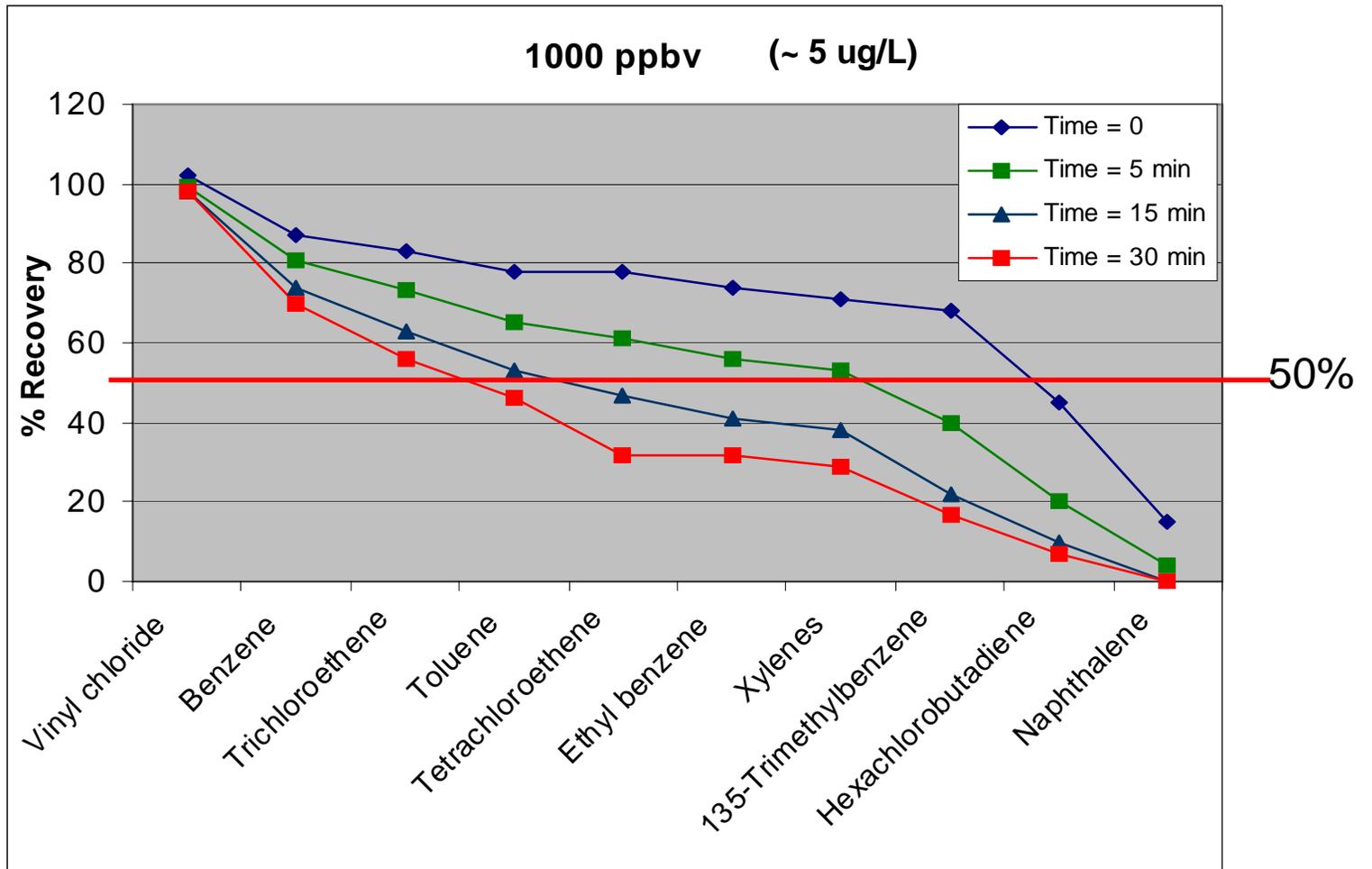
- Disposable Syringes: Polypropylene barrel & Polyethylene plunger
- Evaluation of VOC recovery
 - Hold times from 5 to 30 minutes
 - Effect of VOC concentration on recovery



Disposable Syringes



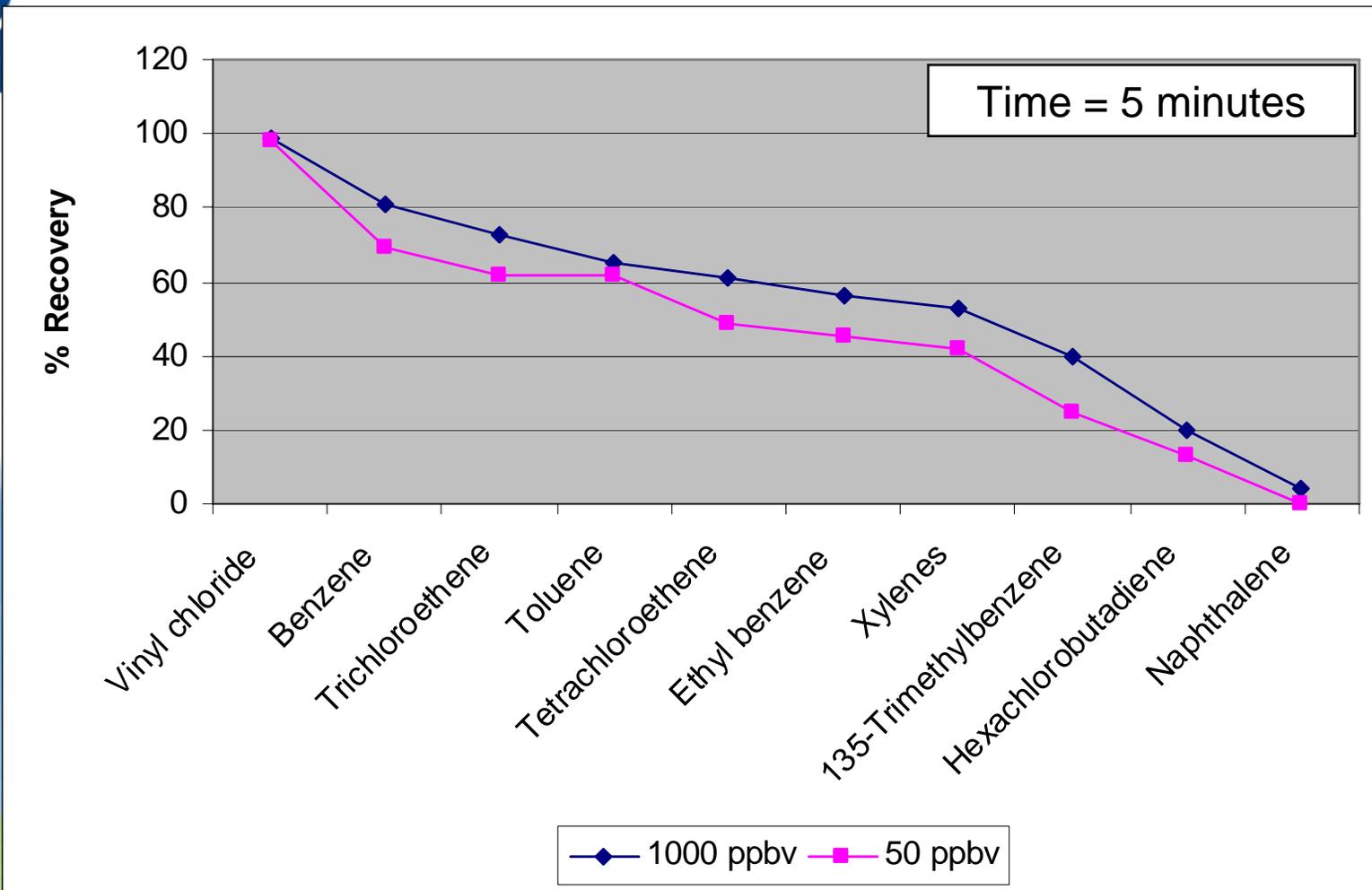
- Flushed syringe 3X with humidified vapor standard
- Pulled up standard and analyzed immediately (time = 0)
- Capped and stored for 5, 15, and 30 minutes
- Replicate analysis: Each time repeated with a new syringe
- Performed at 50 ppbv (~ 0.25 ug/L) and 1000 ppbv (~ 5 ug/L)
- Analyzed by TO-15 calibrated daily with test standard mix introduced directly from cylinder to interface using NIST-mass flow controller



Decreasing Vapor Pressure



1000 ppbv and 50 ppbv Recovery Comparison



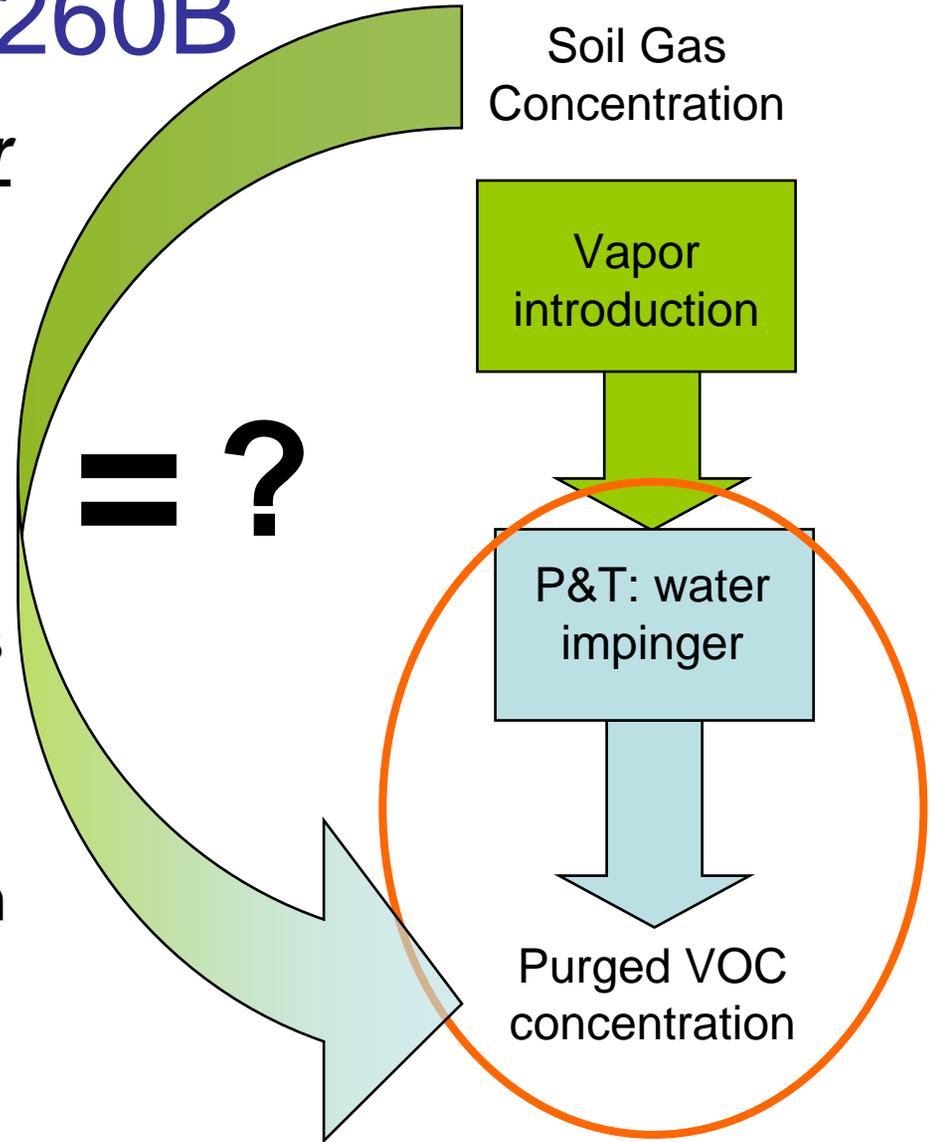
Disposable Syringe Conclusions



- Adsorption of heavier VOCs may result in unacceptable recoveries, even when storage times are less than 5 minutes.
- Adsorption increases with increasing storage time.
- Adsorption plays a greater role at lower sample concentrations.

Implication for 8260B

- The accuracy of soil vapor results is not measured by any of the standard 8260B QC samples
- 8260B liquid phase calibration always requires an assumption
- Validate vapor introduction system using NIST-traceable vapor phase standard



Conclusions



- Selection of sample media can significantly impact soil gas measurements
- Impact on data quality not reflected in any of the standard field and laboratory QC
- Emphasize the need for protocols developed under the rigor of scientific validation
- Laboratory PT program to validate lab developed procedures



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Questions?

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