



## **NASA JPL – Operable Unit 2 (OU-2)**

**March 7, 2002 RPM Meeting**

**Soil Vapor Extraction (SVE) Design, Operation,  
and Monitoring Recommendations**

**OU-2 at the National Aeronautics and Space  
Administration (NASA) Jet Propulsion Laboratory  
(JPL), Pasadena, California**

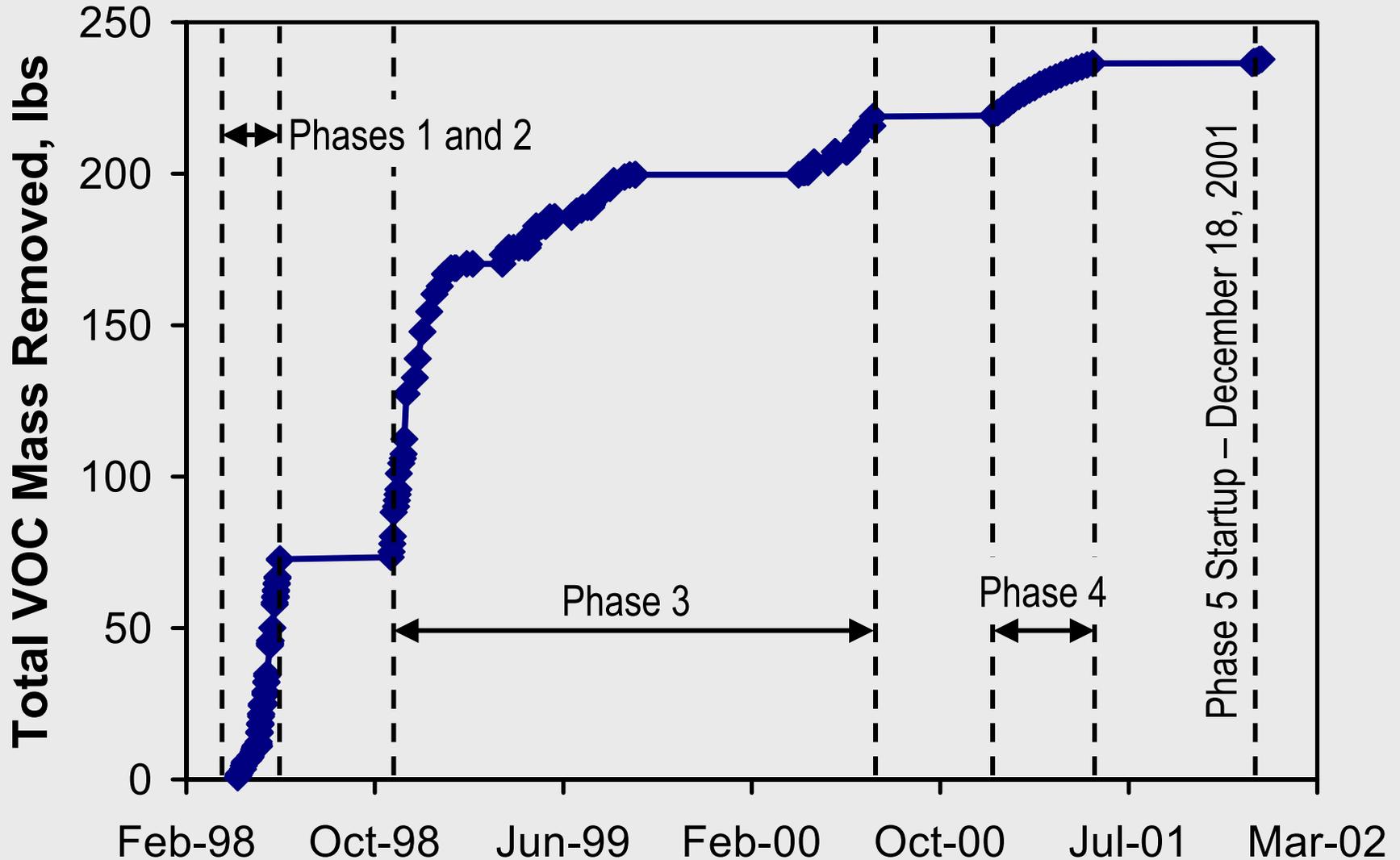


# Summary of Presentation

- Current Status of SVE System and Vapor Monitoring
- PneuLog™ Evaluation of VE-01
- Design and Construction
- Operation and Optimization
- Soil Vapor Monitoring
- Questions and Discussion



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## VOC Mass Removal Analysis

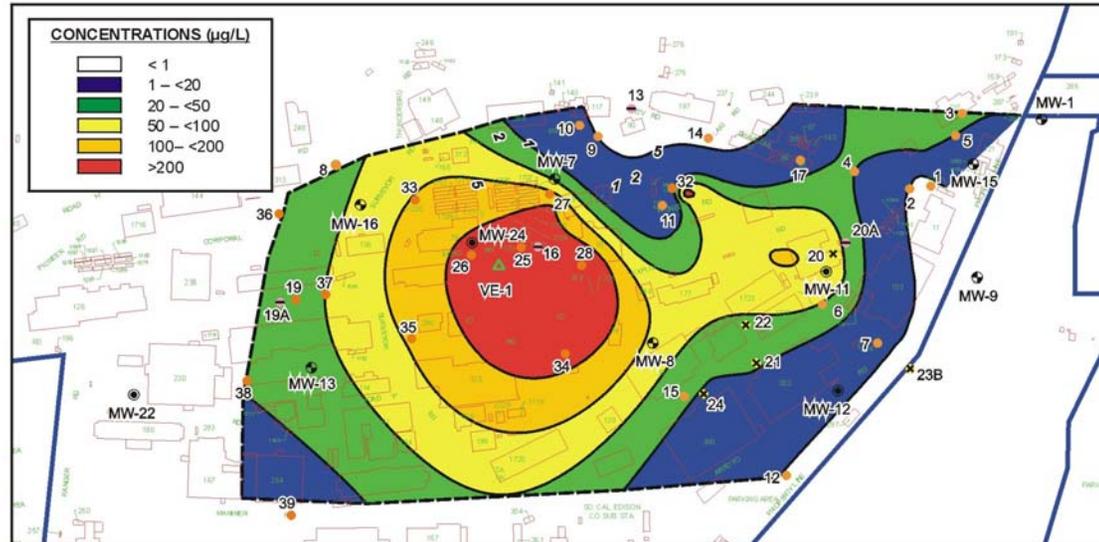
Screened Interval	CCl <sub>4</sub> (ppmv)	TCE (ppmv)	Total VOCs (ppmv)	VOC Removal (lbs/day)
Shallow (44-84 ft bgs)	0.676	0.007	1.141	0.09
Middle (94-134 ft bgs)	0.184 to 0.353	0.015 to 0.085	0.529 to 0.915	0.06 to 0.14
Deep (145-185 ft bgs)	0.175 to 0.281	0.098 to 0.135	0.610 to 0.733	0.07 to 0.11

Data collected by Geofon in December 2001

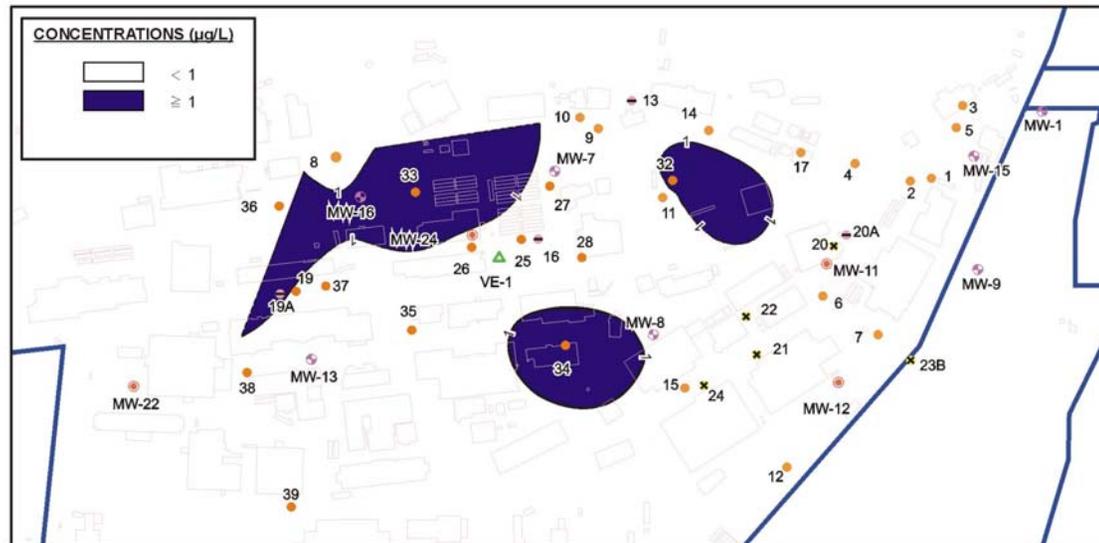


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**$CCl_4$   
Pre-SVE**



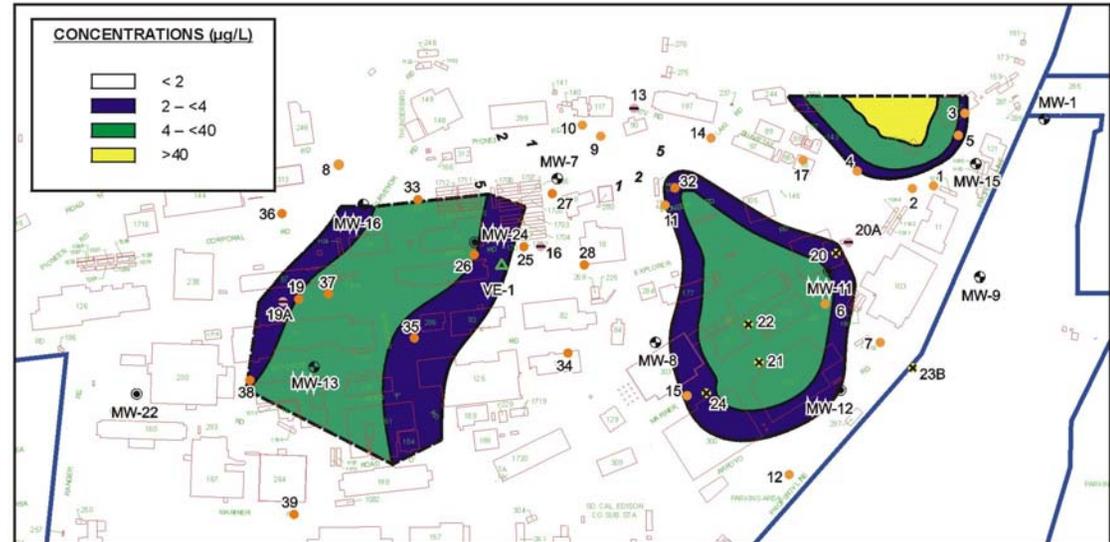
**$CCl_4$   
November  
2001**



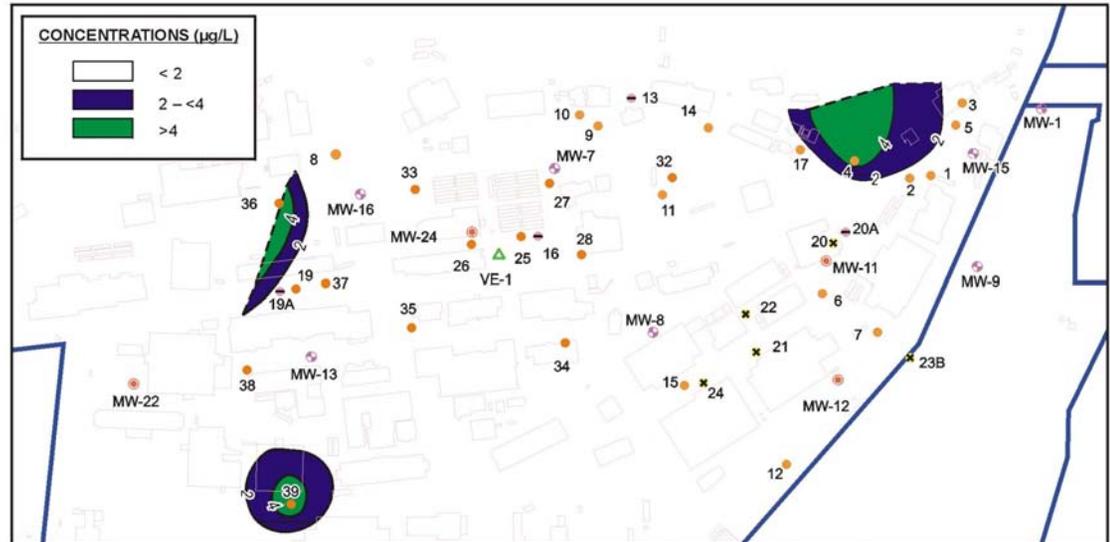


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**TCE  
Pre-SVE**



**TCE  
November  
2001**





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### Revised CCl<sub>4</sub> Mass Calculations

Mass Estimate	Total Mass (lb)	Volume (ft <sup>3</sup> )	Avg. Conc. (μg/L)
Feasibility Study Estimate	1,729-4,140	3.92 x 10 <sup>8</sup>	202
Revised Estimate	468	2.56 x 10 <sup>8</sup>	35
November 2001 Estimate	<b>9</b>	2.57 x 10 <sup>8</sup>	0.65

Note: Revised and November 2001 estimates based on weighted distribution using EarthVision™ Volumetrics program.

### Revised TCE Mass Calculations

Mass Estimate	Total Mass (lb)	Volume (ft <sup>3</sup> )	Avg. Conc. (μg/L)
Feasibility Study Estimate	20.1-123	2.24 x 10 <sup>8</sup>	4.1
Revised Estimate	52	2.57 x 10 <sup>8</sup>	1.51
November 2001 Estimate	<b>30</b>	2.57 x 10 <sup>8</sup>	0.86

Note: Revised and November 2001 estimates based on weighted distribution using EarthVision™ Volumetrics program.



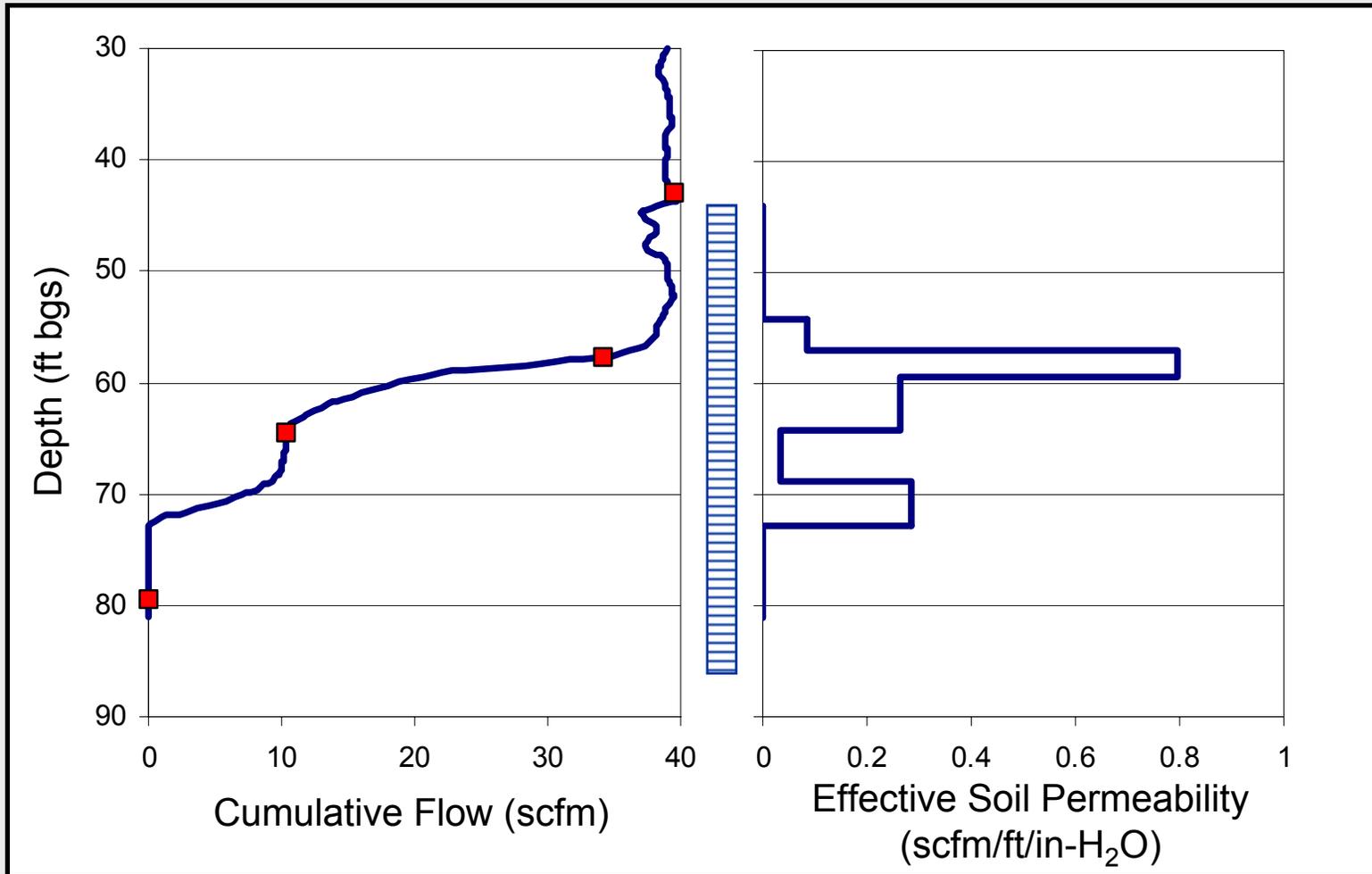
### PneuLog™ Evaluation

- Conducted Testing at VE-01 on January 22, 2002 by Praxis Environmental Technologies, Inc.
- Evaluated Vapor Flow, Soil Permeability, and VOC Concentrations Along Each of the Three Screened Intervals
- Applied a Two-Region SVE Model to Assess  $\text{CCl}_4$  Mass Transfer



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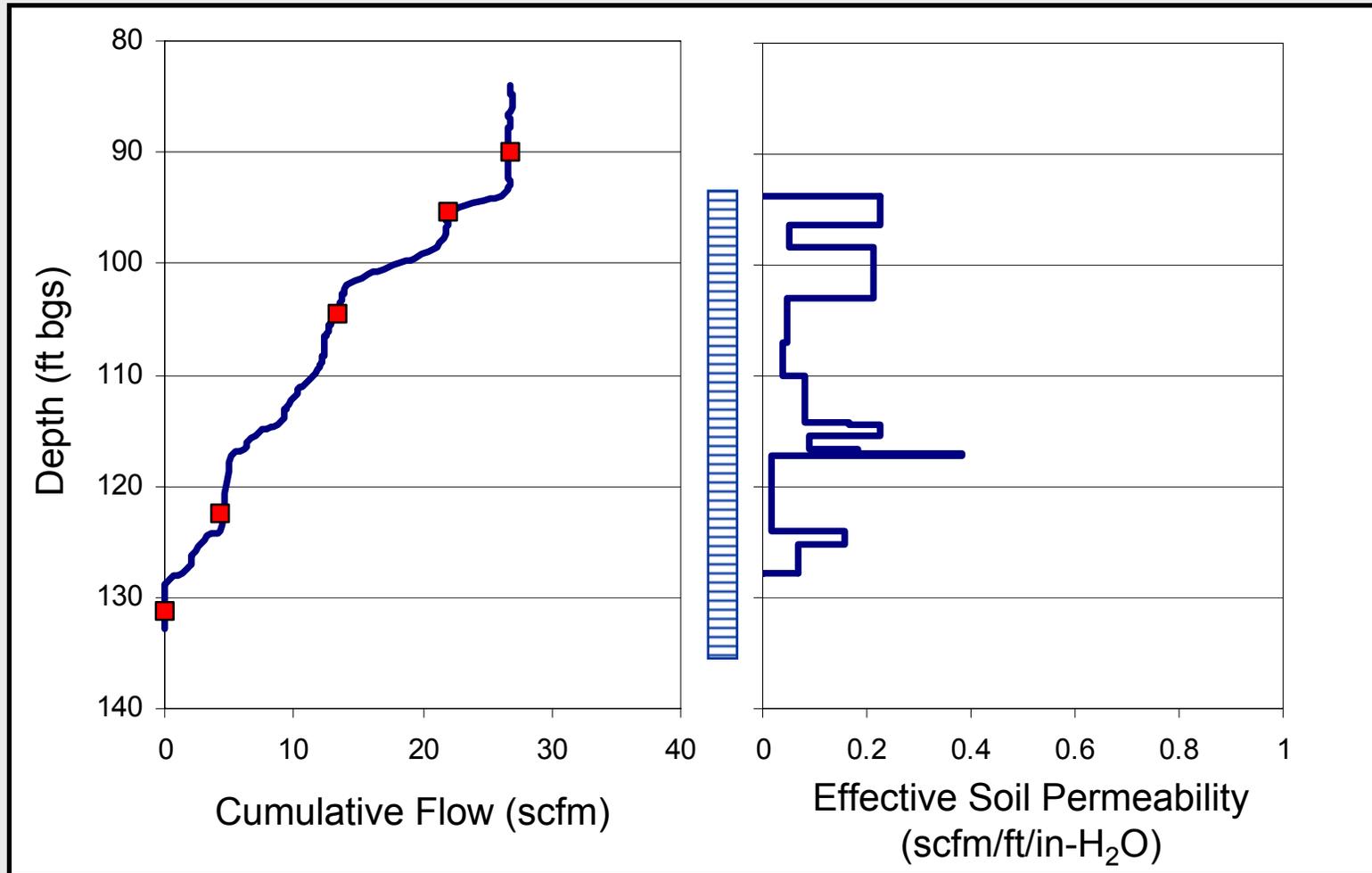
## Shallow Screen





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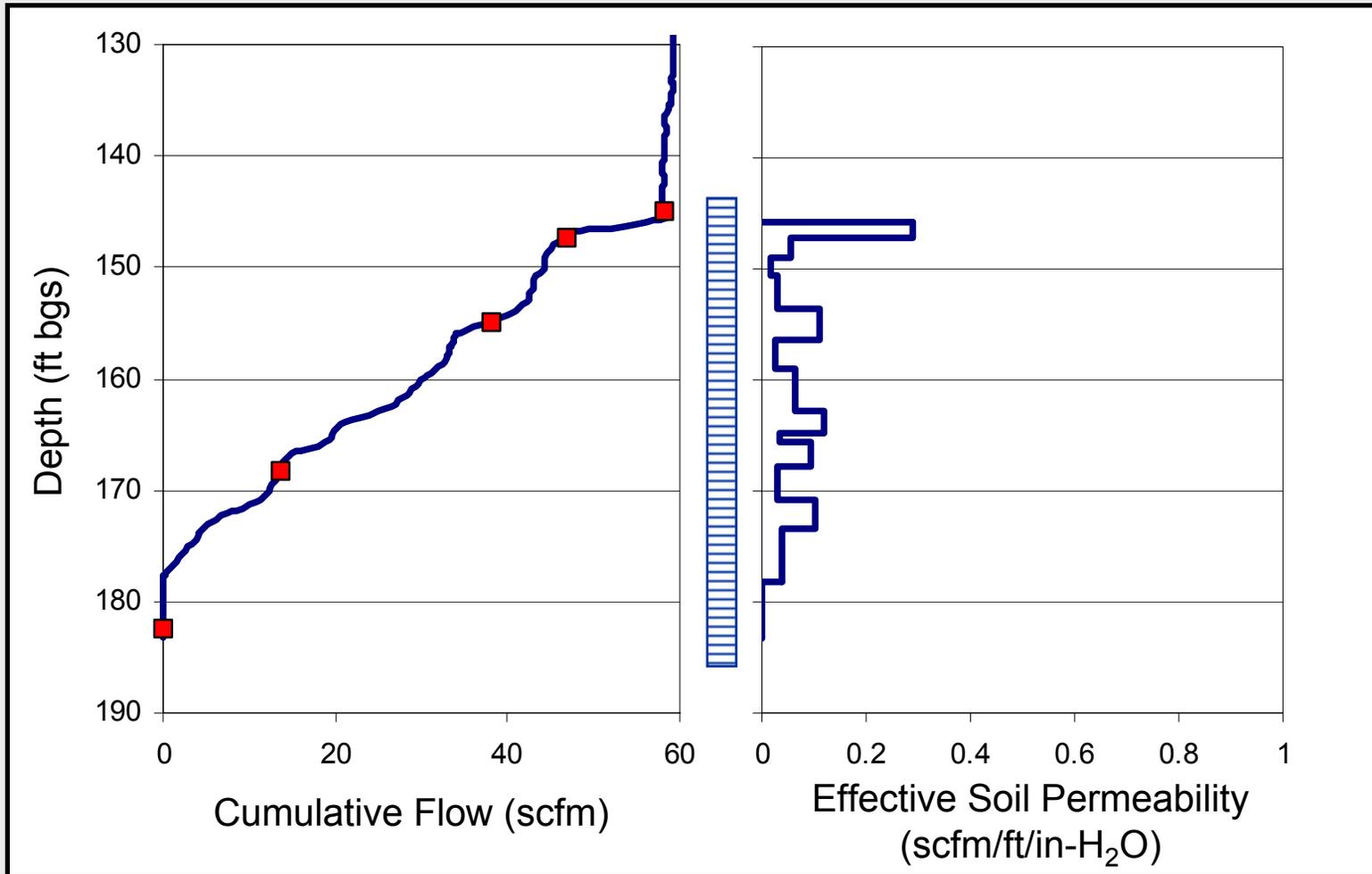
## Middle Screen





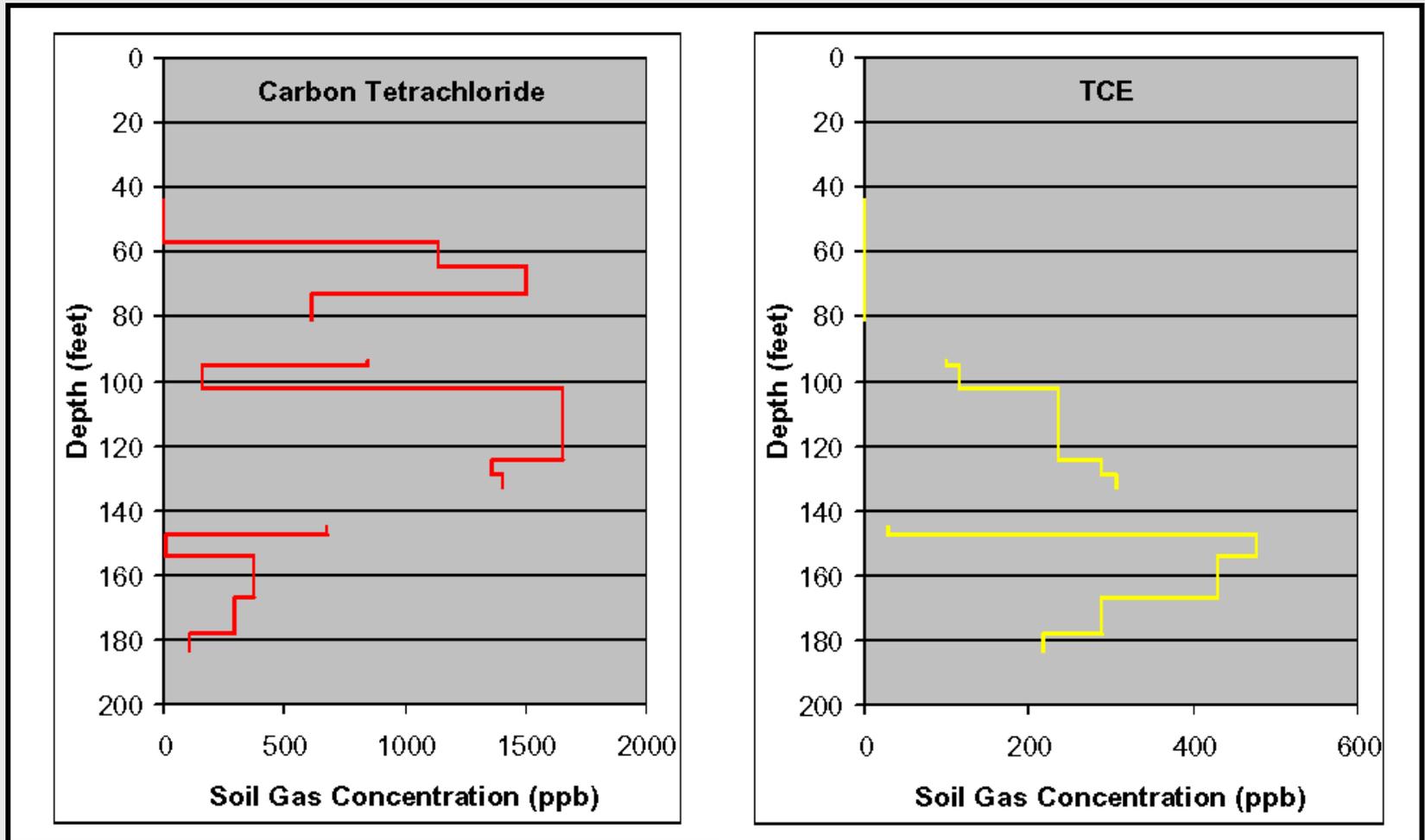
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## Deep Screen





## Concentration Profiles





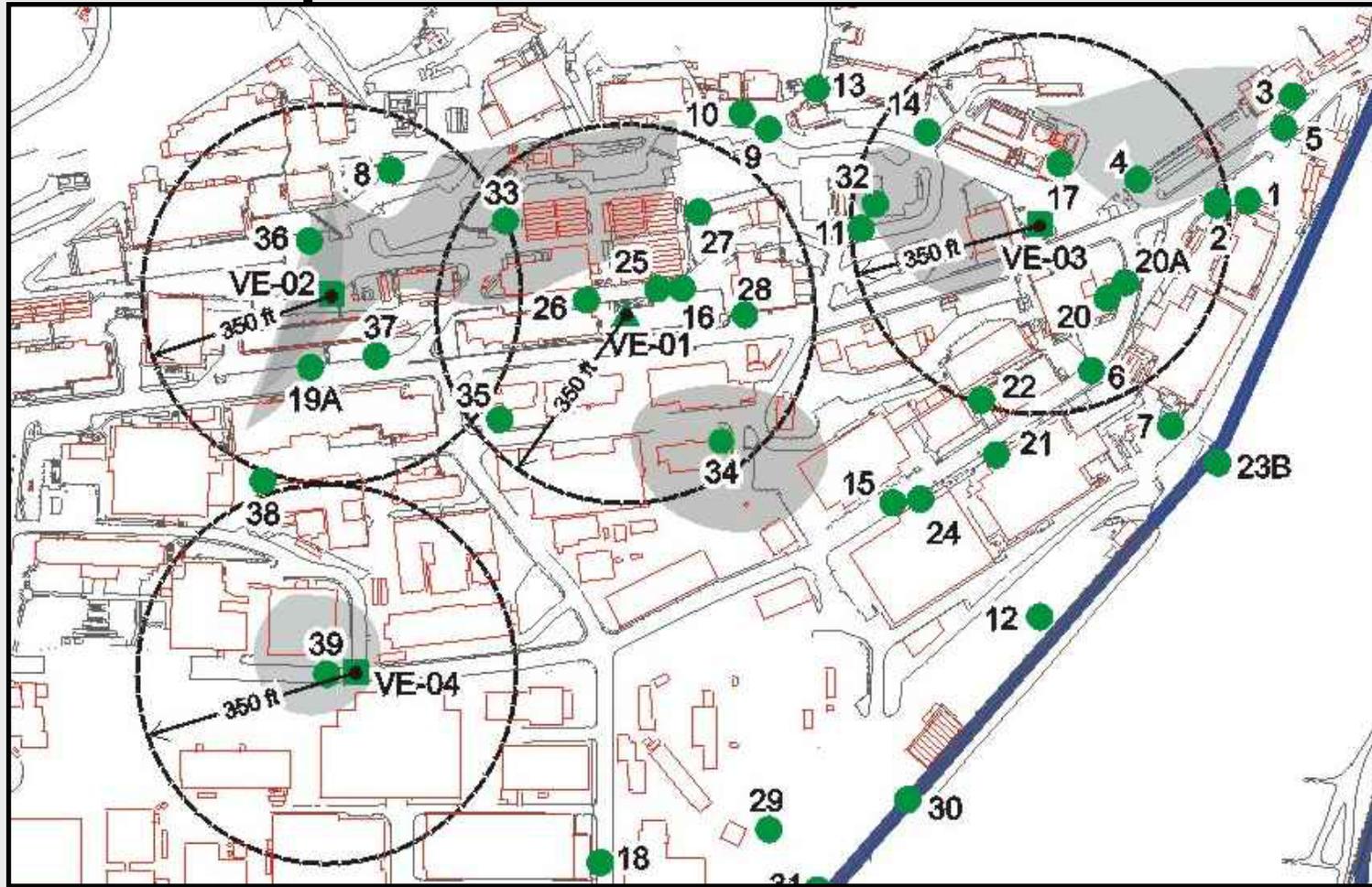
# Design and Construction

- Mobile SVE System
  - Reduce Capital and Operations Costs
  - Observe Rebound Between Rotations
- Update Air Permit
- Soil Perchlorate Analysis
- Additional SVE Wells



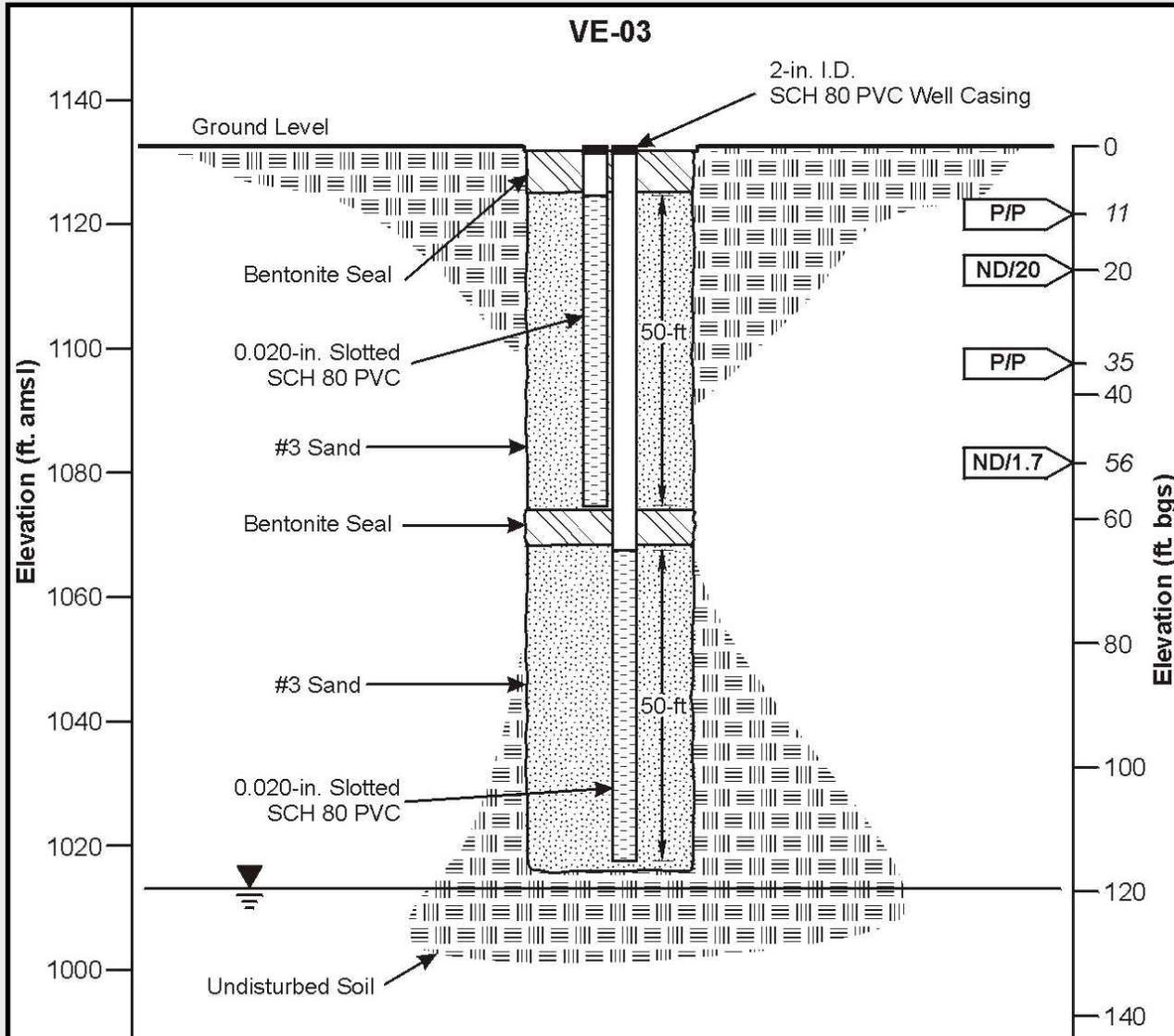
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## Proposed Locations of VE Wells





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## Proposed Construction of SVE Wells



# Operation and Optimization

- Continue Operation at VE-01 Until Asymptotic Conditions are Achieved
- Determine Mass Loadings at Each Screened Interval Using PneuLog™
- Track Cost-Per-Pound of VOC Removed
- Rotate Operation of SVE Unit Between SVE Wells
  - Operate Until Asymptotic Conditions are Achieved
  - Minimum Operational Period – 2 Weeks
  - At Least Two Rotational Periods Per SVE Well

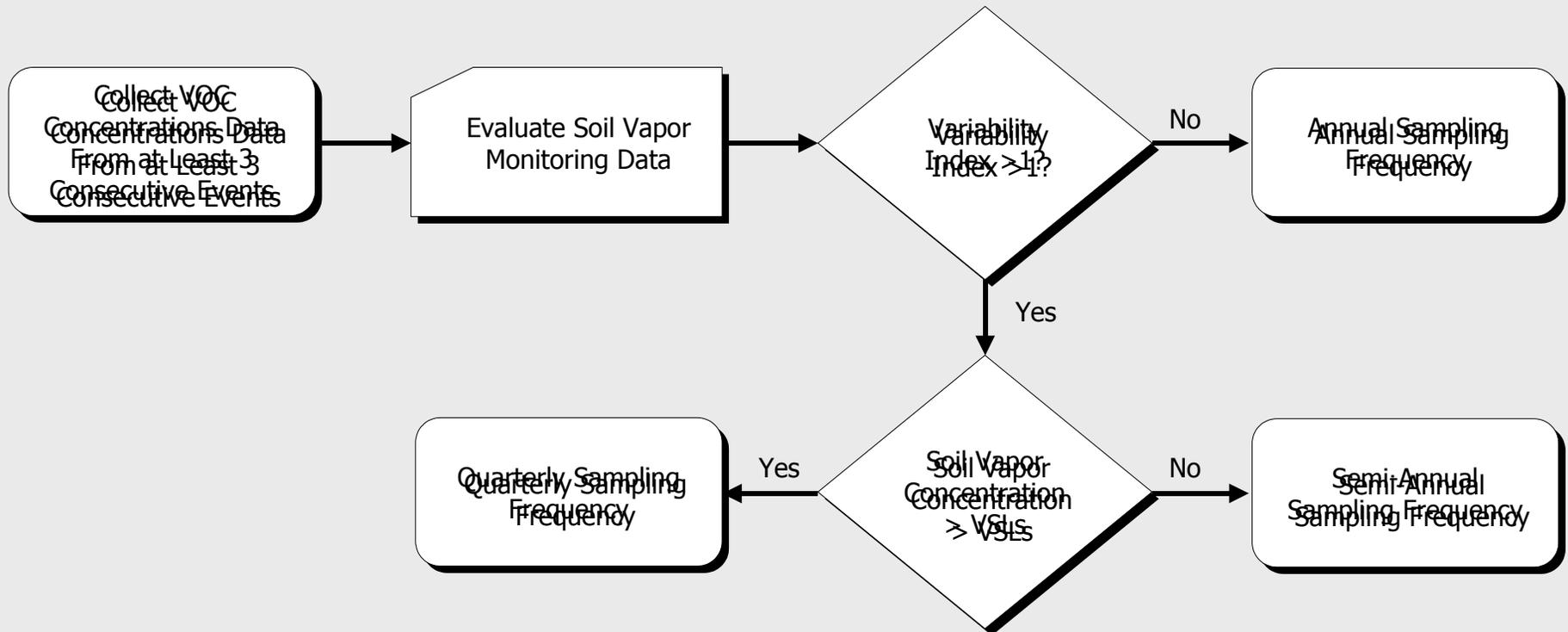


# Soil Vapor Monitoring

- Limit Analytes
- No Additional Vapor Monitoring Points At This Time
- Rebound Evaluation – 4 to 6 Months
- Sampling Frequency Protocol



## Sampling Frequency Protocol



$$\text{Variability Index} = \frac{\text{Concentration Range Over the Past 3 or 4 Events}}{\text{Median Concentration}}$$



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# Questions and Discussion