

A modern approach to Site Investigation and monitoring

*Using the conceptual site model
and modern technologies*

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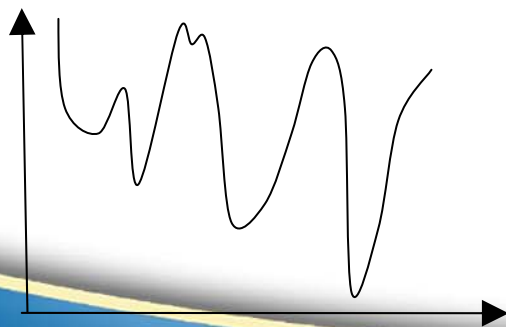
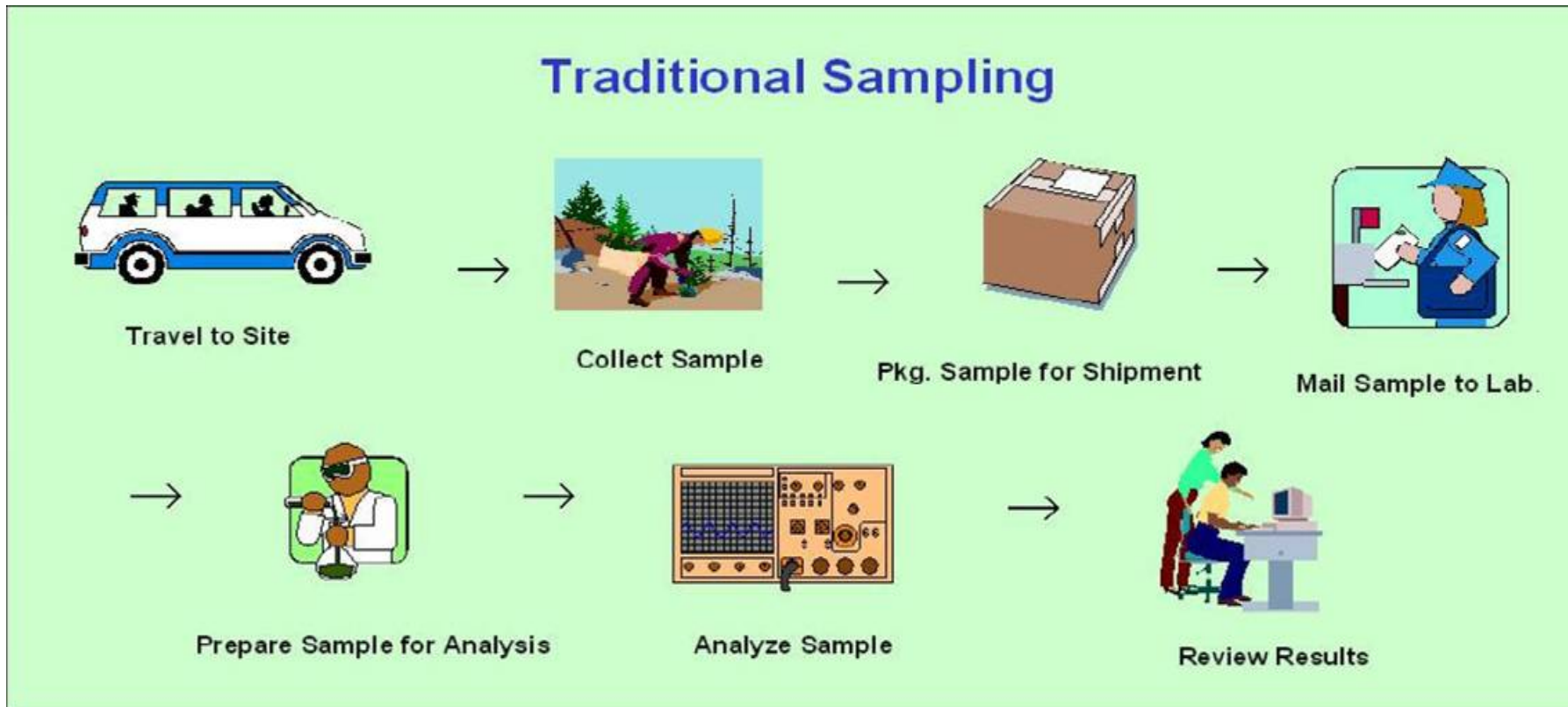
- Traditional Approach
- What about innovative / new technologies
- Are these techniques really innovative??
- EPA-TRIAD approach



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Traditional Approach



High uncertainty in results!

70 tot 90 % due to heterogeneity of soil matrix,
only 10 to 30% due to analytical process!!!



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“new” technologies

- Determine lithology (CPT, GPR, HRS)
- (on-site) screening techniques (MIP, ROST, XRF)
- Sampling techniques (hydrasleeve, sorbicell, ...)



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Why should we also use innovative / new technologies?

- Better understanding of lithology (and relation with contaminants)
- Minimize sampling influences
- Efficient sampling and monitoring
- Representative measurements
- Define preferential pathways
- Minimize failure costs



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Determine Lithology : But WHY?

THE PROBLEM IS HETEROGENEITY?



Soils are heterogeneous
Samples are a small subset

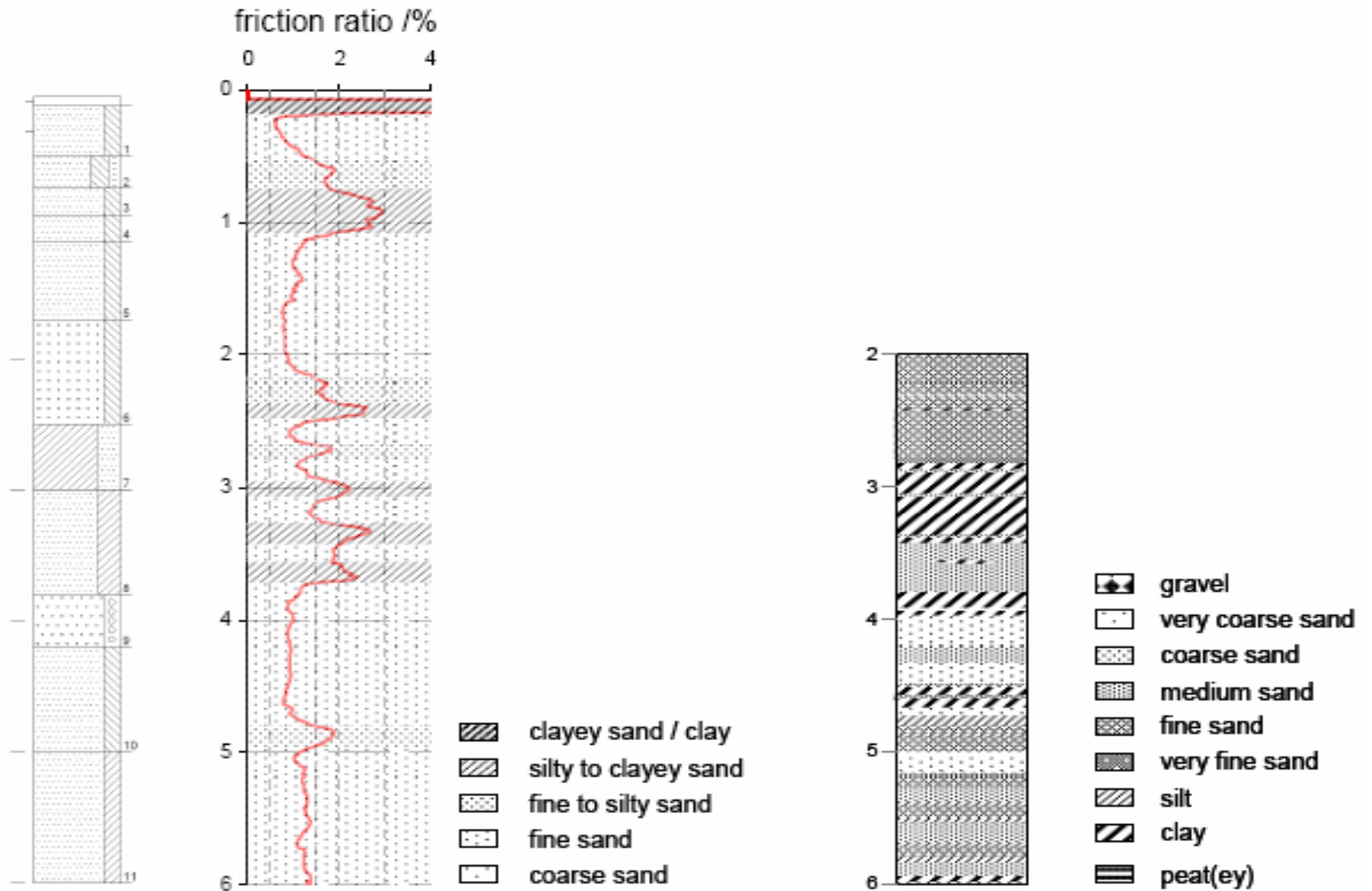
Can't sample everything!



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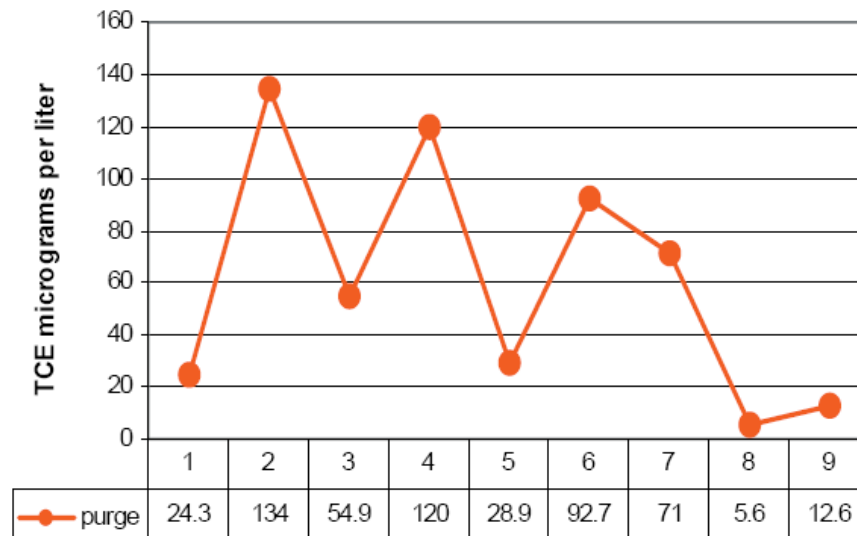
Determine lithology



Sampling techniques : minimize sampling influences

Purge

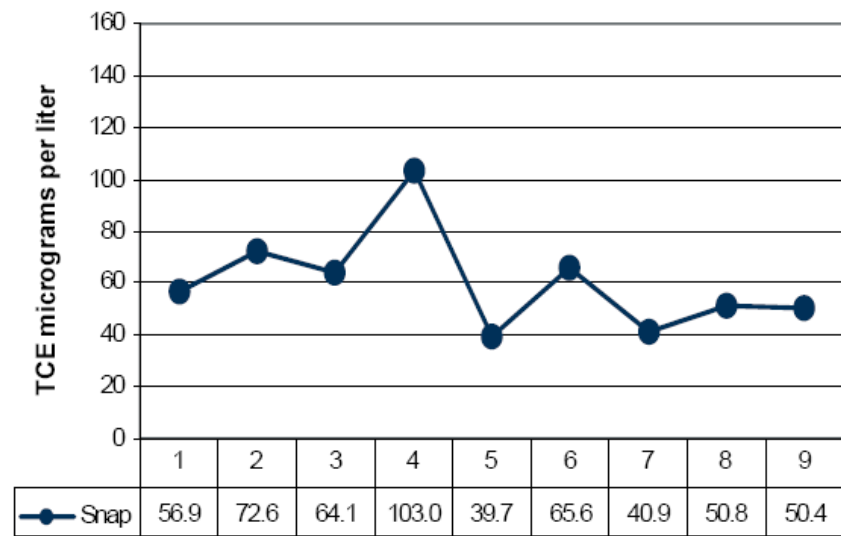
Pump purge and bail sample



Sampling Quarter

Sealed *in situ*

Passive Snap Sample



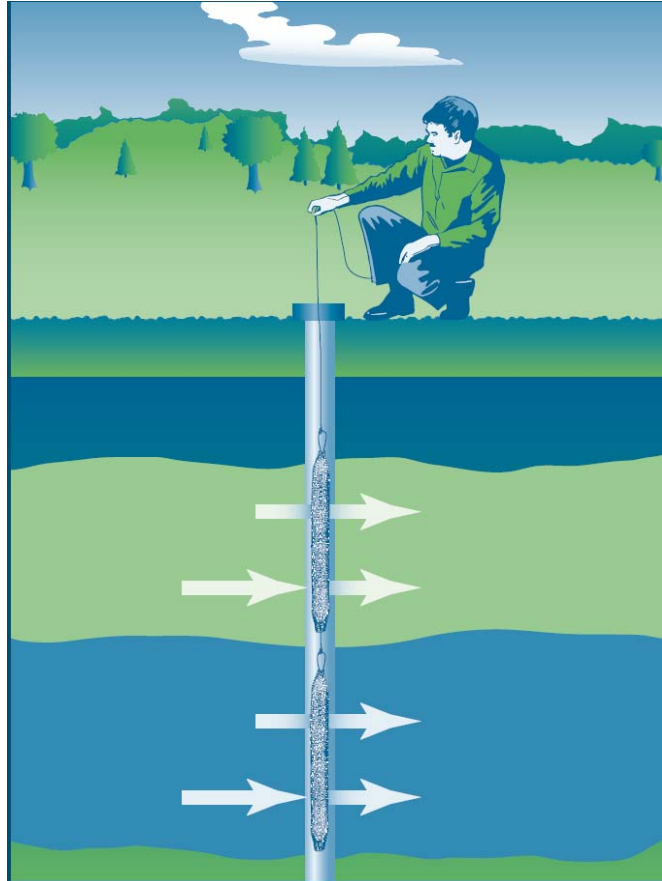
Sampling Quarter



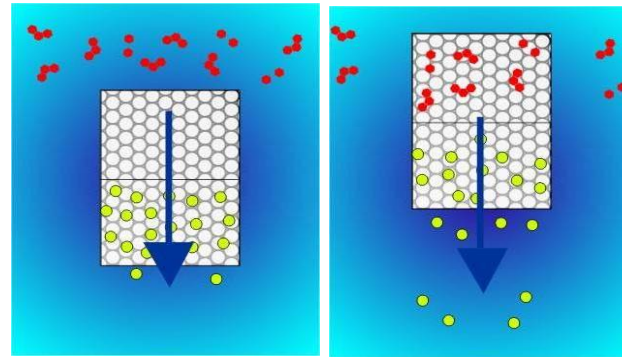
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Sampling techniques : efficient sampling and monitoring



Diffusion sampler



Sorbicell

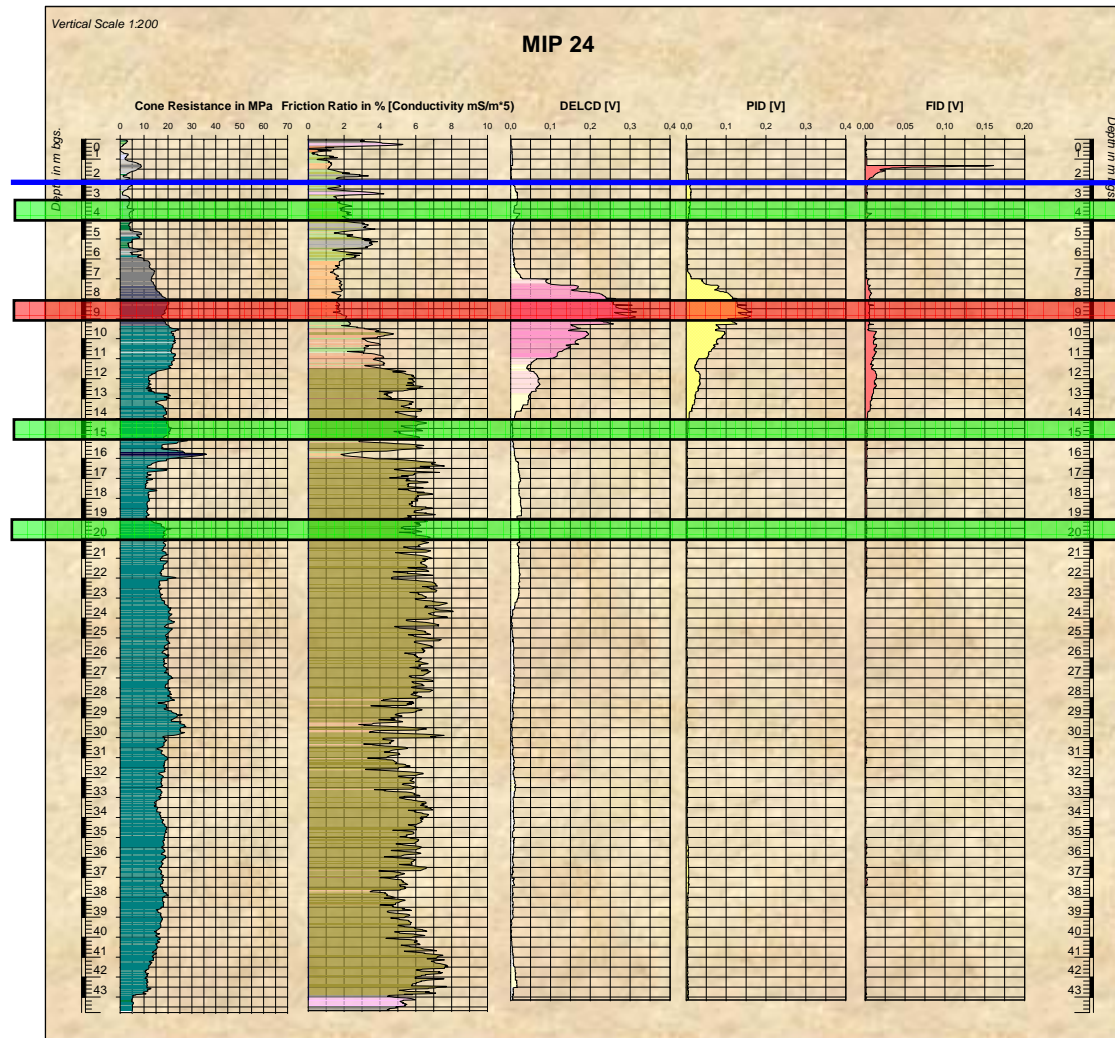


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On-site screening : representative measurements

Monitoring Well 41
 PCE < 0,1 µg/l
 TCE < 0,1 µg/l
 DCE 37.250 µg/l
 VC 14.000 µg/l



▽ **Filter 3.2**
 PCE < 0,1 µg/l
 TCE < 0,1 µg/l
 DCE < 0,1 µg/l
 VC < 0,1 µg/l

Filter 3.3
 PCE < 0,1 µg/l
 TCE 0,11 µg/l
 DCE 4,6 µg/l
 VC 54 µg/l

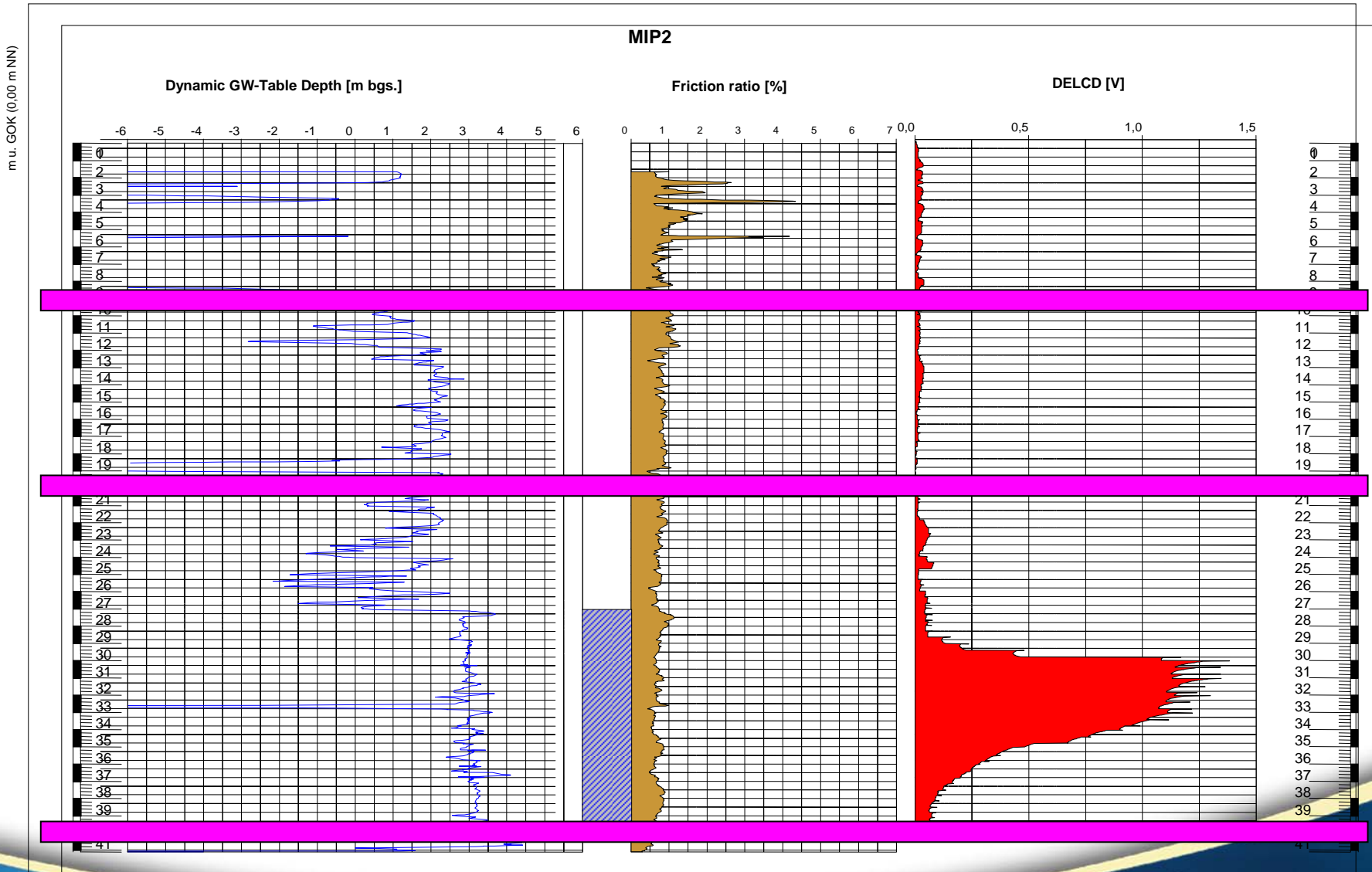
Filter 3.4
 PCE < 0,1 µg/l
 TCE < 0,1 µg/l
 DCE 12 µg/l
 VC 2,2 µg/l



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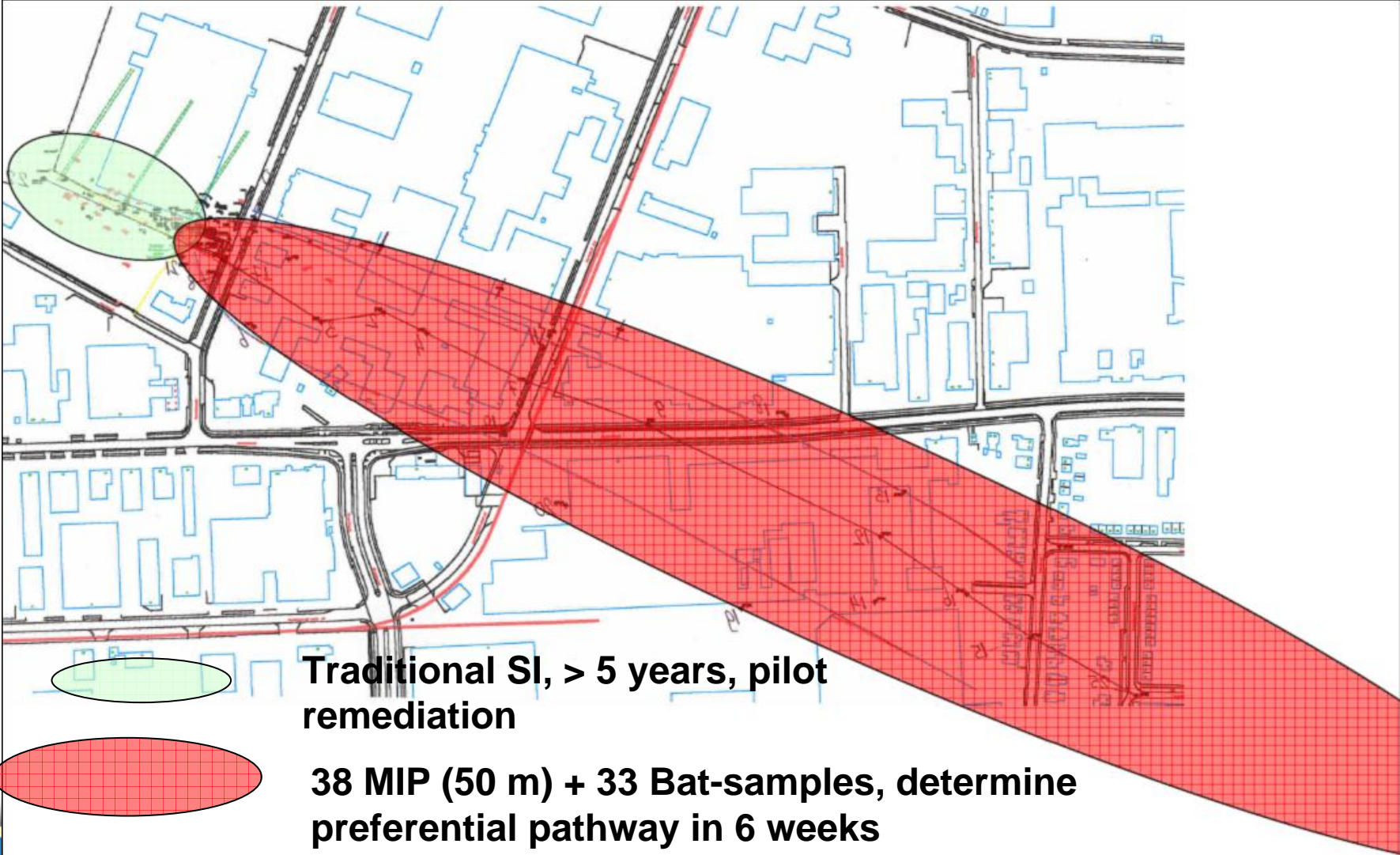
On-site screening : define preferential pathways



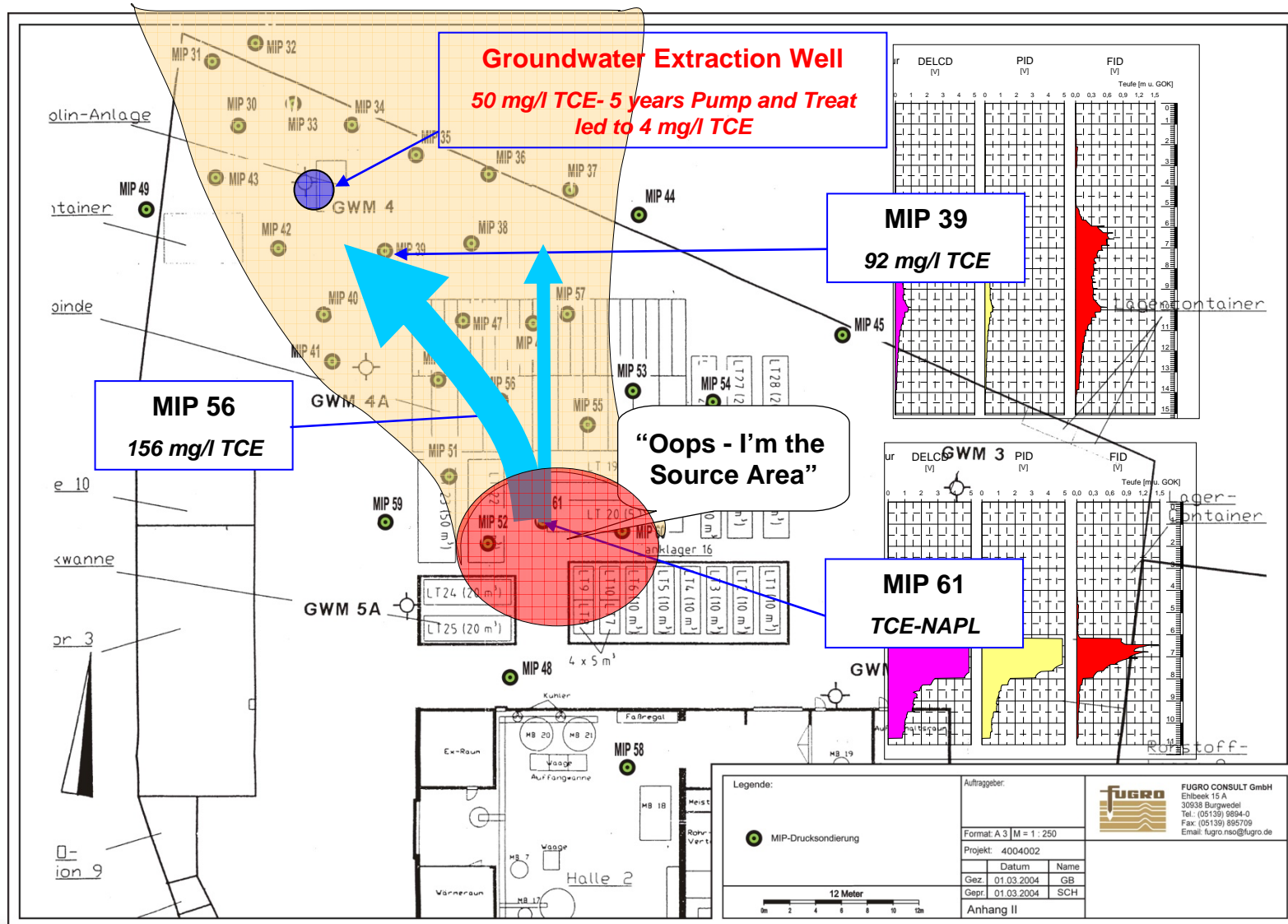
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Minimize failure costs 1



Minimize failure costs 2



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The TRIAD approach

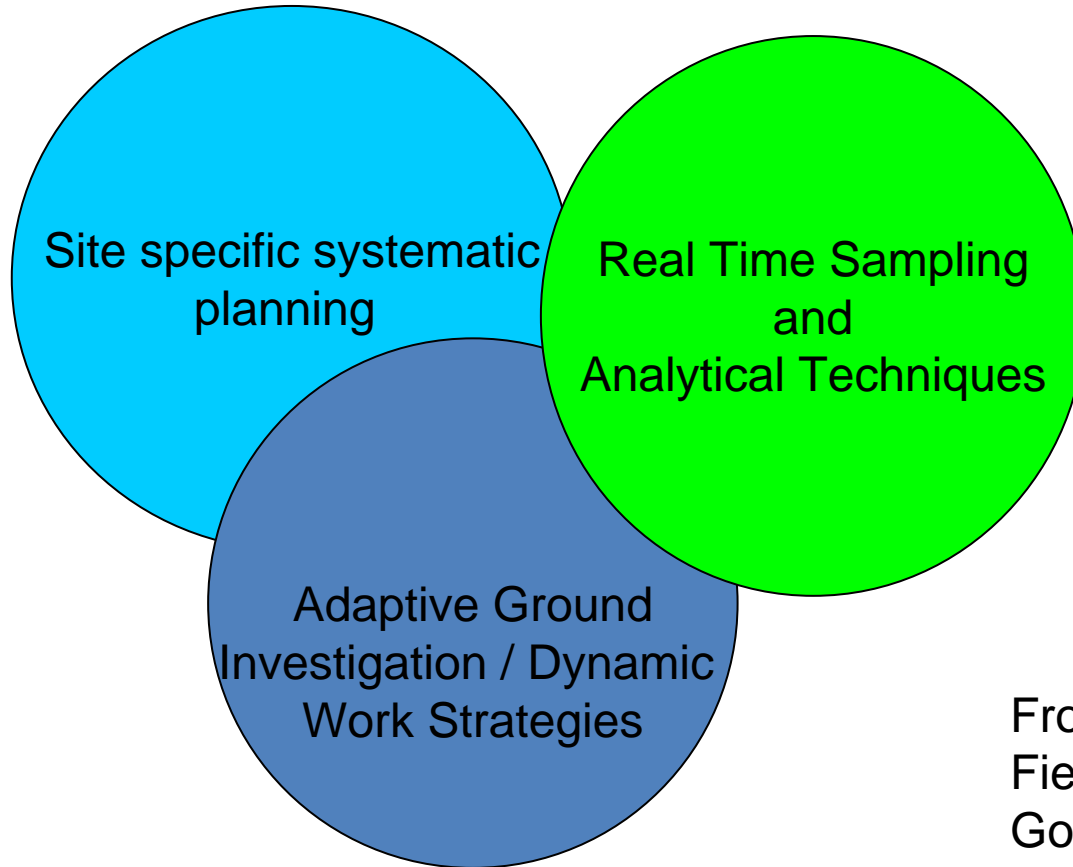
- What is TRIAD?
- How do I use TRIAD?
- Modern tools for chlorinated sites.
- What problems are there?
- What are the benefits?



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WHAT IS TRIAD?



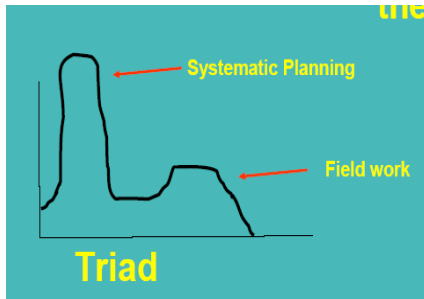
Front end planning
Field based assessment
Good field data management
Decision making by field staff



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How do I use the TRIAD approach?



- What is the point of the work?
- What shall I use the results for?
- How shall I change my plans?
- What level/detail of information do I need?
- How fast do I want the results?
- What's my site set-up?
- What's the most appropriate field test method?



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Modern tools for chlorinated sites

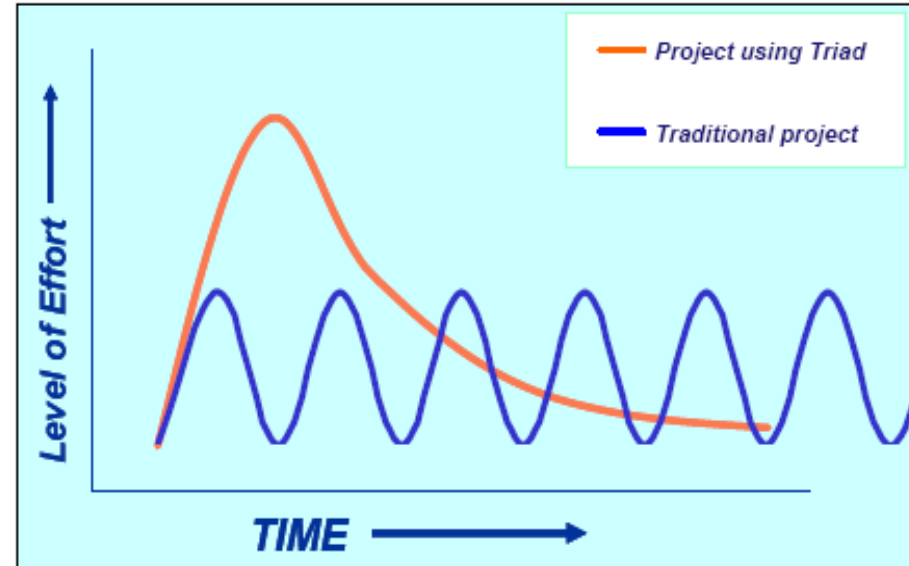
- Soilgas sampling
 - Active
 - Passive
- In-situ screening (MIP-CPT, Enissa-MIP, Geoprobe-MIP)
- In-situ soil and groundwater sampling (Geoprobe and CPT-equipment)
- Passive groundwatersampling (Sorbicell, hydrasleeve, ect)



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WHAT PROBLEMS ARE THERE?

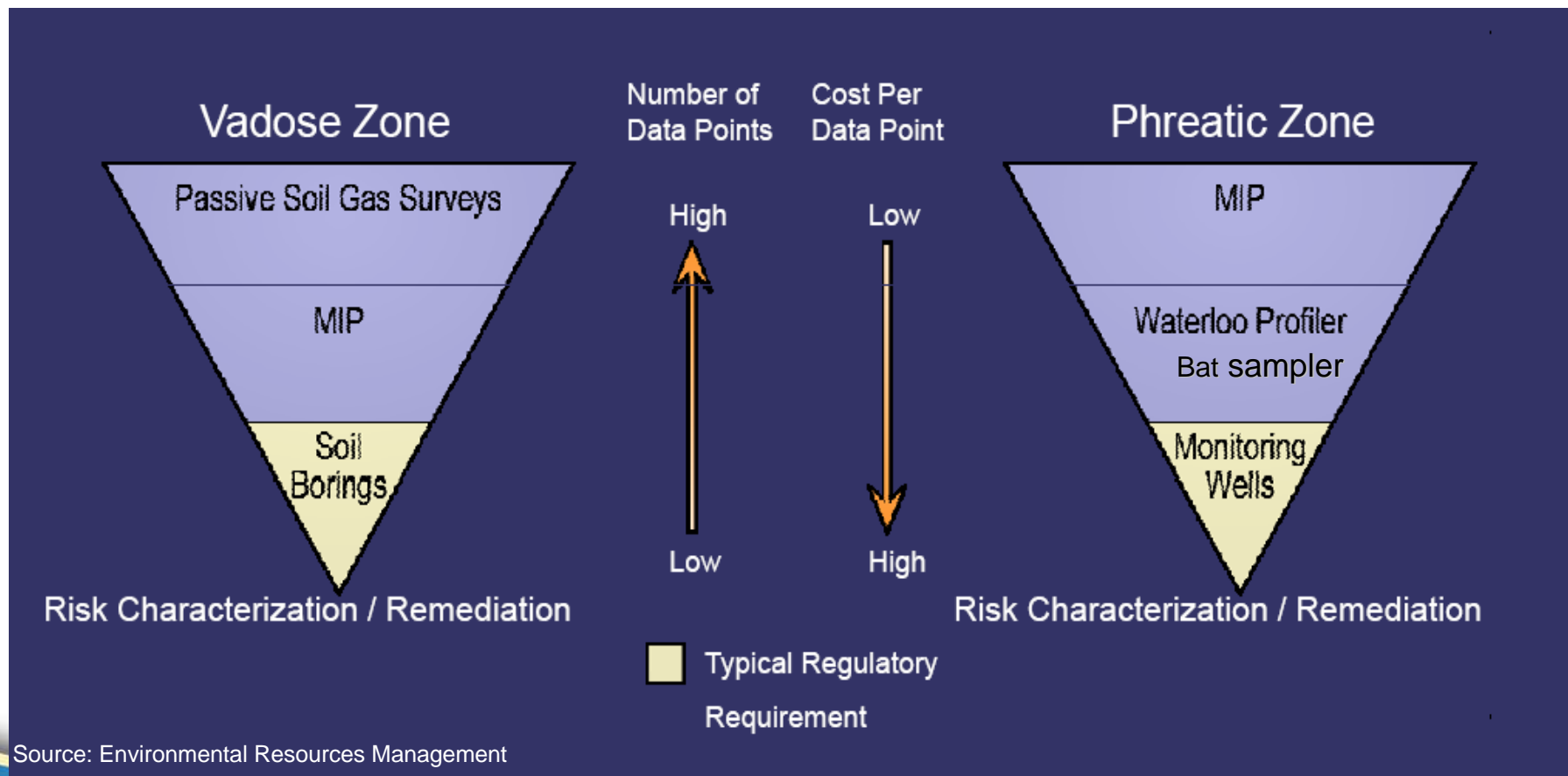


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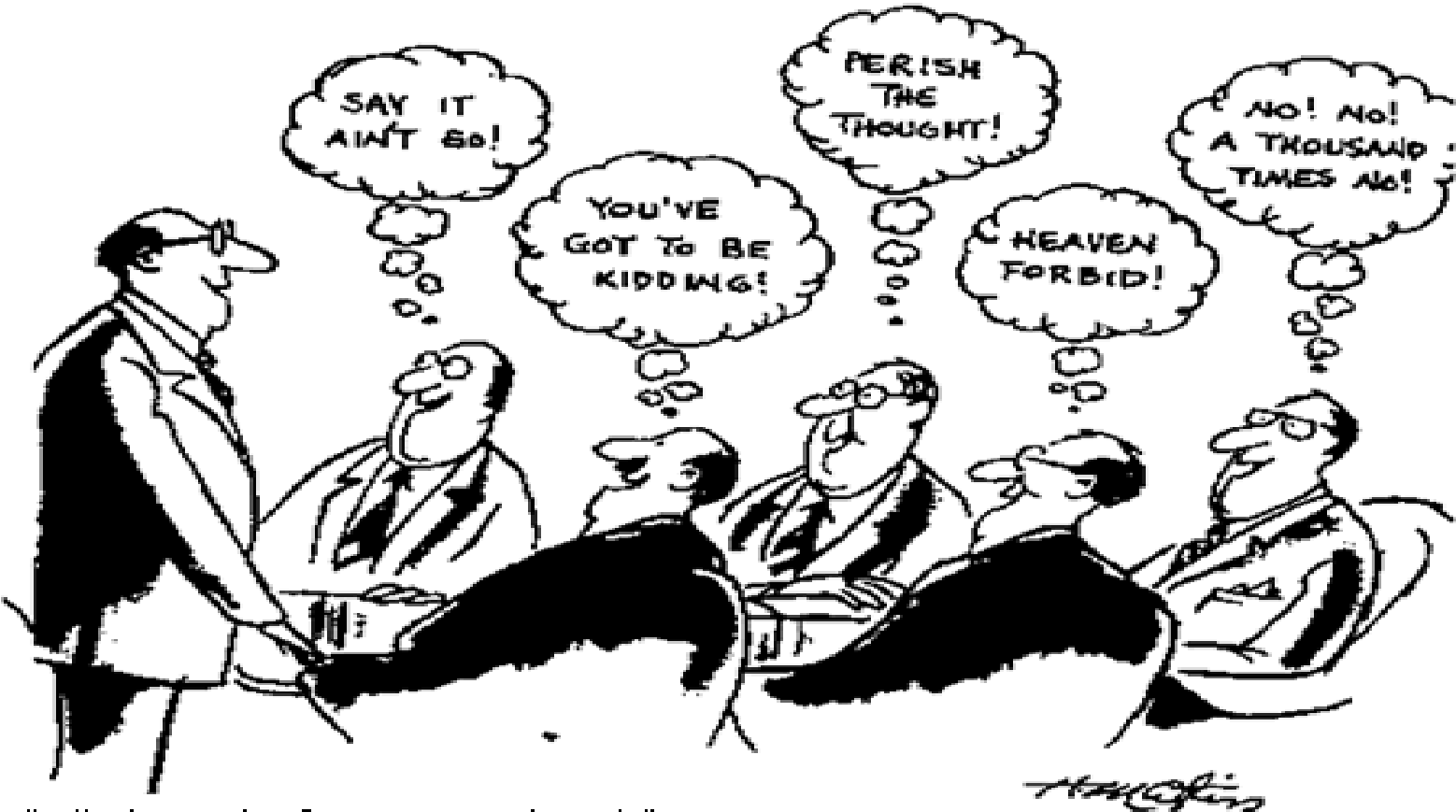
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Advantages of innovative / new technologies?

- Many data points at lower cost per point
 - ➔ More complete site characterisation
- Project uncertainty ↓ ➔ remediation success rate ↑



Questions? Remarks?



"All those in favour say 'Aye'."

"Aye."

"Aye."

"Aye."

"Aye."

"Aye."