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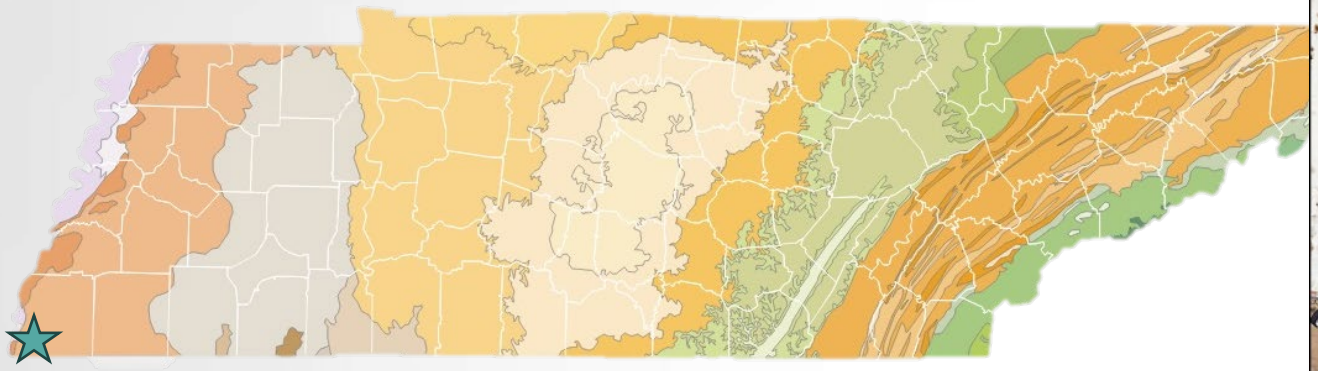
Will ZVI Effectively Degrade Pesticides in Groundwater? A Bench Scale Test

Presented by: Julia Wall

Creotox Chemical



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Site Background

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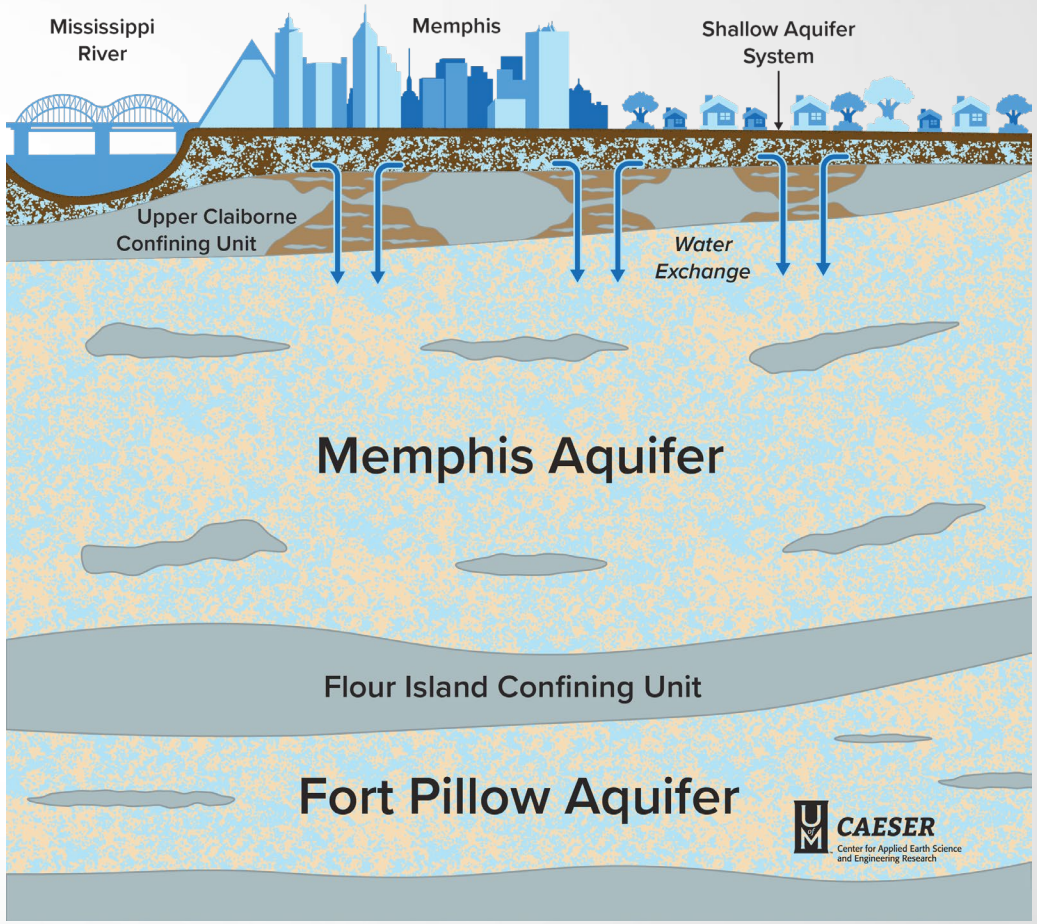
Site Characteristics

- Geology
  - Unsaturated: Fine silty clay
  - Saturated:
    - Fine-medium grained sand
    - Gravelly, med-coarse grained sand
- Hydrology
  - Groundwater table ~30-feet below ground surface
  - Flowing east southeast
  - Hydraulic conductivity typical for geology



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Site Characteristics

Lindane

Pentachlorophenol (PCP)

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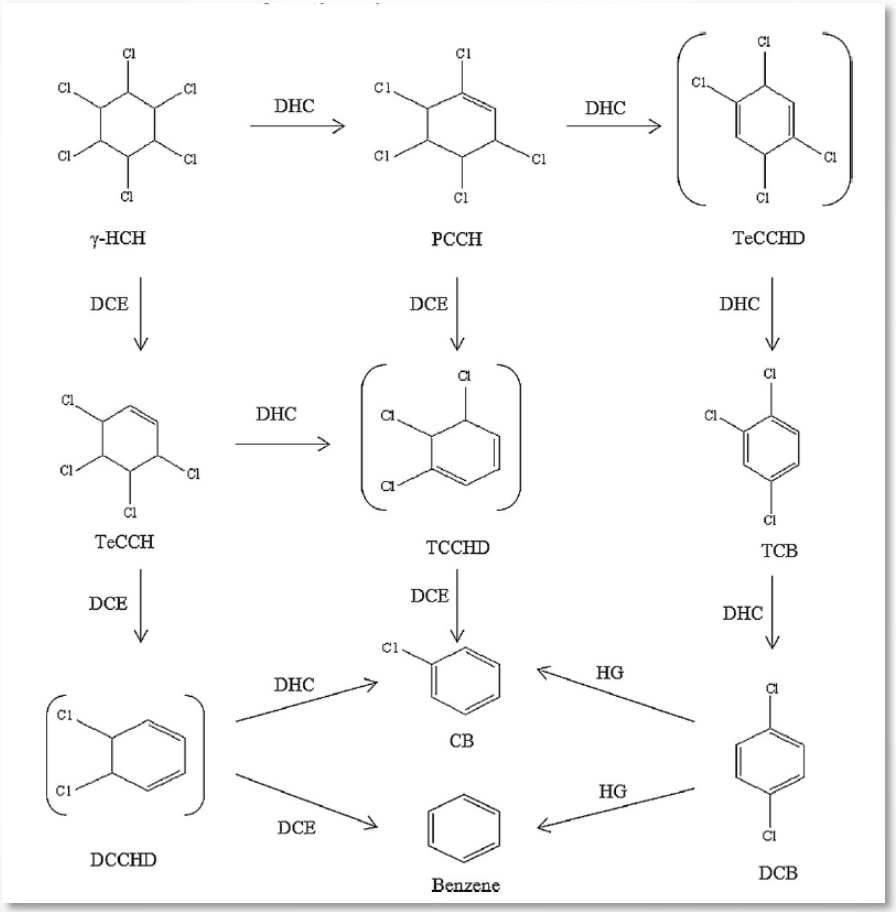
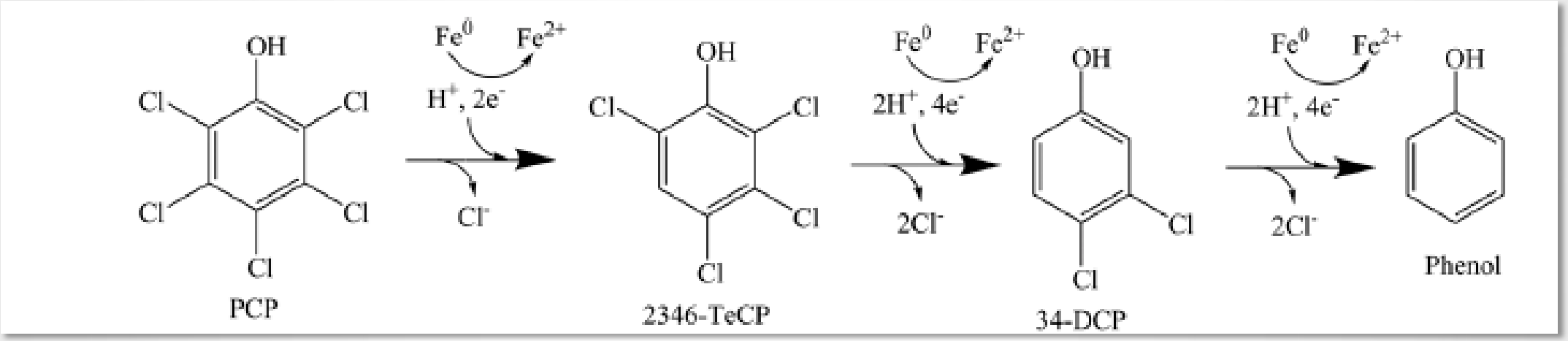
Degradation of Lindane



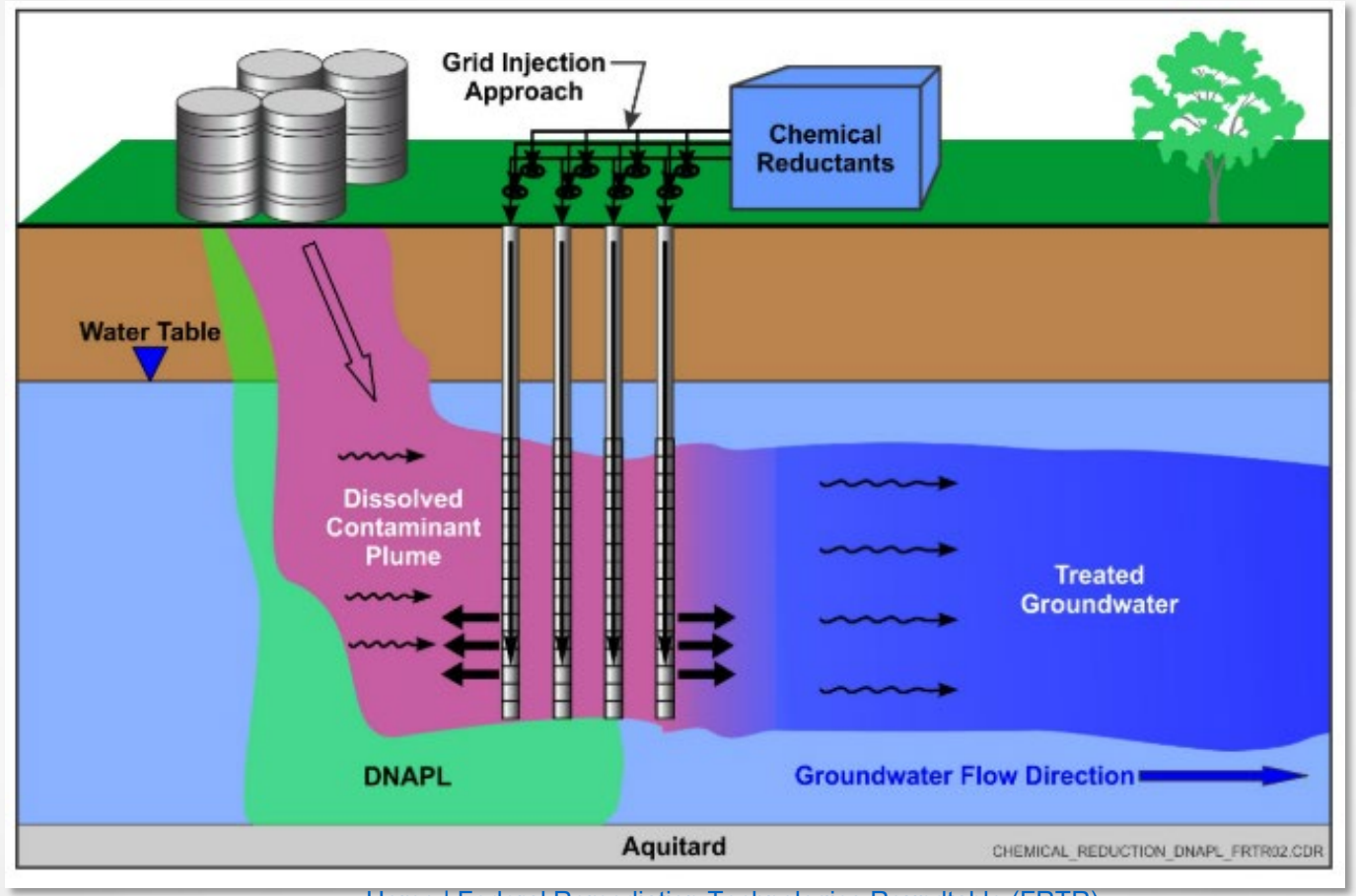
R. Singh et al. / Journal of Hazardous Materials 237–238 (2012) 355-364

Degradation of PCP



F. Cheng et al. / Environ. Sci: Water Res. Technol., 2022, 8, 2567-2579

ISCR using ZVI

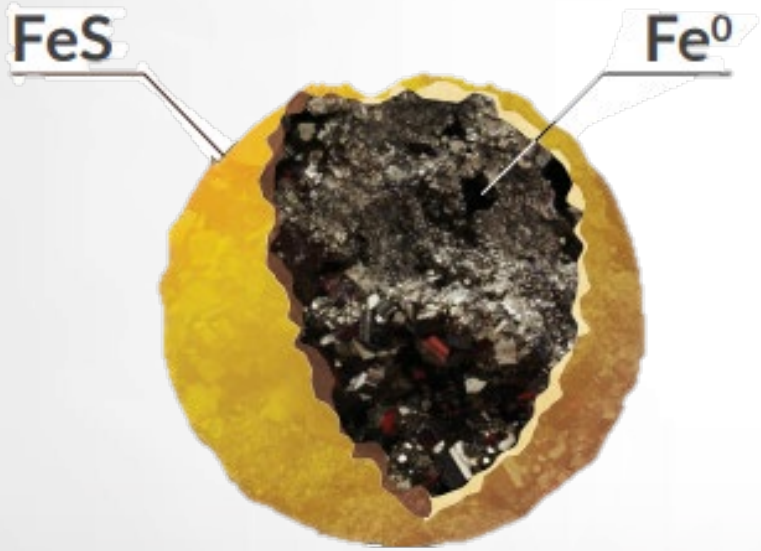


Home | Federal Remediation Technologies Roundtable (FRTR)

Bench Scale Test Objective

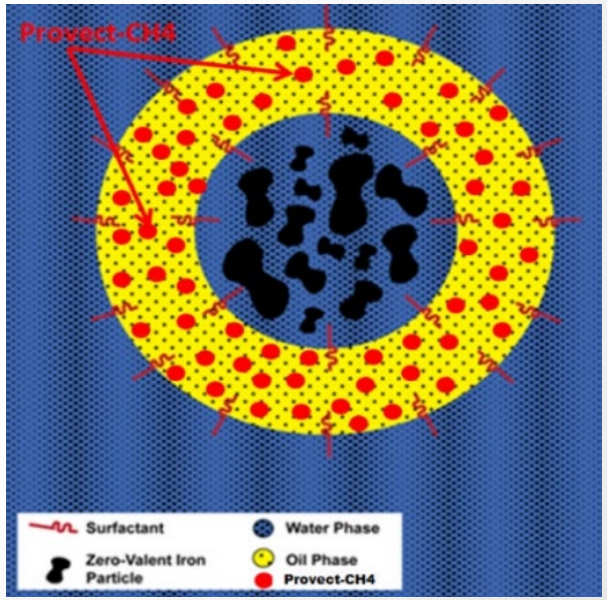
Is ZVI technology effective at degrading Site Constituents of Concern?

S-MicroZVI® from Regenesis



Environmental Remediation Research | Regenesis

EZVI-CH4™ from Provectus



EZVI_Tech_Sheet_FINAL.pdf

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Bench Scale Test

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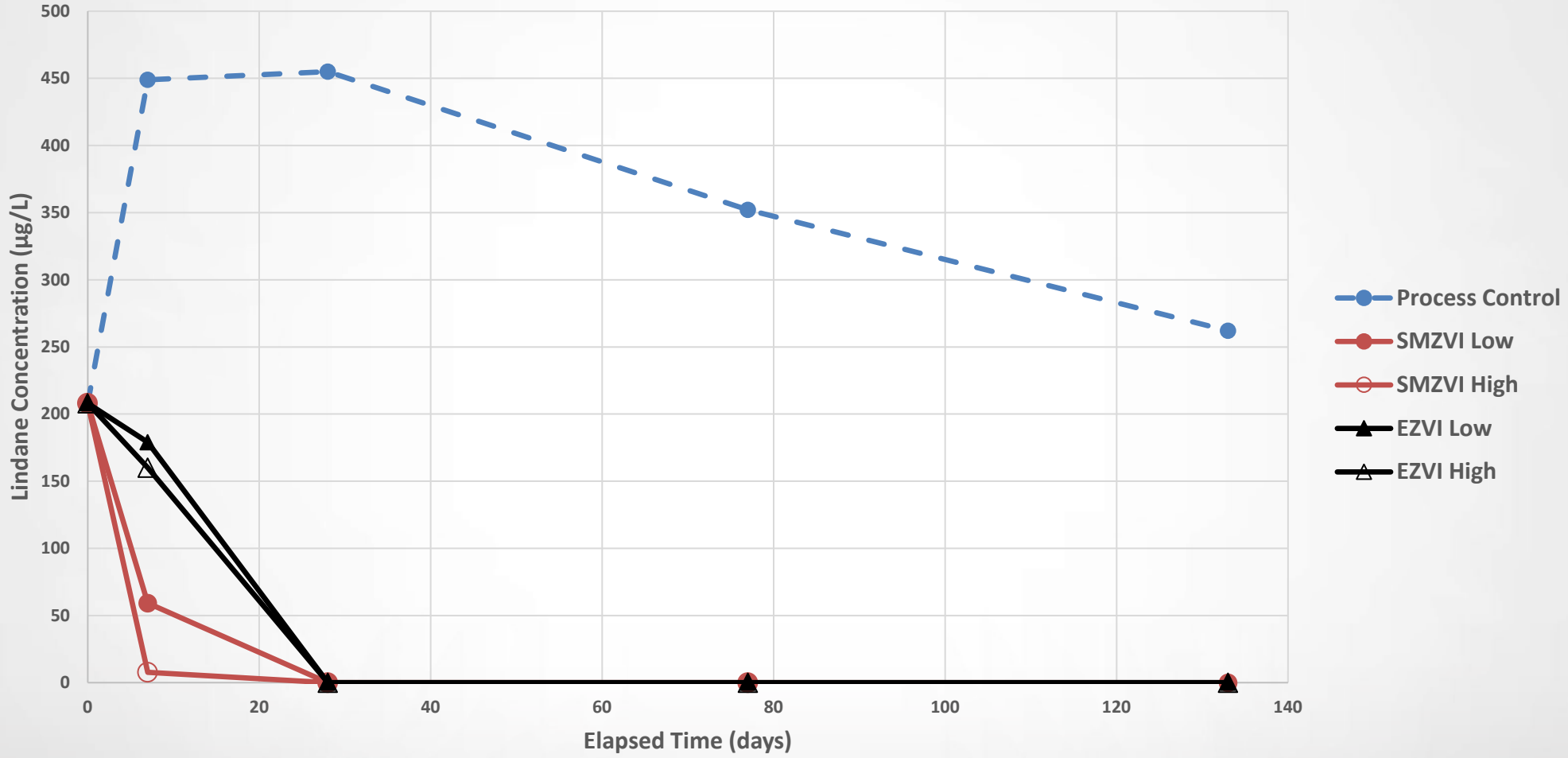
Lindane Results (Groundwater)



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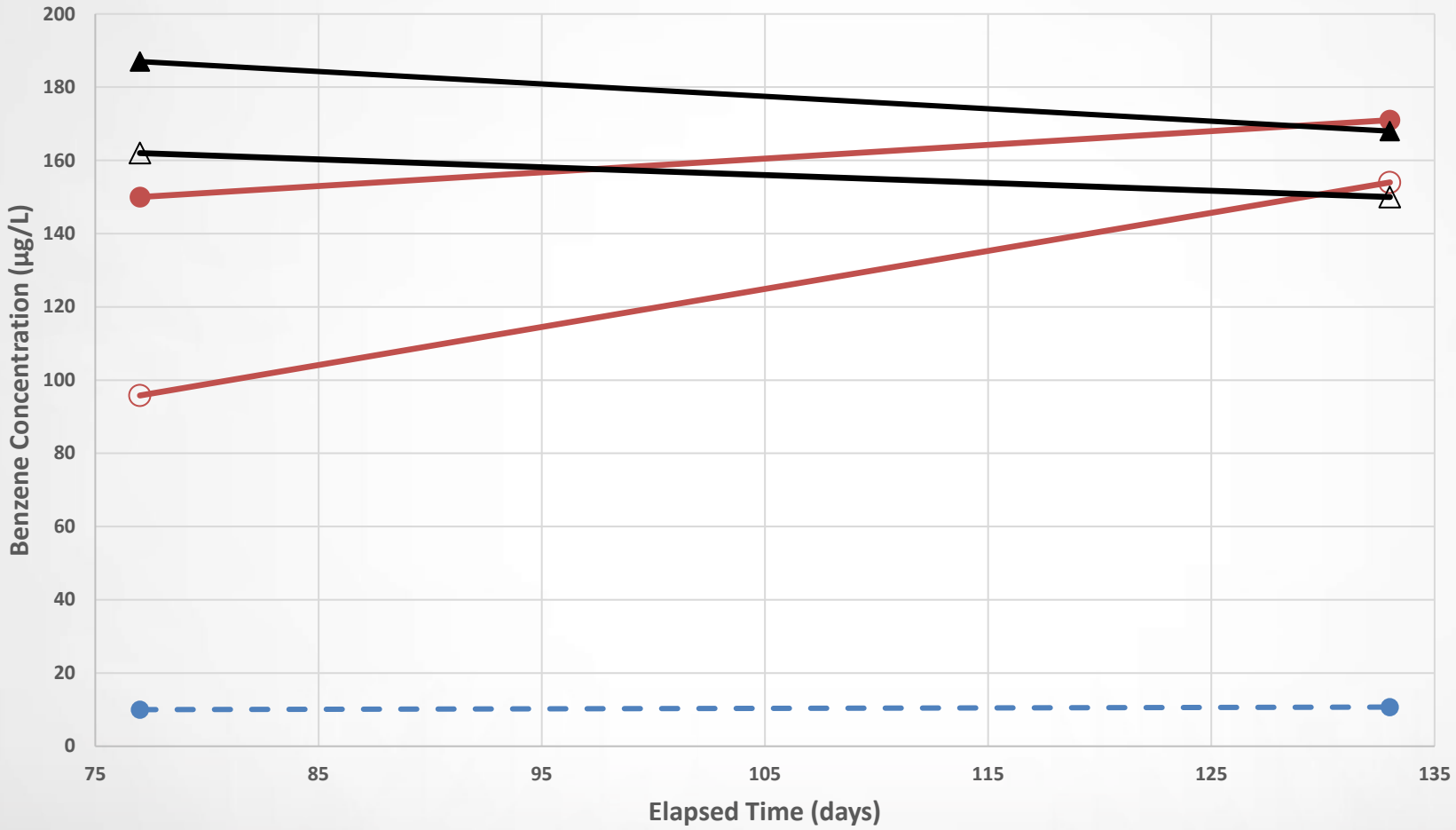
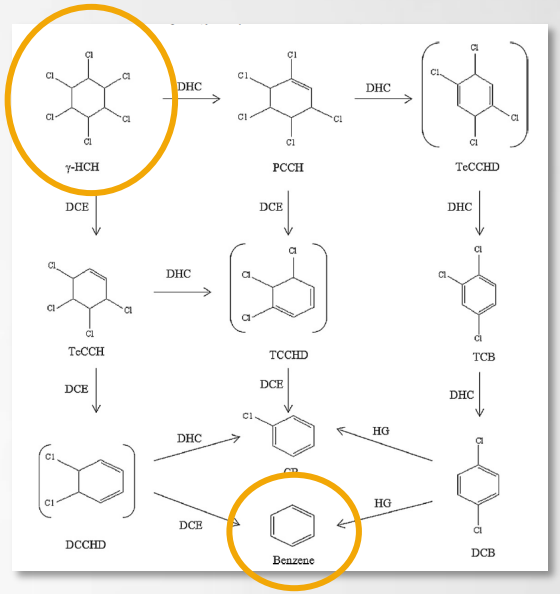
Lindane Degradation Product - Benzene





- Process Control
- SMZVI Low
- SMZVI High
- EZVI Low
- EZVI High

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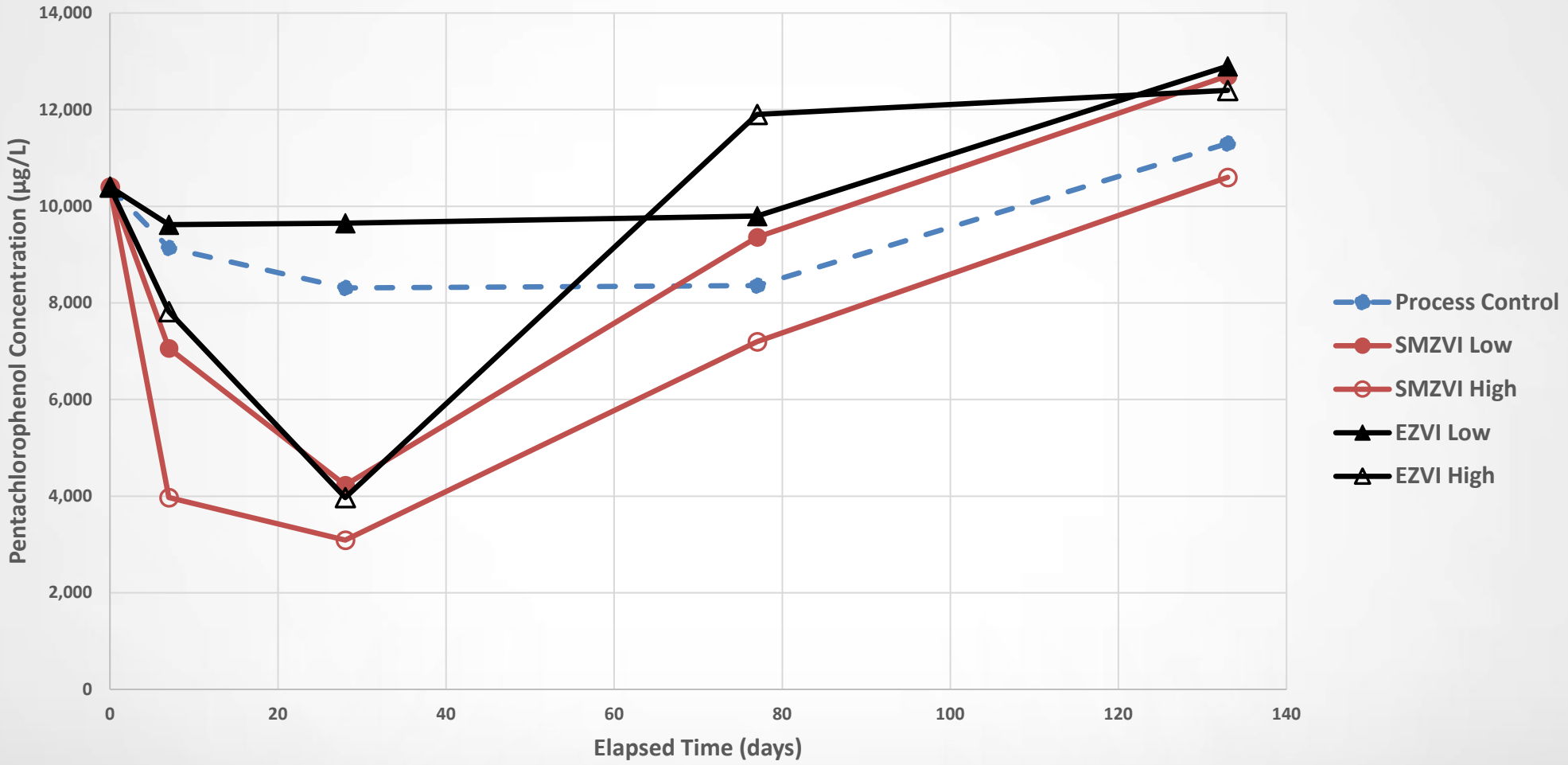
PCP Results (Groundwater)



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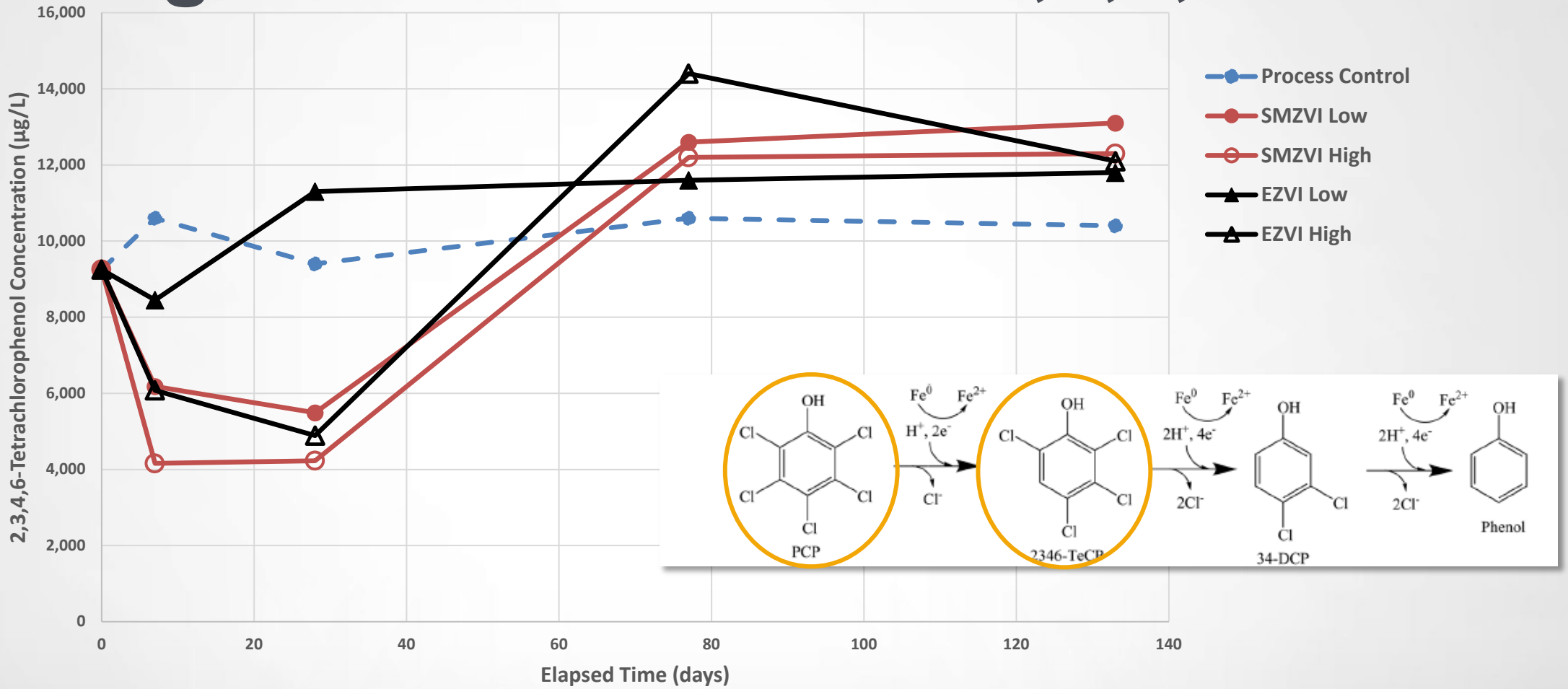
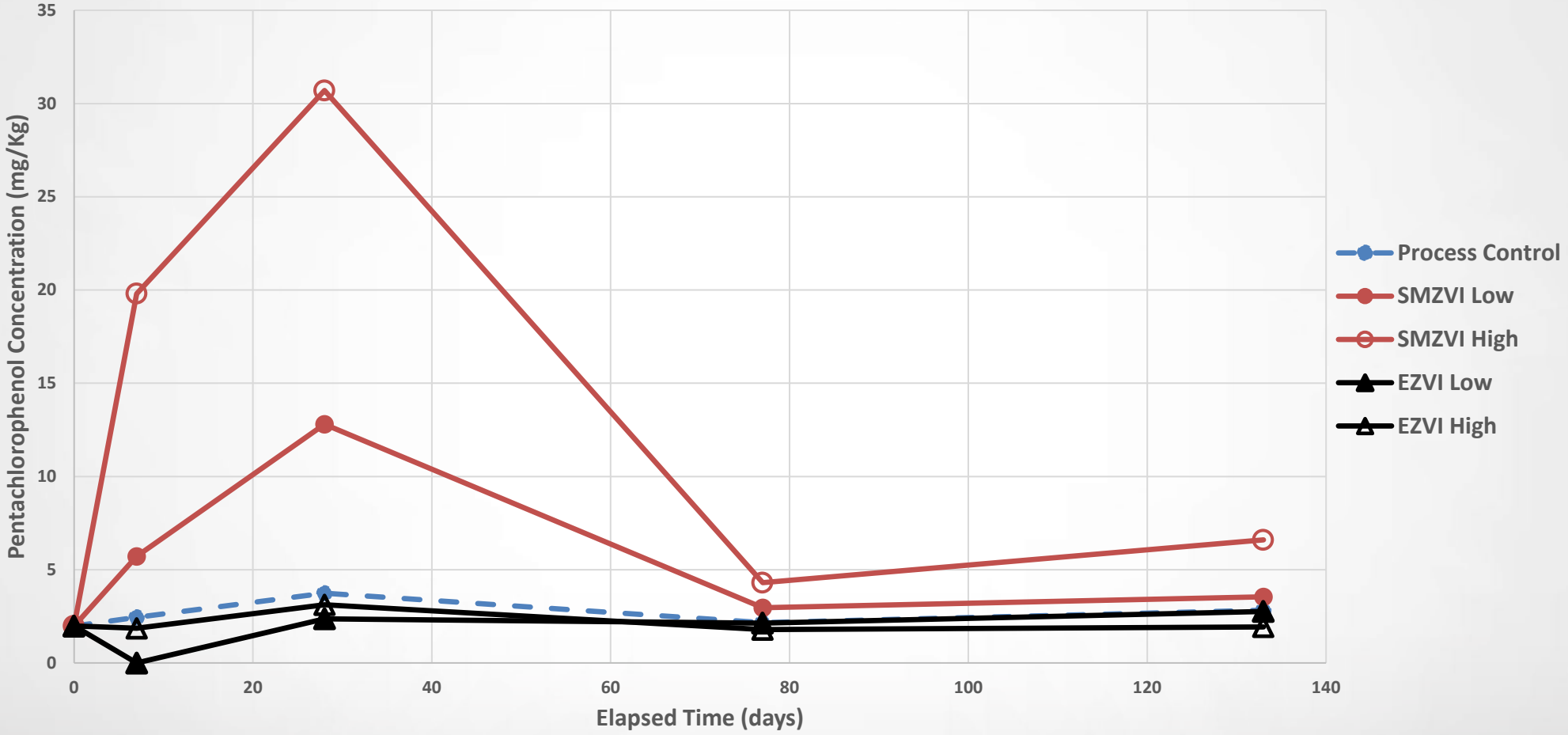
PCP Degradation Product – 2,3,4,6-TeCP



PCP Results (Soil)



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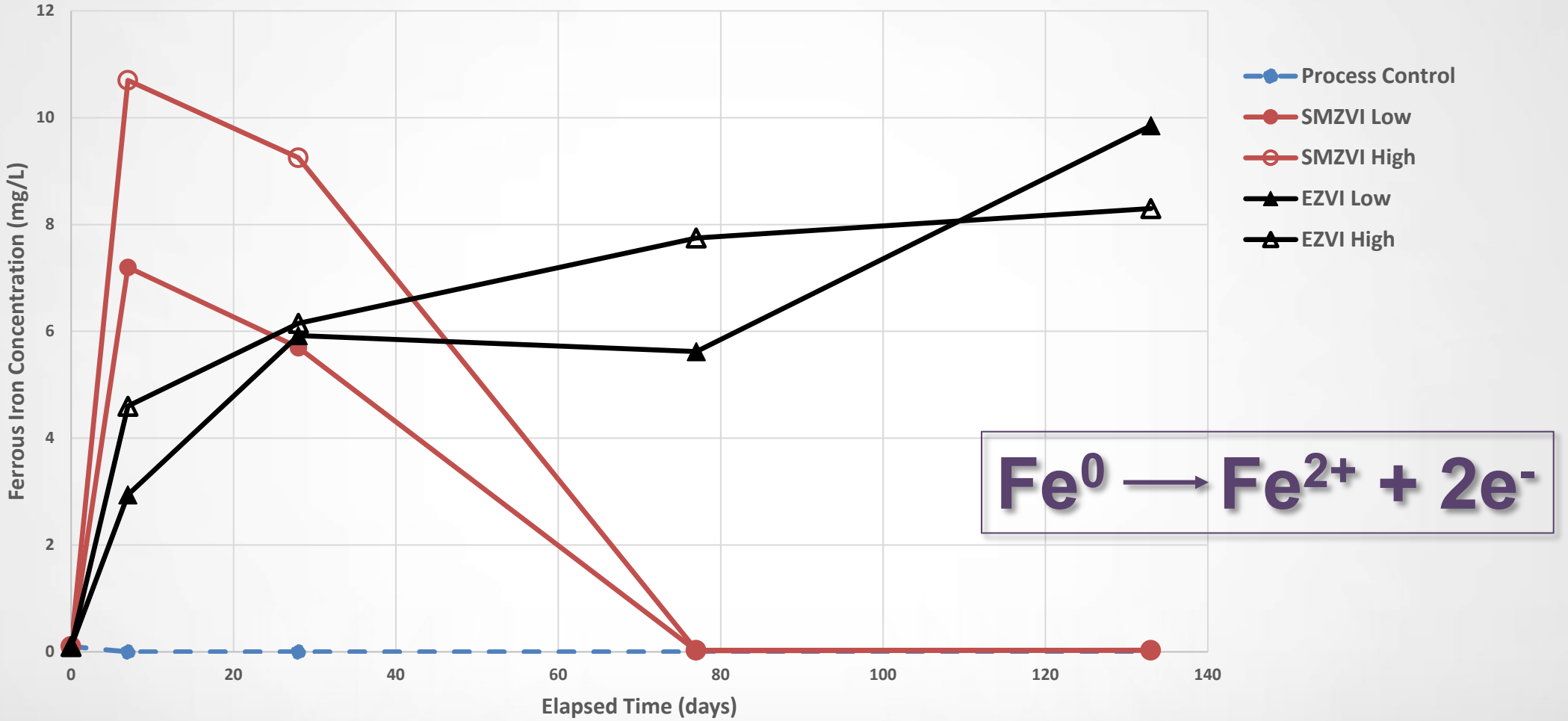
Ferrous Iron Results



$$Fe^0 \longrightarrow Fe^{2+} + 2e^-$$

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Conclusion - Lindane

- Selected ZVI reagents are effective in degrading Lindane and isomers
- Ferrous iron concentrations
  - SMZVI - no available iron by day 77
  - EZVI - available iron concentrations consistent beyond the 133-day test
- Benzene concentrations comparable and higher than process control
- No significant differences observed between high and low ZVI dosing

Conclusion - Pentachlorophenol

- PCP degradation not observed during the 133-day test period
- Desorption may have caused increased concentrations in water
- Ferrous iron concentrations
  - SMZVI - no available iron by day 77
  - EZVI - available iron concentrations consistent beyond the 133-day test
- Degradation product concentrations did not increase as anticipated
- No significant differences observed between the two ZVI products
- No significant differences observed between high and low ZVI dosing

Next Steps for Creotox

- Bench scale test objective:

  Is ZVI technology effective at degrading Site Constituents of Concern?

- Returning to the remedial alternatives matrix
  - Thermal
  - Biodegradation
  - Activated carbon for source control

Presenter

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QUESTIONS?