Closing Thoughts on Remedial Design Data Collection

Duke Engineering and Services

SEAR Workshop

What do we need to know?

Data needs for DNAPL remediation:

- Characterization of volume and extent ✓
- Remediation Design Parameters ✓

Characterization Needs

Data Needs: ***Geosystem***	*ex situ*	Thermal	Surfactants	Chemical Oxidation
• Morphology/stratigraphy	✓	✓	✓	✓
• Hydraulic conductivity		✓	✓	✓
• Air permeability		✓		
• Hydraulic gradient		✓	✓	✓
• Piezometric surface	✓	✓	✓	✓
• Water table fluctuations	✓	✓	✓	✓
• DNAPL mass				✓
• DNAPL distribution (volume/extent of affected soil)	✓[a]	✓	✓	✓

[a] General scoping estimate, only

Characterization Needs (cont.)

Data Needs: ***DNAPL***	*ex situ*	Thermal	Surfactants	Chemical Oxidation
• Density		✓	✓	✓
• Viscosity		✓	✓	✓
• Interfacial tension (IFT) — NAPL:water		✓	✓	✓
• Chemical makeup	✓	✓		✓
• Wettability		✓	✓	✓

Characterization Needs (cont.)

Data Needs: ***Soil/Sediment***	*ex situ*	Thermal	Surfactants	Chemical Oxidation
• Texture, density/porosity		✓	✓	✓
• Structure, clay content and minerology		✓	✓	✓
• pH	✓	✓	✓	✓
• Cation exchange capacity (CEC)			✓	
• Electrical conductivity (EC)		✓[a]		✓
• Fraction of organic carbon (f_{oc})		✓	✓	✓

[a] Needed for certain variants of the technology

Characterization Needs (cont.)

Data Needs: ***Water***	*ex situ*	Thermal	Surfactants	Chemical Oxidation
• Soluble organics (DNAPL components and daughter products)		✓		✓
• pH	✓	✓	✓	✓
• Eh	a	a	a	a
• Cations/anions			✓	✓

[a] If natural attenuation will be a secondary remediation mechanism.

Characterization Needs (cont.)

Data Needs: ***Setting***	*ex situ*	Thermal	Surfactants	Chemical Oxidation
• Structures	✓	✓		
• Topography and drainage	✓	✓		
• Recharge		✓	✓	✓
• Utilities and pipelines	✓	✓	✓	✓
• Flow boundaries		✓	✓	✓
• Available WWTFs		✓	✓	

A Common Foundation

- All DNAPL remediation technologies require detailed site characterization for their design basis
- No one technology works for all sites — the treatment train concept
- Choices for remediation must be based on characterization data and technology limitations

Experience shows:

- Inadequate DNAPL site characterization leads to:
  - Poor feasibility studies
  - Meaningless bids and cost estimates
  - Selection of improper or ineffective designs
  - Remediation failures
  - Increased or wasted $$$

(pinching dollars to save pennies)

Lesson Learned:

- Have an adequate design basis before implementing DNAPL remediation