# PNNL Impact on Hanford Cleanup:

# S&T Innovations Transforming Subsurface Remediation

March 8, 2010

Wayne Johnson, Director
Environmental Sustainability Division

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# Pacific Northwest National Laboratory

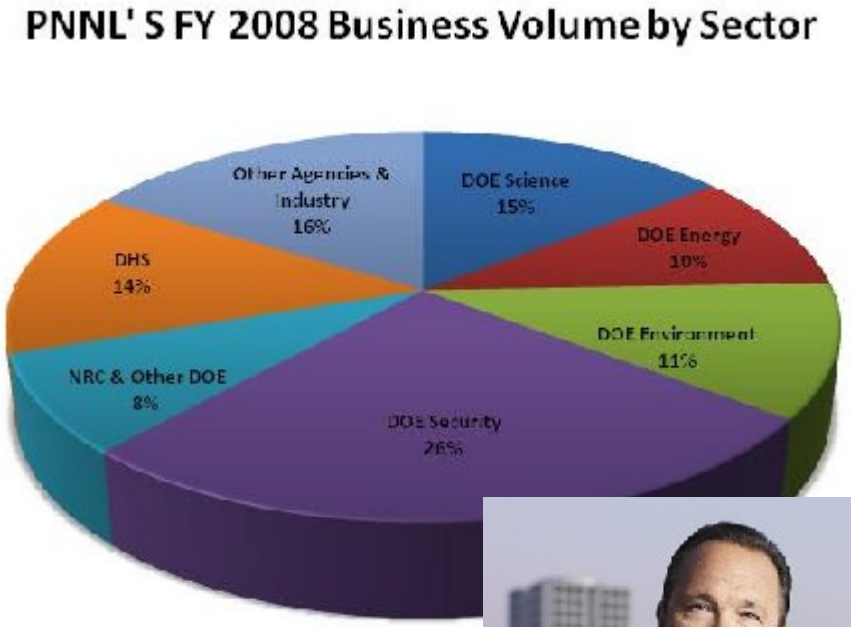
- DOE Office of Science Multi-Program National Lab
- $1.1B in business volume in FY09
- 4,600 staff
- Mission Outcomes:

Strengthen U.S. scientific foundations for innovation

Increase U.S. energy capacity and reduce dependence on imported oil

Prevent and counter terrorism and proliferation of weapons of mass destruction

Reduce environmental effects of human activity and create sustainable systems




**Lab Director's Message:**

"PNNL's core capabilities—its people, facilities, equipment, and systems—must be strong and relevant to address the nation's challenges"

**Mike Kluse**
PNNL Director

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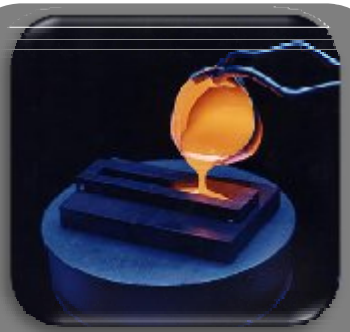
# PNNL's core capabilities support the Environment mission

Radiation Dosimetry and Health Effects

Subsurface Science and Remediation Research



Waste Treatment Process Development

Radiochemical Processing Research

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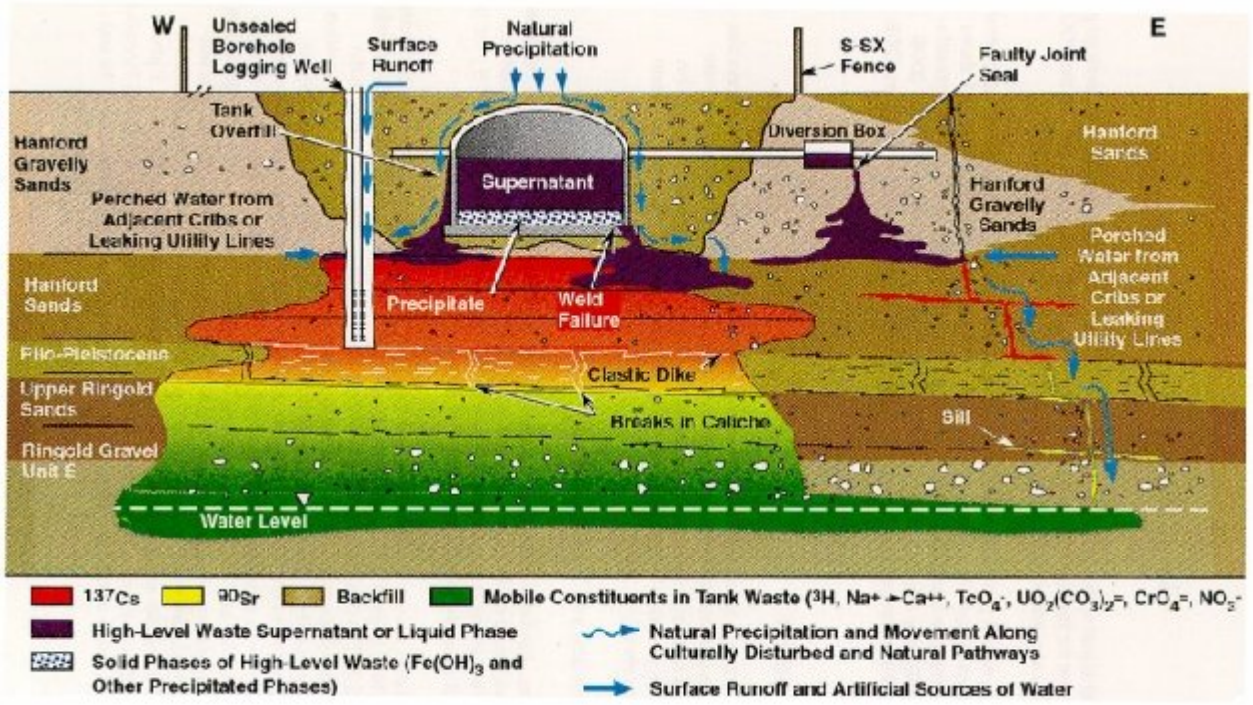
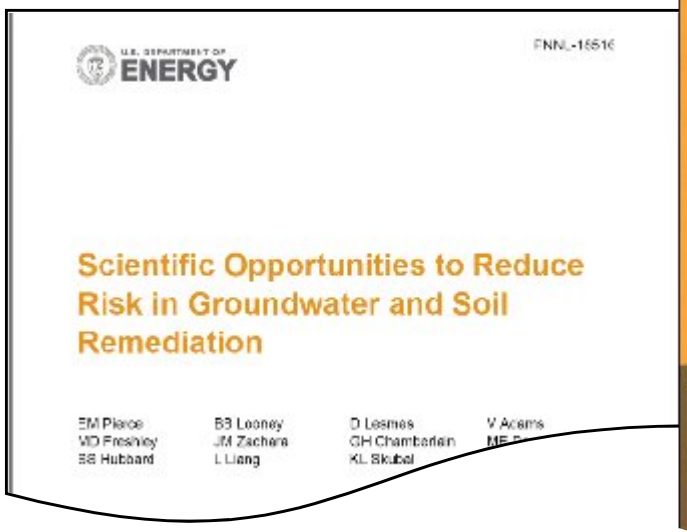
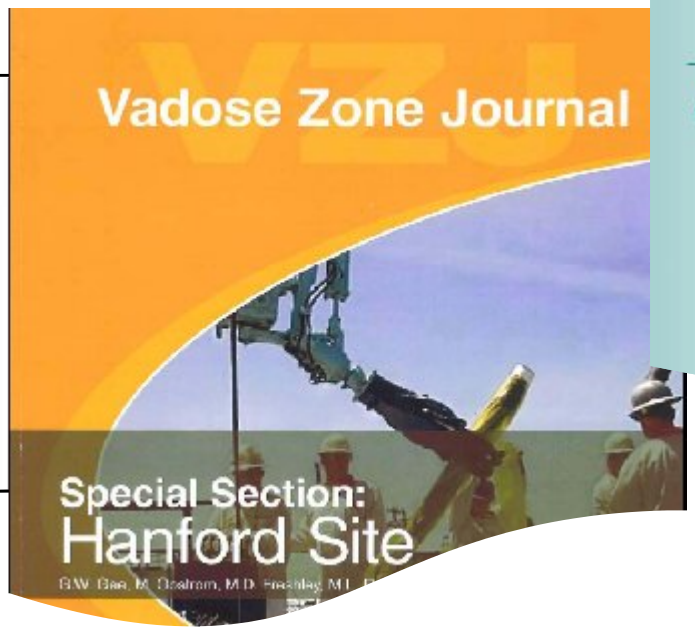
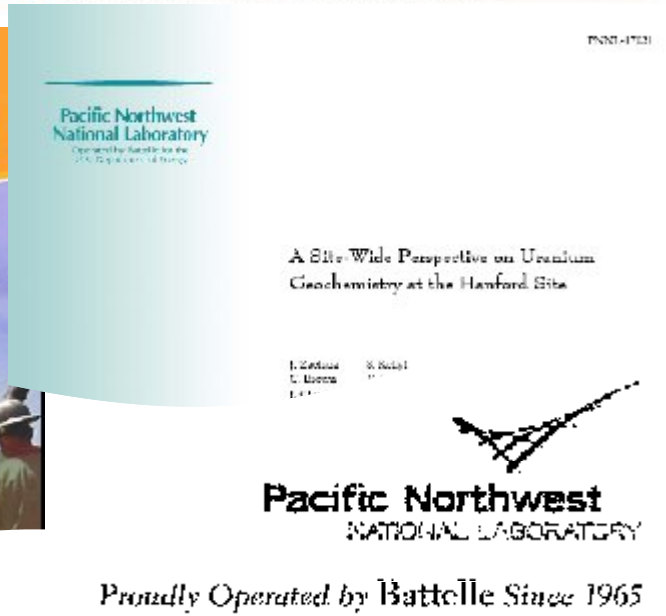
# Subsurface Science and Remediation

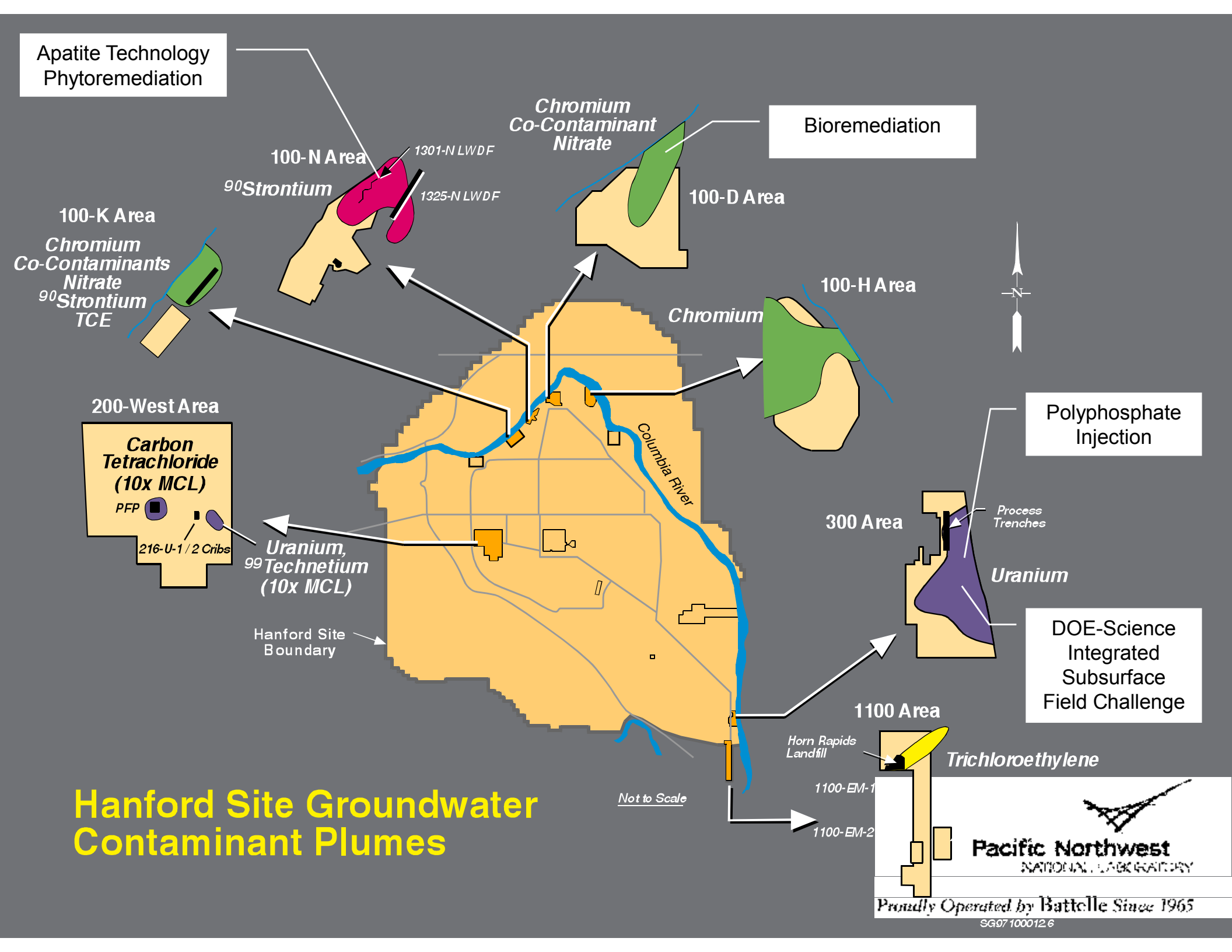
- Strong science and computational core competencies support resolution of complex subsurface issues
  - Cs-migration below Hanford tanks
  - Differences in Uranium migration behavior across the Hanford site




Apatite Technology
Phytoremediation
100-N Area
1301-N LWDF
1325-N LWDF
90Strontium
Chromium
Co-Contaminant
Nitrate
Bioremediation
100-D Area
100-K Area
Chromium
Co-Contaminants
Nitrate
90Strontium
TCE
100-H Area
Chromium
N
200-West Area
Carbon
Tetrachloride
(10x MCL)
PFP
216-U-1/2 Cribs
Uranium,
99Technetium
(10x MCL)
Columbia River
Polyphosphate
Injection
300 Area
Process
Trenches
Uranium
DOE-Science
Integrated
Subsurface
Field Challenge
Hanford Site
Boundary
1100 Area
Horn Rapids
Landfill
Trichloroethylene
1100-EM-1
1100-EM-2
Not to Scale
Hanford Site Groundwater
Contaminant Plumes
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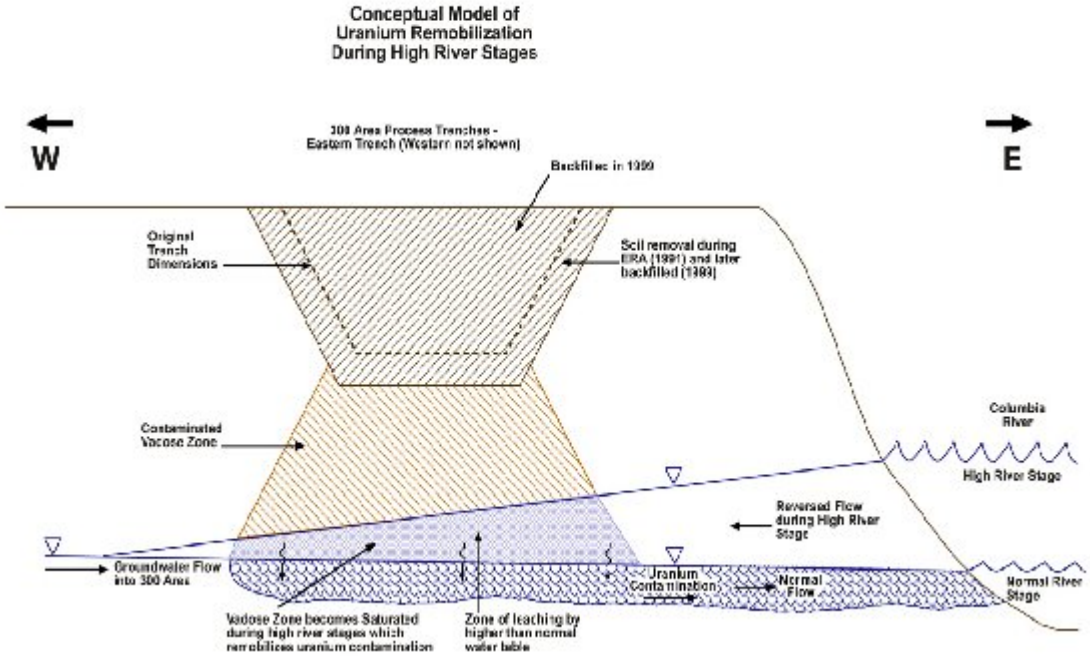
## Example:
# Uranium – Hanford 300 Area

- Integrating science and applied R&D help advance transformational solutions for clean-up
- Complex site geology, geochemistry, and hydrology significantly impact remediation effectiveness

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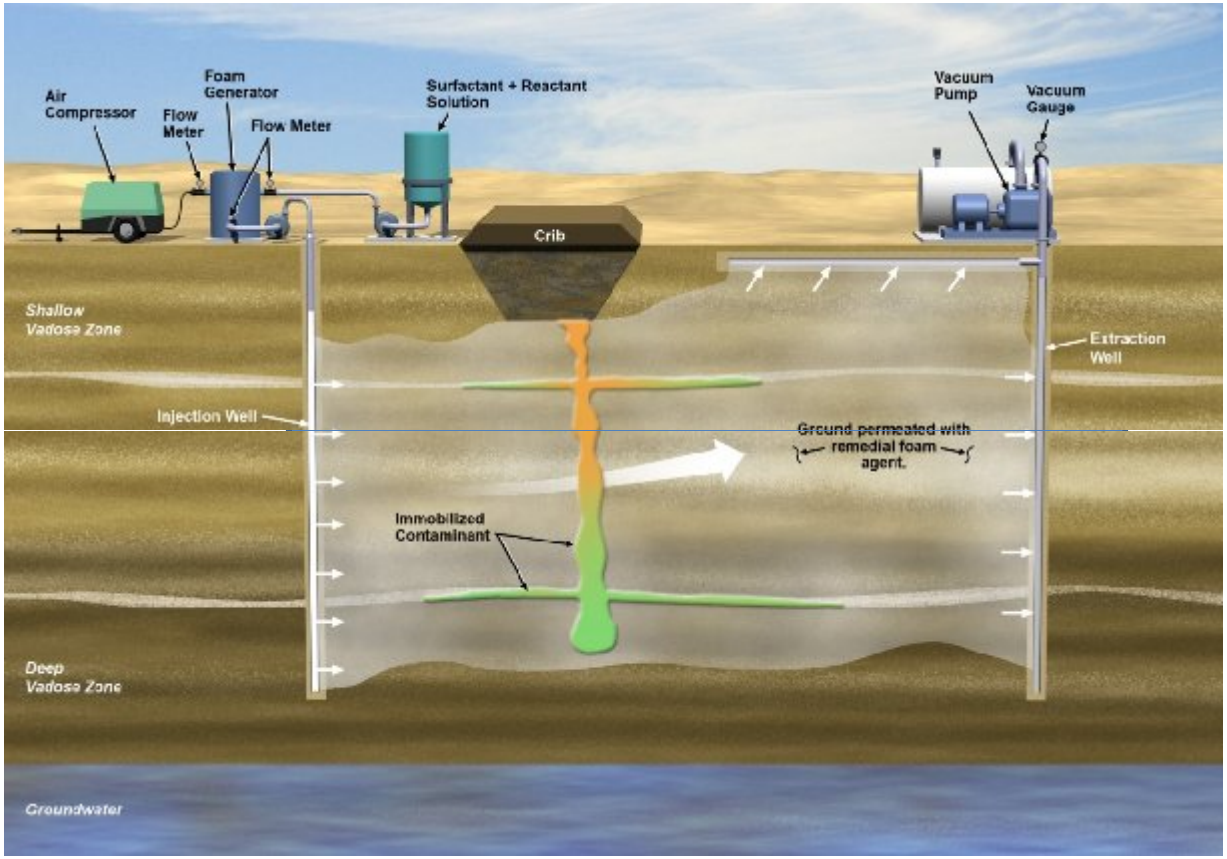
## Example:
# Deep Vadose Zone – Hanford Plateau

- Deep vadose zone limits options, effectiveness of conventional clean-up approaches
- Science- and technology-based innovations lead to new approaches
  - Desiccation
  - Foam-delivered reactive agents

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# PNNL science and innovation underpins Hanford cleanup decisions and delivers transformational solutions for the most complex environmental challenges

- Persistent soil and groundwater contamination
- Deep vadose zone remediation

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