

Hanford's 300 Area Integrated Field Research Challenge Site

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Abstract

The U.S. Department of Energy - Environmental Remediation Sciences Division is supporting an Integrated Field Research Challenge (IFRC) Site at Hanford's 300 Area. This site, immediately adjacent to the Columbia R. (Figure 1), is the location of a groundwater uranium plume that resulted from past discharges of liquid effluent to unlined disposal ponds and trenches. An IFRC site has been established in the area of one of the former disposal ponds to address a series of forefront science questions on mass transfer posed to evaluate the effect of spatial heterogeneities; the importance of scale; coupled interactions between biogeochemical, hydrologic, and mass transfer processes; and measurements/approaches needed to characterize and model a mass-transfer dominated contaminant system. Scientific hypotheses focus on multi-scale mass transfer processes in the vadose zone, capillary fringe, and saturated zone; their influence on field-scale U(VI) biogeochemistry and transport; and their implications to natural attenuation and remediation.



Figure 1. Hanford Site map showing location of 300 Area (red circled area).

Introduction

Hanford's IFRC Site was established in summer 2008 in the 300 Area just North of Richland, Washington, USA. Thirty-five wells were installed at the site (Figure 2) using a resonant sonic drilling method. Thirty-four wells were installed to a depth of ~18 m, and one to a depth of ~45 m.

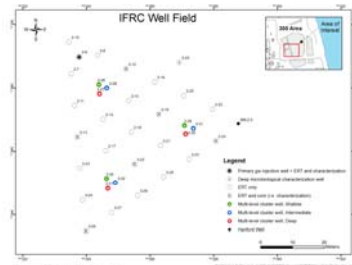
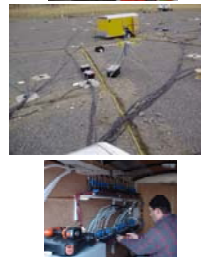


Figure 2. Plan view of 300 Area IFRC well field.

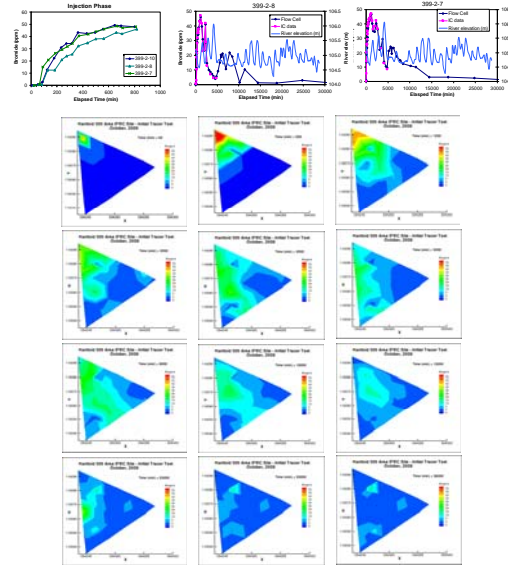
Accomplishments to date:

- Geophysical Characterization
 - surface methods
 - ERT, EMI, GPR
 - borehole methods
 - spectral gamma, neutron moisture, EMI, ERT, borehole deviation, cross-hole radar and seismic, acoustic televiewer
- Installation of Well Instrumentation
 - thermistors (0.6-m spacing), ERT electrodes (0.6-m spacing), dedicated sampling pumps, ion-selective electrodes, pressure transducers, SpecCond probes
- Sediment Sampling and Analyses
 - continuous split-spoon cores from 8 wells
 - >200 grab samples from other wells
 - grain-size analyses, U concentrations
- Aquifer Testing
 - constant-rate pumping tests in 14 wells (avg. K = 6700 m/d for Hanford Fm)
 - EBF testing of all wells (0.6-m intervals)
 - first tracer test in Nov. 2008



Preliminary results from Nov. 2008 tracer experiment

- Injection started 11/11/08 09:32
- 60 ppm NaBr
- 180 gpm x 90 min = 162,000 gal



Ongoing and planned activities:

- Analysis of field and laboratory characterization and experimental data
- New field experiments (see Figure 4)
- Reactive transport experiments with intact cores
- Intermediate-scale reactive transport experiments
- Hydrogeophysical and geochemical property analyses
- Measurement of k-S-P relations on cores
- Porosity and density logging
- Borehole geophysical data calibrations
- Development of petrophysical relationships
- Geostatistical analyses
- Multi-scale modeling of field and lab experiments

About Pacific Northwest National Laboratory

The Pacific Northwest National Laboratory, located in southeastern Washington State, is a U.S. Department of Energy Office of Science laboratory that solves complex problems in energy, national security and the environment, and advances scientific frontiers in the chemical, biological, materials, environmental and computational sciences. The Laboratory employs 4,000 staff members, has a \$760 million annual budget, and has been managed by Ohio-based Battelle since 1965.

For more information about the science you see here, please contact:

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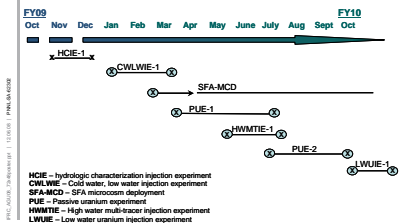


Figure 4. Field experimental plan for FY09.