Innovative In-Situ Groundwater Remediation for Tritium, Metals, and Radionuclides in Acidic Groundwater

History and Original Pump & Treat Strategy

- Seepage Basins operated 1954 - 1988
- Received 12 billion liters of acidic, radioactive process water from chemical separations facilities
- Capped in early 1990s
- Shallow, persistent, low pH contaminant plume stripped the formation of metals (including natural radionuclides) and minimized the retardation of contaminants
- Plumes discharge into Fourmile Branch
- Treatment system employed extraction and injection wells to manage releases to surface water
- Hydraulic containment of tritium was ineffective
- Systems were costly; projected 90-year operation (until tritium compliance achieved) would have been >$10B

Emergence of Technical Issues

- Extraction wells did not fully capture contaminant plumes
- Additional characterization required to understand hydraulic controls

Contaminant Movement in Irwinton Sand

- Core studies and CPT data revealed physical properties and erosional structure of Tan Clay confining unit
- Channels control contaminant migration in overlying Irwinton Sand

New Approach Required

- Needed an effective, innovative, and less costly remedial solution
- Passive system preferred (to avoid waste generation)
- Regulatory requirement: 70% reduction in tritium flux to Fourmile Branch in five years (by ~Oct 2007)
- Regulator requirement: Achieve compliance for other contaminants at Fourmile Branch
- Financial requirement: Pay for new strategy with savings from shutdown of P&T system

Innovative Remedial Solution

- Exploit the preferential flow path in the Irwinton Sand and the erosional structure atop the Tan Clay
- Control and direct the flow of contaminated groundwater using a funnel and gate system
- Inject base solution at the treatment gates to precipitate dissolved metals and radionuclides
- Also achieves 70% reduction in tritium flux to Fourmile Branch