

Abstract for presentation at 2001 Corps of Engineers Environmental Remediation/Ecosystem Restoration Conference: Steam Injection Pilot Test Design at Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island WA.

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The Wyckoff Property on Bainbridge Island, Washington, was the site of various wood-treating businesses from 1903 to 1988. EPA began investigating the property in 1971 and the site was placed on the National Priority List in 1987. In 1993 EPA took over site management and cleanup activities. Estimates of the extent of contamination have increased with each phase of the site investigations; currently it is believed that approximately 1.2 million gallons of creosote and PCP products are present in the 8-acre Former Process Area. Contaminated groundwater is controlled by extraction wells, with concurrent NAPL removal totaling about 10,000 gallons/year; nevertheless, LNAPL and DNAPL seepage continues from the site shoreline into Puget Sound.

EPA Region 10 began consideration of thermal remediation at Wyckoff in 1998 with preparation of a Focused Feasibility Study for Thermal Remediation Technologies, and presentation of site data to the National Remedy Review Board. A Corps of Engineers team prepared the Thermal Remediation Conceptual Design for EPA in 1999, and designed and constructed a sheet pile wall for hydraulic containment of the Former Process Area, completed in February 2001.

Subsequent to the Conceptual Design studies, EPA made a decision to conduct a pilot test which will provide performance, engineering, cost, and community impact data for a potential full-scale thermal remediation. It is anticipated that the full-scale project will proceed if the pilot demonstrates: 1) removal of all mobile NAPL from the test area; 2) reduction of dissolved concentrations to levels which are protective of marine sediments; and 3) reduction of surface soil concentrations to Washington State cleanup levels.

The Corps team is currently completing the Thermal Remediation Pilot Study Design Analysis, Plans, and Specifications. The pilot test will be conducted within a 1-acre, upgradient portion of the Former Process Area, containing an estimated 60,000 gallons of NAPL. The test is expected to begin in September 2001, and lasting 12 to 18 months. Design reviewers include EPA, HTRW-CX, Lawrence-Livermore National Laboratory, University of California-Berkeley, and SteamTech Inc. The pilot design includes the following features:

- A partial sheet-pile-wall enclosure which will simulate site boundaries and limit recontamination.
- Twenty-six steam injection wells and 13 extraction wells arranged in a “7-spot” (hexagonal) pattern.
- A vapor cap with a partitioned vapor collection layer.

- Modifications to the existing treatment plant, incorporating heat exchangers, vapor treatment, and a liquid treatment capacity of 120 gpm.
- A boiler capable of generating 25,000 lb/hr (3.15 kg/s) (50 gpm condensate equivalent) of steam.
- Automated subsurface pressure and temperature monitoring, including both thermocouples and a fiber-optic DTS (distributed temperature sensing) system.
- Process, compliance, community and environmental impact monitoring.

The presentation will include information on site geology and NAPL occurrence, groundwater and thermal/multiphase modeling, well and vapor cap designs, anticipated operational strategies, and treatment process requirements.