

# *Environmental Solutions*

FY05

## PNNL Contributions to Bechtel Hanford, Inc.



**Pacific Northwest  
National Laboratory**

Operated by Battelle for the  
U.S. Department of Energy

PNNL-15539

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## Executive Summary

# Partnership Supports Cleanup of Hanford's River Corridor

Pacific Northwest National Laboratory provided support to Bechtel Hanford, Inc., for their work to safely demolish nuclear facilities and clean up waste sites near the Columbia River. During FY05, PNNL screened a variety of technologies to solve difficult problems.

The danger of lung-scarring beryllium becoming airborne during the demolition of a nuclear fuel fabrication plant was addressed. For Bechtel Hanford, PNNL researchers extensively screened technologies and supported field testing of selected options. Assisted by the Laboratory's information, Bechtel Hanford staff razed the 76,000-square-foot facility near the Columbia River with no release of airborne beryllium.

Removing large tanks and other equipment containing highly radioactive material from the 107-N facility continued to present challenges. The facility housed the filtration equipment for N Reactor's fuel storage basin. In FY05, PNNL identified and reviewed retrieval technologies. This work built on evaluation criteria that PNNL staff developed in FY04.



*Pacific Northwest National Laboratory identified and screened technology solutions in support of Bechtel Hanford's work to safely demolish nuclear facilities and clean up waste sites near the Columbia River.*

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**For Bechtel Hanford, PNNL researchers identified and reviewed technology options for completing site remediation and facilities decommissioning.**

In support of Bechtel Hanford's work to remediate and close the 618-7 burial ground, PNNL researchers evaluated remote technologies to characterize the waste drums as they are retrieved. One objective is to identify any drums containing Zircaloy, a zirconium alloy that can catch on fire when exposed to certain conditions.

To assist in safely retrieving, treating, and disposing of spent nuclear fuel decladding waste in the 116-C-3 tank, PNNL identified and reviewed waste characterization, retrieval, and treatment technologies. This information was used by Bechtel Hanford staff as part of their engineering study of the situation.

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**In support of Bechtel Hanford, PNNL researchers screened a variety of technologies to solve difficult problems.**

**Through an extensive screening process, technologies were identified and options field tested for preventing beryllium from becoming airborne during 313 Building decommissioning work.**

## **Introduction**

As part of the cleanup work managed by Bechtel Hanford, Inc., at the Hanford Site in FY05, Pacific Northwest National Laboratory researchers identified and reviewed technology options for completing site remediation and facilities decommissioning. The Laboratory has supported Bechtel Hanford's work as the Environmental Restoration Contractor since the contract was awarded by the U.S. Department of Energy in 1995.

During the decade that followed, the Environmental Restoration Project team planned, managed, integrated, and executed a full range of activities to clean up radioactive waste sites, contaminated soils, and inactive nuclear facilities at Hanford. In March 2005, the Energy Department selected Washington Closure Hanford to manage the River Corridor Closure Project.

The Laboratory's support to Bechtel Hanford for FY05 is summarized in this booklet. Work performed for other Hanford contractors and the Waste Treatment Plant, and directly for the U.S. Department of Energy is summarized in the other booklets in this series.

## **Decommissioning Facilities**

### **Beryllium-Contaminated 313 Building**

Bechtel Hanford safely demolished the 313 Building, a large, beryllium-contaminated facility in the 300 Area. In past operations, uranium fuel had been machined and coated there. For Bechtel Hanford, PNNL identified and conducted a rigorous screening of technologies to characterize beryllium and keep it from becoming airborne during decommissioning. Beryllium can cause irreversible and sometimes fatal scarring of the lungs. The PNNL researchers also identified and supported field testing for beryllium fixative options; with the contractor selecting the CC Wet H and CC Fix technologies. Assisted by information provided by PNNL, Bechtel Hanford workers were able to demolish this facility with no release of airborne beryllium.



*CC Wet H and CC Fix, the beryllium fixative technologies selected by the contractor, are shown applied within the 313 Building.*



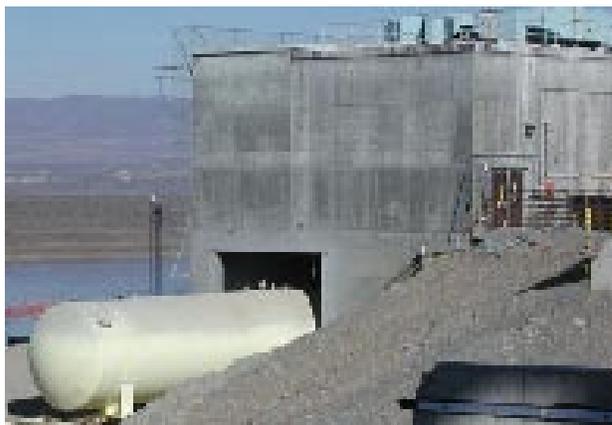
U.S. Department of Energy Photo

*The 76,000-square-foot former fuel fabrication plant (313 Building) was demolished with no release of airborne beryllium.*

## Highly Radioactive 107-N Facility

To demolish the 107-N Basin Recirculation Facility, which housed filtration equipment for the N Reactor fuel storage basin, Bechtel Hanford needed to address issues involved in removing tanks and filtration equipment containing high-dose fission products. Scientists at PNNL identified, reviewed, and summarized technology solutions to:

- Retrieve the high-dose material inside large equipment in the facility
- Stabilize wastes containing barium, which can cause health problems if ingested
- Stabilize radioactive sludge in the equipment.



U.S. Department of Energy Photo

*PNNL identified, reviewed, and summarized technology solutions to remove tanks and waste treatment equipment from the 107-N facility. Demolition challenges for this facility include retrieving high-dose fission products, along with stabilizing barium wastes and radioactive sludge.*

**PNNL researchers provided extensive information on technologies that would affix beryllium to hard surfaces during building demolition.**

**Technical solutions were outlined for safely retrieving high-dose fission products from fuel filtration equipment and stabilizing barium-containing wastes and radioactive sludge in the 107-N facility.**

**Remotely operated systems were evaluated for use in the field to determine if drums in the 618-7 burial ground contain pyrophoric Zircaloy metal chips; a conceptual design for the characterization system was provided.**

**Information was provided on characterization, retrieval, and treatment of waste in the 116-C-3 chemical tank.**

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## Characterizing Waste

### Characterizing Drums in the 618-7 Burial Ground

To remediate and close the 618-7 burial ground, Bechtel Hanford identified the need for a remotely operated field characterization system for determining if drums contain pyrophoric Zircaloy (a zirconium alloy) metal chips. For Bechtel Hanford, PNNL researchers evaluated remotely operated technologies to characterize the waste drums as they are retrieved. In addition, the researchers provided a conceptual layout of a characterization system, including associated equipment and instrumentation.

### Remediating the 116-C-3 Chemical Tank

To assist Bechtel Hanford in retrieving, treating, and disposing of waste in the 116-C-3 chemical tank without endangering workers' safety, PNNL researchers identified and reviewed waste characterization, retrieval, and treatment technologies. This waste, which was generated in spent nuclear fuel decladding operations, contains a complex mixture of highly radioactive materials. Bechtel Hanford completed an engineering study of the situation, based in part on data provided by PNNL staff.



*The highly radioactive waste in the 116-C-3 tank, shown being sampled through a glovebox interface, provided significant challenges for characterization, retrieval, and treatment of the waste.*