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Fluor Hanford Decommissioning Update: Spring 2008

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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DD&R Newsletter
Michele Gerber, Fluor Hanford

K East Basin D&D Underway

Fluor Hanford is completing D&D of the K East Basin at the U.S. Department of Energy's (DOE's) Hanford Site in southeastern Washington State this spring, with demolition expected to begin in June. Located about 400 yards from the Columbia River, the K East Basin is one of two indoor pools that formerly contained irradiated nuclear fuel, radioactive sludge and tons of contaminated debris. In unique and path-breaking work, workers finished removing the spent fuel from the K Basins in 2004.

In May 2007, workers completed vacuuming the sludge into containers in the K East Basin, and transferring it into containers in the K West Basin. In December, they finished vacuuming the remainder of K West Basin sludge into these containers. The K East Basin was emptied of its radioactive inventory first because it was more contaminated than the K West Basin, and had leaked in the past.

In October 2007, Fluor Hanford began physical D&D of the 8,400-square foot K East Basin by pouring approximately 14-inches of grout into the bottom of it. Grout is a type of special cement used for encasing waste.

Two months later, Fluor Hanford workers completed sluicing contaminated sand from the large filter that had sieved contaminants from the basin water for more than 50 years. Next, they poured grout into the filter housing and the vault that surrounds the filter, as well as into ion exchange columns that also helped filter basin water.

For a six-week period in February and March, personnel drained the approximately one-million gallons of contaminated water from the K East Basin. The effort required more than 200 tanker truck loads that transported the water to an effluent treatment facility for treatment and then release. A thin fixative was also applied to the basin walls as the water was removed to hold residual contamination in place.

As soon as the water was out of the basin, Fluor pumped in approximately 18 feet of "controlled density fill" material (somewhat similar to sand) to shield workers to a safe level from the residual radioactivity. Workers then continued preparations for demolishing the structure. Currently, they are isolating utilities, removing asbestos, draining oils, and removing other items not allowed to be disposed in Hanford's Environmental Restoration Disposal Facility (ERDF).

The basin's superstructure will be demolished using a heavy industrial excavator equipped with a shear. This portion of the work is expected to be completed in September, with removal of the basin substructure to follow in 2009. D&D of the K East Basin eliminated the final major radioactive sources there, and made the Columbia River and the adjacent environment safer for everyone who lives downstream.

Retrieving Buried Waste Beats Milestones

For the fourth year in a row, Fluor Hanford's Waste Stabilization and Disposition (WSD) Project met an annual milestone in the Site's Tri-Party Agreement ahead of schedule. (The Tri-Party Agreement, which governs cleanup, is formally called the Hanford Federal Facility Agreement and Consent Order.) In December 2007, WSD had retrieved more than 7,200 cubic meters (9,417 cubic yards) – 36,000 drum equivalents -- of buried waste since beginning retrieval work in late 2003. Today, WSD has retrieved approximately 7,530 cubic meters (nearly 9,850 cubic yards) of buried waste.

The waste was a by-product of plutonium production at Hanford during the 1970s and 1980s. The waste is located in four specific burial grounds, and because it is suspected of being transuranic (TRU) waste, it must be assayed after it is exhumed. If it is TRU waste, it is packaged for shipment to the DOE's Waste Isolation Pilot Plant (WIPP) in New Mexico. If it is low-level waste (LLW), it is treated and repackaged if necessary and re-buried at Hanford.

LLW contains less than 100 nanocuries per gram of alpha-emitting TRU isotopes with half-lives longer than 20 years, and TRU waste contains more than 100 nancuries per gram. Transuranic isotopes are those higher than uranium on the Periodic Table of the Elements. A nanocurie is a unit of radioactivity that is one-billionth of a curie.

The waste in the burial trenches includes contaminated debris, tools, clothing, and other solid materials, and was disposed in 55-gallon drums as well as boxes. Some of the boxes are very large, ranging up to the size of a parcel delivery truck.

Retrieval is difficult because in most cases the waste containers were stacked in trenches in the burial grounds and covered with an overburden of soil and protective systems in various configurations. Protective systems involved asphalt pads, concrete and metal structures, plastic tarps and other materials. Over time, the metal and wood containers have deteriorated to varying degrees.

Retrieving the deteriorated containers requires special handling and innovative approaches to protect the workers and the environment. In addition, the work is being done year-round in weather that varies from frigid and windy to extremely hot. This past year, Fluor Hanford installed large portable shelters to cover the worksites and increase the comfort level of workers and the efficiency of operations. The shelters allow work to continue in some adverse weather conditions.

During the past six months, Fluor Hanford has retrieved 2,715 drum-equivalents of buried waste, and made approximately 35 shipments of TRU waste from Hanford to WIPP. Some of the TRU waste that was shipped was retrieved from Site burial grounds and some of it consisted of other TRU waste generated during cleanup operations. In total, Fluor Hanford has made more than 400 shipments containing more than 3,000 cubic meters (nearly 4,000 cubic yards) – nearly 16,000 drum equivalents -- of TRU waste to WIPP since beginning shipments in fiscal year 2000.

Huge Glovebox Being Cleaned out at Plutonium Finishing Plant

Workers in Fluor Hanford's Plutonium Finishing Plant (PFP) Closure Project are achieving success as they remove process equipment from a large, historic glovebox in the main process building -- the 234-5Z Building. The nearly 760-cubic foot HA-23S box, weighing 26,000 pounds, is part of the original Remote Mechanical "A" Line -- an interconnected plutonium-processing line installed in the 234-5Z Building in 1951. The "A" Line was the first production-scale line of its kind in the world, and operated to change liquid plutonium nitrate into solid metal plutonium for weapons.

HA-23S, a storage box, could hold more than 350 containers of plutonium in a safe configuration during its production mission. It has four levels, each with a conveyor belt that snakes through the level in carousel fashion. An elevator inside the box was also capable of moving product jars to each of the four levels.

The ergonomics of accessing and size-reducing process equipment inside this box are extremely challenging. Equipment is large and heavy, bolts have been stuck in place for more than 50 years, visibility is poor, and positions are so awkward that two workers often have to reach into the box while holding and coordinating the same tool.

The Fluor Hanford team carefully studied the box in an extensive planning process, and drained and removed eight, heavy, water walls that surrounded it last summer. The walls were 12 feet tall and a foot thick, and had been used to shield radiation. Next, team members drained and removed the elevator and supporting hydraulic system. They began removing the equipment from Level II in November. Level II was closest to "eye level," and cleaning it out created space to facilitate accessing equipment in Level I. Cleanout of Level I finished in January. Next the crew placed scaffolding to remove equipment from Levels III and IV. The HA-23S process-removal project is 40 days ahead of schedule, and is expected to complete in June. Approximately 30, 55-gallon drums of waste are expected to result from cleaning out glovebox HA-23S.

Three-Dimensional Modeling Tools Developed to Aid Cleanup Projects

One of the unique methods Fluor Hanford used in planning to safely and efficiently clean out glovebox HA-23S was three-dimensional (3D) modeling. Although 3D modeling is becoming standard in the engineering and construction worlds, Fluor uniquely adapted the modeling to D&D work. The effort first involved an extensive records search to identify the parts, materials, dimensions used, and modifications made, inside PFP's aged gloveboxes and hoods. The records search itself was exhausting, because some records had been lost, many were classified and compartmentalized, many vendors were no longer in business, and photos were scattered.

Piecing together minute facts and figures, designers built a data base of the components inside these formerly classified gloveboxes. Then they painstakingly loaded each dimension, air-space, part, thickness and component into computer programs and produced 3D views of the insides of the gloveboxes. The images could rotate, zoom in or out, and print out lists of parts with exact weights, materials and dimensions.

The planning teams found the 3D views extremely helpful, because they could see and plan how to dismantle, lay down and remove each piece of equipment. They could brainstorm the best methods to use in cleaning out each specific box. In addition, the views could be updated as the project moved along, showing which equipment had been removed and how much extra work space was now available. Time, radiation dose and money were saved by accessing the 3D images during the project planning and execution phases.

Fluor Hanford designers also adapted the 3D technique to produce models of air space and pathways inside aged filter systems that were critical for safely removing radioactive contaminants from the air from building air and glovebox exhausts. They produced models that "talked" to the analysis program, saving time and budget in producing analyses of the systems.

Other D&D News at Fluor Hanford

Fluor workers at the Fast Flux Test Facility continued to deactivate systems as part of facility shutdown by removing combustibles, draining liquids, isolating water and sewer systems, and deactivating support systems. They also removed an additional transformer that contained polychlorinated biphenyls (PCBs), and began shipping remaining fuel to the Idaho National Laboratory for final disposition.

Fluor Hanford's Soil and Groundwater Remediation Project (SGRP) once again exceeded its goals in drilling new wells and decommissioning older, non-compliant wells. It collected more than 1,250 well samples, a record for any previous year at Hanford, and improved sampling efficiency and reliability. It expanded two pump-and-treat systems, tripling the capacity of one of them, and engaged in innovative tests to explore new ways of containing and treating contaminated plumes in groundwater. In addition, it delivered two large work plans required under the Comprehensive Environmental Response, Compensation and Liability Act.

Photos & Captions:

KE Dewater.1: Fluor Hanford workers ready a tanker truck to remove a load of the contaminated water being drained from the K East Basin, February 2008.

HA-23S 1: Three-dimensional graphic of glovebox HA-23S in Hanford's Plutonium Finishing Plant, developed by Fluor Hanford designers to aid workers cleaning out contaminated process equipment from the massive box.