

Environmental Cleanup of the East Tennessee Technology Park - Year Two

A Status Report – 14060

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ABSTRACT

On August 1, 2011, URS | CH2M Oak Ridge LLC (UCOR) began its five-year, \$1.4 billion cleanup of the East Tennessee Technology Park (ETTP), located on the U.S. Department of Energy's (DOE) Oak Ridge Reservation in Tennessee. When the contract base scope of work is completed in 2016, the K-25 gaseous diffusion building, the largest building in the DOE complex, will have been demolished and all waste dispositioned. Also at that time, demolition will be well under way on the K-27 gaseous diffusion building; all contact-handled and remote-handled transuranic waste in inventory (approximately 500 cubic meters) will have been transferred to the Transuranic Waste Processing Center located on the Oak Ridge Reservation; previously designated "No-Path-To-Disposition Waste" will have been dispositioned to the extent possible; and UCOR will have managed DOE Office of Environmental Management (EM)-owned facilities at ETTP, Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (Y-12) in a safe and cost-effective manner.

Since assuming its responsibilities as the ETTP cleanup contractor, UCOR has completed its life-cycle Performance Measurement Baseline; received its Earned Value Management System (EVMS) certification; completed removal of a contaminated underground storage tank, called Tank W-1A, at ORNL; and completed the cleanup of the K-1070-B Burial Ground.

In 2013, UCOR completed the deactivation and demolished the K-25 gaseous diffusion building; completed the Resource Conservation and Recovery Act (RCRA) closure of the Toxic Substance Control Act Incinerator (TSCAI) that was used to destroy radioactively contaminated polychlorinated biphenyl (PCB) wastes; and completed closure of the Central Neutralization Facility (CNF) used to treat low level radioactive liquid wastes.

UCOR continues to characterize, package, and ship contact-handled transuranic waste to the Transuranic Waste Processing Center; dispose cleanup waste (150,000 cubic yards as of December 31, 2013) at the onsite Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)¹ Environmental Management Waste Management Facility (EMWMF); perform pre-demolition activities in the K-27 gaseous diffusion building; and provide operations, surveillance, and maintenance activities at DOE EM facilities at ETTP, ORNL, and the Y-12 National Security Complex.

Project performance as of December 31, 2013, has been excellent:

- Cost Performance Index – 1.10
- Schedule Performance Index – 1.03

At the same time, since safety is the foundation of all cleanup work, UCOR's safety record goes hand-in-hand with its excellent project performance. Through calendar year 2013, UCOR's recordable injury rate was 0.62 and days away case rate was 0.45 per 200,000 hours worked.

This performance continues to be due, in large part, to the people and processes URS and CH2M HILL, the parent companies of UCOR, brought to the project, as well as the skilled work force that was already at the site when UCOR took over the contract. Key approaches included the following:

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- Selected and deployed experienced staff in key leadership positions throughout the organization
- Implemented previously successful safety programs and initiatives from other DOE sites, such as Safety Trained Supervisor and DOE's Voluntary Protection Program
- Brought fresh thinking and innovation to tackling tough project issues, such as the deactivation of the technetium-99 contaminated areas of K-25 and remediation of unknown contamination associated with the cleanup of the Central Neutralization Facility, and successfully addressed a variety of legacy radioactive wastes that were previously determined to have "no path" to disposition
- Maintained continuing alignment between UCOR's contract with DOE and its Performance Measurement Baseline – rapidly addressing contract changes when they arose

INTRODUCTION

The 2,200-acre East Tennessee Technology Park (ETTP) is located in the southwestern portion of the DOE's Oak Ridge Reservation in East Tennessee. Figure 1 shows the location of ETTP on the Oak Ridge Reservation. ETTP's uranium enrichment facilities operated for more than 40 years and date back to the World War II Manhattan Project, which produced fissionable material for the world's first nuclear weapon. The plant also produced enriched uranium for the commercial nuclear power industry from 1945 to 1985. Uranium enrichment operations were permanently shut down in 1987. As a result of these operations, ETTP has a legacy of contaminated buildings, soil, sediment, and groundwater that require remediation for the protection of human health and the environment. The DOE Office of Environmental Management is overseeing cleanup operations at the site with the end goal of transforming ETTP into a private sector industrial park as well as a national historical preservation site.

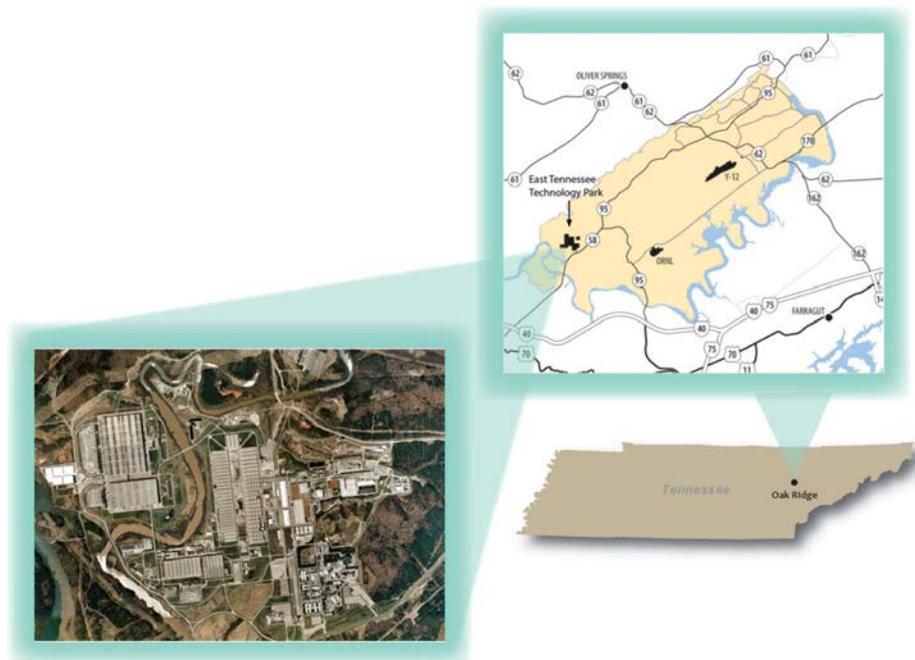


Figure 1. Location of ETTP on the Oak Ridge Reservation in Eastern Tennessee.

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Major cleanup activities at ETTP began under a previous contractor in 1998. URS | CH2M Oak Ridge LLC (UCOR) is completing this work under a five-year contract² with an additional four-year option. The project consists of:

- Demolition of the K-25, K-27, and K-31 uranium enrichment buildings
- Demolition of remaining ETTP facilities, such as the Toxic Substances Control Act Incinerator (TSCAI), Central Neutralization Facility (CNF), K-1037 manufacturing plant, centrifuge facilities, and other ancillary buildings and structures
- Environmental remediation of soil and groundwater contamination on the ETTP site
- Disposition of all Deactivation and Demolition (D&D) and remediation waste, either onsite at the Environmental Management Waste Management Facility (EMWMF), or offsite at commercial or DOE treatment or disposal sites

ETTP CLEANUP PROJECT STATUS

With UCOR more than 50 percent complete on its contract scope of work, the ETTP Cleanup Project is ahead of schedule and under budget. Through December 2013, project cost and schedule performance against the Performance Measurement Baseline are as follows:

- Cost variance is \$63M with a cost performance index of 1.10.
- Schedule variance is \$21M, with a schedule performance index of 1.03.

A key enabler to any successful DOE EM nuclear cleanup project is an excellent safety record, and the ETTP cleanup project is no different. Through December 2013, UCOR has recordable case rate of 0.62 and days away restricted case rate of 0.45 (per 200,000 hours worked). Both of these rates are better than the DOE EM Prime Contractor average.

Another key enabler of a successful nuclear cleanup project is environmental compliance. In 2013, all regulatory milestones were met and no environmental non-compliances were noted by State and Federal environmental regulators.

Following are notable accomplishments in 2013.

D&D of K-25

The K-25 facility was a former gaseous diffusion plant built as part of the Manhattan Project in the early 1940s. Once the largest building under one roof in the world, it enriched uranium first for nuclear weapons and later for the commercial nuclear power industry. The mile-long facility was comprised of three major sections – the east and west wings and the north end – aligned in a “U” shape. The north end forms the base of the “U” and was the smallest section.

The west wing was demolished prior to UCOR’s arrival, and the east wing (consisting of 23 “units”) and the north end (consisting of three units) remained to be demolished when UCOR took over the contract. A unit typically consists of about 60 converters, 120 compressors, and associated piping and auxiliary equipment. The east wing was divided into two sections. The smaller section, consisting of five units, was contaminated with significant quantities of technetium-99 (Tc-99), a radioactive isotope that is more mobile in the environment than other radioactive materials associated with nuclear fuels. Special techniques are used to manage and dispose of some of these wastes. The larger section, consisting of 18 units, did not contain significant quantities of Tc-99.

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The demolition of the K-25 building was completed on December 19, 2013, five years after demolition started on December 16, 2008. The K-25 Facility D&D Project completed demolition of the north end of the building in January 2013. Demolition of the east wing non-Tc-99 area retaining wall and slab and slope restoration was completed in February 2013. Pre-demolition activities in the Tc-99 area of the East Wing were completed in September 2013. As part of the pre-demolition activities, project personnel completed removal of all converter units, removal of all process piping (more than 47,000 linear feet), foaming of all process piping greater than 3 inches in diameter (more than 60,000 linear feet), and disposition of all 17 surge tanks located in the K-25 Building. Demolition of the last section standing of the K-25 building began on September 17, 2013.



Figure 2. Demolition of the final section of the K-25 Building by a Hitachi machine

Deactivation of K-27

K-27 is a smaller “sister” gaseous diffusion facility to K-25. In April 2012, deactivation (pre-demolition) of the K-27 facility began, almost two years ahead of the Performance Measurement Baseline schedule. This acceleration was made possible by cost savings identified by UCOR during Fiscal Years 2011 and 2012, availability of some additional characterization monies courtesy of the American Recovery and Reinvestment Act (ARRA) that were being managed by DOE and the Oak Ridge Institute for Science and Education (ORISE), and the availability of characterization resources from the K-25 Project. The sodium fluoride (NaF) traps were removed from the K-27 building in late February 2013. When K-27 was operational, the NaF traps were part of the final uranium removal process. Sodium fluoride pellets were used to trap the uranium, and these particular traps still contain uranium materials from when the facility was shut down decades ago. The NaF traps are each about the size of a household hot water heater and weigh

up to 850 pounds each. The NaF traps were considered some of the highest-risk components remaining in the building. Lessons learned from the successful removal of NaF traps at K-25 were used.

The K-27 Facility D&D Project has completed installation of lifelines and grip strut, fire system deactivation, vent and purge of any residual waste gases and liquids of over 135,000 linear feet of pipe, cell floor intrusive sampling, and cell floor process gas non-destructive assays. Characterization and deactivation efforts continue including duct cutting and vent/purge/drain activities.

Toxic Substances Control Act Incinerator (TSCAI) Facility

When the TSCAI began operations in 1990, it was only supposed to operate for five years to prove the technology worked. It was the only incinerator in the nation permitted to burn certain hazardous and radioactive wastes. Operations ceased nearly 20 years later in December 2009, after a safe and successful run in which the facility treated 35 million pounds of liquids and solids from DOE sites across the United States – even some from Hawaii.

The project completed all activities required to put the facility into a safe condition pending future D&D, such as draining and rinsing contaminated piping and backfilling sumps with grout. This marked the completion of 14-months of cleanup and RCRA closure activities at TSCAI under UCOR's contract, all with no accidents or regulatory violations. The facility is now being maintained by the UCOR Surveillance & Maintenance Organization awaiting future D&D.



Figure 3. RCRA Closure of TSCAI – Sump stabilization with grout

Water Tower Demolition

One of the most iconic structures at East Tennessee Technology Park—the checkerboard water tower that has dominated the site’s skyline for 55 years—was demolished in September 2013 (Figure 4). UCOR, along with its subcontracting partners, brought down the 382-foot-tall tower through a controlled explosive demolition that sent the structure toppling into an empty field. The 400,000-gallon structure was designed and built by the Chicago Bridge and Iron Company in 1958 to service the site’s fire protection system.



Figure 4. Water Tower demolition

Central Neutralization Facility (CNF)

UCOR completed shutdown and decommissioning of the Central Neutralization Facility in 2013. This facility was the main wastewater treatment plant at ETPP.

Activities that were completed included sludge removal and disposal; chemical removal and disposal; waste, material, media, and equipment removal and disposal; oil removal and disposal; equipment rinsing and pressure washing; and characterization and filling of some subsurface facilities. The Central Neutralization Facility Deactivation and Demolition Project includes approximately 49 buildings, structures, containment and storage tank facilities, and support trailers.

The Central Neutralization Facility treated wastewater to remove radioactive materials, metals, and suspended solids to meet required discharge criteria for effluent discharged to the Clinch River. The treat-

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ment process provided elementary neutralization, metals removal, organic oxidation/filtration, solids settling, solids removal, and filtration of contaminants present in the waste streams treated at the facility.

Waste Management

Waste management work at ETTP continues to keep pace with demolition work under UCOR's "pack as you go" philosophy. D&D and waste management work hand-in-hand to ship demolition debris immediately for disposal, rather than allowing the waste to remain on the building site. This philosophy, combined with the fast pace of demolition since UCOR began work in August 2011, has resulted in more than 20,000 loads being shipped to the Environmental Management Waste Management Facility since work began.

UCOR completed the initial phase of remote retrievals as part of the Solid Waste Storage Area 5 (SWSA-5) Project. The purpose of the project is to retrieve high fissile waste materials packaged in stainless steel drums from below ground storage and store them in above-ground facilities located in SWSA 5. The initial phase includes remote retrieval of 93 drums from their current location, movement to temporary storage areas in SWSA 5, and transfer to venting facilities and the Transuranic Waste Processing Center (TWPC), where they will be processed by stabilization and/or repackaging for shipment to WIPP.

Surveillance and Maintenance of EM Facilities

UCOR manages more than 515 DOE EM facilities and more than 5,600 acres located at ETTP, ORNL and Y-12. Activities that are routinely performed as part of this facility management includes management of the Liquid and Gaseous Waste Operations, which treats approximately 120 million gallons of process waste water per year; performing surveillance and maintenance of radiologically and mercury contaminated facilities such as Alpha 4 at Y-12; and similarly performing surveillance and maintenance activities at ORNL, including 44 highly contaminated hot cells. UCOR was able to successfully achieve a downgrade of the Building 3026 hot cells facility from a Hazard Category 3 nuclear facility to a radiological facility, placing it in surveillance and maintenance mode while awaiting D&D. This downgrade will make the building less costly to maintain, saving about \$600,000 per year. UCOR conducted various stabilization activities to achieve the downgrade, including installing permanent electrical equipment as well as a new berm to replace sand bags to prevent rain runoff.

Eventually the facilities under the Surveillance and Maintenance Program will be D&Ded as part of the long-term cleanup of the Oak Ridge Reservation.

EXECUTION WITH CERTAINTY SM

The continuing success of the ETTP Cleanup Project was made possible originally with a roadmap that guided UCOR during the bid/proposal development, through transition, and finally to project execution.

The execution of the roadmap relied on people recruited by UCOR largely from its parent companies, URS and CH2M HILL, who brought the requisite skills and leadership to the ETTP cleanup project. These selected individuals bring not only time-tested processes used successfully at other DOE EM nuclear cleanup projects but also innovative new approaches to accomplishing work safer and more efficiently.

An example of one of these innovative approaches is a process used to segregate and transport waste from the K-25 demolition project. When UCOR first approached the demolition and cleanup of the Tc-99-contaminated section of the building's east wing, the prevailing thought was that most of the equipment in the building would have to be packaged and shipped off-site, requiring a great deal of worker hands-on

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interaction with the contaminated debris. The workforce would have spent weeks cutting out the pipes and other equipment and packaging them for shipment. However, after characterizing that section of the building, UCOR determined that much of the building could be disposed locally and that only certain pieces of equipment would need to be disposed off-site. To identify the contaminated components that would need to be packaged and shipped off-site, UCOR management developed a unique plan to paint the pieces of equipment with bright paint, then segregate them in the field. This plan would require much less employee direct involvement with the material, making the process safer, and it would also be much less expensive, requiring only certain items to be shipped off-site while allowing a majority of the waste to be disposed more economically on-site.

Another example is an innovative approach related to the disposition of legacy wastes that were judged by the DOE to have “no path to disposal” prior to UCOR’s arrival at ETTP. “No path to disposal” wastes means that in their current configuration, none of these wastes could meet the waste treatment or disposal criteria of either onsite or offsite waste treatment or waste disposal facilities. At contract start, DOE identified six waste streams to UCOR that had previously been identified as having no path to disposal. Relying on the experience of UCOR personnel skilled at dealing with unusual wastes as a result of experiences gained at other DOE EM cleanup sites, UCOR has identified disposal paths for five of the six. To date, two of the six have already been disposed, two are planned to be disposed of in 2014, and one is planned for 2015 disposal. Details of each waste stream are noted below.

1. Classified formerly F027 Waste Debris - Disposed
2. Classified PCB-Contaminated LLW - Disposed
3. Reactive Waste - Disposal path identified, disposal planned by June 30, 2014
4. Classified MLLW - Disposal path identified, disposal planned by March 31, 2015
5. Mercury & Organically Contaminated Waste - Disposal path identified, disposal planning in progress
6. Dioxin & Furan Waste - no disposal path yet identified

Yet another example of working efficiently was UCOR’s acquisition of a key piece of machinery for a fraction of the cost that would usually be incurred. A new Hitachi “high reach” machine used to perform demolition of the gaseous diffusion buildings was obtained through a property transfer from DOE’s Hanford Site, which is saving an estimated \$800K for the K-25 Project alone. The high-reach attachment can be removed and the equipment used for size reduction, digging, or processing of concrete. Transferring equipment from other sites is one way UCOR is saving funds by avoiding high rental or purchase costs.

CONCLUSION

The excellent project performance UCOR has achieved in its second year of cleanup of the ETTP is largely attributable to the people and processes (Execution with CertaintySM) brought to the ETTP cleanup project, combined with the experienced personnel that transitioned from the previous contractor. Based on performance to date, UCOR expects to continue completing cleanup and remediation ahead of schedule and under budget as it moves toward final completion of the project.

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REFERENCES

1. 42 USC § 9601 et seq, 1980 “Comprehensive Environmental Response, Compensation, and Liability Act of 1980,” *United States Code*, December 11, 1980
2. U.S. Department of Energy Oak Ridge Office, 2011, Contract DE-SC-0004645, “East Tennessee Technology Park” Contract