



# 2015 Cleanup Progress

Annual Report to the  
Oak Ridge Regional Community





## About the Cover

Wildlife is as much a part of the East Tennessee Technology Park landscape as the buildings and structures that are being demolished. The Tennessee Urban Forestry Council has designated a stretch of land near a remediated ETTP pond as a certified arboretum. The cover photo shows two tree swallows that nest in the birdhouses erected near the pond.

# Message from the EM Manager

## Department of Energy Oak Ridge Office

To the Oak Ridge Regional Community:

Reflecting on 2015, I am extremely proud of the Oak Ridge Office of Environmental Management's cleanup accomplishments. We continued our tremendous progress on demolishing the former gaseous diffusion process buildings at the East Tennessee Technology Park (ETTP); progressed on cleanup projects at the Oak Ridge National Laboratory (ORNL) and the Y-12 National Security Complex (Y-12); and continued processing transuranic waste and removing our inventory of uranium-233 from ORNL. Without question, this has been a great year, and we are excited about what lies ahead in 2016.

In the coming year, we are positioned to achieve Vision 2016, which involves safely completing demolition of all gaseous diffusion process buildings at ETTP. This accomplishment will bring us one step closer to completing the transformation of the former Manhattan Project and Cold War era complex into a viable private-sector industrial park that will contribute to the region's economic development efforts. Our work at the site has made that former vision a near-term reality.

As we achieve our vision at ETTP, and in order to maintain our talented workforce, our plan is to shift to large-scale remediation at the Y-12 site in the mid-2020s. To support this shift, it is necessary that we begin preparations today, and that is why we are fully engaged in planning for some critical infrastructure that will be needed to support cleanup. In order for us to make a seamless, uninterrupted transition, we must construct additional on-site disposal capacity, as well as a mercury treatment facility. Our program is making progress on both of these projects, and will fully engage the public as our plans become more mature. Needless to say, in order for us to continue the tremendous progress we are making on cleanup of the Oak Ridge Reservation, our program will require the attention and support of the local community, and I look forward to continuing to work with all of you.

I believe and have often boasted that Oak Ridge is the best community partner in the U.S. Department of Energy's Environmental Management complex. As you know, a key to a strong partnership is trust as well as sharing a common vision for Oak Ridge's future. I want to assure you that I am committed to diligently work to maintain that trust and to work together to make our vision a reality.

Thank you for your time, interest, and shared commitment to protect, restore, and sustain our environment. We are grateful for your involvement and for the feedback that you provide to enhance our operations. I look forward to another great year of partnership as we work together to advance our cleanup mission in Oak Ridge.



Sue Cange

A handwritten signature in black ink that reads "Sue Cange".

Susan M. Cange



**E  
M Environmental Management**

safety ♦ performance ♦ cleanup ♦ closure

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**UCOR**  
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Oak Ridge LLC

This report was produced by URS | CH2M Oak Ridge LLC, DOE's Environmental Management contractor for the Oak Ridge Reservation.

# Introduction

Cleanup activities on the Department of Energy's (DOE) Oak Ridge Reservation reached a notable milestone in Fiscal Year (FY) 2015 as DOE and its contractor began work on the deactivation and demolition of the fifth—and last—building in the gaseous diffusion complex. When completed in 2016, the demolition of the K-27 Building will mark completion of the first-ever complete cleanup of a gaseous diffusion complex anywhere.

This milestone reflects the impressive progress DOE is making in cleaning up legacy contamination at the Oak Ridge Reservation's three major facilities: East Tennessee Technology Park (ETTP), Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (Y-12).

The Oak Ridge Reservation has played key roles in our nation's defense and energy research. However, past waste disposal practices and unintentional releases have left land and facilities contaminated with radioactive elements, mercury, asbestos, polychlorinated biphenyls (PCBs), and industrial wastes.

The contaminated portions of the Reservation are on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL), which includes hazardous waste sites across the nation that are to be cleaned up under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Areas that require cleanup or further action on the Oak Ridge Reservation have been clearly defined, and EM is working to clean those areas under a Federal Facility Agreement with the EPA and the Tennessee Department of Environment and Conservation (TDEC).



Components removed

from the Oak Ridge  
Research Reactor  
pool are being loaded  
into a shipping cask.

Components were  
removed to address  
a seep previously  
discovered at the  
reactor. See page 17  
for more information.



# East Tennessee Technology Park



The former K-25 Gaseous Diffusion Plant began operations during World War II as part of the Manhattan Project. Its original mission was to produce enriched uranium for use in atomic weapons. The 2,200-acre plant was permanently shut down in 1987 and is undergoing cleanup for ultimate conversion to a private-sector industrial park. Restoration of the environment, deactivation and demolition of facilities, and disposition of waste are the major activities at the site.

# K-31 Building demolition completed

Demolition of the K-31 Building at East Tennessee Technology Park (ETTP) was completed in June 2015, marking the removal of the fourth of five gaseous diffusion buildings at the former Oak Ridge uranium enrichment site.

ETTP—once called the Oak Ridge Gaseous Diffusion Plant, as well as the K-25 Site—was built as part of the Manhattan Project in the 1940s to enrich uranium for the atomic bombs that would end World War II. The site later produced enriched uranium



for commercial and defense purposes. Operations ceased in 1985, and the site was permanently shut down in 1987. DOE then began cleanup operations, which include demolition of many of the buildings at the site.

The 750,000-square-foot K-31 Building was built in 1951. As part of a cleanup project in 2005, most of the hazardous materials were removed from the facility, leaving its shell to be demolished. URS | CH2M Oak Ridge LLC (UCOR), DOE's cleanup contractor,



*K-31 site as demolition was nearing completion.*

began demolishing the building in October 2014 and completed demolition ahead of schedule and under budget.

"We have a tremendously talented workforce that is driving work forward and an excellent partnership with our cleanup contractor, UCOR," said Sue Cange, manager of the Oak

Ridge Office of Environmental Management. "Together, we are safely and efficiently transforming ETTP and making clean land available for future reuse."

With the demolition of K-31, only one gaseous diffusion building remains at ETTP—the K-27 Building.



**Pictured above is the 750,000-square-foot K-31 Building before demolition. At right is the final section of the building being brought down, concluding demolition of the fourth of five gaseous diffusion facilities at ETTP.**



**Demolition of K-31, which was preceded by demolition of K-33, has created a large land parcel available for private use.**

# Demolition of K-31 and K-33 ancillary facilities completed

In addition to completing K-31 demolition, buildings that supported the gaseous diffusion operations at K-31 and K-33 were removed, which created a 200-acre tract of land for use by the private sector.

Demolition of four support pedestals remaining from the tear down of Building K-791 in the late 1990s was safely completed in February 2015.

The pedestals were built as part of Building K-791 in the early 1950s to support the equipment that regulated power to the K-33 Building during gaseous diffusion operations. The pedestals were constructed of formed concrete and rebar. Each pedestal was 30 ft x 18 ft x 18 ft with a wall thickness varying from 40 inches to 52 inches.

Demolition was completed on the K-761 Switch House, which was the power distribution and electrical switching station for the K-31 gaseous diffusion building at ETTP. The 14,640-square-foot, five-story building was built in the early

1950s, and after K-31 ceased operations in 1985, K-761 was shut down. Activities were then limited to routine surveillance and maintenance, storage of various types of waste containers, and the occasional removal of process equipment items for shipment to other gaseous diffusion plants.

Other ancillary buildings that were demolished include the K-892 fire and raw cooling water pump house and the K-892-Y recirculating cooling water sludge softener.



**K-791 pedestal demolition.**



**Demolition of Building K-761 Switch House.**

# K-27 Building demolition

## will eliminate final ETTP gaseous diffusion facility

Demolition of the K-27 Building will mark the first-ever complete cleanup of a gaseous diffusion complex.

In FY 2015, transite paneling on the structures's outer skin was being removed from the K-27 Building, with demolition expected to follow. Building demolition is anticipated to be completed in 2016.

The building is one of EM's highest priorities at the site due to its risk and deteriorated state. The K-27 Building is similar in structure to the already-demolished K-25 Building. It spans more than 8 acres and is approximately 900 feet long, 400 feet wide, and 58 feet in height.

Characterization of the building structure, equipment, and piping was completed for the purpose of waste disposal. A total of 105 samples of the building structure and 184 samples of equipment and piping were collected. Oil and other fluids were drained from various equipment. The application of polyurethane foam in process gas equipment, the off-site shipment of sodium fluoride traps, the removal of technetium (TC)-99-contaminated cylinders, and the removal of high-risk equipment were completed. Removal of process gas equipment from the cell floor in two units of the building was completed. Other project activities completed in FY 2015 include sealing slab penetrations, installing storm water berms, and preparing waste disposal documents.



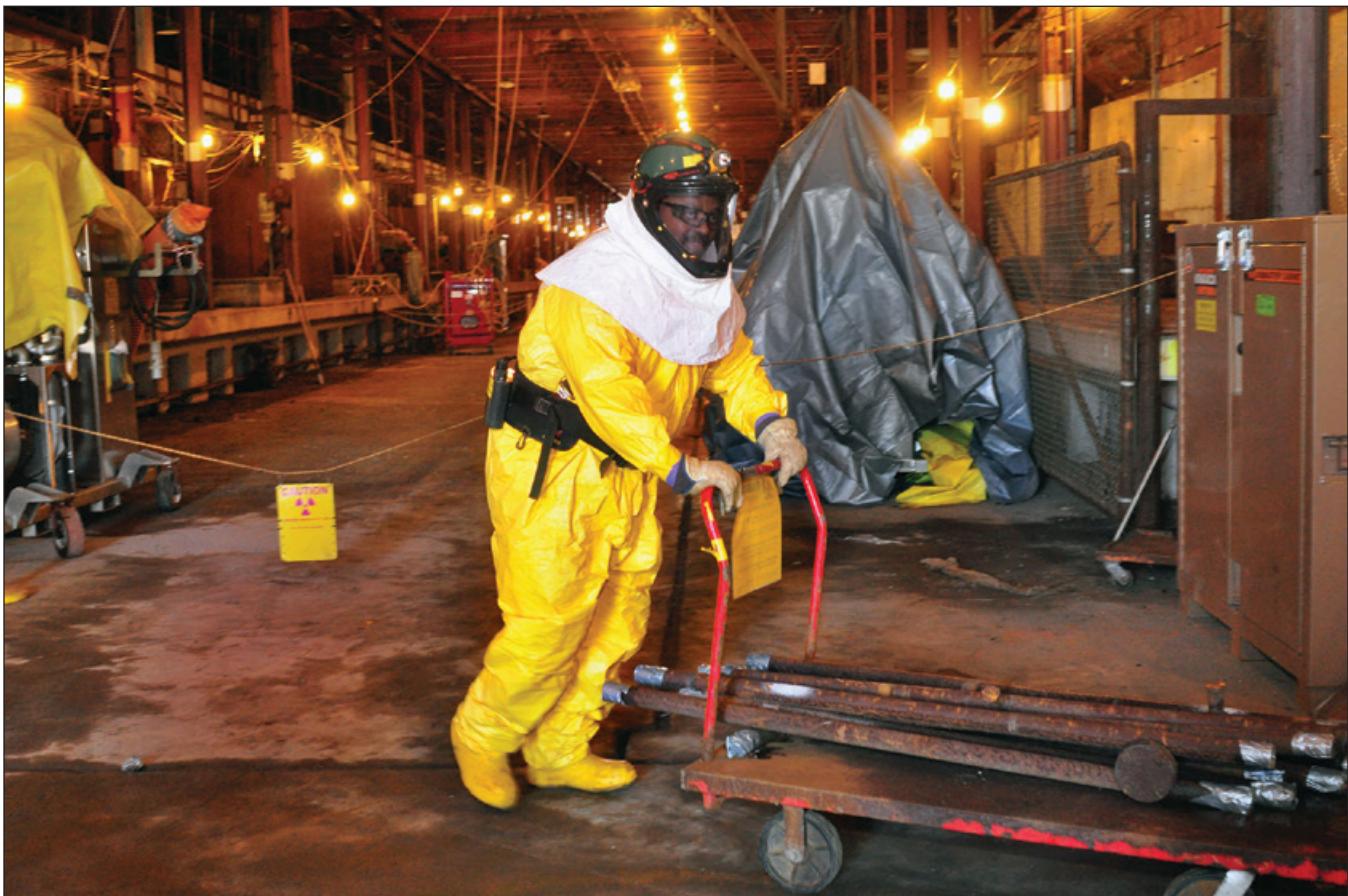
*Transite paneling removal.*



*The K-27 Building.*



*Above, process pipe from K-27 is being packaged for shipment. Right, carpenters are assembling scaffolding in the building for safe removal of process pipe. Below, a laborer is moving a seal exhaust line.*



# ETTP environmental contamination undergoing remediation efforts

EM continued remediation activities to reduce ETTP soil contamination in 2015. The site is divided into two cleanup regions: Zone 1, a 1,400-acre area outside the main plant, and Zone 2, the 800-acre area that comprises the main plant area.

## Zone 1

The interim Record of Decision (ROD), which documents the cleanup method for the site, required EM to remediate soil to a depth of 10 feet (suitable for the protection of an industrial workforce) and remove sources of groundwater contamination. The EM program prepared a Remedial Investigation/Feasibility Study (RI/FS) to address groundwater, surface water, ecological protection, and final land use controls. The EPA and TDEC provided comments on the RI/FS, and the agencies reached an agreement to initiate a Zone 1 Final Soils ROD and defer Zone 1 surface water and groundwater to a future decision. In FY 2015, The RI/FS was approved and a revised Zone 1 Final Soils Proposed Plan was also prepared and transmitted to EPA and TDEC for review. Upcoming work includes addressing EPA and TDEC comments and finalizing the Zone 1 Final Soils Proposed Plan, conducting a public meeting on the Proposed Plan, and preparing the Zone 1 Final Soils Record of Decision.

## Zone 2

Remediating Zone 2 involves removing contaminated soil so that the site is safe for industrial use and removing sources of groundwater contamination.

In FY 2015, EM completed characterization of the K-25 and K-31 footprints. In FY 2016, this characterization data will be evaluated to determine if remediation is required under the Zone 2 Soils ROD. The approximately 40-acre footprint of the K-25 Building has been declared the K-25 Preservation Footprint, and it is dedicated for historical commemoration and interpretation activities. The characterization results are also being used to support preservation of the area and evaluation of potential end states of the slab.

## Tc-99 GW Investigation

Elevated levels of Tc-99, a slow-decaying isotope, were observed in groundwater, storm water, and sanitary sewage during the demolition of the K-25 Building. In 2014, a Removal Site Evaluation was prepared to assess the potential threat to human health and the environment from the elevated Tc-99 levels, discuss mitigative measures taken, and determine

if further action is needed. The evaluation concluded that the levels of Tc-99 do not pose a threat to human health and the environment and recommended a shallow groundwater investigation south of the K-25 Building slab to evaluate the potential migration of Tc-99. In 2015, the shallow groundwater investigation was implemented.

The shallow groundwater investigation was performed in phases. The results of Phase 1 and Phase 2 are documented in *Addendum to the Technetium-99 Removal Site Evaluation at the East Tennessee Technology Park, Oak Ridge, Tennessee* (DOE/OR/01-2663&D1/A1). This document was submitted to DOE on Dec. 21, 2015. The Removal Site Evaluation document will be revised to update the results of the Phase 3 investigation, which were scheduled to be completed in FY 2016.

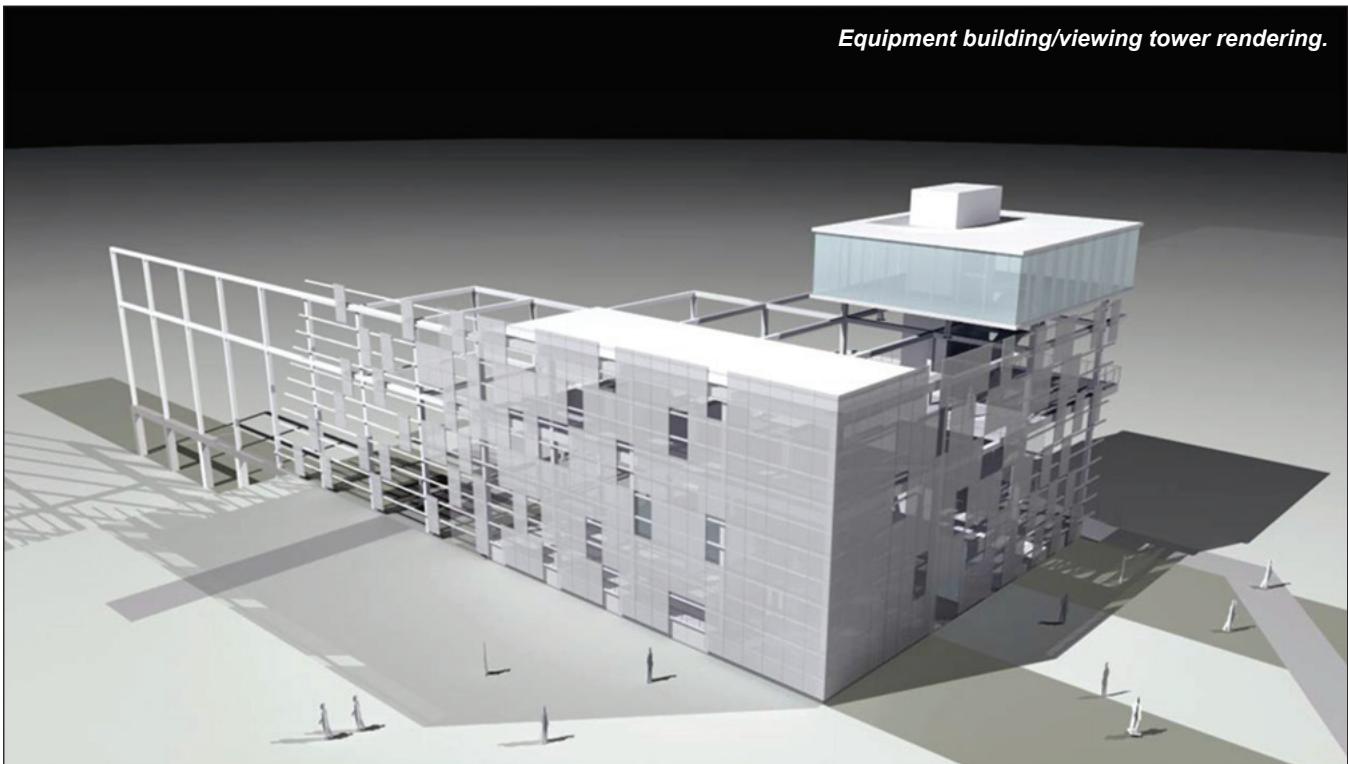


## K-1037 demo prep begins

After almost 10 years of being placed in standby condition, the K-1037 Building has had revised security measures approved by DOE to allow for the removal of materials in preparation for deactivation and demolition of the facility. The building was used to produce barrier material for the gaseous diffusion process.

Initial planning walkdowns for the building have been conducted, which identified issues with the building's electrical service and combustibles storage. The original electrical distribution has been isolated, and a new temporary lighting service has been installed. Workers also began removing combustible materials from the building.

Preliminary planning and engineering walkdowns have been conducted to allow for future asbestos and hazardous material abatement.



*Equipment building/viewing tower rendering.*

## K-25 historic preservation efforts progress

Historic preservation of the K-25 Site continued in FY 2015 with the completion of the conceptual design of the Equipment Building, Viewing Tower, K-25 History Center, Wayside Exhibits, and K-25 slab delineation. A consultation meeting was held in January 2015, where representatives from the Professional Site Design Team and Museum Professional (Smee + Busby Architects and Hilmerty and Associates) presented the conceptual design to a group of 12 consulting parties, made up of historic preservation agencies and other interested agencies. Following review of the conceptual design documents, preliminary design activities started in April 2015.

Development of the K-25 Virtual Museum website proceeded throughout FY 2015, and the website was previewed by the consulting parties in May 2015. Their comments were incorporated into the website, which is now available online at [www.K-25virtualmuseum.org](http://www.K-25virtualmuseum.org). The designer of the web-based K-25 Virtual Museum is Westside Media; historical content was provided by UCOR staff.

The National Defense Authorization Act of 2015, passed by Congress and signed into law Dec. 19, 2014, by President Obama, included provisions authorizing a Manhattan Project National Historical Park. Although the historic preservation

activities at the K-25 Site are being implemented separately and independently of the National Historical Park, the passage of the Park legislation may provide opportunities to benefit from the experience of the National Park Service (NPS).

In August 2015, NPS officials, accompanied by an interpretive team from the NPS Harpers Ferry Center, toured Oak Ridge historic properties and held preliminary discussions with DOE headquarters and local officials about launching the park. The visit included a tour of the K-25 Site and discussions on the status of K-25 historic preservation activities.



*K-25 Virtual Museum home page.*



## Reindustrialization Program continues land reuse efforts

As cleanup has progressed extensively at ETTP, more large parcels are becoming available for transfer. The completion of K-31 demolition allows for the first parcel of over 200 contiguous acres that can be developed for large scale, industrial projects at Heritage Center Industrial Park. This area has been approved for transfer by EPA and TDEC. Transfer of the land is expected to take place in 2016. This will be the second largest transfer in the history of the program.

Additionally, a large area of 170 acres at the southeast corner of ETTP is in the final stages of an Environmental Assessment (EA) to transfer the property to the Metropolitan Knoxville Airport Authority for a potential airport project. The general aviation airport runway will accommodate small corporate jets, private airplanes, and Emergency Management Services aircraft. In 2015, DOE began draft documentation for future property transfers of large industrial parcels at the Former Powerhouse Area and Duct Island, both at the western end of the site.

In FY 2015, three new businesses began operations at ETTP. FY 2015 also saw the construction of Powerhouse Six, the third and largest solar array on site. Powerhouse Six is a 1MW solar array on five acres of former DOE land, providing electricity to the Tennessee Valley Authority (TVA) through the City of Oak Ridge.

Heritage Center also established numerous greenway areas, as well as an arboretum certified by the Tennessee Urban Forestry Council.



**Powerhouse Six.**

# Oak Ridge National Laboratory



Oak Ridge National Laboratory is one of the world's most modern campuses for scientific discovery in materials and chemical sciences, nuclear science, energy research, and supercomputing. However, among all this modern infrastructure are large contaminated areas that resulted from past operations and waste disposal practices. The Environmental Management Program has divided ORNL into two major cleanup areas: Bethel Valley and Melton Valley. The Bethel Valley area includes reactors and the principal former research facilities, and Melton Valley area includes reactors and waste management areas, such as burial grounds.



# Components removed from Oak Ridge Research Reactor

Component removal and capping of a pool in the 60-year-old Oak Ridge Research Reactor at ORNL highlighted FY 2015 efforts to remedy a seep that was discovered in the pool in September 2014.

Four irradiated components—the source of 96 percent of the radiation—were removed from the pool. The items were moved by long-handled tools into a container that was placed in the pool. The container was then retrieved; moved by a crane into an 80,000-pound, heavily-shielded shipping cask; and transported for disposal.

The pool was then capped, and at the end of the fiscal year, workers were ready to begin draining the structure with the wastewater being treated at an on-site facility. The project was completed in December 2015.

Building 3042, which houses the reactor, is one of hundreds of Manhattan Project and Cold War-era structures across the Oak Ridge Reservation monitored by DOE OREM. Nuclear research had not been conducted at the facility since 1988, but it still contained the highly irradiated components from those operations. The seep was causing the pool to lose the water that served as a protective, shielding agent for the irradiated components.



**Workers load cask onto transport truck.**

## Prep work continues for U-233 disposition

DOE remains focused on disposing a significant inventory of uranium-233 (U-233) stored in Building 3019 at ORNL. U-233 is a special nuclear material that requires strict safeguards and security controls to protect against access. The U-233 Project's objective is to address safeguards and security requirements, eliminate safety and nuclear criticality concerns, and safely dispose of the material.

Processing and transporting the U-233 inventory as expeditiously as possible will reduce the substantial annual costs associated with safeguards and security requirements, eliminate the risk of a nuclear criticality event, and avoid the need for future facility upgrades to Building 3019 to ensure safe, enduring storage. Constructed in the 1940s, Building 3019 is the oldest continually operating nuclear facility in the DOE Complex.

In 2015, DOE also successfully resolved the concerns associated with the disposition of the Consolidated Edison Uranium Solidification Project (CEUSP) material. CEUSP originated from a 1960s research and development test of thorium and uranium fuel at Consolidated Edison's Indian Point 1 Nuclear Plant in New York. Direct disposition efforts were resumed during the year, and preparations for a processing campaign for material that cannot be directly disposed continued.

Building 2026, located directly across from Building 3019 at ORNL, will be used for this processing work. Preparations in Building 2026 continued in FY 2015, including cleaning out the existing hot cells and cell access areas and performing some deferred maintenance work.

**Workers practice loading components at the Oak Ridge Research Reactor pool.**

# Waste disposed at Molten Salt Reactor Experiment Facility

Work continued during FY 2015 to characterize and dispose of waste items from the Molten Salt Reactor Experiment (MSRE) facility, a graphite-moderated, liquid-fueled test reactor that operated at ORNL from June 1965 until December 1969. In 2015, 14 waste items were characterized, and 16 waste items were disposed, which exceeds the scheduled plan.

Since the reactor's shutdown, EM has performed several studies and removal actions to stabilize the facility, including removal of uranium deposits and defueling of the reactor salts.

Routine surveillance and maintenance activities continue to manage the remaining hazards associated with the facility, including periodic removal of reactive gas generated by the defueled salts.

In 2014, an addendum to the waste handling plan for the facility was approved to address disposition of remaining waste from the earlier actions. The addendum includes a schedule for characterization and disposition of 74 waste items. Waste disposition will continue in FY 2016.

*MSRE waste  
disposal activities.*



*Aerial view of  
MSRE facility.*

# Y-12 National Security Complex



The Y-12 National Security Complex is a premier manufacturing facility dedicated to making our nation and the world a safer place. The Y-12 Complex helps ensure a safe and reliable U.S. nuclear weapons deterrent. The site also retrieves and stores nuclear materials, fuels the nation's naval reactors, and performs highly skilled, specialized manufacturing work for other government and private-sector entities.

# Outfall 200 Mercury Treatment Facility

## conceptual design approved, preliminary design under way

In 2015, DOE Headquarters approved the Outfall 200 Mercury Treatment Facility (MTF) Conceptual Design Report, as well as plans to proceed with MTF design. The goal of the MTF is to reduce the mercury concentration in water exiting the Y-12 Complex.

Outfall 200 is the point at which the west end Y-12 storm drain system discharges to Upper East Fork Poplar Creek. Mercury from historical operations is present in the Outfall 200 storm water entering Poplar Creek.

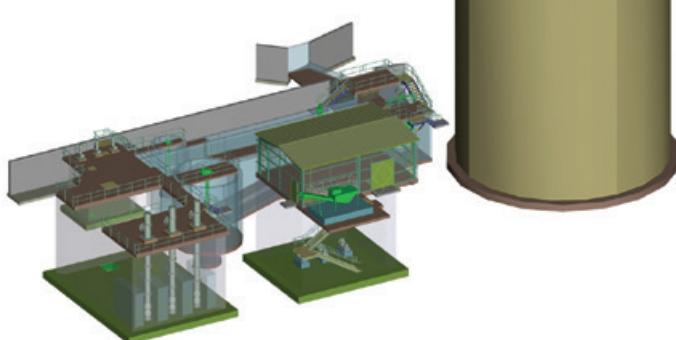
Also in 2015, eight pre-design studies were completed to provide information to support design. The studies evaluated storm water chemistry, optimal treatment parameters, potential water diversion strategies, storm impacts on mercury levels, and MTF siting.

As a CERCLA project, a Focused Feasibility Study and Proposed Plan that describes the MTF and goals for reducing concentrations of mercury levels at the site has been prepared and approved. A public comment period, including a public meeting, was held to obtain comments and questions. An amendment to the Phase I Upper East Fork Poplar Creek ROD is being prepared to document the final remedy.

The MTF is being designed to treat storm water up to 3,000 gallons per minute and includes a 2-million-gallon storage tank to collect storm water during peak flow conditions up to 40,000 gallons per minute and treat it after storm flow subsides. Captured storm water will be piped to a treatment facility located on an available site east of Outfall 200.

Mercury treatment will be accomplished using chemical precipitation, clarification, and media filtration. Treated water will be discharged back into UEFPC. The Outfall 200 MTF design incorporates flexibility and expandability of treatment processes, if required in the future.

*Outfall 200 conceptual design.*



## Mercury remediation technologies considered

Mercury remediation is a high priority for the DOE OREM because of large historical losses of mercury within buildings and to soils and surface waters at the Y-12 National Security Complex.

Remediation of Y-12 and East Fork Poplar Creek is based upon a phased, adaptive management approach. The approach for surface water includes mercury treatment actions in the short-term and research and technology development to evaluate longer-term solutions in the downstream environment. DOE has developed and is executing a Mercury Technology Development Plan.

In FY 2015, research and technology development activities focused on the major factors influencing the accumulation of mercury in fish (fish are the major route of both human and wildlife exposure). Three lines of investigation for East Fork Poplar Creek were developed to: (1) examine potential downstream sources, such as bank soil and sediment control, (2) investigate the water chemistry and flow characteristics of the creek and its influence

on mercury, and (3) study the ecology and how differences in food chain processes may influence the uptake of mercury in fish.

Understanding movement of mercury in the East Fork Poplar Creek system was deemed essential to the development of new technologies and ultimately to the development of remedial options and strategies for the creek. Early studies have pointed to the importance of bank soils and sediments as a source of mercury to the creek, especially during high-flow events. Research is under way to examine potential technologies that may limit mercury erosion. Stream management changes – such as controlling nutrients or algae growth or managing fish populations – are also under investigation.

In March 2015, ORNL scientists issued a report titled "Mercury Remediation Technology Development for Lower East Fork Poplar Creek (ORNL/SPR-2014/645). This report offers science-based approaches and ideas to research and technology development activities that may lead to new options for mercury remediation.

# Building 9808

## demolished, mercury spill cleaned

The National Nuclear Security Administration (NNSA) and its contractor, CNS, completed demolition of Building 9808 in FY 2015. Building 9808 was constructed in 1952, had a floor space of 7,540 square feet, and was used primarily as a plant maintenance facility. It was located immediately adjacent to the east wall of Building 9201-5 (Alpha 5) and shared several utility connections with Alpha 5, one of the highest risk facilities in the DOE Complex awaiting demolition.

Building 9808 served as an HVAC repair shop, a carpenter shop, and a pump repair (including COLEX pumps) shop during various periods. It was contaminated by uranium, thorium, beryllium, PCBs, and mercury originating from Alpha 5 equipment that was maintained or repaired in 9808 and by way of shared

utility system lines. A vacuum line running from Alpha 5 to Building 9808 was known from previous deactivation work to contain residual elemental mercury.

Although precautions were taken to minimize spillage during demolition, approximately one gallon of mercury was spilled while cutting a section of the vacuum line where, apparently, mercury had pooled behind a sludge bank and overwhelmed attempts to catch it all. The mercury and soil in the area were cleaned up within 48 hours of the spill. A total of 98 pint size jars of mercury and mercury mixed with sludge were collected from the vacuum line for treatment and disposal.

Demolition of Building 9808 accomplished one more step necessary to facilitate the eventual D&D of Alpha 5.

*Building 9808 before demolition  
(right) and after (below).*



# Waste Management



Wastes on the Oak Ridge Reservation are being disposed in a variety of ways. Most of the waste is being disposed on-site in either the Environmental Management Waste Management Facility (EMWMF) or the Oak Ridge Reservation Landfills. Some wastes are shipped off-site for treatment and/or disposal. Wastewater is treated at the Chromium Water Treatment System at ETTP and the Process Waste Treatment Complex at ORNL.



## Reservation facilities receive majority of waste from cleanup

Most of the waste generated during FY 2015 cleanup activities was disposed at facilities on the Oak Ridge Reservation.

The Environmental Management Waste Management Facility (EMWMF), located in east Bear Creek Valley near the Y-12 Complex, received 10,554 truckloads of waste, accounting for 99,787 tons during FY 2015. This engineered landfill consists of six disposal cells that only accept low-level radioactive and hazardous CERCLA waste meeting specific waste acceptance criteria. Waste types that qualify for disposal include soil, dried sludge and sediment, solidified waste, stabilized waste, building debris, scrap equipment, personal protective equipment, and classified waste.

EMWMF operations collected, analyzed, and dispositioned approximately 5.2 million gallons of leachate at the ORNL Liquid and Gaseous Waste Operations Facility in FY 2015. No contact water (water that comes in contact with waste but does not enter the leachate collection system) required treatment at ORNL in FY 2015. However, 10.9 million gallons of contact water were collected, analyzed, and released to the storm water retention

basin after laboratory analyses verified it met all discharge standards. Operating practices at the landfill also effectively controlled site erosion and sediment.

During FY 2015, waste and debris from K-25, K-31, and several smaller cleanup projects at ETTP, ORNL, and Y-12 were shipped to the EMWMF.

DOE also operates and maintains solid waste disposal facilities called the Oak Ridge Reservation Landfills, three of which are active. These landfills, located on the Y-12 Complex, are engineered facilities used to dispose sanitary, industrial, construction, and demolition waste. In FY 2015, approximately 38,410 cubic yards of waste were disposed in the landfill, which was a 22.7 percent increase over FY 2014 volumes. Major site improvements were also made, including upgrading the classified landfill.

Operation of the Oak Ridge Reservation Landfills generated approximately 2 million gallons of leachate that were collected, monitored, and discharged into the Y-12 Complex sanitary sewer system.

# New on-site disposal facility planned

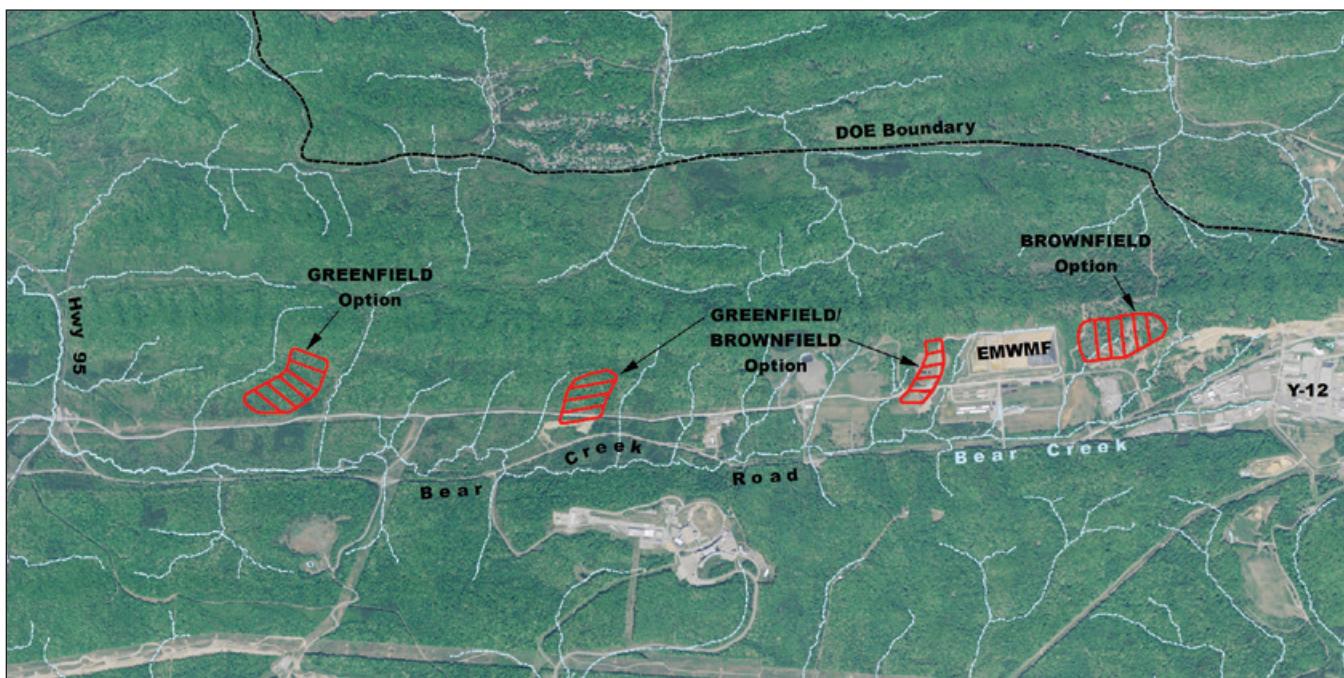
EMWMF, the existing on-site disposal facility for low-level, mixed, and classified waste, was constructed to accommodate demolition debris from cleanup at ETTP and is expected to reach capacity before all Oak Ridge Reservation cleanup waste has been generated and disposed. Therefore, initiating planning for another landfill is essential so that cleanup work is not interrupted once EMWMF is full.

During 2015, EM submitted a revised Remedial Investigation/Feasibility Study that was modified to include characterization data for a proposed new Environmental Management Disposal Facility (EMDF) in East Bear Creek Valley. DOE continues to work with regulators to submit a final version of the document for approval. The revised document will analyze on-site, off-site, hybrid, and no action alternatives to support cleanup decisions:

1. Under the no action alternative, no coordinated Oak Ridge Reservation-wide strategy to manage wastes generated by future CERCLA actions would be implemented. The no action alternative provides a benchmark for comparison with the action alternatives.
2. The on-site disposal alternative now considers three site options in Bear Creek Valley, including the original East Bear Creek Valley site (a Brownfield site to the east of EMWMF) and two others that incorporate Greenfield sites, and would provide consolidated disposal of future-generated CERCLA waste in one or possibly two newly constructed, engineered facilities referred to as EMDF.
3. Under the off-site disposal alternative, future CERCLA waste would be transported off-site for disposal in approved disposal facilities, primarily by rail.
4. The hybrid disposal alternative will consider a smaller on-site landfill (the smallest Brownfield footprint) in conjunction with sending waste off-site as completed under the off-site disposal alternative.

The alternatives document concludes that both on-site and off-site disposal alternatives would protect human health and the environment long-term by disposing the waste in landfills designed for site-specific conditions. Short-term risks are much higher for the off-site disposal alternative due to significant transportation efforts required to move the waste off-site. The off-site disposal alternative has the potential to isolate the wastes more effectively, since the disposal sites are located in arid climates. Along with higher costs, off-site disposal would extend the ORR cleanup schedule by ten or more years over current projections.

While the on-site disposal alternative requires a permanent commitment of additional Oak Ridge Reservation land for waste disposal and thus impacts environmental resources, it would be much less costly, allow for more expedited waste disposal, have lower transportation risk, and provide a greater level of certainty that long-term disposal capacity will be available, thus offering the most condensed overall cleanup schedule for the Oak Ridge Reservation.



*Proposed locations for the new Environmental Management Disposal Facility.*

# Wastewater treatment continues on Oak Ridge Reservation

Each year, activities on the Oak Ridge Reservation generate millions of gallons of wastewater that must be treated to remove oil, chemical, radiological constituents, and other contaminants.

The NNSA at the Y-12 Complex treats wastewater generated from both production activities and environmental cleanup activities. Safe and compliant treatment of almost 116 million gallons of wastewater was provided at various facilities this year.

At ORNL, the Process Waste Treatment Complex treated approximately 90 million gallons of wastewater. In addition, the liquid low-level waste evaporator at ORNL treated approximately 76,700 gallons. The ORNL 3039 Stack Facility treated a total of 1.63 billion cubic meters of gaseous waste. These waste treatment activities supported both EM and Office of Science mission activities in a safe and compliant manner.

## LGWO engineering evaluation being conducted

A six-month engineering evaluation/study of ORNL's Liquid and Gaseous Waste Operations (LGWO) was initiated in FY 2015. The focus of the study is to evaluate the current conditions of the process water, gaseous waste, and liquid low-level waste systems; determine the future capacity needs to support OREM and the Office of Science missions at ORNL; research alternate technologies; and recommend and prioritize repairs and/or system upgrades for long-term operations.

The LGWO operating systems vary in age from 30 to 40 years old and all of them are well beyond their designed life. The systems are experiencing frequent equipment breakdowns and in many cases spare parts are not available due to the obsolete equipment that is in service. The engineering evaluation has confirmed and identified additional equipment repairs to be conducted in 2016.

## New LGWO process saving \$80,000 per year



*The dewatering bag is being moved from its yellow frame into a shipping container.*

A new process for preparing sludge at LGWO will save more than \$80,000 per year.

The LGWO project generates various sludges during the wastewater treatment process that must be dewatered, or drained, before being shipped for disposal. The dewatering process that had been used involved placing PVC tubing in the bottom of a 90-cubic-foot box and sluicing the sludge into the box. Suction would then be applied to the PVC tubes to remove water, which would take a couple of months.

The new process, which takes only 72 hours, involves placing the sludge into a dewatering bag that is inside a dewatering frame. Vacuum is applied to the frame, which helps pull water out, reducing the moisture content to about 44 percent. The old method left the moisture content at 60 percent or more.

The new packaging allows absorbent material to be added above and below the dewatered sludge as an added precaution. Another benefit of this new process is that radiation dose exposure is anticipated to be reduced because of the reduced time needed to process the sludge.

# Progress continues on transuranic waste processing

The Transuranic (TRU) Waste Processing Center (TWPC) characterizes and packages TRU waste from the Oak Ridge Reservation for disposition in underground salt caverns at DOE's Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. In December 2015, North Wind Solutions, LLC, replaced Wastren Advantage, Inc. (WAI) as the managing contractor for the TWPC.

TRU waste contains man-made elements heavier than uranium, such as plutonium, hence the name "trans" or "beyond" uranium. Transuranic waste material is generally associated with the human manipulation of fissionable material dating back to the Manhattan Project. It consists primarily of clothing, tools, rags, residues, soil and debris.

Two waste streams—contact-handled (CH) and remote handled (RH)—are processed at the TWPC. CH TRU can be safely handled without remote equipment, although workers never actually touch the waste without protective barriers such as special clothing or equipment. Higher energy radioactive TRU is processed by remote control equipment in special rooms called "hot cells." Workers who process RH waste are protected by barriers, such as thick concrete walls and leaded-glass viewing windows.

In FY 2015, the TWPC processed 44 cubic meters of CH waste, achieving an overall total of 1484 cubic meters of processed CH waste. In addition, employees at the facility



An employee works in a cask processing enclosure at TWPC, which processed more than 100 cubic meters of contact-handled and remote-handled waste in FY 2015.

processed 69 cubic meters of RH waste for an overall total of 484 cubic meters. These totals represent approximately 99 percent of the legacy CH TRU waste and about 86 percent of the legacy RH TRU waste.

During the year, employees shipped a total of 13 cubic meters of fallout (i.e., waste recharacterized as low level) from CH TRU inventory, reaching a total of 1,037 cubic meters disposed. In addition, they shipped 25 cubic meters of fallout from RH TRU inventory, reaching a total of 163 cubic meters disposed. These totals represent approximately 69 percent of the legacy CH TRU waste disposed and approximately 29 percent of the legacy RH TRU waste disposed.

### Remote-handled overpacks developed

Due to the prolonged shutdown of the WIPP facility, WAI designed new containers to store RH TRU wastes that have been processed at the TWPC. These containers, referred to as remote-handled overpacks (ROPs), were designed to provide shielding and protection from the highly radioactive TRU waste processed and stored until the reopening of the WIPP site. The ROPs were designed with layers of steel, concrete, and a thermoplastic inner liner which is water tight. This innovative solution allowed for RH waste processing to continue safely and compliantly.



**Workers move one of the newly designed remote-overpacks.**

## Contract awarded for sludge buildout project

OREM awarded a contract to CH2M HILL Constructors, Inc. for the Sludge Processing Facility Buildout Project at the TWPC.

In September 2014, CH2M HILL was selected as the most qualified among the contractors that submitted qualification packages for the sludge buildout project.

In April 2015, DOE completed cost negotiations and awarded the contract. CH2M HILL immediately started work on the first elements in the contract, which are associated with the design of the mock prototype test facility. The purpose of the mock test facility is to advance the technical maturity of the technology, and recommend any improvements in the design of equipment and systems, which will be used to treat and process the sludge

As of January 2016, the contractor has assessed the maturity of the technology, made recommendations for design and technology improvements and made significant progress in advancing the design of the mock test facility. DOE has completed the review of the recommendations and directed the contractor to prepare contract changes to implement these improvements.

The design of the mock test facility is scheduled for completion during FY 2016.

The remainder of the project scope includes construction and operation of the mock test facility, as well as the completion of the final design of the Sludge Processing Facility. These tasks are included as options in the contract, and DOE will authorize those options at the appropriate time.

The alternate test facility site is currently undergoing a geotechnical evaluation. A formal geotechnical report will be instrumental in establishing the requirements associated with the test facility.

"Processing the inventory of 2,000 cubic meters of transuranic sludges is one of our program's top priorities, and this is the first step in achieving that goal," said Sue Cange, OREM Manager. "We are pleased that contract negotiations were successful, and we look forward to working with CH2M HILL on this important project."

# Oak Ridge Reservation



The DOE Oak Ridge Reservation is home to ETTP, ORNL, and the Y-12 Complex, as well as waste repositories and other facilities. It contains approximately 33,500 acres, which is mostly wooded. In addition to cleanup projects at the three facilities on the Reservation, the DOE Oak Ridge Environmental Management Office is taking measures to address Reservation-wide issues.

# Reservation groundwater strategy evaluates potential off-site movement

Work continued in 2015 to implement key recommendations from the Oak Ridge Reservation Groundwater Strategy report that was approved in 2014.

Two off-site groundwater sampling events were completed in 2015 in accordance with an approved work plan. Samples were collected at 34 wells and 15 springs located west and north of the Clinch River at the western boundary of the Oak Ridge Reservation. The project is a cooperative DOE, EPA, and TDEC effort. A report on the study is planned for November 2016.

A Technical Advisory Group composed of DOE, EPA, and the TDEC members, as well as industry experts, met several times in 2014 and 2015 to review progress and make recommendations for development of a regional groundwater flow model.

The geologic framework for the model was completed in 2015. Testing activities on a test case model were also completed and construction of the regional scale groundwater flow model is under way. The regional flow model will serve as an underlying framework to support future cleanup decisions and actions.



*Collecting samples at an off-site spring location.*

# Work begins on 2016 Five-Year Review

Work began in FY 2015 on the 2016 Five-Year Review, which assesses the protectiveness of completed CERCLA remedial actions. This review includes 37 sites where remedial actions have been completed and contamination has been left in place above unrestricted cleanup levels.

In FY 2015, sampling used specifically for the Five-Year Review was performed and site visits were completed to each of the 37 sites. The site visits included representatives from the Site Specific Advisory Board (ORSSAB), EPA, TDEC, DOE, and DOE support contractors.

Also in FY 2015, the annual Remediation Effectiveness Report was completed and submitted to EPA and TDEC. This report documents the progress of the remedial actions toward cleanup goals. In 2017, a report will be written documenting the evaluation and culminating with protectiveness determinations for each of the sites.



***The Water Resources Restoration Program Technical Lead addresses the Five-Year Review site tour participants in Bethel Valley.***



***An EPA representative addressed the Five-Year site tour group in Bethel Valley.***

# Public Involvement



The public is involved in all cleanup decisions made by DOE. To keep the public informed, DOE provides information through a variety of outlets, including tours, meetings, fact sheets, public notices, the Internet, and various publications.

# Media events held for K-31 demolition kickoff, completion

Local dignitaries and the media were invited to ETTP in FY 2015 to witness the start of K-31 Building demolition, and the completion of the demolition just a few months later. Demolition began Oct. 8, 2014, and concluded June 26, 2015, ahead of schedule. The high-profile project also brought a site visit by Dr. Elizabeth Sherwood-Randall, Deputy Secretary of Energy, in March 2015.



*Dr. Elizabeth Sherwood-Randall, Deputy Secretary of Energy (right) views K-31 progress.*



*Local media interview UCOR President and Project Manager Ken Rueter.*

## Advisory board provides input on DOE cleanup activities

ORSSAB is a federally appointed citizens' panel that provides independent advice and recommendations to OREM. The board is composed of up to 22 members, who are chosen to reflect the diverse occupations, perspectives, and interests of people living near the Oak Ridge Reservation. The board also includes two non-voting student representatives from area high schools.

Since 1995, ORSSAB has actively provided input to OREM on cleanup operations and stewardship of remediated areas and permanent waste disposal sites. The board continued that tradition in FY 2015. More information about ORSSAB is available online at [www.energy.gov/orssab](http://www.energy.gov/orssab).

Following are some of the board's major contributions and activities for FY 2015.

In FY 2015, ORSSAB members made a concerted effort to be more proactive. At ORSSAB's annual meeting at the end of 2014, the board set some objectives to become more involved in understanding DOE remediation projects on the Oak Ridge Reservation and to make board meetings more interesting.

Two of those objectives were to take tours of areas where OREM has requested recommendations from the board and to hold board meetings at different locations.



The tours have helped members better understand the areas in question. The idea for occasional changes in venue is to add variety for members and make the meetings more accessible to the public.

The effort got under way soon after the August annual meeting when in November board members Alfreda Cook, Bob Hatcher, Greg Paulus, Dennis Wilson, and student representative Claire Rowcliffe went on a tour of ETTP. Led by Dave Adler,

**Dennis Wilson,  
left, Alfreda  
Cook, center,  
Greg Paulus,  
looking left,  
Dave Adler,  
DOE, and Bob  
Hatcher, right,  
with others on a  
site tour of Zone  
1 at ETTP.**



the board's Alternate Deputy Designated Federal Officer, they saw the area known as Zone 1 (the surrounding acreage outside of the ETTP plant area), which is considered for a ROD for remediation of contaminated soils.

Also in November, the entire board met off-site at a Knoxville restaurant. The purpose was an extension of the annual meeting where the board had a facilitated discussion about different ways to conduct board meetings, how to improve member participation, and how to recruit more members.

In December, DOE Oak Ridge EM held a "meet and greet" event at the DOE Information Center so board members could chat informally with portfolio and project managers.

In February 2015, board members Bob Hatcher, Fay Martin, Corkie Staley, and Greg Paulus braved a cold winter afternoon to see the site of the proposed new waste disposal facility near Y-12.

In May, the board went off-site again for a meeting at an Oak Ridge restaurant. The board invited Oak Ridge City Manager Mark Watson to talk about the city's perspectives on DOE's cleanup operations.

This was the year for the Five-Year Review site visits to document if stewardship controls that have been implemented at remediated sites are still working as planned and if they are still applicable under current conditions. Alfreda Cook, Bob Hatcher, and Ed Trujillo went on several of the visits.

Dave Hemelright and Belinda Price attended the final demolition of the K-31 Building in June.

In September, Martha Deaderick went on a tour of the Y-12 Complex to see the area where a mercury treatment facility is proposed to remove mercury from Upper East Fork Poplar

Creek, and Dennis Wilson attended the public meeting on the facility at the DOE Information Center.

At the 2015 annual meeting, the board decided to continue the momentum and is planning to take even more tours of the Oak Ridge Reservation during FY 2016.

### **Community Outreach**

In FY 2015, ORSSAB continued efforts to keep the public informed of its activities to provide opportunities for dialogue between EM and the surrounding communities.

Each board meeting is video recorded, and the presentation portion is broadcast on cable television stations in Anderson, Knox, and Loudon counties. The videos are also on the board's YouTube channel. ORSSAB's website and Facebook site have links to the postings.

The board also reaches out through its quarterly *Advocate* newsletter, news releases, and postings on the board's website and Facebook page. The board's permanent exhibit at the American Museum of Science and Energy in downtown Oak Ridge features a variety of touch-screen kiosks and displays on waste management activities, long-term stewardship, history, and other aspects of DOE's cleanup program.

### **Recommendations**

ORSSAB's primary function is to provide advice and recommendations to DOE on its environmental cleanup of the ORR. Complete text of all ORSSAB recommendations can be found on the ORSSAB website at <http://www.energy.gov/orem/listings/orssab-recommendations-responses>.

# DOE Information Center in Oak Ridge

The DOE Information Center is a one-stop information facility that maintains a collection of more than 47,000 documents involving environmental activities in Oak Ridge.

The Center hosts various meetings, including some of the ORSSAB meetings, relevant to cleanup activities in Oak Ridge. Staff are available Monday through Friday, 8 a.m. to 5 p.m., to assist with information needs. A website is available for users to search for information at the Center. Go to the website listed below and click on "Search the DOE Information Center Online Catalog" to begin the search.



*The DOE Information Center, located at the Office of Scientific and Technical Information, has more than 47,000 documents regarding Oak Ridge cleanup.*



**DOE Information Center staff, from left, are Trilla Hutchins, Wanda Joyce, and Eva Butler.**

## FY 2015 Stats

Average number of visitors per month	53
Number of public meetings held	46
Total citizen inquiries	554
Total number of documents at the center	47,394
Total number of documents on-line	15,354

Visit the DOE Information Center on the Web at [www.energy.gov/orem/services/community-engagement/doe-information-center](http://www.energy.gov/orem/services/community-engagement/doe-information-center)  
Phone: 865-241-4780

The DOE Information Center is located at the Office of Scientific and Technical Information, Building 1916 – T1, 1 Science.Gov Way, Oak Ridge, Tennessee, 37831

# Information Resources

DOE Information Center  
Office of Scientific and Technical Information  
Building 1916 – T1, 1 Science.Gov Way  
Oak Ridge, Tennessee 37831  
Phone: (865) 241-4780  
Fax: (865) 574-3521  
E-mail: [DOEIC@oro.doe.gov](mailto:DOEIC@oro.doe.gov)  
Hours 8 a.m. to 5 p.m., Monday – Friday

DOE OREM Office  
(865) 576-0742

DOE-ORO Public Information Line  
1-800-382-6938

Oak Ridge Site Specific Advisory Board  
(865) 241-4583, (865) 241-4584  
1-800-382-6938

Tennessee Department of Environment  
and Conservation - DOE Oversight Office  
(865) 481-0995

U.S. Environmental Protection Agency  
Region 4  
1-800-241-1754

## Internet Sites

DOE OREM Program [www.energy.gov/orem](http://www.energy.gov/orem)

DOE Main Web Site [www.energy.gov](http://www.energy.gov)

Oak Ridge Site Specific Advisory Board [www.energy.gov/orssab](http://www.energy.gov/orssab)

Tennessee Department of Environment  
and Conservation [www.state.tn.us/environment/](http://www.state.tn.us/environment/)

U.S. Environmental Protection Agency [www.epa.gov/region4/](http://www.epa.gov/region4/)

DOE Information Center [www.energy.gov/orem/services/community-engagement/doe-information-center](http://www.energy.gov/orem/services/community-engagement/doe-information-center)

# Commonly Used Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CEUSP	Consolidated Edison Uranium Solidification Project
CH	Contact-handled
DOE	U.S. Department of Energy
EM	Environmental Management
EMDF	Environmental Management Disposal Facility
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ETTP	East Tennessee Technology Park
FFA	Federal Facility Agreement
FY	Fiscal year
MSRE	Molten Salt Reactor Experiment
NNSA	National Nuclear Security Administration
NPL	National Priorities List
ORNL	Oak Ridge National Laboratory
ORSSAB	Oak Ridge Site Specific Advisory Board
RH	Remote-handled
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TRU	Transuranic
TWPC	Transuranic Waste Processing Center
UEFPC	Upper East Fork Poplar Creek

# Commonly Used Terms

**CERCLA:** The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for hazardous waste releases at these sites, and established a trust fund to provide cleanup when no responsible party could be identified. The law, which governs cleanup operations on the Oak Ridge Reservation, authorizes two kinds of response actions: short-term removal actions, where actions may be taken to address releases or threatened releases requiring prompt response, and long-term remedial actions, which permanently and significantly reduce the dangers associated with releases or threats of releases. Long-term actions can be conducted at sites on the Environmental Protection Agency's National Priorities List, a listing of the nation's most hazardous waste sites. The Oak Ridge Reservation was added to that list in 1989.

**Federal Facility Agreement:** CERCLA requires an agreement between state and federal entities to guide cleanup work at CERCLA sites. For the DOE Oak Ridge Office, the parties of this agreement, called a Federal Facility Agreement, is DOE, the Environmental Protection Agency, and the Tennessee Department of Environment and Conservation. The Federal Facility Agreement for Oak Ridge was initiated in January 1992.

**Removal Actions:** Some cleanup activities on the Oak Ridge Reservation are conducted as Removal Actions under CERCLA. These actions provide an important method for moving sites more quickly through the CERCLA process. When a site presents a relatively time-sensitive, non-complex problem that can and should be addressed, a Removal Action would be warranted.

**Remedial Actions:** Remedial actions are long-term response actions that seek to permanently and significantly reduce the risks associated with the release or threat of release of hazardous substances.

**Remedial Investigation/Feasibility Study:** The purpose of the remedial investigation/feasibility study (RI/FS) is to assess site conditions and evaluate alternatives to the extent necessary to select a remedy. Developing and conducting an RI/FS generally includes the following activities: project scoping, data collection, risk assessment, treatability studies, and analysis of alternatives. The scope and timing of these activities should be tailored to the nature and complexity of the problem and the response alternatives being considered.

**Record of Decision:** Under the CERCLA process, a Record of Decision formally documents the selection of a preferred cleanup method after a series of steps, including a Remedial Investigation/Feasibility Study. A preferred cleanup alternative is selected and presented to the public for comment in a Proposed Plan. The Environmental Protection Agency, the state, and the lead agency then select a remedy and document it in the Record of Decision.

**For more information, please contact the DOE Public Affairs Office  
at (865) 576-0885 or 1-800-382-6938.**