Advocate

A publication of the Oak Ridge Site Specific Advisory Board – a federally appointed citizens panel providing independent recommendations and advice to DOE's Environmental Management Program

For OREM, Cleanup and Innovation Go Hand in Hand: Efforts on U-233, MSRE Drive Unique Partnerships

Workers extract thorium from U-233 using a series of gloveboxes to avoid contact with the material or chemicals used in the process. It begins by mixing the uranium with nitric acid.

The Department of Energy's (DOE) Oak Ridge Office of Environmental Management (OREM) hosted multiple events in November aimed at providing local expertise and resources to support new technologies at the national and international levels.

In mid-November, DOE leaders came to Oak Ridge to announce a public-private partnership to use isotopes produced during OREM's processing of the remaining inventory of uranium-233 (U-233) at Oak Ridge National Laboratory (ORNL) for medicine.

Earlier in the month, OREM provided an update to ORSSAB on its efforts at ORNL's Molten Salt Reactor Experiment. Locally, that includes a multi-million-dollar maintenance project. But as members learned on their tour, OREM and its contractors also provide in-demand expertise on molten salt reactors to researchers and national and international organizations as the technology experiences a resurgence in popularity.

"Our federal and contractor employees are not only advancing cleanup, they are also constantly identifying opportunities where our mission can benefit the public," said OREM Manager Jay Mullis.

From waste material to life-saving treatment options

OREM contractor Isotek Systems, TerraPower, and DOE announced a unique partnership that will extract rare isotopes used in next-generation medical research and treatment from legacy nuclear material.

Isotek is tasked with removing the remaining U-233 stored at ORNL. (ORSSAB will hear more about that process at its February meeting — see page 7.) TerraPower is a nuclear innovation company founded by Microsoft cofounder Bill Gates, among

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25 Years of ORSSAB Involvement

In December of 1994, local stakeholders, who had been asked to discuss environmental restoration and waste management issues with DOE, met with then-Assistant Secretary for EM Thomas Grumbly to propose an Oak Ridge Site Specific Advisory Board. He approved, and the formation process began in January 1995.

Since then, ORSSAB has made nearly 250 recommendations to DOE that have helped shape cleanup of the Oak Ridge Reservation. It's fitting that the board celebrates its

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Reservation Update

Sites Talk Outreach, More at Cleanup Roundtable

Managers leading cleanup at EM's largest sites discussed accomplishments, the changing contracting landscape, and the importance of community engagement during a roundtable session at this year's National Cleanup Workshop.

The panel of managers from Savannah River, Portsmouth/Paducah, Los Alamos, Oak Ridge, Hanford, and Idaho emphasized the significance of EM sharing its accomplishments in the communities surrounding its sites before shifting to the importance of engaging the community in the early phases of planning before finalizing approaches and beginning field work.

In some cases, engagement itself is leading to new accomplishments. In Oak Ridge, these collaborations with the city, Roane County, and the Community Reuse Organization of East Tennessee (CROET) help EM transfer ownership of land and infrastructure for new uses. As a result, the region has been provided with assets to enable economic development, while helping EM avoid more than $110 million in costs associated with maintenance, emergency services, and other oversight responsibilities.

Cleanup Crews Work Hard to Transform ETTP Landscape

Oak Ridge crews recently tore down another facility at the East Tennessee Technology Park (ETTP), bringing EM closer to completing cleanup at the site. Each ETTP demolition brings more change to the landscape, drawing sharp contrast to the government enrichment complex of decades past. Enrichment operations ceased in 1987.

Workers have finished demolition and debris removal of the 30,817-square-foot K-1423 Toll Enrichment Facility. The building was originally used to transfer liquefied uranium hexafluoride to cylinders for the plant's uranium enrichment process. EM cleanup contractor UCOR performed the demolition as part of efforts to complete major cleanup at ETTP by the end of next year.

Oak Ridge crews spent several months completing deactivation work to prepare the K-1423 Toll Enrichment Facility for demolition.

Crews have demolished five massive uranium enrichment facilities at the site, as well as hundreds of ancillary facilities spanning 12 million square feet. Next year, Oak Ridge will become the first in the world to complete major cleanup at a former uranium enrichment complex.

EM and UCOR are working to transform the site into a thriving, multi-use industrial park. More than 1,200 acres have already been transferred to the community, and removal of this facility opens additional land for future industrial development. Its removal also enhances safety and reduces risks associated with these old, unneeded facilities.

The K-1423 Toll Enrichment Facility operated from 1969 to 1986. The building was later used for a variety of purposes, including addressing radiologically contaminated drums, washing chemically contaminated drums, and storing waste.

EM's Highest Priority at Oak Ridge Lab Gains Momentum

Workers have begun processing a powder form of U-233 a year ahead of schedule as part of a larger EM project to safely process and dispose of the remaining inventory of the nuclear material stored at ORNL.

Launching this portion of the disposition project is an achievement for OREM and Isotek, the contractor responsible for processing and disposing of the site's U-233 inventory — EM's highest priority at ORNL. This work also eliminates the need to use Building 3019, which is the oldest operating nuclear facility in the world, for storage of the material.

In the 1970s and 1980s, nuclear facilities sent ORNL liquid uranium-233, and the site converted it into an oxide form, known as Oak Ridge Oxide, which is more stable for storage. Some of that material was shipped to facilities for use as fuel in reactors. However, most of it was stored at ORNL until it could be dispositioned.

Workers were originally scheduled to begin processing that material in October 2020, when crews are set to finish upgrading hot cells in an ORNL facility. The upgraded cells will be designed to handle larger amounts of uranium-233, providing more shielding for workers equipped with mechanical arm manipulators.

Rather than wait for the hot cells to be completed for larger-scale processing, Isotek arranged for workers to begin processing the portions of the uranium-233 inventory with lower levels of radioactivity in gloveboxes this year. Gloveboxes are structures with ports containing gloves that allow waste handlers to safely work with hazardous material.

For the first year of the Oak Ridge Oxide campaign, approximately 11 percent of the oxide will be processed using gloveboxes. This work consists of dissolving the material and then mixing it with grout to be safely shipped for disposal.

Isotek received approval from EM to implement the glovebox approach in August 2018.

Additional Employees Advance Biology Complex Cleanup

EM crews are making significant progress removing asbestos and other hazardous waste from the Biology Complex at Oak Ridge's Y-12 National Security Complex in a deactivation project that's more than 60 percent complete.

Asbestos abatement teams with UCOR, EM's Oak Ridge contractor, are working inside the six-story 9207 Facility, which spans 256,600 square feet, and the three-story 9210 Facility, which spans 64,700 square feet. This project paves the way for EM to begin demolishing remaining buildings that comprise the Biology Complex next year.

Momentum is building in the project after UCOR subcontracted deactivation work at the 9210 Facility, augmenting the workforce so abatement and demolition preparation can proceed at that facility in tandem with the work going on inside the 9207 Facility.

Oak Ridge is also adding newly trained workers to the project. Ten members of the inaugural East Tennessee Apprenticeship Readiness Program class now work at the Biology Complex.

After completing a specialized training experience, these new employees team up with seasoned deactivation personnel at a mock-up area created by UCOR. There, the new workers gain experience and proficiency with various methods of asbestos removal before beginning their work inside the Biology Complex buildings.

Photos show a hallway in the Biology Complex before (above) and after (below) Oak Ridge crews completed asbestos abatement.

Also advancing cleanup are transfer platform cars. These lifts installed by UCOR facilitate the movement of equipment, supplies, and employees between floors of the multi-level facilities. This approach has enabled crews to remove the hazards of these deteriorating buildings more safely and quickly.

Workers have already abated and shipped more than 350,000 pounds of asbestos waste for disposal. Deactivation is expected to be complete in summer 2020, and demolition is scheduled to begin later that year.

Originally constructed for recovering uranium from process streams, the Biology Complex was later used for DOE's research on the genetic effects of radiation from the late 1940s. When operational, the facilities once housed more individuals with doctorates than anywhere in the world.

The Biology Complex previously consisted of 11 buildings. EM demolished four of the structures in 2010 as part of work under the American Recovery and Reinvestment Act, and EM removed another two structures in 2018 as part of DOE's Excess Contaminated Facilities initiative.

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Recent Recommendations

Following is a summary of the recommendations ORSSAB has recently approved and voted to send to DOE for consideration. The full text of the recommendations are available at **www.energy.gov/orssab.**

Recommendation 246: On Improving SSAB and Public Engagement in the EM Budget Process

Each EM site is unique in its stage of cleanup – some are smaller, some are closer to the end of their cleanup and some have decades to go. Because of the uniqueness, difference in size, complexity, Federal Facility Agreements and length of cleanup the level of budget detail needed by each board may be different.

The eight citizen advisory boards that make up the SSAB that provide recommendations, advice and public perspectives to their local EM management believe that it is important to provide well-informed and timely recommendations, advice and comments regarding priorities at their sites. In order to do that they need to have an adequate level of priority planning detail provided in time to deliberate, develop and transmit timely recommendations to their respective local EM management. Consideration of our recommendations while the local EM offices are developing their priorities and budget requests and prior to local offices transmitting their priorities and budget request to EM headquarters is in the spirit of transparency and collaboration.

The EM SSAB recommends:

- DOE engage the local boards that make up the EM SSAB in the December-January-February timeframe in the budget process to ensure adequate time for the boards to be able to provide informed advice/recommendations for submittal to their local DOE EM management for review and consideration as local priorities and budget requests are being developed.
- Local EM site offices work with their advisory board early in the December-January-February timeframe to identify the level of priority and budget detail that each Board needs to discuss and develop informed advice/recommendations in time for DOE consideration as they develop their budget request submittal to DOE-EM HQ. For larger sites with multiple cleanup actions the detail should include an integrated priority planning list that identifies those cleanup activities that would be delayed if funding levels are not sufficient or if unplanned/emerging issues must be addressed.
- DOE-EM HQ relay to the local EM offices whatever guidance is required in the December-January-February timeframe to ensure that the information local advisory boards need in order to understand and develop priorities and budget advice, recommendations are submitted to local EM management for review and consideration prior to their budget request submittal to HQ deadlines.

Recommendation 247: On the Disposition and Transport of Nuclear Material

The Waste Isolation Pilot Project (WIPP) transport program has been incredibly successful in helping accomplish the task of safe movement of transuranic (TRU) waste, to Carlsbad, New Mexico, from multiple DOE-EM sites, beginning in the spring of 1999.

As members of the EM SSAB, we laud the collaborative work between DOE and the Western states in the development and execution of this plan and the ongoing cleanup, transportation and disposition of TRU waste and other shipments thus far. We understand that the program includes common sense elements that exceed regulatory requirements.

The EM SSAB Chairs agree that safe transport of waste material to its permanent disposition addresses one of the most important goals that the DOE-EM complex has undertaken. We urge you not to undervalue the importance of this program which will be needed far into the future in order to address remaining TRU at all DOE-EM sites.

DOE activities are funded by Congress through its annual appropriation process. Within that appropriation framework, DOE requests funds necessary to support long-term obligations within its statutory and regulatory requirements.

It is important to the EM SSAB Chairs that DOE-EM, when dispositioning waste off-site, strive to move all DOE-EM regulated waste material, including TRU waste, once to its final disposition.

We appreciate this opportunity to share our observations and applaud DOE-EM's continued focus on solutions for nuclear waste disposition and safe transport to permanent repositories.

It is recommended that DOE-EM:

- Prioritize development of final disposition sites with the goal of reducing the interim storage footprint at each of the sites.
- Specify Waste Acceptance Criteria for all forms of waste and Spent Nuclear Fuel in a manner that will allow all sites to proceed with waste processing confidently, efficiently, and without delay.
- Continue to insist on a compliant budget that will provide sufficient funding to act without delay, nor impediment, to prepare waste for shipment.
- Create a transportation program for the safe and uneventful shipment of all EM waste material.

Future Recommendation: Groundwater Feasibility Study Released

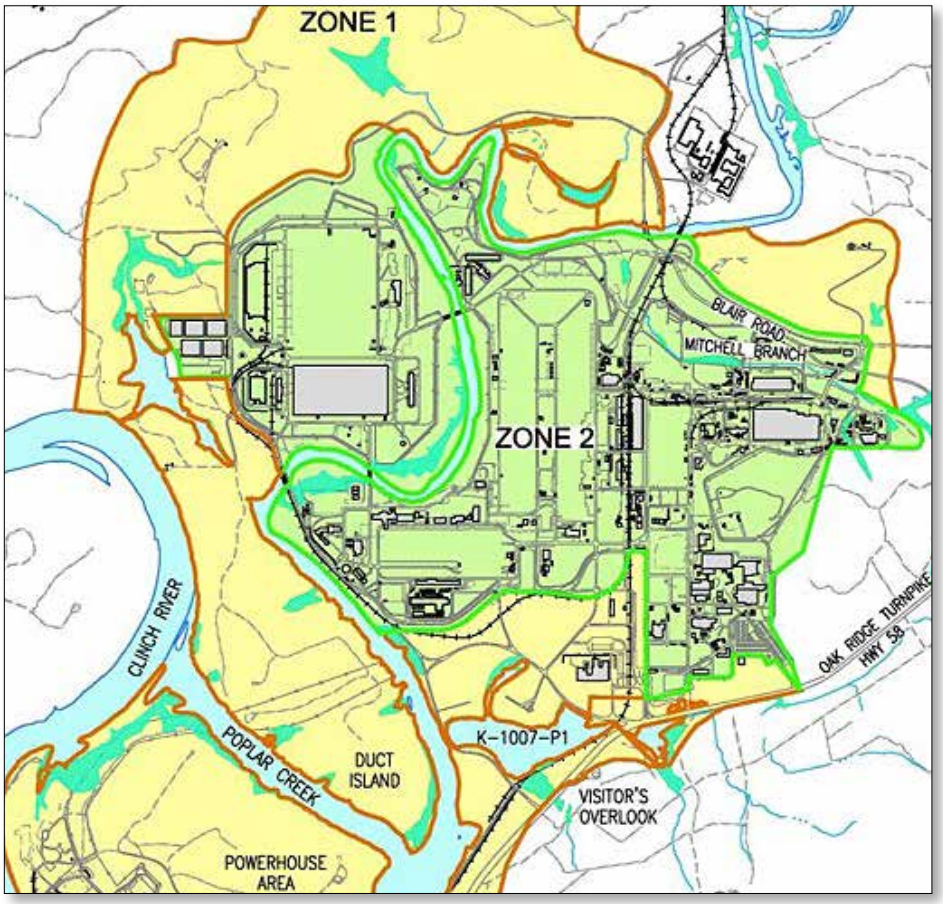
OREM in late November released its completed ETTP Main Plant Groundwater Feasibility Study. This is the first time ORSSAB will get to weigh in on final options to address groundwater contamination within the main plant area, also known as Zone 2, at ETTP. A separate document will cover other areas of ETTP, referred to as Zone 1. Zone 2 is where most groundwater contamination is located, because it includes most of the major facilities associated with uranium enrichment and related activities during the Manhattan Project.

The feasibility study outlines potential remediation projects that protect the environment and public health while supporting DOE's efforts to reindustrialize the site and the National Park Service's plans to use part of the area for the Manhattan Project National Historical Park.

Treatment options target broad types of contamination —primarily technetium-99 and different volatile organic compounds (VOCs)— at their source and in plumes that have resulted. Specific sites where unique activities were performed, such as the K-1070-C/D Burial Ground, the former Central Neutralization Facility, and others, also received special consideration.

Five potential strategies are laid out in the study, which are categorized from a passive, sitewide approach, some mixed options, and, finally, the most aggressive active treatment implementation at all sources and plumes. All alternatives incorporate land use controls to ensure long-term stewardship and oversight.

Using these general options as a "menu," many combinations of containment and treatment are up for consideration in the final remedy, according to the document. For example any of the five alternatives presented for addressing VOC sources could be combined in a number of different ways with the three suggestions for addressing plumes.



To better manage cleanup, ETTP was divided into two areas: Zone 1, about 1,400 acres outside the original fence line of the plant, and Zone 2, the main area inside the fence

Detailed information that guided these analyses are discussed in appendices, including results of ground and water samples, and potential treatment technologies that were assessed. Additional maps of the site, such as that shown above, identify groundwater plumes and source material and discuss the complex underlying geology of ETTP.

The alternatives were evaluated against seven of the nine criteria as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These include the two threshold criteria: overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements; and the five balancing criteria: long term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short term effectiveness, implementability, and cost. The final two criteria, state acceptance and community acceptance, will be addressed in a future Proposed Plan and Record of Decision (ROD).

RESOURCE

The feasibility study is available at the DOE Information Center or online at *doeic.science.energy.gov*. Search for "**Main Plant Groundwater Feasibility Study**" or document number **01-2835&D1.** Results include the study itself as well as three appendices.

Partnerships

(Continued from page 1)

others, to develop advanced nuclear ideas and technologies to solve a variety of global problems.

Dubbed the New Life Partnership, the agreement will provide high-quality life-saving material to the radiopharmaceutical research community. Isotek is already downblending the remaining inventory of U-233 stored at ORNL, which will be safely packaged and shipped offsite for disposal. By adding just a few extra steps to its process, Isotek will extract thorium-239 from the uranium:

- Dissolve samples of U-233 material with nitric acid, breaking it down to uranyl nitrate, plutonium, and thorium,
- Using resins, filter and separate the plutonium and thorium,
- Using nitric acid, dissolve the resin and remove the thorium,
- Package thorium for shipment to TerraPower and the remaining material for disposal.

About 45 grams of thorium will be produced. TerraPower, in turn, will use a similar chemical process on the thorium it receives to produce actinium-255, which is used in cancer treatment. While this may seem like a miniscule amount, it will allow TerraPower to produce a million doses annually, about 100 times more doses than are currently available worldwide. This will jump-start a viable market for treatment as well as facilitate ongoing clinical trials.

The proceeds from selling the thorium will allow Isotek to accelerate this important cleanup project. It will speed up the completion of one of DOE's highest priority projects in Oak Ridge by more than a year and save nearly $90 million, which can be put toward other urgent cleanup needs.

Clockwise from top: U-233-containg material samples, pumping uranyl nitrate solution into resin columns to remove plutonium and thorium, and a finished sample of thorium.

MSRE still offers insights decades after its closure

MSRE operated from 1965 until 1969 and served as a successful demonstration of molten salt technology. In 1968 it became the first reactor to use U-233 fuel. Just as the uranium that powered it is being disposed, the reactor is shut down and awaits final deconstruction. However, certain systems within the reactor building continue to operate to keep it safe and stable. In fact, EM is conducting a $4.7 million maintenance program there that will upgrade systems, lower long-term costs, and reduce risk to personnel.

The institutional knowledge of EM workers in maintaining the reactor remains valuable to researchers and private companies seeking to advance new uses of molten salt technology. Locally, UT-Battelle experts in the ORNL Materials Science and Corrosion Department have participated in MSRE engineering evaluations and routinely consult with personnel on operational issues.

Recently, a team from Vanderbilt University met with Tommy Morgan, UCOR's project manager for ORNL nuclear facilities, to tour MSRE. The team explored molten salt reactor system designs and operational issues experienced at the facility. Other institutions, such as The Ohio State University, are exploring technologies and requirements associated with building and operating MSRE.

A partnership between Southern Company and TerraPower (the same company involved in the New Life Partnership mentioned earlier) is set to build a molten chloride salt test loop to support licensing for a future reactor. Members of that partnership plan to work with the MSRE team to explore lessons learned about molten salt reactor system design.

These unique resources also interest organizations outside the U.S. Delegates from Ontario Power Generation have toured the Molten Salt Reactor Experiment. The Canadian organization came to understand lessons learned from UCOR's expert personnel about the unique waste challenges of molten salt reactors. The Canadian public utility is one of many organizations globally looking into molten salt as an option to produce power through small modular reactors.

Chairs Get Update on Transport Safety, Draft Two Recommendations

ORSSAB is a part of a nationwide network of similar boards at DOE sites throughout the country known collectively as the EM SSAB. Board leaders and DOE meet regularly for updates on the EM program and to learn about other sites' challenges. This fall members met in Idaho and toured the Idaho National Laboratory site, which, like Oak Ridge, includes a variety of challenges, ranging from legacy wastes from World War II- and Cold War-era efforts, other defense missions, and research activities.

During the meeting, Principle Deputy Assistant Secretary Todd Shrader emphasized the importance of focusing on "final cleanup" at sites. He detailed how the evolving use of end-state contracts will allow the completion of "big chunks" of work, which will become apparent as contracts at most sites turn over in the near future. Lastly he reiterated the importance of working with groups like EM SSAB for feedback as DOE decides how to put finished sites into stewardship mode.

Members also received updates on budget discussions and waste disposition planning as well as a briefing on how DOE works with states on transportation of materials.

DOE's Brad Bugger uses a scale model of the Idaho Radioactive Waste Management Complex to outline EM's cleanup plan for the site for SSAB members during a site tour in October 2019.

Two recommendations were drafted at the event and later approved by ORSSAB — see page 4 for details on the input into budget and transport.

History

(Continued from page 1)

25th anniversary as OREM launches its K-25 History Museum and wraps up major cleanup at the site in 2020. For the rest of this year, we will be featuring highlights from the board's history in our outreach.

The board first met in September of 1995 and included 20 members. Its first chair was Bob Peelle. Mary Bryan was vice chair and Donna Campbell, secretary.

Bob Peelle

The first *Advocate* newsletter was published in September of 1996. That issue featured news on a tour of WIPP and ORSSAB's input into the very first OREM Ten-Year Plan.

During the first half of 1996 the board also adopted bylaws, established committees, and elected officers; provided recommendations to DOE on its environmental project ranking system; received briefings on air monitoring, facility reuse efforts and plans to build an onsite waste facility; sponsored public forums on future land use; followed up on citizen requests regarding the K-25 site; and recommended the extension of public comment for a high-profile environmental study.

In 1997 it would take on the topic of stewardship with the first-of-its-kind End Use Working Group.

Join Us for a Discussion on Processing of Uranium-233 Material

6 p.m. Wednesday, February 12
DOE Information Center
1 Science.gov Way
Oak Ridge, TN 37831

A representative from OREM contractor Isotek will brief ORSSAB on the U-233 disposition project. Come learn how the project is making ORNL safer and how it will save significant funds that OREM can use in other cleanup areas. A recently announced partnership between DOE, Isotek, and TerraPower will accelerate that effort and advance life-saving cancer research at the same time.

Questions? Contact us at 865-241-4584 or orssab@orem.doe.gov

25 Advocate

Oak Ridge Site Specific Advisory Board
January 2020

ORSSAB Member Recruitment Drive Extended into January

Each year, ORSSAB seeks candidates to join the board and contribute to shaping DOE's environmental cleanup, monitoring, and stewardship activities in Oak Ridge.

Apply online. Tell us a bit about yourself and why you would be a good candidate. You must be a U.S. citizen. Contractors are eligible but federal employees are not.

No technical expertise is necessary. Members are chosen to reflect the diversity of gender, race, occupations and interests of people living near the reservation. Training is provided.

Help ensure a safe, healthy future for your community. Some of the board's latest activities include recommendations on OREM budget priorities and waste cleanup technology. Members recently toured ORNL and Y-12 for a first-hand look the cleanup mission. The board, which encourages historic preservation efforts by DOE, suggested topics and displays for the K-25 History Center.

Your voice matters. DOE seeks interested residents of the multi-county area surrounding the Oak Ridge Reservation. As an active member, you will volunteer just 4 hours per month, on average. We are especially interested this year in representation of Oak Ridge's Scarboro community.

Applicants will be considered for the annual member drive and for future openings throughout the year should a vacancy become available.

APPLY TODAY

Learn more about ORSSAB membership and download an application on the website or contact our office:

www.energy.gov/orssab

orssab@orem.doe.gov

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UPCOMING MEETINGS

Meetings are held at 6 p.m. in the DOE Information Center, 1 Science.gov Way, Oak Ridge, TN, unless noted otherwise.

Board: Wednesday, February 12

EM & Stewardship Committee: Wednesday, February 26

ABBREVIATIONS

DOE – Department of Energy
EM – Environmental Management
EMDF – Environmental Management Disposal Facility
EMWMF – Environmental Management Waste Management Facility
ETTP – East Tennessee Technology Park
OREM – Oak Ridge Environmental Management
ORNL – Oak Ridge National Laboratory
ORR – Oak Ridge Reservation
ORSSAB – Oak Ridge Site Specific Advisory Board
TDEC – Tennessee Department of Environment & Conservation
UCOR – URS | CH2M Oak Ridge
WIPP – Waste Isolation Pilot Plant
Y-12 – Y-12 National Security Complex

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