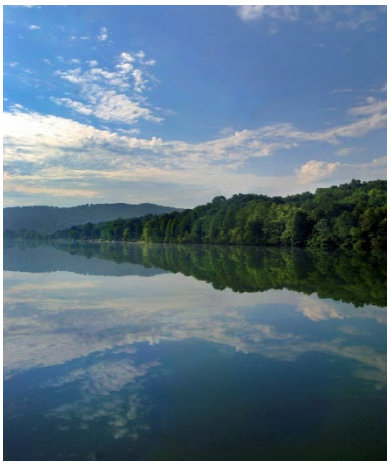

Located on the banks of the Clinch River, the Oak Ridge Reservation comprises three major facilities involved in every mission in the DOE portfolio. DOE is committed to enhancing environmental stewardship and managing the impacts its operations may have on the environment.

Executive Summary

Overview

The Oak Ridge Reservation (ORR) is located in Roane and Anderson Counties in East Tennessee. It is about 40 km (25 mi) west of Knoxville and is managed by the US Department of Energy (DOE). Today, ORR is one of DOE's most complex sites. The site was established in the early 1940s as part of the Manhattan Project to enrich uranium and pioneer methods for producing and separating plutonium; ORR continued those activities until the mid-1980s. Today, ORR comprises three sites with thousands of employees performing every mission in the DOE portfolio: energy research, environmental restoration, national security, nuclear fuel supply, reindustrialization, science education, basic and applied research in areas important to US security, and technology transfer. Scientists at the Oak Ridge National Laboratory (ORNL), DOE's largest science and energy laboratory, conduct leading-edge research in advanced materials, neutron scattering, nuclear programs (including isotope production), and high-performance computing. The Y-12 National Security Complex (Y-12 or Y-12 Complex) is vital to maintaining the safety, security, and effectiveness of the US nuclear weapons stockpile and reducing the global threat posed by nuclear proliferation and terrorism. The Heritage Center, the former uranium enrichment complex known as East Tennessee Technology Park (ETTP), has been transitioned to a clean, revitalized industrial park.

ORR is managed by three DOE Program Secretarial Offices, their management and operating contractors, and other prime contractors. This calendar year 2024 Oak Ridge Reservation Annual Site Environmental Report (ASER) contains information furnished to the DOE ORR integrating contractor by other contractors, including UT-Battelle, LLC (UT-Battelle); Consolidated Nuclear Security, LLC; United Cleanup Oak Ridge LLC (UCOR); Oak Ridge Associated Universities; and Isotek Systems, LLC (Isotek). DOE and its contractors at ORR are committed to environmental protection and compliance, which includes the site's utmost efforts to ensure the validity and accuracy of monitoring data.

Chapter 3 of this report was prepared by UCOR, the lead cleanup contractor for DOE's Oak Ridge Office of Environmental Management (OREM). Chapter 4 was developed by Consolidated Nuclear Security, LLC, which manages and operates the Y-12 Complex. Chapters 5, 6, and 7 were written by UT-Battelle, LLC, the ORNL management and operating contractor. These contractors are responsible for independently carrying out the various DOE missions at the three major ORR sites. They manage and implement environmental protection programs through environmental management systems that adhere to International Organization for Standardization Standard 14001, Environmental Management Systems. Chapters 3, 4, and 5 include detailed information on each contractor's environmental management systems, which interface with DOE's signature integrated safety management system (ISMS) to provide unified strategies for managing resources. ISMS incorporates safety in all aspects of work and helps ensure safety at all DOE facilities. Safety, as defined in ISMS, encompasses protection of the public, the worker, and the environment and includes all safety, health, and environmental disciplines: radiation protection, fire protection, nuclear safety, environmental protection, waste management, and environmental management.

DOE operations on ORR have the potential to release various constituents to the environment via atmospheric, surface water, and groundwater pathways. Some of these constituents, such as particles from diesel engines, are common at many types of facilities. Other constituents, such as radionuclides, are unique to specialized research and production activities like those conducted on ORR. DOE is committed to enhancing environmental stewardship and managing the impacts its operations may have on the environment. To encourage the public to participate in matters related to ORR's environmental impact on the community, DOE solicits citizens' input, through multiple channels, on matters of significant public interest. DOE also offers access to information on its Oak Ridge environmental, safety, and health activities.

The ASER is prepared for DOE according to the requirements of DOE Order 231.1B, *Environment, Safety, and Health Reporting*. The ASER includes data on the environmental performance of each major DOE ORR contractor and describes significant accomplishments in pollution prevention programs that reduce many types of waste and pollutant releases to the environment. Since the mid-1970s, DOE has published an annual environmental report with consolidated data on overall ORR performance and status. The ASER is a key component of DOE's effort to keep the public informed about environmental conditions across DOE and National Nuclear Security Administration sites.

Impacts

In 2024, DOE ORR operations resulted in minimal impact to the public and the environment. Permitted discharges to air and water continued to be well below regulatory standards. In addition, potential radiation doses to the public from activities on the reservation were much less than the 100 mrem standard established for DOE sites in DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

The maximum radiation dose a hypothetical off-site individual could have received from DOE activities on ORR in 2024 was estimated to be 0.6 mrem from air pathways, 0.3 mrem from water pathways (drinking water, fish consumption, swimming, recreation, and other uses), and 3 mrem from the consumption of wildlife harvested on ORR. This is under 4 percent of the DOE 100 mrem standard for all pathways and is significantly less than the 300 mrem annual average dose from background radiation to people in the United States.

Environmental Monitoring

Each year, extensive environmental monitoring is conducted across ORR. Site-specific environmental protection programs are implemented at ORNL, the Y-12 Complex, and

ETTP. ORR-wide environmental surveillance programs, which include locations and media both on and off the reservation, enhance and supplement data from site-specific efforts. In 2024, many thousands of samples and measurements of air, water, direct radiation, vegetation, fish, and wildlife were collected from across the reservation; these samples were analyzed for radioactive and nonradioactive contaminants. Sample media, locations, frequencies, and parameters were selected based on environmental regulations and standards, public and environmental exposure pathways, environmental permits, and measurement capabilities. Chapters 2 through 7 of this report summarize the environmental protection and surveillance programs on ORR. These extensive sampling and monitoring efforts demonstrate DOE's commitment to ensuring safety; protecting human health; complying with regulations, standards, DOE orders, and the "as low as (is) reasonably achievable" principle; reducing the risks associated with past, present, and future operations; and improving cost-effectiveness.

Compliance with Environmental Regulations

Federal, state, and local government agencies, including the US Environmental Protection Agency and the Tennessee Department of Environment and Conservation, monitor ORR for compliance with applicable environmental regulations. These agencies issue permits, review compliance reports, participate in monitoring programs, and inspect facilities and operations. Compliance with environmental regulations and DOE orders ensures ORR activities do not result in adverse impacts to the public or the environment.

Compliance in 2024 with applicable regulations for the three major ORR sites is summarized as follows:

- ETTP had no notices of environmental violations or penalties.
- Y-12 had 100 percent compliance with water quality permit discharge limits for 2024 and no Clean Air Act violations or exceedances. However, three Clean Water Act violations were noted. Two violations were the result of fish kills on June 20, 2024, from a potable water line break, and on October 1, 2024, from concrete mix entering East Fork Poplar Creek. A third violation, an instantaneous flow rate exceedance in the sanitary sewer, occurred on July 28, 2024, from excessive rainfall. From May 21-22, 2024, personnel from the Tennessee Department of Environment and Conservation Division of Solid Waste Management performed an unannounced Resource Conservation and Recovery Act hazardous waste compliance inspection of Y-12. One issue was identified: a 10-gal container of hazardous waste was not labeled with the accumulation start date. This was corrected immediately. The issue and its causes were reviewed to prevent recurrence.
- ORNL facilities include those on the Oak Ridge campus as well as off-campus entities, such as the National Transportation Research Center and the Carbon Fiber Technology Facility. A compliance inspection by TDEC on December 12, 2024, resulted in the issuance of a minor violation for a petroleum underground storage tank. The violation was immediately resolved and was closed by TDEC on January 14, 2025. No notices of environmental violations or penalties were received by other contractors (Isotek and UCOR) who conducted activities at ORNL in 2024. ORNL wastewater treatment facilities achieved a numeric permit compliance rate of 100 percent in 2024. The Carbon Fiber Technology Facility also achieved 100 percent compliance with the UT-Battelle City of Oak Ridge Industrial and Commercial User Discharge Pre-Treatment Permit in 2024.

Chapter 2 provides a more detailed summary of ORR environmental compliance during 2024. Chapters 3, 4, and 5 further discuss each site's compliance status for the year. All chapters discuss lessons learned, participation in work groups, and involvement with communities of practice, as applicable.

Environmental Management and Pollution Prevention

Numerous environmental management and pollution prevention programs across ORR embody efforts to achieve continuous distinction in facility operations and organizational culture. The objectives of these programs are to conserve water and energy and minimize waste. They also aim to promote energy-efficient buildings, landscaping to reduce environmental impact, green transportation, and environmentally responsible procurement. Consequently, these initiatives decrease the life cycle costs of programs and projects while also reducing risks to the environment. As described in Chapters 3, 4, and 5, ORR contractors achieved a high level of excellence in environmental management and pollution prevention programs in 2024.

Environmental Management

Since 1943, ORR has played key roles in America's defense and energy research. However, past waste disposal practices, operational and industrial practices, changing standards, and unintentional releases left some land and facilities contaminated with radioactive elements, mercury, asbestos, polychlorinated biphenyls, and industrial wastes. The DOE Environmental Management program is responsible for cleaning up these sites; as a result, numerous cleanup projects are underway at the reservation's three main facilities.

Completion of soil remediation at ETTP, referred to as Vision 2024, has been achieved 4 years after UCOR completed demolition of all unneeded facilities at the site. During this cleanup, OREM worked to transform ETTP into a multiuse industrial park. Currently, there are 25 businesses operating at the site. As part of transforming the site into a community asset, attention will now turn to the final remediation effort at ETTP: addressing final cleanup of groundwater and surface water.

Deactivation activities at three large former uranium processing facilities—Alpha-2, Alpha-4, and Beta-1— were among Y-12 achievements in 2024. (Demolition began at Alpha-2 later in the year.) Currently, there are 44 excess facilities at Y-12, and within the next 10 years, another 39 buildings and trailers will be excessed. Also in 2024, UCOR assumed construction responsibility for the Outfall 200 Mercury Treatment Facility and began construction of the treatment plant and headworks facility. In support of ongoing mercury remediation, a new Technology Demonstration Facility is being developed in the repurposed Disposal Area Remedial Action facility to carry out demonstrations of proposed mercury treatment technologies.

Accomplishments in continuing demolition and deactivation were made at ORNL in 2024. These activities included shipment of the reactor vessel from the Low-Intensity Test Reactor (Building 3005) for off-site disposal. Deactivation work is ongoing in six of the 11 buildings comprising "Isotope Row" (facilities historically used to process radioisotopes). To this end, four Krypton tanks have been removed from Building 3093; the building is now in its deactivation end state. In addition, water tanks shielding hot cells in Building 3038 have been removed. Further, through continuing work to remove the building's final hot cell, Building 3026 is being prepared for demolition in 2025. Deactivation activities also continued at the Oak Ridge Graphite Reactor support facility buildings 3002 (Filter House), 3003 (Fan House), and 3018 (Exhaust Stack); the process is nearing completion with demolition expected to begin in 2025.

The Environmental Management Waste Management Facility received 9,976 waste shipments from ORR cleanup projects in 2024. Environmental Management Waste Management Facility operations also collected, analyzed, and disposed of approximately 3.42 million gallons of leachate treated by the Liquid and Gaseous Waste Operations Facility.

In FY 2024, the Transuranic Waste Processing Center compliantly performed 12 shipments of legacy transuranic waste shipments (301 drums) to the Waste Isolation Pilot Plant in Carlsbad, New Mexico, and 12 shipments of mixed low-level waste to treatment and disposal, low-level waste,

and hazardous industrial waste resulting from the processing and certification of the transuranic legacy waste. The Transuranic Waste Processing Center team also processed and repackaged four boxes and 13 drums of Nuclear Fuel Services waste into 140 drums of compliant soil and debris for disposal.

Pollution Prevention and Resource Management

The three main ORR sites made significant strides in resource management and pollution prevention in 2024; highlights are summarized below.

In 2024, Y-12 experienced a slight decrease in energy intensity (three-quarters of a percentage below 2023). Also in 2024, Y-12 diverted 59.9 percent of municipal and 2.8 percent of construction and demolition waste from landfill disposal through reuse and recycle and certified one building as a High Performance Sustainable Building.

ORNL implemented 28 ongoing and new pollution prevention projects during 2024. These projects eliminated more than 2.6 million kg of waste. Presently, 80 percent of all ORNL vehicles are alternative fuel vehicles (AFVs), with 86 percent of all replacements since FY 2020 being alternative fuel or electric vehicles. Also, 77 percent of the light-duty vehicles operate on alternative fuels. Water use intensity increased by 5 percent between 2023 and 2024 due to increased demands for cooling tower makeup water to support growth of high-performance computing systems. Calculated energy use intensity for FY 2024 was 250,387 Btu per gross square foot, a cumulative reduction of 31.2 percent since FY 2003 but an increase of 5.42 percent from FY 2023.

During 2024 at ETTP, OREM continued to see significant momentum in the Reindustrialization Program. The former government-owned uranium enrichment complex is being turned into a multiuse industrial park that includes national historic preservation and conservation and green space areas. OREM has transferred over 1,700 acres for economic development at ETTP, including 470 acres during FY 2024. Reindustrialization efforts at ETTP are expected to generate 1,400 jobs from the $1.35 billion in investments announced by the on-site companies, which are largely focusing on clean energy technology.

OREM continued planning for capital asset projects that will further advance ORR cleanup objectives. These include completion of the following activities over the next five years: construction of the Outfall 200 Mercury Treatment Facility at Y-12; demolition activities at ORNL's Central Campus, Beta-1, and Alpha-2; processing, downblending, and disposing of the remaining inventory of ^{233}U stored at ORNL; and construction of the first phase of the new Environmental Management Disposal Facility.