3. Environmental Management and Reservation Activities

Much of the work accomplished by the DOE Oak Ridge Office of Environmental Management (EM) on the ORR is performed as a result of the requirements of the Federal Facility Compliance Act and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The 1992 Federal Facility Compliance Agreement requires that all DOE facilities manage and dispose of mixed waste in accordance with their respective site treatment plans. Bechtel Jacobs Company LLC has established programs to address the storage, transportation, treatment, disposal, and recycling of legacy and newly generated waste from the ORR. Bechtel Jacobs LLC manages the Toxic Substances Control Act Incinerator, wastewater treatment facilities, landfill operations, and certain other treatment and recycle facilities that also contribute to meeting the requirements of the Federal Facility Compliance Agreement and other EM milestones.

Another large portion of the EM work conducted at ORR is performed according to the requirements of CERCLA, which is implemented by the 1991 Federal Facility Agreement. The Federal Facility Agreement, signed by DOE, TDEC, and EPA, addresses contamination resulting from past activities of DOE operations that remain in structures, buildings, facilities, soil, groundwater, surface water, or other environmental media.

3.1 Introduction

For over half a century, one of the primary missions of DOE and its predecessor agencies was the production of nuclear weapons for the nation's defense. Production of materials for nuclear weapons, which began in 1943, produced hazardous and radioactive waste and resulted in contamination of facilities, structures, and environmental media. Two laws passed by Congress included requirements to address these problems. These two laws are the Federal Facility Compliance Act and CERCLA. The Federal Facility Compliance Agreement, made in accordance with the Federal Facility Compliance Act, requires that all DOE facilities manage and dispose of waste in accordance with their respective site treatment plans. The Waste Disposition and Waste Operations projects address waste stored, treated, disposed of, or recycled on the ORR in accordance with the Site Treatment Plan. The DOE Environmental Management program also operates and maintains waste treatment, storage, disposal, and recycling facilities at each of the three Oak Ridge sites (ETTP, ORNL, and the Y-12 Complex). These activities are included in the Waste Operations Project.

CERCLA addresses any environmental contamination resulting from past industrial operations, not just those performed at federal facilities. CERCLA requires that sites requiring cleanup actions be placed on the National Priorities List. Once on the list, the responsible entities are required to investigate and remedy abandoned or uncontrolled hazardous waste sites where a release has occurred or may occur. The ORR was placed on the National Priorities List in 1989. In 1990, DOE Headquarters (DOE-HQ) established the Office of Environmental Management (EM), making DOE-ORO responsible for cleanup of the reservation. CERCLA also requires public involvement to ensure that citizens will be informed of cleanup decisions that may affect them or the area in which they live.

The following sections highlight some of the EM activities for 2004 and some related activities carried out to ensure good stewardship of the reservation.

3.2 East Tennessee Technology Park

3.2.1 Decontamination and Decommissioning

3.2.1.1 ETTP Three-Building Decontamination and Decommissioning Project Nearing Completion

The ETTP Three-Building Decontamination and Decommissioning Project is nearing completion, with 97% of the work accomplished as

of the end of 2004. The contractor, under a fixed-price contract with DOE awarded in August 1997, is dismantling, removing, and dispositioning the materials and equipment within the K-33, K-31, and K-29 gaseous diffusion buildings at ETTP. The three buildings cover more than 4.89 million ft^2 of floor space and housed more than 159,000 tons of contaminated or potentially contaminated material.

The purpose of the project is to dismantle, remove, and disposition all of the material from the three buildings and to decontaminate two of the three buildings to certain specifications, making them available for reuse without radiological or other safety concerns.

A total of 157,432 tons of material has been dismantled, removed, and dispositioned as waste or recyclable material for the entire project. During 2004, more than 8% of the overall project was completed, including dismantlement, disassembly, removal, and dispositioning of all of the process equipment and material from the last four remaining cascade units in Buildings K-29, K-31, and K-33.

The decontamination of the interiors of Buildings K-33 and K-31 is expected to be completed in 2005. The interior of Building K-29 will not be decontaminated as part of this project.

3.2.1.2 K-25/K-27 Facilities Decontamination and Decommissioning

The K-25 Building, the largest building on the ORR, covers 1,637,170 ft^2. The three-story, U-shaped building was built during the Manhattan Project and contains 3018 stages of gaseous diffusion process equipment and associated auxiliary systems. Each stage (or cell) consists of a converter, two compressors, two compressor motors, and associated piping. The K-27 Building covers 383,000 ft^2 and contains 540 stages of gaseous diffusion equipment and associated auxiliary equipment.

An action memorandum for the decontamination and decommissioning of the K-25 and K-27 buildings was signed in February 2002. The memorandum stipulates that the buildings be demolished to slab and that the associated wastes be disposed of. The decontamination and decommissioning project is being executed in phases. Phase 1, hazardous materials removal, started in spring 2002 and was more than 85% complete by the end of 2004. Phase 1 activities primarily include the removal of asbestos-containing building materials from inside the K-25 and K-27 facilities. At the close of 2004, hazardous material abatement had been completed for 2,800 stages, and more than 555,000 ft^3 of waste from the K-25 and K-27 buildings had been disposed at the Environmental Management Waste Management Facility (EMWMF), a disposal facility located near the Y-12 Complex.

The following activities were performed in 2004 for Phase 2, process equipment removal: subcontractor procurement and mobilization, completion of required safety documentation, approval of the waste handling and characterization plans, and approval of the removal action work plan. Equipment characterization was 100% complete for the K-25 building. Equipment characterization for the K-27 Building is scheduled to be completed in 2005. In addition, 43 loose converters were shipped to the Nevada Test Site for disposal. Also in Phase 2, the work on removal of excess materials from the K-25 and K-27 buildings was awarded to a subcontractor. Excess materials consist of nonprocess items, such as laboratory equipment, laboratory samples, office equipment, tools, wooden pallets and crates, and drums of chemicals. Excess material characterization was 97% complete at the end of 2004 and more than 13,900 ft^3 of waste was shipped to EMWMF for disposal. Loose items that were tagged for historic preservation were collected and placed into storage.

Phase 3 demolition began on a limited scale in 2004 with the removal of the outside covering transite panels (approximately 17,000 ft^2) and the demolition of seven (out of 114 total) K-25/K-27 Building filter houses. Full-scale demolition is scheduled to begin in 2005.

3.2.1.3 Main Plant Area

In FY 2000, DOE signed an action memorandum to demolish the main plant facilities. In 2004, the classified waste from Building K-1413 was disposed of at the Nevada Test Site, completing the required work for this removal action, and the final removal action report was submitted to the regulators for approval.

3.2.1.4 Group II Buildings, Phase II Buildings (K-1064 Peninsula)

DOE signed an action memorandum in July 2002 for the demolition of facilities and the removal of scrap material located in the K-1064 peninsula area. Demolition began in 2004, and the remainder of the facilities are planned to be demolished in 2005.

3.2.1.5 Balance of Plant

In September 2003, DOE signed an action memorandum to demolish the approximately 500 remaining facilities. In 2004, the demolition of 169 predominantly uncontaminated facilities was initiated, demolition was started on the Balance of Site–Laboratories Group facilities, and characterization and utility deactivation continued as predecessor activities for significant demolition work in 2005. The remaining facilities will individually scheduled or will be addressed separately in the Low-Risk/Low-Complexity Facilities program.

3.2.1.6 Zone 2 Record of Decision Developed

The focused feasibility study, focused feasibility study addendum, and proposed plan for cleanup of the Zone 2 portion of ETTP were approved in 2004 by the Federal Facility Agreement parties (DOE, EPA, and TDEC). These documents detail the options and selected remedy for remediation of the site. A public meeting was held on August 24, 2004, to discuss the Zone 2 Proposed Plan.

Zone 2 includes the area within the main fence of the plant (approximately 800 acres). Zone 1 is the area surrounding ETTP outside the fence. These documents address soil, slab, subsurface structure, and burial ground contamination. Remedial action objectives have been set to provide for protection of a future industrial work force and to protect underlying groundwater. A record of decision has been developed for EPA and TDEC to review and approve. Signature of the record of decision is scheduled to take place in 2005.

3.2.1.7 ETTP Sitewide Record of Decision Project Under Way

The ETTP Sitewide Record of Decision addresses contamination in groundwater, surface water, and sediment for the protection of human health and the environment. In addition, it will determine whether additional soil action is necessary to protect the environment. The geographic areas included in this decision are Zone 1 (outside the main plant) and Zone 2 (inside the plant fencing).

After a series of data-quality-objective workshops focusing on groundwater, surface water, sediment, and soil actions were held, a work plan for additional investigations was developed and was submitted to EPA and TDEC for approval. Fish sampling and aquatic community surveys were conducted as stated in the work plan. Additionally, the three Federal Facility Agreement parties developed a detailed schedule of the ensuing activities to allow for signature of the record of decision in early 2007.

3.2.1.8 ETTP Begins Removing Scrap Waste

The ETTP Scrap Removal Project began shipping contaminated scrap from the K-770 Scrap Yard to the EMWMF on July 26, 2004. The total project includes approximately 47,000 tons of scrap metal from the K-770 Scrap Yard, K-1131 Area, K-1064 Scrap Yard, K-1300 Area, and K-1066-G Maintenance Yard. Remediation of contaminated soil at the scrap yard is planned for 2005.

3.2.1.9 ETTP Outdoor Legacy Waste

The ETTP Outdoor Legacy Waste is composed of 6209 containers of low-level waste that were the result of past operations at the site. This waste has been characterized to support disposal and shipment to the EMWMF, which is in progress.

3.2.1.10 UF_6 Cylinders Being Shipped Off Site

More than 6000 cylinders containing uranium hexafluoride (UF_6) are being shipped to the Portsmouth Site for disposition. Most

contain depleted UF_6. These steel cylinders hold approximately 10 to 14 tons of depleted UF_6. They are stored in storage yards in aisles and are stacked two high. More than 1800 of these cylinders were shipped in 2004.

Natural uranium in the form of UF_6 was used as feed material during the gaseous diffusion process to enrich uranium at the former K-25 Site. The percentage of uranium-235 was increased from the original feed material in the process (i.e., enriched). The remaining material is depleted UF_6. It is stored as a white, crystalline solid that is slightly less radioactive than natural uranium.

3.2.1.11 Waste Characterization at Blair Quarry Completed

Characterization of waste at Blair Quarry, located on Blair Road at ETTP, was completed in 2004. Blair Quarry was created in the early 1940s by excavating into McKinney Ridge, forming a U-shaped amphitheater with exposed rock on three sides. The rock material was used to support construction of the K-25 Site (now called ETTP). It operated as a quarry until 1945 and was used throughout the late 1950s for open burning of trash and debris. Removal of more than 10,000 yd^3 of contaminated soil and debris began in November 2004. The contaminated material was removed and disposed of at the EMWMF. Several streamlined investigations were conducted as part of the Blair Quarry Pilot Project to characterize the nature and extent of the waste at the site. Based on these investigations, only one acre of the initial 67-acre area was determined to require remediation. The remediation work is being performed by an environmental remediation subcontractor under subcontract to Bechtel Jacobs Company LLC.

3.2.1.12 TSCA Incinerator Hazardous Waste Treatment

The TSCA Incinerator, located at ETTP, treated 684,138 lb of liquid waste and 265,638 lb of solid waste in 2004. Plans are in place to increase the throughput at the incinerator to ensure cost-effective operations in support of the DOE complex's cleanup mission. For 2005, approximately 650,000 lb of liquids and 250,000 lb of solids are planned for incineration.

The TSCA Incinerator plays a key role in treatment of radioactive PCB and hazardous wastes (mixed wastes) from the ORR as well as other facilities across the DOE complex, thus facilitating compliance with regulatory and site closure milestones.

3.2.1.13 Central Neutralization Facility

The Central Neutralization Facility (CNF) is ETTP's primary wastewater treatment facility and processes both hazardous and nonhazardous waste streams arising from multiple waste treatment facilities and remediation projects. The facility removes heavy metals and suspended solids from the wastewater, adjusts pH, and discharges the treated effluent into the Clinch River. Sludge from the treatment facility is treated, packaged, and disposed of off-site. The CNF treated 34 million gal of wastewater in 2004.

3.3 Oak Ridge National Laboratory

3.3.1 Melton Valley Remedial Actions

Continued well plugging and abandonment; decontamination and decommissioning of the New Hydrofracture Facility; hydrologic isolation at SWSAs 4, 5, and 6 and the Pits and Trenches area; and remediation of several inactive waste ponds were among the remediation activities in Melton Valley in 2004.

The Federal Facility Agreement parties signed the Melton Valley Record of Decision in September 2000. The Melton Valley Record of Decision presents the selected remedy for environmental remediation of various burial grounds and other contaminated waste units within the ORNL Melton Valley area. Remediation will be accomplished through a combination of responses that includes containment, stabilization, removal, treatment, monitoring, and interim land-use controls.

Regulators approved a remedial design work plan in May 2001, with the approval of the land use control implementation plan still outstanding. The plan specifies what actions must be taken to implement and maintain the required land use controls. Remediation work mandated

by the Melton Valley Record of Decision has been ongoing and will continue through 2006. Individual actions completed before 2004 include remediation of both the Process Waste Sludge Basin and the Old Hydrofracture Facility, demolition of various surface structures in Melton Valley, and excavation and disposal of contaminated soil from the Intermediate Holding Pond.

An amendment and two explanations of significant difference to the Melton Valley Record of Decision were approved in 2004. The amendment changed the treatment of Seepage Trenches 5 and 7 from in situ vitrification, which is specified in the original Melton Valley Record of Decision remedy, to in situ grouting. One of the explanations of significant difference added the Intermediate Waste Management Facility, Tumulus I, and Tumulus II to the capping and hydraulic isolation remedial action already selected for SWSA 6. The other explanation added eleven new inactive Melton Valley units that were considered "active" at the time of the Melton Valley Record of Decision signature. Some of these units require demolition to facilitate hydrologic isolation of the burial grounds under the Melton Valley Record of Decision remedy.

3.3.2 Hydrofracture Wells Plugging and Abandonment

Between the 1960s and mid-1980s, the process of deep waste injection was used at ORNL to dispose of radioactive liquids and sludge in mixtures of waste with cement-based grout and various additives. Two test injection wells were constructed, along with boreholes and wells, so that the behavior of the injected grout in the injection zone bedrock could be observed. At these two test sites, small quantities of radionuclides were added to the injected grout to make the grout sheets detectable by gamma detectors. The third and fourth injection wells, located within the Old Hydrofracture Facility and New Hydrofracture Facility, respectively, were constructed for large-scale waste disposal. More than 5 million gal of liquid waste-grout mix, containing approximately 1.4 million Ci of activity, were injected into artificially induced fractures in a shale formation at depths of 300 to 1000 ft. All large-scale disposals were at depths greater than 780 ft. Contamination levels in hydrofracture monitoring wells have been reported as high as 97 million pCi/L gross beta.

These surplus wells are potential pathways for the migration of contaminated fluids from the grout sheets and from deep groundwater to shallower groundwater zones. To prevent this migration, a remedial action was initiated in 2001 to plug and abandon 111 wells consisting of 4 injection wells and 107 monitoring wells. Plugging and abandonment of the last well (injection well 1968), which was located within the New Hydrofracture Facility, were completed in March 2004.

3.3.3 New Hydrofracture Facility Decontamination and Decommissioning

The New Hydrofracture Facility was built at ORNL between 1979 and 1982 and operated from 1982 to 1984. It replaced the Old Hydrofracture Facility, which operated between the late 1950s to the mid-1970s. The New Hydrofracture Facility was designed to facilitate the injection of a mixture of radioactive waste solutions and grout into an impermeable shale formation at depths between 700 and 1000 ft below grade. The hydrofracture process is essentially a batch process in which the waste/grout mixture is pumped down a tubing string in the injection well and out into the shale formation. The high injection pressure of approximately 3000 psi fractures the subsurface shale and forces the waste/grout mixture into the fractures, where it hardens into "grout sheets."

The objective of the decontamination and decommissioning of the New Hydrofracture Facility is the removal and disposition of the main and ancillary facilities, including some subsurface structures. The majority of the New Hydrofracture Facility has been demolished. Only three rooms, or cells, of the main structure remain. All process equipment and piping have been removed from these cells in preparation for demolition of the cell structures, scheduled to be completed in 2006.

On Friday, May 14, 2004, a contamination incident occurred that necessitated an emergency removal action. A truck transporting materials from the New Hydrofracture Facility site to EMWMF leaked strontium-90 onto State Route 95, causing the highway to be shut down for a couple of days while extensive radiological sur-

veys and repaving took place. This concluded the emergency removal action. An accident investigation was conducted, and a public meeting was held to discuss the incident and the corrective actions needed to ensure that a similar incident does not occur.

3.3.4 SWSA 4 Hydrologic Isolation

Work on the SWSA 4 project includes the hydrologic isolation of the SWSA 4 burial ground, Liquid Waste Disposal Pit 1, the Pilot Pits Area, and the 7819 Decontamination Area, as well as the excavation of the Intermediate Holding Pond. Hydrologic isolation includes the installation of a multilayer cap, upgradient storm-flow diversion trenches, and downgradient collection trenches. To facilitate cap installation, this project also included plugging and abandonment of unneeded, shallow, non-hydrofracture wells within the cap boundary; developing a borrow area and associated haul roads; and relocating Lagoon Road.

From 1951 to 1959, DOE used SWSA 4 for disposing various liquid and solid radioactively contaminated wastes in unlined trenches and auger holes. SWSA 4 contains approximately 20,000 Ci of radioactive wastes and contributes approximately 27% of the total risk in surface water to a hypothetical resident at White Oak Dam.

Pit 1 was constructed in 1951 to test the feasibility of disposing liquid waste in pits excavated in the natural clays in Melton Valley. Pit 1 received liquid waste from August to October 1951. In 1981 Pit 1 was backfilled and covered with an asphalt cap. In 1991 a portion of the wastes disposed of in Pit 1 was stabilized as part of an in situ vitrification technology demonstration. In situ vitrification is a process that uses electrical power to heat and melt contaminated soil, fusing the soil and waste into a glass-like solid.

Construction of an approximately 30-acre cap, upgradient and downgradient groundwater interception trenches, and a groundwater treatment unit were completed in CY 2004.

3.3.5 Spent Nuclear Fuel

Research and development programs related to nuclear reactor fuel have historically been a part of ORNL's mission. Many of these programs involved the postirradiation examination and testing of spent nuclear fuel from various types of reactors. After these programs were completed, the remaining spent fuel was collected and placed into on-site storage facilities, primarily during the 1970s. Spent fuel was stored in below-grade storage positions in facilities 7823A, 7827, and 7829 in SWSA 5 North. In addition, one package of spent fuel was placed in SWSA 6 in Melton Valley.

With the issuance of the programmatic environmental impact statement record of decision for spent fuel in 1995, smaller sites, like Oak Ridge, were directed to ship aluminum-clad spent fuel to the Savannah River Site and non-aluminum-clad spent fuel to the Idaho National Engineering and Environmental Laboratory (INEEL). Following the issuance of the record of decision for the programmatic environmental impact statement, an environmental assessment was prepared for the Oak Ridge spent-fuel activities, and a finding of no significant impact was issued. All planned shipments to INEEL have been completed.

3.3.6 Molten Salt Reactor Experiment Fuel and Flush Salts Removal

The Molten Salt Reactor Experiment (MSRE) facility operated from 1965 to 1969 to test the molten salt concept. Unlike most current commercial reactors that have fuel confined to fuel rods, the MSRE was fueled by molten salt that flowed through the reactor chamber, where the nuclear chain reaction produced heat.

A CERCLA action to remove the fuel and flush salt is under way. Testing of fuel and flush salt removal equipment and a cold trap system was successfully completed in 2003. Operating procedures were developed based on results of the testing, and training of operators was completed. Melting of the salt in preparation for removal began in December 2004. Completion of salt removal is scheduled for late 2006.

3.3.7 TRU Waste Processing Facility

The mission of the Oak Ridge Transuranic (TRU) Program is to provide cost-effective, safe, and environmentally compliant treatment and disposal of all TRU waste stored at ORNL. In CY 2003, the TRU Program continued the

construction of the Waste Processing Facility. The scope of the facility is to treat and dispose of 900 m^3 of remote-handled TRU sludge, 550 m^3 of remote-handled TRU/alpha low-level radioactive waste (LLW) solids, 1600 m^3 of remote-handled-LLW supernate, and 1000 m^3 of contact-handled TRU/alpha LLW solids currently stored in Melton Valley.

In 2004 approximately 1,600 m^3 of highly contaminated tank waste, known as supernate, was retrieved from ORNL storage tanks, solidified at the facility, and shipped to the Nevada Test Site for disposal. Construction and testing of the remote-handled solids and sludge systems will resume early in CY 2006. Acceptance of two of the Oak Ridge waste streams at the Waste Isolation Pilot Plant is pending the outcome of permitting actions by DOE with the state of New Mexico.

3.3.8 22-Trench Area TRU Waste Retrieval

During the 1970s, packages of TRU waste were retrievably stored in the 22-Trench. Since the 1980s, packages of newly generated TRU waste have been stored in constructed facilities. Radionuclides in the TRU waste containers represent some of the most toxic and longest-lived radioisotopes stored on the ORR. In a consent agreement signed in September 2000, DOE committed to the state of Tennessee to retrieve the TRU waste from the 22-Trench Area under DOE's Atomic Energy Act authority.

A request for proposals for the 22-Trench Area retrieval project was issued for bid early in 2003. The proposals were evaluated, and a subcontract was awarded. The scope of work consists of retrieving the TRU waste packages, placing the waste packages in overpacks, and staging the waste in appropriate areas pending transport to the TRU Waste Processing Facility when directed by DOE. There the wastes will be repackaged to meet the acceptance criteria for off-site disposal facilities and then shipped off site for disposal. Soil exceeding remediation levels in the Melton Valley Record of Decision and debris waste associated with the excavation will be disposed of at the EMWMF or other appropriate facility. Retrieval of waste packages began in December 2004. As of the end of CY 2004, six packages had been retrieved, overpacked, and staged.

3.3.9 Melton Valley Hydrologic Isolation

In addition to the SWSA 4 cap, the Melton Valley Record of Decision calls for construction of caps on several other waste disposal areas (SWSA 5, SWSA 6, and selected pits and trenches). Approximately 100 acres of multilayer caps, several groundwater interception trenches, and a groundwater treatment unit will be constructed. In CY 2004 plugging and abandonment of approximately 800 unneeded wells was completed. Caps were completed at the SWSA 5 North 4-trench Area; Pits 2, 3, and 4; and Trench 6. Downgradient groundwater interception trenches were completed at Pits 2, 3, and 4 and SWSA 5. Cap construction began at SWSA 5 South and SWSA 6.

3.3.10 T-1, T-2, and HFIR Tanks Remediation

The T-1, T-2, and HFIR tanks were the last inactive liquid low-level waste (LLLW) tanks at ORNL to be remediated. The HFIR Tank was stabilized in 2004 by being filled with grout. The residual sludge in Tanks T-1 and T-2 was to have been treated to destroy organic resins; however, it was determined that the quantity of resins in the sludge would not adversely impact the LLLW system. Therefore, the sludge was transferred directly to the active LLLW system in 2004, and Tanks T-1 and T-2 were stabilized with grout.

3.3.11 Soils and Sediments Remediation

Several inactive waste ponds and areas of soil with radioactive contamination above criteria established in the Melton Valley Record of Decision require excavation. In CY 2004 four inactive ponds and associated contaminated soil at the HFIR were excavated and disposed of, as was contaminated soil surrounding the Homogeneous Reactor Experiment Pond.

3.3.12 Decontamination and Decommissioning Projects

A number of structures and facilities, including ancillary Homogeneous Reactor Experiment facilities, the 7841 Equipment Storage Area, and Shielded Transfer Tanks, will undergo decon-

tamination and decommissioning. The remedial design report/remedial action work plans for these activities were approved by the regulators in 2004.

3.3.13 In Situ Grouting of Trenches 5 and 7

The selected remedial action for Seepage Trenches 5 and 7 in the Melton Valley Record of Decision was in situ vitrification. During 2003, a predesign field investigation and a procurement for design and construction services were conducted in preparation for performing in situ vitrification. New information resulted from these activities and prompted a reassessment. The new information included the presence of standing water in the trenches and a much higher cost for performing the in situ vitrification than was expected. After further evaluation, DOE proposed in an amendment to the record of decision that an alternative treatment, in situ grouting, be substituted for in situ vitrification for Trenches 5 and 7. This remedy change and the associated record of decision amendment were approved in 2004 by the regulatory agencies.

The requirements decision record/remedial action work plan for the in situ grouting of the trenches was approved in September 2004. The trenches will be treated by the permeation grouting method, utilizing portland-cement-based grouts injected under low pressure into the crushed limestone trench material. The grout will form a solid mass with the crushed limestone and the finer sediments, greatly reducing the permeability of the trench materials. The soil adjacent to the trench walls will be treated with a solution grout (e.g., polyacrylamide) to reduce migration of contaminants away from the trench by sealing off seepage pathways. Grouting of the trenches is scheduled for the latter half of 2005.

3.3.14 Bethel Valley Remediation

The Bethel Valley Record of Decision, signed by the Federal Facility Agreement parties in May 2002, presents the remedy selected for environmental remediation of various contaminated areas within the ORNL Bethel Valley area. Higher-risk sites will be addressed first. Remediation work mandated by the Bethel Valley Record of Decision will continue through FY 2014. The first three projects to be performed under the record of decision are the Bethel Valley Groundwater Engineering Study; remediation of the T-1, T-2, and HFIR Tanks; and partial remediation of the Hot Storage Garden.

3.3.15 Bethel Valley Groundwater Engineering Study

The Bethel Valley Record of Decision specified that a groundwater engineering study be conducted to satisfy data needs for the design of several remedial actions related to groundwater, including (1) deep groundwater extraction at the Corehole 8 plume, (2) in situ biodegradation at the East Bethel Valley volatile organic compound (VOC) plume, (3) groundwater monitoring in West Bethel Valley, and (4) soil excavation at known leak sites to minimize impacts to groundwater. Planning for the groundwater engineering study was summarized in the *Engineering Study Work Plan for Groundwater Actions in Bethel Valley*, issued as a final document in 2003. The work plan includes an evaluation of existing, relevant data from previous characterization activities and defines the scope of work to be performed to design groundwater and soil remedial actions under the record of decision. Once the engineering study data have been collected, a report summarizing the results will be issued in 2005.

In CY 2004, the Bethel Valley Groundwater Engineering Study completed most of the components of the required fieldwork. Two hundred and thirty-five soil push probes were completed to obtain soil and groundwater samples. Forty-eight additional push probe locations will be installed in 2005 to supplement the original sampling. The soil gas installations were completed, and the data were acquired and analyzed. All of the surface water, groundwater, process waste system, storm sewer, and outfall sampling has been completed. Well installations were also scheduled to be initiated in 2005 and completed in April 2005.

3.3.16 Hot Storage Garden

Beginning in the mid-1950s, the Hot Storage Garden supported research at ORNL by storing radioactive material, including spent fuel rods, in the below-grade wells and in a partially above-grade, water-filled canal. All the fuel was transferred for storage to a solid waste storage

area in the mid-1980s. The facility was then placed in the surveillance and maintenance program.

In 2003, some additional funding was made available to perform decontamination and decommissioning on a facility currently in the surveillance and maintenance program. The Hot Storage Garden was selected because it was a small facility that could be decontaminated and decommissioned with the available funding, and existing documentation indicated that the source material had been removed with no indication of residual contamination. Additional characterization data were obtained by analyzing radiological smears from the below-grade canal, residual well water, and wells. However, smears of the removable well sleeves were only obtained to approximately one-half the well depth.

The project started in the summer of 2004. All the surface structures were removed, and 5 of the 14 well sleeves were removed and cut. High concentrations of removable alpha-emitting contamination were found near the bottom of one of the well sleeves. Each of the sleeves had been cut in half using a reciprocating saw. The vibration caused by the reciprocating saw is believed to have caused the contaminants to become airborne. As a result, four workers received an unexpected dose of less than 500 millirem, or 10% of the maximum annual dose allowed by nuclear regulations.

The project was immediately stopped, and the area was secured. The project is in the planning stages to perform additional characterization on the five removed well sleeves. The characterization will include sampling and analysis to ensure that all the residual radionuclides on the well sleeves are identified and quantified. The sampling will be performed in a negative-air enclosure through glove ports to minimize the chance of creating airborne contamination. After sampling, a fixative will be applied to the interior and exterior of the well sleeves. Once the characterization is complete, the analytical data will be reviewed to determine the appropriate approach to containerization and disposition. Once the approach is determined, the removed well sleeves will be containerized and transported to the appropriate disposal facility. As a result of the unexpected residual contamination, the remaining nine wells will be sealed until a final cleanup effort begins in 2009.

3.4 Off-Reservation Activities

3.4.1 Witherspoon Site Cleanup

The David Witherspoon, Inc. (DWI) 901 Site, located on Maryville Pike in Knoxville, Tenn., consists of a 9.5-acre parcel formerly owned and operated as the DWI Recycling Center and a 0.5-acre parcel owned by CSX Transportation, Inc. A 1993 court order forced cessation of DWI operations at the site, and the Tennessee Division of Superfund took control of the property. The objective of this off-site project is to perform interim actions and to complete the supporting documentation, resulting in a record of decision at the DWI 901 Site.

The scope of the project is to decontaminate and demolish the main building, a metal office building, the incinerator, the magnet house, the compactor house, the control house, the scale house and scale, the bailer house, and the breaker house. Contaminated soils will be excavated and disposed of in the EMWMF as radioactive PCB mixed waste. The contaminated soils will be excavated and treated to meet land disposal restrictions.

The interim action for decontamination and decommissioning and debris removal started in April 2004. At the end of 2004, nine of the ten buildings had been demolished, 970 yd^3 of building material and debris had been sent to the Y-12 Landfill, 1960 yd^3 of site debris were shipped to the EMWMF, and five loads of universal waste were shipped for off-site disposal.

During 2005, the soil removal interim action work plan will be completed, and excavation of soil will begin. This phase of the Witherspoon work is scheduled to be completed in 2007.

3.4.2 Atomic City Auto Parts Field Work Completed

DOE has completed the cleanup of the Atomic City Auto Parts site, which is located in northeast Oak Ridge. This 5-acre site was originally used as a coal distribution center by the Manhattan Project and was sold in 1954. From 1954 to 1975, the site was used as a private salvage business and received contaminated metals from the Y-12 Complex. After 1975, the business operated as an automobile salvage/repair and scrap yard facility. In 1994, the site was declared a TDEC Superfund Site. Subsequent in-

vestigations found that contamination existed from the past salvage and automobile repair operations. The contaminants of concern included uranium, PCBs, and heavy metals. The wastes resulting from remediation were sent to the EMWMF. A ceremony was held in October 2004 with TDEC Commissioner Betsy Child to recognize completion of field work at the site.

3.5 Waste Treatment and Disposal

3.5.1 Tons of Wastes Placed in the EMWMF and Other Landfills

The EMWMF, located in East Bear Creek Valley near the Y-12 Complex, is an on-site waste facility that is being used to contain the wastes generated during cleanup of the ORR and associated sites in Tennessee. The EMWMF accepted its first waste shipment in May 2002. Since then, projects from all over the ORR have shipped waste to EMWMF for disposal. The operations also effectively controlled site erosion and sediments, resulting in an 80% reduction in total suspended solids measured in surface waters during the year.

DOE also operates solid waste disposal facilities located near the Y-12 Complex, called the ORR Sanitary Landfills. In 2004, industrial, construction/demolition, classified, and spoil material waste were disposed of at this facility.

The Construction Demolition Landfill VII was expanded in 2004. Areas II and III were constructed to add 175,000 yd^3 of capacity. Construction Demolition Land fill-VII will be the repository for much of the uncontaminated debris generated by demolition of buildings at ETTP. Consequently, design work for construction of Area IV also commenced in 2004. Area IV will add another 336,000 yd^3 of capacity to Construction Demolition Landfill-VII.

The EMWMF and ORR Landfills are serving the disposal needs of the ORR cleanup program as well as the active missions of the Y-12 Complex and ORNL.

3.5.2 EMWMF Upgrades

3.5.2.1 Underdrain Constructed to Lower the EMWMF Water Table

An underdrain to lower the water table beneath the EMWMF was constructed in 2004. The 1050-ft-long drain was built using a core of rocks the size of railroad ballast, surrounded by a layer of smaller crushed stone (the size of parking lot gravel), which was surrounded by a layer of sand. This three-component drain was installed in the bottom of a 25-ft-deep trench that was dug 12 ft wide and subsequently backfilled as the drain construction progressed. The site water table is dropping as predicted because groundwater flows at approximately 8 gal/min across the outlet weir and into the remnant channel of North Tributary 4.

3.5.2.2 Build-Out to Add to Disposal Capability

Another notable construction project started at the EMWMF in 2004. A build-out to add 800,000 yd^3 of disposal capacity kicked off in June. An addendum to the requirements decision record detailing the build-out was approved by EPA and TDEC. This effort will add Cells 3 and 4 to the two cells that were completed in 2002. Construction of Cells 3 and 4 will finish in May 2005. Waste disposal operations in the new cells can commence upon approval of the construction completion report by EPA and TDEC. The construction completion report is the compilation of all of the quality control and quality assurance testing and monitoring that was performed to ensure that the build-out was constructed in accordance with the approved design.

3.5.2.3 Haul Road Planned

It became apparent in early 2004 that removing shipments of ETTP waste bound for the EMWMF from public roads would better serve project and public interests. Conceptual design work to identify feasible routes to construct a haul road between ETTP and the EMWMF was initiated in early summer. The road enhances public safety by eliminating the hazards presented by large trucks mixing with passenger vehicles on public roads. It also reduces cleanup costs by decreasing the cycle time for each load

of ETTP waste that is disposed at the EMWMF. As 2004 closed, the preferred route for the haul road was being presented to the regulators and to the Oak Ridge Site Specific Advisory Board (ORSSAB). An explanation of significant difference to the EMWMF record of decision was planned to provide the regulatory framework for the Haul Road project. An addendum to the EMWMF requirements decision record will be issued for regulator approval. Construction started and is expected to finish in 2005, just in time for the start of the intensive waste-hauling campaign from the ETTP cleanup.

3.5.3 Millions of Gallons of Waste Water Treated in FY 2004

During 2004, the EM Program treated 25 million gal of liquid waste at the Groundwater Treatment Facility, East End Mercury Treatment System, Central Mercury Treatment System, and East End VOC System.

The West End Treatment Facility and the Central Pollution Control Facility at the Y-12 Complex processed wastewater, primarily in support of NNSA operational activities. This wastewater included hazardous materials such as PCBs, cyanide, mercury, cadmium, chromium, and uranium. The hazardous materials end up in the sludge that results from wastewater treatment. In March 2004, construction began on a 300-gal/min water treatment facility near Building 9201-2, identified as the "Big Springs West Treatment System." The system will use a series of granular activated carbon columns to reduce mercury concentrations in the system effluent to 200 ppt or less. The system influent will include the outfall 51 discharge and 9201-2 sump water. The existing West End Mercury Treatment System will be removed.

At ORNL, wastewater was treated and released at the Process Waste Treatment Complex. The LLLW evaporator at ORNL also treated, such waste. Gaseous waste was also treated at the ORNL 3039 Stack Facility. These important waste treatment activities supported both EM and Office of Science mission activities in a safe and compliant manner.

3.5.4 Transuranic, Low-Level, and Mixed Waste Operations

Operations at the ORR produce wastes that frequently contain radionuclides. Such wastes are characterized as either LLW or TRU wastes. Mixed low-level wastes (MLLWs) are those that contain materials deemed hazardous and are regulated under RCRA.

Mixed low-level sludge was treated and shipped from the ORR for off-site disposal in compliance with site treatment plan milestones. The 2004 work completed the treatment and disposal of the Y-12 mixed low-level sludge that was addressed under the site treatment plan.

TRU wastes from throughout the DOE complex are to be disposed of at the WIPP, near Carlsbad, New Mexico. Before being shipped to the WIPP, however, TRU wastes must be treated, packaged, and certified to meet its waste acceptance criteria.

DOE awarded a contract to Foster Wheeler Environmental Corporation in 1998 to build and operate a TRU waste treatment facility on the ORR. In 2001, an approximately 1000-ft extension to the access road from White Wing Road (State Route 95) and fencing of the approximately 20-acre site were completed. Waste processing at the TRU waste treatment facility began in 2004.

The ORR has the largest inventory of legacy LLW (i.e., waste from historic reservation operations) in the DOE complex. In addition, active DOE missions at the Y-12 Complex and ORNL produce newly generated LLW that must be managed and disposed of safely and efficiently. In 2004, DOE shipped 40 legacy LLW monoliths (2161 yd^3) to the Nevada Test Site for disposal. Disposal of the legacy LLW inventory got well under way in 2004. Much of the inventory was shipped for disposal. The ORR also has a large inventory of MLLW, but most of it has been dispositioned since the sewage treatment plant agreement was signed in 1995.

By the end of 2005, the entire inventory of sewage treatment plant mixed waste listed in Table 3.4 in the *Site Treatment Plan for Mixed Wastes on the DOE Oak Ridge Reservation*, excluding the East Chestnut Ridge Waste Pile, is scheduled to be safely disposed of, closing an important chapter in the cleanup of the ORR.

3.6 Public Involvement

3.6.1 Public Input on Environmental Management Initiatives

Many projects have moved from the decision-making phase to actual fieldwork. However, DOE is still seeking public involvement in many decisions affecting cleanup of the ORR. Public input was sought in 2004 on a variety of initiatives, including the following:

- the Oak Ridge Reservation Groundwater Strategy document, which provides a framework for identifying decision boundaries, phases, goals, and technology needs for making cleanup decisions for contaminated groundwater;
- the Draft Risk-Based End State for the Oak Ridge Reservation document, which presents DOE's vision for focusing remediation efforts at its sites on clearly defined risk-based end states;
- draft Environmental Impact Statements for Depleted Uranium Hexafluoride Conversion Facilities, proposed for Paducah, Kentucky, and Portsmouth, Ohio;
- the Covenant Deferral Request package for the transfer of five office buildings at ETTP to CROET;
- the Public Involvement Plan for CERCLA Activities at the U.S. Department of Energy Oak Ridge Reservation, a document that describes opportunities for public involvement on the Oak Ridge Reservation (in addition to releasing the document for public review, a team of stakeholders was assembled to help craft the document);
- a proposed plan to change the treatment remedy for Melton Valley Seepage Trenches 5 and 7;
- the ETTP Zone 2 Proposed Plan, which addresses remediation of the fenced area of ETTP;
- an environmental assessment evaluating the potential environmental impacts of processing uranium-233-bearing material at ORNL; and
- the proposed haul road to transport waste from ETTP to EMWMF.

Mobilization for the cleanup of the DWI Superfund site in South Knoxville prompted several initiatives aimed at informing and involving affected stakeholders. A focused communications plan was developed in the spring of 2004 and included a brochure mailed to a list of residential and commercial neighbors within a one-mile radius of the site. Subsequently, DOE contractor Bechtel Jacobs Company opened an on-site visitor information office, which is open every Thursday. Also, prior to startup, the Local Oversight Committee, along with TDEC, sponsored two public meetings, which were attended by local residents. By working closely with local elected officials, community groups, neighbors, and local media, DOE's cleanup of the DWI site has proceeded quickly and safely.

DOE was also involved in a number of other public involvement initiatives. A surplus trailer at ETTP was donated to the Roane County Humane Society, which will use it as a spay/neutering facility. Special events were held to commemorate significant accomplishments for the reservation, including the donation of a gaseous diffusion plant converter to the American Museum of Science and Energy and the shipment of sludge from the West End Treatment Facility.

DOE continued distributing its monthly stakeholder newsletter, *Public Involvement News*, to the community and elected officials. Several EM project fact sheets were also revised and combined into three main fact sheets: ETTP, Melton Valley, and Balance of Reservation.

3.6.2 Oak Ridge Site Specific Advisory Board

The ORSSAB posted several accomplishments this year in its mission to provide informed advice and recommendations to DOE on its Oak Ridge EM Program and to involve the public in environmental decision-making. ORSSAB is an independent, volunteer, federally appointed citizens' panel formed in 1995.

The board generated nine recommendations this year on a variety of EM topics, including

- recommendations on the proposed plan for the Amendment of the Record of Decision for Interim Actions for the Melton Valley Watershed: Revised Remedial Action for Seepage Trenches 5 and 7,
- comments on the ORR Risk-Based End State Vision, Revision D1,
- recommendations on the ORR Groundwater Strategy,

- comments on the Draft Environmental Impact Statements for Depleted UF_6 Conversion Facilities, and
- comments on the Public Involvement Plan for CERCLA Activities at the DOE ORR.

3.6.3 Annotated Outline for a Long-Term Stewardship Implementation Plan

Stewardship of contaminated areas of the ORR following cleanup has long been an ORSSAB priority. So when DOE signed the Long-Term Stewardship Strategic Plan for the Oak Ridge Reservation in March 2004, the board's Stewardship Committee took the next logical step by producing an Annotated Outline for a Long-Term Stewardship Implementation Plan.

The outline is specifically tailored to the known contaminated areas of the reservation with the hope that this approach will result in an implementation plan that provides detailed functional specifications. A solid implementation plan will enable the design and execution of an ORR-specific stewardship system that meets both current and future needs and also has the acceptance of local stakeholders.

DOE representatives have responded favorably to the outline, noting that it provides a firm framework for the implementation plan, which is tentatively slated for publication in 2005. The Annotated Outline is available on the board's web site at www.oakridge.doe.gov/em/ssab/recommendations/FY2004/R7-14-04.8.pdf.

3.6.4 Student Summary of ORR Stakeholder Report on Stewardship

ORSSAB published the second volume of its two-volume *Oak Ridge Reservation Stakeholder Report on Stewardship in 1999*. As time passed, though, it became apparent that the report was too detailed for some audiences—notably the high school students whom the board was trying to reach through its public outreach program.

To address the problem, the ORSSAB Stewardship Committee asked advance-placement science classes at Oak Ridge and Roane County high schools to summarize the report. The resulting *Student Summary of the Oak Ridge Reservation Stakeholder Report on Stewardship* was published in May 2004 and does an outstanding job of distilling the original reports into language easily understood by high school students.

The student summary was widely distributed to local schools and libraries to help ensure long-term awareness and understanding of the community's responsibility for stewardship of contamination that will remain on the reservation following cleanup. The summary is available on the ORSSAB web site, www.oakridge.doe.gov/em/ssab/Publications/StudentSummary.pdf