# 3. Environmental Management and Reservation Activities

***Setting***

The law requires federal agencies and private-sector companies to investigate and remedy abandoned or uncontrolled hazardous waste sites where a release has occurred or may occur. A number of monitoring and cleanup activities are conducted on the ORR under the Environmental Management Program to meet the legal requirements. Additional activities, such as wildlife management and activities that encourage public involvement, are also conducted.

***Update***

Two 1998 DOE Pollution Prevention Awards were awarded: one to the Jacobs EM team for installing a treatment system to protect human health and the environment from coal ash contaminants from the Chestnut Ridge Filled Coal Ash Pond at the Y-12 Plant and the other to members of the team charged with cleaning up the Old Hydrofracture Facility at ORNL, who avoided the creation of 5000 gallons of wastewater and recycled 40,000 pounds of scrap metal.

The ROD for the Bear Creek Watershed at the Y-12 Plant was submitted to EPA and TDEC on August 28, 1998, well ahead of the milestone date of October 1, 1998.

The ROD for the K-1070-C/D Operable Unit at the ETTP was signed by the regulators on January 23, 1998.

The removal and transfer of the sediment and subimpoundment soil from the Surface Impoundments Operable Unit at ORNL was completed for basins 3513 and 3524 in FY 1998.

An interim ROD was signed on July 8, 1998 signaling approval to begin removal of the fuel salts from the Molten Salt Reactor Experiment facility at ORNL.

## 3.1 INTRODUCTION

For nearly 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 on the ORR in 1943 as part of the Manhattan Project, also produced radioactive and hazardous wastes. In 1989, EPA placed the reservation on the National Priorities List (NPL), which names waste sites across the country most in need of cleanup.

Once the reservation was added to the NPL, cleanup became subject to the process specified in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), more commonly known as Superfund. This law requires federal agencies and private-sector companies to investigate and remedy abandoned or uncontrolled hazardous waste sites where a release has occurred or may occur. It also requires public involvement to ensure that citizens are informed of and are involved in making cleanup decisions.

In 1990, DOE Headquarters (DOE-HQ) established the Office of Environmental Management, making the Oak Ridge Operations Office (DOE-ORO) responsible for cleanup of the reservation; Lockheed Martin Energy Systems, Inc., served as its managing and operating contractor until the end of 1997, when responsibility was transitioned to Bechtel Jacobs Company LLC (see Sect. 1.6.2). The following sections highlight some of the environmental management activities for 1998 and some related activities carried out to ensure good stewardship of the reservation.

## 3.2 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities continued throughout 1998 on the Oak Ridge Reservation (ORR) under implementation of the ORR Federal Facilities Agreement (FFA) (see Sects. 2.2.2 and 2.2.3). These activities take place at a CERCLA area, which is any inactive unit or area at which a release or threatened release of hazardous substances, pollutants, or contaminants exists. These sites are listed in Appendix C of the FFA according to their remediation status. When remediation decisions for an area have been approved, the area becomes an operable unit (OU) in Appendix C of the FFA.

### 3.2.1 Oak Ridge Y-12 Plant

The remedial action strategy at the Y-12 Plant integrates the numerous applicable federal and state regulations for efficient compliance on a watershed basis. CERCLA remedial actions at two watersheds or hydrogeologic regimes have been initiated at the facility: Bear Creek Valley (BCV) and Upper East Fork Poplar Creek (UEFPC).

The following CERCLA accomplishments were reported for FY 1998 (BJC 1999). The ROD for the Bear Creek Watershed was submitted to EPA and TDEC on August 28, 1998, well ahead of the milestone date of October 1, 1998. This ROD will establish end-use land goals for the watershed, final surface water goals, and interim groundwater goals, as well as address remedial actions at numerous release sites within the watershed, including the BCV Bone Yard/Burn Yard (BY/BY) and S-3 Ponds. The Remedial Investigation/Feasibility Study (RI/FS) for the Environmental Management Waste Management Facility (EMWMF), an abovegrade earthen facility that will support on-site management of cleanup wastes under CERCLA and will be located in east BCV southwest of the Y-12 Plant, was approved by both EPA and TDEC on November 16, 1998. The notice was issued to proceed with Title I 30% design work for the EMWMF. All field activities were completed for the UEFPC Firing Range and the Basin 9822 Cleanout.

### 3.2.2 East Tennessee Technology Park

The remedial action strategy taken by DOE involves a watershed approach in the planning and implementation of the ETTP Sitewide Record of Decision (ROD). The watershed approach will assist DOE in selecting consistent cleanup alternatives that optimally balance cost effectiveness and risk reduction by considering all contamination, including sources, groundwater, surface water, etc., within ETTP boundaries rather than focusing on one site or one pathway at a time.

Ongoing actions for 1998 include five removal actions and three remedial actions and the development of numerous documents required by the FFA. The Sitewide remedial investigation (RI) Plan was approved by EPA and TDEC in February 1998, and the RI field activities were initiated and completed. Work proceeded on the K-1070-A Burial Ground, which is not included in the Sitewide ROD. The ROD for the K-1070-A Burial Ground was submitted on September 8, 1998. Plans for 1999 include completing the approval process for the ROD and preparing the Remedial Design Work Plan (RDWP). The ROD for the K-1070-C/D operable unit (OU) was signed by the regulators on January 23, 1998, and the K-1070-C/D OU RDWP was approved. D&D activities were completed for Buildings K-724 and K-725, both of which were contaminated with beryllium and radioactivity in excess of release limits. Also, D&D activities were initiated at Buildings K-1131, K-1410, and K-1031, with plans to complete the D&D activities in 1999. The K-1070-C/D and Mitchell Branch Plumes Removal Action is designed to capture and treat contaminated groundwater from the K-1070-C/D and Mitchell Branch areas. Construction activities for installation of groundwater collection systems were completed in June 1998, and pumping groundwater to the Central Neutralization Facility (CNF) was initiated. Other removal and remedial actions consisted of removal of more than 1,370,000 lb of equipment from Buildings K-31 and K-33, some of which was contaminated and

the remainder of which was clean and recycled, and completion of construction of a groundwater collection system for Buildings K-1401 and K-1420 with initiation of transmission of the buildings' sump water to the CNF for treatment prior to discharge.

#### 3.2.2.1 ETTP Record of Decision

The ETTP Sitewide ROD project is currently addressing facilities, buildings, and contaminated sites with either a remediation project or a determination that no action is required. More than 100 individual units at the ETTP have been identified as known or suspected sources of environmental contamination to the soil, groundwater, and surface water. A remedial investigation (RI) had been initiated during CY 1997 to characterize the nature and extent of contamination. During 1998, the RI field activities were completed in accordance with the approved RI Work Plan. Methods for remediating contaminated areas that pose an ecological or human health risk are being evaluated in a feasibility study, due to be completed in 1999. Remediation strategies will be agreed upon in a ROD between the stakeholders, DOE, EPA, and TDEC.

### 3.2.3 Oak Ridge National Laboratory

The cleanup strategy for ORNL involves two watersheds, or hydrogeologic regimes, White Oak Creek (WOC)/Bethel Valley and WOC/Melton Valley. Actions for 1998 included both removal and remedial actions, and the development of CERCLA documentation.

The following CERCLA accomplishments were reported for 1998. The First Draft (D1) remedial investigation/feasibility study (RI/FS) in support of the Bethel Valley (BV) Watershed Record of Decision (ROD) was submitted to the regulators on September 24, 1998. An RI/FS provides site characteristics, the risks associated with such characteristics, and a summary of potentially feasible remedial actions. It is planned to include 10 FFA radioactive liquid low-level waste (LLLW) tanks in the final BV RI/FS scope; previously, they were planned to be addressed under an early action. The Gunite and Associated Tanks (GAAT) project consists of eight underground liquid radioactive waste storage tanks located in two tank farms in the center of the ORNL main plant area. Tanks W-3 and W-4 are in the north tank farm, and W-5, W-6, W-7 , W-8, W-9, and W-10 are in the south tank farm. Although a majority of the wastes were removed in the 1980s, 253,000 gallons of liquid and 80,000 gallons of sludge remained. In 1997 and 1998, four of the eight tanks, W-3 and W-4 in the north tank farm, and W-5 and W-6 in the south tank farm, were remediated by removal of both the liquid and sludge contents. All tanks are expected to be remediated by February 2001 (see Sect. 3.6). The Surface Impoundments Operable Unit (SIOU) consists of four surface basins, two unlined and two clay lined, located in the south-central portion of the ORNL main plant area. The impoundments, which were used to collect, mix, or store untreated wastewaters, now contain radioactively contaminated sediments. Based on input from the Site Specific Advisory Board (SSAB) on end use, along with regulator comments, a revised Proposed Plan (PP) for remediation was submitted, which includes off-site disposal after suitable treatment of sediments. The ROD for the SIOU was signed on September 24, 1997, and removal and transfer of the sediment and subimpoundment soil was completed for basins 3513 and 3524 in 1998. Plans call for submitting the remedial action work plan and design report for the remaining two impoundments to the regulators by September 28, 1999.

The Melton Valley (MV) Watershed includes 35 separate areas or sub-basins within the 1000 acres in the southern portion of ORNL that defines the watershed. These areas eventually drain into White Oak Creek, which flows into White Oak Lake, from which the Clinch River receives the discharge after it passes over White Oak Dam. Through historic waste disposal practices, portions of MV have been contaminated with a variety of liquid and solid radioactive wastes, containing radionuclides such as strontium-90, tritium, and cesium-137, which are of primary concern as contaminants leaving the MV watershed in surface water. Surface water, floodplain soils, and source units in the watershed are being evaluated as a single entity to ensure a consistent approach to remediation and prioritization to achieve the greatest risk reduction. In

support of the MV ROD, the RI was approved by EPA and TDEC on June 13 and August 4, 1998, respectively, and the FS was approved on August 28, 1998. Plans for 1999 consist of submitting a draft ROD.

Between 1964 and 1980, waste liquid and suspended solids from the ORNL main plant LLLW system were decanted and pumped to five tanks at the Old Hydrofracture Facility (OHF), from which the radioactive liquid was mixed with grout and injected deep into shale bedrock. The OHF has been inactive since 1980. Nonetheless, the five storage tanks, which are located in close proximity to Melton Branch and White Oak Creek, continued to contain residual waste categorized as hazardous and radioactive (mixed waste). In 1998, the Remedial Action Work Plan (RmAWP) was approved by the regulators, and removal of 62,000 gallons of sludge, supernate, and sluicing liquid containing 30,000 Ci of mixed transuranic waste from the five tanks was completed.

### 3.2.4 Other FFA Activities

Other FFA activities include the Nuclear Material and Facility Stabilization (NMFS) project and the Footprint Reduction task. Under the NMFS, designated facilities at ORNL are surveyed, maintained, and deactivated; nuclear fuel and spent nuclear fuel (SNF) is removed, packaged, and shipped from a shutdown reactor (Bulk Shielding Reactor); and SNF on the ORR is safely managed, stored, removed, packaged, and shipped to other DOE sites. In 1998, 73 spent nuclear fuel elements were removed from the Bulk Shielding Reactor pool; all inventory quantities of plutonium were removed from Building 3038; contamination control activities were completed in Buildings 3026 C and D; and over 650 tons of green-tagged (i.e., clean) material and 90 tons of red-tagged (i.e., contaminated) material were characterized at the Tower shielding Facility (TSF) in preparation for sale and/or removal to facilitate privatization of the TSF site. The Footprint Reduction task is responsible for identifying areas on the ORR that are not known or suspected of being contaminated. The objective is to reduce the size and configuration of the area on the ORR designated as part of the National Priorities List (NPL). During 1998, Remedial Site Evaluations (RSEs) were submitted to the regulators for the Perimeter Road fill area, the site contractor's spoil area, the Reeves Road dump site, the 0900 firearms range, and the West End dump site.

## 3.3 ORR INTEGRATED WATER QUALITY MONITORING PROGRAM

The EM program established the Integrated Water Quality Program (IWQP) as a comprehensive approach to addressing the requirements for groundwater, surface water, and biological monitoring programs on the ORR (DOE 1998e). The purpose of the IWQP is to develop a consistent and watershed-based approach that will support watershed management decisions. In the past, the IWQP produced two annual reports: the IWQP Annual Monitoring Report, which documented baseline water-quality conditions for the five ORR watersheds, and the Remediation Effectiveness Report (RER) (DOE 1999), which is a program-wide evaluation and reporting of performance assessment monitoring and an FFA primary document. The IWQP Annual Monitoring Report has been canceled and information normally included in that report will be included in the RER. The RCRA Annual Groundwater Quality Assessment Report for Solid Waste Storage Area (SWSA) 6 at ORNL was submitted to TDEC on February 26, 1998.

## 3.4 POLLUTION PREVENTION

On September 14, 1998, President Clinton signed Executive Order (EO)13101, "Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition." The order calls for government agencies to incorporate waste prevention and recycling in the agencies' daily operations and work. It also calls for "affirmative procurement," which means the purchase of products made with recycled materials and also the purchase of environmentally friendly materials. The order puts in place a system of awards for pollution prevention successes. During 1998, all

sites included EO 13101 in their existing pollution prevention programs.

Each of the plants has in place procedures to recycle paper, cardboard, aluminum cans, toner cartridges, coal ash, fluorescent lamps, batteries, scrap metal, used oil, and plastic waste. Each continued to make strides in pollution prevention by recycling as noted in Table 3.1.

## 3.4.1 The DOE-ORO Environmental Management Radiological Scrap Metal Program

The U.S. Department of Energy National Center of Excellence for Metals Recycle was established in October 1997. The vision of this new program is to develop a DOE culture that considers the recycle and reuse of metal as the first and primary disposition option and burial as a last option, thus reducing health risks and life-cycle costs. The Center of Excellence takes the approach that unrestricted release of metal is the first priority. When this is not appropriate, restricted release, beneficial reuse, and stockpile are considered.

The scope of the metals disposition problem is simply that for the entire DOE complex, Oak Ridge owns the vast majority of the material, at 72% of the total or 967,000 tons; Idaho, Los Alamos, and Hanford each own 5% of the total or 72,000, 74,000 and 73,000 tons each, respectively; and Rocky Flats owns 7% or 97,000 tons, for a grand total of 1.4 million tons of scrap metals. To support metals recycle, the Center of Excellence is developing a "toolbox" to help project teams perform life-cycle analysis, perform ALARA analysis, produce pollution prevention information, produce independent government estimates, and implement sales/service contracts.

**Table 3.1 Results of selected Oak Ridge Reservation recycling activities for 1998**

| Material | ORNL | Y-12 Plant | ETTP |
|---|---|---|---|
| White paper (lb) | 316,600 | *a* | *b* |
| Mixed paper (lb) | 190,800 | 620,576 | 555,748 |
| Corrugated cardboard (lb) | 224,400 | 144,317 | *b* |
| Aluminum cans (lb) | 8,600 | 19,779 | 5,733 |
| Plastic lab waste (lb) | 574 | 10,099 | 44 |
| Coal ash (lb) | 4,898,000 | 19,410,615 | *a* |
| Foam peanuts (lb) | 265 | *a* | 66 |
| Scrap metal (lb) | 1,055,000 | 2,313,695 | 279,021 |
| Lead-acid batteries (lb) | 50,200 | 25,997 | 287[c] |
| Photographic silver waste (lb) | 2,050 | *a* | 617 |
| Toner (cartridges) | 3,437 | 2,132 | 700 |
| Used oil (gallons) | 2,200 | 8,475 | 23,956[d] |
| Fluorescent lamps (tubes) | 19,000 | 42,909 lb[e] | 12,006 |

[a]Not reported.
[b]All paper/cardboard recycling at the ETTP is reported as mixed paper.
[c]Mercury and mercury batteries.
[d]Includes 463 gallons of cooking oil.
[e]Includes fluorescent light ballasts.

#### 3.4.1.1 Recycle of Metal Pallets

During CY 1998, suspect radiologically contaminated metal pallets from the ETTP Pond Waste Management Project (PWMP) were offered for sale rather than shipping the pallets to a commercial melt facility for disposal. With the assistance of the Center of Excellence, the pallets were sold to a private company for reuse. The total weight of the 1200 pallets was 538,560 lb. The associated cost avoidance in 1998 was estimated at $912,638.

#### 3.4.1.2 Sale of ETTP LLW Drums

This project, with the assistance of the Center of Excellence, enabled empty mixed and mixed-PCB waste drums in storage at ETTP to be reused within the DOE system. The inventory of both types of waste drums was 8600. In FY 1998, the total project waste avoidance was 53.5 metric tons and cost avoidance was $102,981.

#### 3.4.1.3 Tower Shielding Facility Clean Material Recycle

The Center of Excellence assisted ORNL with the requirements and documentation needed to generate a sales agreement to recycle and reuse scrap metal and concrete at the TSF instead of disposing of it. The agreement involved 210 tons of clean scrap metal and 305 tons of clean concrete. In addition, 3 tons of activated stainless steel and 30 tons of concrete were sent to the High Flux Isotope Reactor (HFIR) for reuse. Total project waste avoidance was 497.14 metric tons, and cost avoidance was $2,206,000 in FY 1998.

#### 3.4.1.4 ETTP Reindustrialization—Building K-1401

In preparation for use of space at the ETTP, activities were planned to clean, decontaminate, and remove property from an area in Building K-1401. A contract was issued to a vendor that required removal of radioactive contamination from the interior of the building in exchange for surplus equipment in the building. A commercial public auction was held for 900 lots of equipment and materials, which were sold for recycle and reuse and resulted in sales revenues of $2.2M. This action amounted to a waste avoidance of 9072 metric tons and a cost avoidance of $900,000.

#### 3.4.1.5 ETTP K-31 and K-33 Switchyard

The work in Switchyards K-31 and K-33 includes the removal of all electrical equipment and appurtenances plus the removal of Buildings K-791, K-791S, and K-791N to the top of the concrete pedestal or slabs. Building K-761 is in good condition and will be left for reindustrialization after all interior electrical equipment has been removed. The dismantlement work began July 14, 1998, and is scheduled to be completed May 5, 1999. Total project savings are estimated at $1,103,833. As of December 1998, 10,574 metric tons of clean scrap metal have been recycled from the ETTP K-31 and K-33 switchyards.

## 3.5 REMEDIATION UNDER WAY FOR THE MOLTEN SALT REACTOR EXPERIMENT FACILITY

Remediation of the Molten Salt Reactor Experiment (MSRE) facility continued during 1998. The facility operated from 1965 to 1969. The reactor was fueled by molten uranium tetrafluoride salt and was cooled by molten salts of lithium and beryllium. After being shut down, the reactor was mothballed. The fuel was solidified in tanks for long-term storage, and surveillance and maintenance programs were initiated.

In subsequent years, a number of potential problems were found in the facility. Samples of off-gas revealed that fluorine and uranium hexafluoride gas were being emitted, leading to the discovery of a 7-lb deposit of uranium in a charcoal-bed off-gas filter. Because the charcoal bed was within a water-filled chamber, it raised a concern that a nuclear criticality was possible. In addition, the fluorine had reacted with the charcoal to form chemically unstable compounds. These discoveries led to the initiation of remedial

actions, which began in 1994 and are currently ongoing.

The MSRE remediation project was initiated to reduce and eliminate three potential risks: a nuclear criticality accident, an explosive release of radioactive material, and a release of reactive and/or radioactive gases. Since 1994, the water was drained from around the charcoal bed, and the atmosphere was replaced with an inert gas ($CO_2$); the charcoal bed was isolated from the off-gas system to prevent further migration of uranium and fluorine; and a hold-down ring was installed to contain the radioactive and reactive gas if the events posed in a "worst-case scenario" were to occur.

A system to remove uranium hexafluoride was designed, fabricated, and installed during 1995 and 1996. The system, which began operation on November 21, 1996, contains chemical traps that adsorb gases emitted by the MSRE. The traps are being stored until equipment can be fabricated to process and package the material for long-term storage.

On June 28, 1996, DOE issued an action memorandum for a removal action for the uranium in the charcoal bed. Once the gases are eliminated from the MSRE, the solid uranium deposits will be removed. A mockup of the charcoal bed has been built, and prototype robotic tools are being fabricated.

During 1997, the removal action report, *Removal Action Report on the Molten Salt Reactor Experiment Time-Critical Removal Action at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (DOE/OR/01-1623&D1) (DOE 1997), was submitted to and approved by the regulators. Also, chemical treatment of the blockages was initiated and the reactive gas removal system was operated 62 times with the removal of a total of 6 kg of uranium (84% $^{233}U$).

During 1998, upgrades to the MSRE electrical tank heating system were completed in preparation for melting and removing the fuel salt, the tank access shielding and tooling were put in place, and the steam dome from one fuel salt tank was removed and inspections were completed. The inspections provided confidence that the tank had not deteriorated and that future in-tank melting of the salt and in-tank chemical processing would be possible. The final ROD for the MSRE was submitted on June 22, 1998, and signed by EPA and TDEC on July 7, 1998, and June 26, 1998, respectively.

## 3.6 GUNITE AND ASSOCIATED TANKS REMEDIATION

Remediation of the Gunite and Associated Tanks (GAAT) is currently operating under an interim record of decision (IROD). The interim action involves removal of liquid and sludge wastes from eight tanks (W- 3 through W-10) and transfer of the wastes to the Melton Valley Storage Tanks (MVST). Seven other tanks (W-1, W-1a, W-2, W-11, W- 13, W-14, and W-15) in the GAAT operable unit (OU) contain no recoverable sludge, have low contaminant levels, and do not pose a significant threat to human health or the environment either now or in the future. Tank TH-4 is also part of the GAAT OU and contains sludge; however, its contents are very different from the contents of the other sludge-containing tanks and do not pose a significant threat to human health and the environment. DOE is deferring action on the contents of these eight tanks (seven non-sludge-bearing tanks plus tank TH-4) and any residual contamination left in tanks W-3 through W-10 after waste removal. At that time, the need for any further remedial action will be evaluated as part of the Bethel Valley watershed remediation decision process.

The gunite tanks were originally constructed in the 1940s with a projected operational life of 1 year. Although monitoring data have not indicated any tanks leaking, remote visual inspections of the tanks have revealed some degradation on the interior surface of Tanks W-5 and W-6. The results of these inspections and the age of the tanks have raised concerns about their long-term integrity. Liquid and solid materials stored in the tanks include mixed wastes containing radionuclides, organics in trace amounts, and heavy metals. Solids in some of the tanks contain U, Pu, Th, and other long-lived (thousands of years) isotopes that meet the criteria for transuranic (TRU) waste. These wastes also contain high concentrations of $^{137}Cs$ and $^{90}Sr$, which have relatively short half-lives (approximately 30 years). At the start of the remediation, these tanks contained mixed transuranic waste with a total of

68,000 Ci of radioactivity in 253,000 gal of liquid and 81,000 gal of sludge.

It was recognized early that remediation of the tanks by removal of the contents would be complicated by the high concentration of radionuclides in the sludge, the location of the tanks underground, and the fact that they are located in the middle of the ORNL complex. Therefore, it was determined that remotely operated systems would be required to handle some of the sludges to ensure worker safety.

The Radioactive Tank Cleaning System (RTCS), which is the first full-scale, remotely operated system to clean radioactive liquid, sludge, and other debris from large underground storage tanks, was developed as part of a CERCLA treatability study, which was designed specifically to support remediation of the GAAT. The treatability study involved a partnership between DOE, EPA Region 4, TDEC, local government, and stakeholders. In addition to a control system, the RTCS comprises a waste dislodging and conveyance system to dislodge waste and clean the tank floors and walls; a modified light-duty utility arm to perform automated operations inside the tank; a remotely operated vehicle to move sludge and other tools to pick up debris; a camera system to allow the operators to view the waste removal operations; and a decontamination system to remove the majority of contamination from the equipment before it is brought to the surface.

In CY 1997, the first two of eight gunite tanks that contain approximately 40% of ORNL's transuranic sludge were successfully cleaned. The completion of waste removal operations in tanks W-3 and W-4 prove the RTCS is capable of removing thick, deep sludge. Approximately 96% of the contaminants contained in the tanks was removed by a combination of sludge mining and wall scarification. The amount of residual waste in each tank is estimated to be 100 gallons, which is 0.25% of the total tank volume.

In 1998, the transfer of 45,000 gallons of supernate from tank W-8 to the active LLW system was completed. Approval was received from EPA and TDEC to use W-8 for low-solid-content liquid consolidation and 70,000 gallons of liquid were transferred from Tank W-9 to W-8. The waste removal operations at tank W-6 were completed in accordance with the Interim Action ROD, and waste removal activities at Tanks W-5 and W-7 were initiated using advanced tank waste retrieval equipment.

## 3.7 LAND APPLICATION OF SEWAGE SLUDGE

The city of Oak Ridge owns and operates a publicly owned treatment works (POTW) that receives wastewater from a variety of industrial, commercial, and residential generators in the Anderson/Roane county area. One of the chief contributors, with approximately 20% of the POTW's total influent, is the Oak Ridge Y-12 Plant. The POTW uses a standard activated-sludge process, in which sludge from both primary and secondary sedimentation is fed into four anaerobic digesters. Under an agreement with DOE and the state of Tennessee, the city transports digested municipal sewage to approved sites on the ORR and applies the sludge as a soil conditioner and fertilizer. The city of Oak Ridge has been applying sludge at selected, state-approved sites on the ORR since 1983 (Fig. 3.1). The current sludge land-application program uses five sites totaling approximately 205 acres on which about 391 tons (dry weight) of sewage sludge were applied in 1998. The sludge contains trace quantities of heavy metals and radionuclides; however, it is not considered to be RCRA or radioactive waste and is regulated under the provisions of 40 CFR 503 of the CWA. No biosolids were applied in excess of land application limits as stated in 40 CFR 503.13 (Tables 3.2, 3.3, and 3.4).

During 1998, ORNL submitted a wastewater treatment questionnaire to the city of Oak Ridge to allow ORNL's sewage sludge to be transported to the Oak Ridge Sewage Treatment Plant and to be included in the city's Land Application Program. ORNL was approved by the city of Oak Ridge to begin transferring its sewage sludge; however, transfers were not initiated until early 1999.

ORNL-DWG 95M-7718

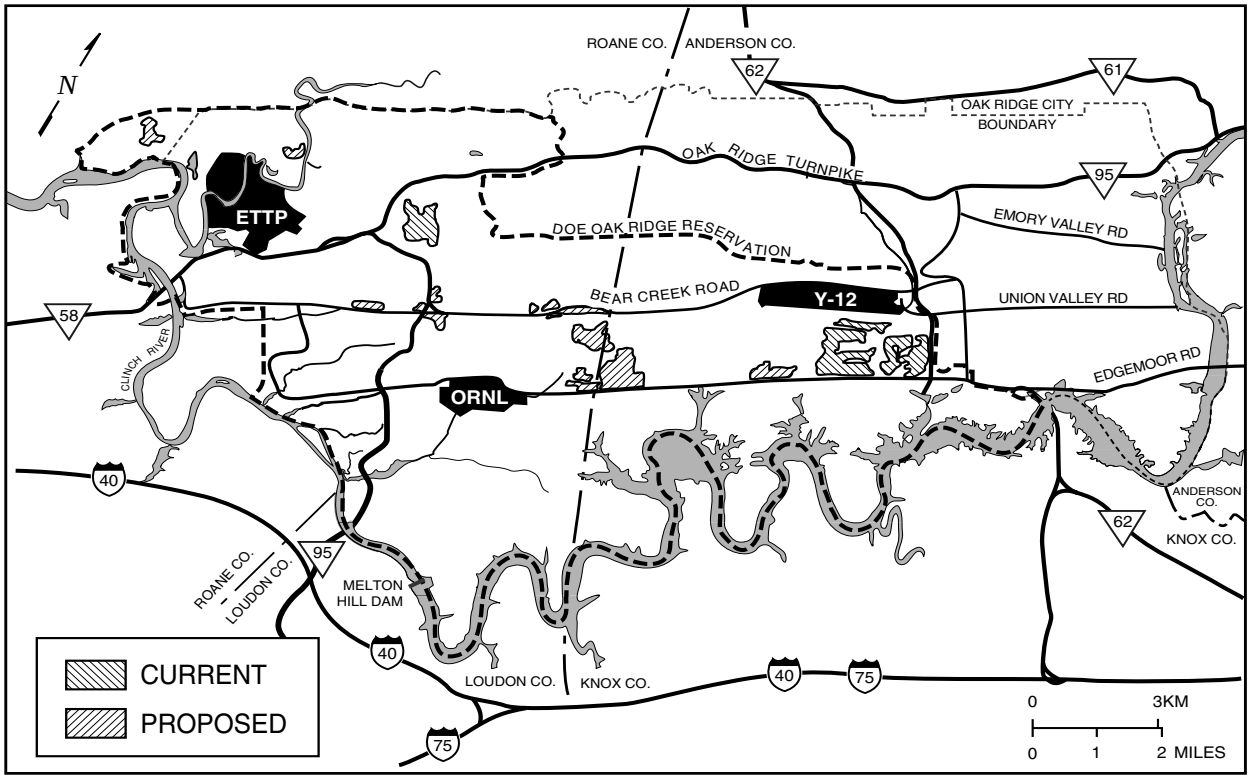


**Fig. 3.1. Current and proposed sites for the land application of sewage sludge on the ORR.**

**Table 3.2. Highest heavy metal levels in city of Oak Ridge sludge for 1998 vs 40 CFR 503.13 ceiling concentration limits**

| Heavy Metal | Highest detected biosolids level in 1998 (mg/kg, dry) | 40 CFR 503.13 Table 1 limits (mg/kg, dry) |
|---|---|---|
| Arsenic | 4.3 | 75 |
| Cadmium | 4.8 | 85 |
| Chromium | 180 | *a* |
| Copper | 700 | 4,300 |
| Lead | 63 | 840 |
| Mercury | 16 | 57 |
| Molybdenum | 21 | 75 |
| Nickel | 100 | 420 |
| Selenium | 7 | 100 |
| Zinc | 1,600 | 7,500 |

[a]Excised from 40 CFR 503 regulations as of March 1998.

**Table 3.3. Cumulative heavy metal loading levels for biosolids land application sites through 12/31/98**

| Heavy metal | Upper Hayfield #1 (kg/ha) | Upper Hayfield #2 (kg/ha) | Rogers (kg/ha) | High Pasture (kg/ha) | Watson Road (kg/ha) | Scarboro Road (kg/ha) | 40 CFR 503 Limits (kg/ha) |
|---|---|---|---|---|---|---|---|
| Arsenic | 0.19 | 0.23 | 0.22 | 0.27 | 0.26 | 0.22 | 41 |
| Cadmium | 0.36 | 0.43 | 0.53 | 0.45 | 0.47 | 0.41 | 39 |
| Chromium | 6.71 | 7.54 | 17.67 | 6.69 | 7.22 | 6.68 | *a* |
| Copper | 22.85 | 26.46 | 37.24 | 24.95 | 25.56 | 23.26 | 1,500 |
| Lead | 4.05 | 4.26 | 9.90 | 3.63 | 4.15 | 3.49 | 300 |
| Mercury | 0.58 | 0.71 | 1.00 | 0.52 | 0.52 | 0.61 | 17 |
| Molybdenum | 0.90 | 0.40 | 2.99 | 0.42 | 0.43 | 0.55 | *a* |
| Nickel | 1.86 | 1.37 | 4.55 | 1.42 | 1.51 | 1.28 | 420 |
| Selenium | 0.29 | 1.87 | 0.33 | 1.73 | 1.92 | 1.68 | 100 |
| Zinc | 79.48 | 91.83 | 115.34 | 83.24 | 85.64 | 81.68 | 2,800 |

[a]40 CFR 503 cumulative limits for molybdenum have been excised by the EPA until further notice.

## 3.8 PARTNERS IN FLIGHT SURVEY

Partners in Flight (PIF) is an international program with partners from various governments, agencies, nongovernment groups, and volunteers collaborating in bird conservation and monitoring. ORNL is cooperating with the Tennessee Wildlife Resources Agency (TWRA) in its monitoring program of breeding birds in Tennessee. Permanent plots on the ORR have been monitored by TWRA, ORNL staff, and volunteers from the Tennessee Ornithological Society for 5 years as part of the Tennessee PIF program. The Tennessee Conservation League is coordinating data compilation for TWRA. A manuscript about the PIF program was published in 1998 in the journal *The Migrant*. This report contains historical records for occurrences of species of conservation concern from surveys conducted on the ORR since the early 1950s.

## 3.9 PUBLIC VISITS TO THE ORR

### 3.9.1 American Museum of Science and Energy Tours

Visitors to ORNL may participate in prearranged general orientation tours, customized group tours, self-guided driving tours, or public bus tours originating at the American Museum of Science and Energy (AMSE) in the city of Oak Ridge. The public bus tours, introduced as a pilot program in 1995, have reached more than 6000 people. Through the customized tours, some 2000 students, business people, and technical people visit the Laboratory annually. These tours serve to educate local, regional, and national groups about DOE activities in the Oak Ridge area. They are also expected to help increase science literacy and to serve as a means of obtaining feedback on how ORNL is perceived by the public.

**Table 3.4. Biosolids land application site radionuclide soil levels observed in 1998**

| Application site | $^{60}$Co (pCi/g) | | $^{137}$Cs (pCi/g) | | $^{238}$U (pCi/g) | | $^{235}$U (pCi/g) | |
|---|---|---|---|---|---|---|---|---|
| | Treated | Reference[a] | Treated | Reference[a] | Treated | Reference[a] | Treated | Reference[a] |
| High Pasture | 0.011 | 0.005 | 0.19 | 0.32 | 0.82 | 0.80 | 0.058 | 0.04 |
| Rogers Site | 0.24 | *b* | 0.92 | 0.67 | 7.28 | 1.98 | 0.27 | 0.058 |
| Scarboro Road | 0.031 | *b* | 0.61 | 0.62 | 2.59 | 1.04 | 0.078 | 0.067 |
| Upper Hayfield#1 | 0.05 | *b* | 0.37 | 0.62 | 2.11 | 1.04 | 0.089 | 0.067 |
| Upper Hayfield #2 | 0.028 | *b* | 0.57 | 0.62 | 1.49 | 1.04 | 0.10 | 0.067 |
| Watson Road | *b* | *b* | 0.81 | 1.04 | 2.75 | 0.98 | 0.15 | 0.046 |

[a]Nonbiosolids applied, adjacent areas to biosolids application sites.
[b]Nondetectable activity.

### 3.9.2 Community Hikes on the Oak Ridge National Environmental Research Park

In May 1996, ORNL began sponsoring community hikes on the Oak Ridge National Environmental Research Park. The hikes allowed participants from the local community to explore areas of the reservation usually closed to the public. The purpose of the hikes was to strengthen the local community's sense of pride in the ORR and to help them recognize its regional value.

Building on the successful pilot community hikes in 1996, ORNL with the AMSE sponsored public wildflower and public bird walks in 1998. The walks were led by volunteers from ORNL, JACOR Environmental, and TWRA so that no cost accrued to participants, ORNL, or AMSE.

## 3.10 PUBLIC INVOLVEMENT ACTIVITIES

The year 1998 was eventful for public involvement. Thirty public meetings and workshops were held plus dozens of informal meetings that included DOE officials, individual stakeholders, and stakeholder groups. In addition, stakeholder involvement included 17 formal comment periods, 14 meetings of the Oak Ridge Reservation Environmental Management Site Specific Advisory Board (SSAB), and 18 recommendations from the SSAB project teams.

### 3.10.1 White Oak Creek Watershed

The Bethel Valley portion of the WOC Watershed was the subject of two public workshops in 1998. The first, in February, was a brown-bag luncheon to introduce the public to the site issues. The second, held in October, was to update stakeholders on the results of the Remedial Investigation (RI) and the alternatives being considered in the Feasibility Study (FS). Also, the Bethel Valley team along with the SSAB End Use working Group (EUWG) initiated a project in which Oak Ridge High School 11th and 12th graders made end-use recommendations for Bethel Valley.

For the Melton Valley portion of the WOC Watershed, stakeholders attended a public meeting in January on the Proposed Plan (PP) for the decontamination and decommissioning (D&D) of the Molten Salt Reactor Experiment. Remediation alternatives for the valley were the subject of a workshop in September.

### 3.10.2 Upper East Fork Poplar Creek

In March 1998, a kick-off workshop was held to introduce the watershed and discuss its remediation challenges. A videotape of this workshop was televised on the local public access channel.

### 3.10.3 Bear Creek Watershed

In March, a DOE-, EPA-, and TDEC-sponsored public workshop was held on the proposed waste management facility to be located in Bear Creek Valley (BCV). Based on stakeholder input at that meeting, DOE offered a follow-up workshop in June on Waste Acceptance Criteria (WAC) for the proposed facility. A group of stakeholders participated in planning the WAC workshop as well as a follow-up workshop held in August.

### 3.10.4 ETTP Reindustrialization

Reindustrialization was the topic of a well-attended, SSAB-sponsored public workshop in April. Other ETTP-related public involvement activities included a public meeting on the PP for the K-1070-A Burial Ground, public meetings on the draft Environmental Impact Statement for depleted uranium hexafluoride (DUF6) and subsequent meetings on the disposition of the DUF6 cylinders at the ETTP, and public workshops on treatment options and subcontracting efforts associated with the Broad Spectrum Procurement Process.

## 3.10.5 High School Students

On November 4, 5, and 10, presentations were made to Oak Ridge High school students on the CERCLA process and the CERCLA relationship to the ongoing efforts in the BV Watershed. On March 5, a class of Oak Ridge students toured ORNL.

## 3.10.6 Scarboro Community

ORO sponsored numerous public meetings in the Scarboro community regarding the environmental sampling and analysis of water, soil, and sediments in and near the community. In addition, work on developing information sources specific to concerns expressed by Scarboro residents continued in 1998.

## 3.10.7 EnvironMENTAL Fair

An EnvironMENTAL Fair has been held in Oak Ridge at the AMSE since 1992. From the original 1-day affair, it has expanded to 2 days to accommodate the increase in student attendance from the original 3000 to a current 7500. In addition, volunteers now include stakeholders as well as DOE and contractor volunteers. The 1998 EnvironMENTAL Fair was held on September 23 and 24, and included 6th, 7th, and 8th graders from Anderson, Roane, Rhea, Meigs, and Loudon counties among others. More than 50 booths of scientific demonstrations, experiments, and activities related to the environment were included in the 1998 fair.

## 3.10.8 Site Specific Advisory Board

The Oak Ridge Environmental Management Site Specific Advisory Board (SSAB), formed in 1995, is a primary source of stakeholder input to DOE on environmental management matters. It also functions as a major communication link between relevant government agencies and the public. In 1998, the SSAB continued to advise DOE on environmental management issues such as recommendations for cleanup levels, technology development, future land use, and long-term waste management issues. Throughout 1998, the SSAB held regular board meetings as well as topic-specific meetings, and all meetings were open to the public. SSAB information, including meeting schedules, meeting minutes, membership, and recommendations to DOE, are available on the Web at http://www.ornl.gov/doe_oro/em/ssab/hpage.htm. Major highlights and accomplishments are also available to the public in the SSAB's annual report, *Oak Ridge Reservation Environmental Management Site Specific Advisory Board 1998 Annual Report*, which was published in October 1998. The various SSAB project teams are described along with their primary missions. The text of each of the recommendations submitted to DOE is given along with background information relevant to the recommendation.

### 3.10.8.1 End Use Working Group

In response to the state of Tennessee's recommendation that broad public involvement should be part of final remediation decisions on the Oak Ridge Reservation (ORR), DOE asked the SSAB to develop a process for deciding remediation levels for contaminated areas. In January 1997, the SSAB sponsored a public meeting to form the Oak Ridge End Use Working Group (EUWG). The EUWG, which completed its work in 1998 with numerous recommendations on end uses for contaminated land, forwarded the recommendations to the SSAB, which submitted them to DOE. The EUWG's final report, *Final Report of the Oak Ridge Reservation End Use Working Group,* was issued in July 1998. The EUWG also formed a Stewardship Committee, which issued its report, *Stakeholder Report on Stewardship,* in July 1998.

## 3.10.9 Use and Reuse of Contaminated Land

To provide a consistent land-use approach that would involve stakeholders in remediation and reutilization of contaminated land on the ORR, a reservation-wide strategy had been developed under the environmental management (EM) program in 1994 and 1995. The Common Ground process was a stakeholder-driven process to determine preferred land-use options for the ORR so that cleanup operations would be based on the

most likely and acceptable land uses (*Common Ground—Future Land Use Process for the Oak Ridge Reservation*, December 1995). Subsequent to the Common Ground process, and in response to requirements in DOE O 430.1, *Life Cycle Assets Management*, DOE-ORO established an integrated land- and facility-use process for land-use decision-making for proposed changes in land use outside the immediate plant boundaries. DOE O 430.1 requires DOE to involve stakeholders in land-use planning. Under the Comprehensive Integrated Plan, each site identifies and plans land- and facility-use changes based on programmatic need. The individual sites also ensure project review for various compliance issues. Any changes in land or facility uses in areas outside the sites must be approved by the process described in the Comprehensive Integrated Plan (see Sect. 3.11 for the Web address for the Integrated Plan). The review process includes the application of the following land-use priorities, which include stakeholder input from Common Ground and other citizen/stakeholder processes since 1994, including the EUWG of the SSAB (see Sect. 3.10.8.1).

- Priority 1—Preserve and protect land for meeting the requirements of existing and future DOE mission-related facilities and programs;
- Priority 2—Maintain land and facilities to promote sustainable economic development; and
- Priority 3—Protect the environment, meet the requirements of scientific and technical education, and support educational research opportunities on the ORR.

## 3.11 SOME WEB SITES AND A TOLL-FREE NUMBER

Information on environmental cleanup and waste management in Oak Ridge, including the Public Involvement Calendar, is available at the following Web addresses:

- http://home.doe.gov/ reaches the national DOE Web site;
- http://www.em.doe.gov takes you to the national DOE environmental management Web site;
- http://www.ornl.gov/emef/facts/public.htm provides public involvement information for the environmental management program in Oak Ridge;
- http://www.ornl.gov/~dmsi/cip/cip.htm gives you the Comprehensive Integrated Plan for the ORR;
- http://www.bechteljacobs.com/emef/newsfacts/facsheet.htm gives you a list of fact sheets on each of the Oak Ridge environmental management projects;
- http://www.ornl.gov provides access to all public ORNL home pages, plus home pages for the Y-12 Plant, the ETTP, ORAU, Energy Systems, and other sites of local interest; and
- http://www.oakridge.doe.gov/ reaches the DOE Oak Ridge Operations Web site.
- http://eimdb-web.bechteljacobs.org:8080/oreis/help/oreishome.html/ accesses the OREIS data from sampling events conducted on the ORR.

Stakeholders outside the local calling area may reach the Environmental Management Community Relations Office by calling toll-free 1-800-382-6938.