

# *Oak Ridge*

t e n n e s s e e



*A Citizen's Guide to the Environment*

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# A *Word from the Authors*

Welcome to *Oak Ridge, Tennessee — A Citizen's Guide to the Environment*. This truly is a citizen's guide, written by and for people who choose to make their home in this beautiful and friendly part of Eastern Tennessee.

We, the citizen authors of this guide, examined a wide range of sources in looking at current environmental and health conditions for Oak Ridge residents. We have concluded that Oak Ridge's federal plants do not threaten the environment of the community or the health of its residents where they live, work, and enjoy the city's many resources. On the contrary, Oak Ridge fares better than most cities across Tennessee and the United States in terms of environmental quality. Most important, we wanted anyone considering a move to Oak Ridge to have the information necessary to make this important decision. We are confident that once you have that information and visit Oak Ridge for yourself, you will come to the same conclusion we have: that Oak Ridge is an outstanding place to live.

The story of Oak Ridge is a rich one. This was a quiet, agricultural region for much of American history, but that calm came to an abrupt end in the middle of the 20<sup>th</sup> century. Almost overnight, the area saw dramatic growth in population and activity; Oak Ridge had become a major player in the Manhattan Project effort to create the first nuclear weapons. Today, Oak Ridge is a thriving city of 27,000 residents, many of whom have lived here for many years: working, raising families, and retiring to enjoy the many benefits offered in this safe, healthy, and affordable community.

There are those outside of Oak Ridge, however, who mistakenly believe that environmental problems have made the city an unhealthy place to live. Recognizing this perception, a diverse group of Oak Ridge citizens came together to provide residents—and potential residents—with an accurate and balanced understanding of environmental conditions in the city. This guide gives an overview of environmental health for both the community and the adjacent U.S. Department of Energy (DOE) reservation. It also explains how local citizens are working with DOE to correct environmental damage created by the agency during the Cold War. As an overview, the guide is not designed to provide detailed information on these topics, but it does identify resources where such in-depth information can be found.

Being neighbors to one of the nation's most active federal reservations has shaped the Oak Ridge community in many ways. Most of these by far have been positive, but not all. This guide discusses the environmental condition of Oak Ridge residential and business areas and the health of its citizens. At the same time, it recognizes that the DOE plants have released contaminants and that some people in the past may have been harmed by these releases. Work is under way on the DOE reservation to prevent future releases and to correct environmental damage there.

The citizens of Oak Ridge are not only well aware of environmental releases, they have played an instrumental role in detecting and correcting contamination from the reservation. These past releases do not pose a current risk to residential and commercial areas of the city.

This document was written and edited by a large group of local citizen volunteers. No government funding was used in its development; instead, all necessary services and resources were donated by more than 20 civic groups and businesses working together. We have made every effort to check and double check the facts presented in this guide to ensure that it provides a source of information you can trust.

March 2002



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## ACRONYMS

<b>ATSDR</b>	Agency for Toxic Substances and Disease Registry, an agency of the U.S. Department of Health and Human Services
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
<b>DOE</b>	U.S. Department of Energy
<b>EPA</b>	U.S. Environmental Protection Agency
<b>ETTP</b>	East Tennessee Technology Park, one of three major facilities on the DOE Oak Ridge Reservation
<b>ORNL</b>	Oak Ridge National Laboratory, one of three major facilities on the DOE Oak Ridge Reservation
<b>ORSSAB</b>	Oak Ridge Site Specific Advisory Board
<b>PCB</b>	polychlorinated biphenyl
<b>TDEC</b>	Tennessee Department of Environment and Conservation
<b>TSCA</b>	Toxic Substances Control Act of 1976
<b>TVA</b>	Tennessee Valley Authority
<b>Y-12</b>	Y-12 National Security Complex, one of three major facilities on the DOE Oak Ridge Reservation



## INTRODUCTION

Oak Ridge, Tennessee, holds a special place in American history. It is best known for supplying the special nuclear materials needed for research, development, and production of the first atomic bomb. Today, the City of Oak Ridge is home to approximately 27,000 residents, many high-tech businesses, and lush natural surroundings. The Department of Energy's (DOE) Oak Ridge Reservation, while located mostly within the city limits of Oak Ridge, is separated from business and residential centers by distance and natural barriers. In addition to its ongoing national defense role, the reservation is home to world-class research and development in energy, the environment, and many other areas.

Because they share the same name, the City of Oak Ridge and DOE's Oak Ridge Reservation often are mistakenly viewed as a single entity. A great deal of evidence has been developed to confirm that the community is a safe place to live; nevertheless, hazardous materials remaining on the DOE reservation have focused attention on the environment and on the health and safety of Oak Ridge residents.

This publication explains how Oak Ridge citizens and DOE are working together to resolve environmental issues resulting from years of research and development at the federal facilities. The guide does not address those environmental and social issues that are present in all communities, but looks at issues that are unique to Oak Ridge as host of the DOE reservation. Dozens of Oak Ridge citizens and organizations volunteered to develop the guide, which helps people understand the Oak Ridge community and the complex health and environmental issues that are important to its citizens.

The guide provides overviews of

- the history of Oak Ridge,
- environmental issues and monitoring in the city,
- environmental issues on the DOE Oak Ridge Reservation,
- cleanup and waste management on the reservation, and
- public involvement in cleanup of the reservation.

If you would like more detailed information, selected resources are identified throughout the document, and a list of information resources is included on page 27.

Copies of this guide and a brief summary version are available through the Oak Ridge Chamber of Commerce, 1400 Oak Ridge Turnpike, Oak Ridge, TN, 37830, Phone: (865) 483-1321. They can also be viewed at the Chamber's web site: **[www.orcc.org](http://www.orcc.org)**.

Copies can also be downloaded from the following web sites:

- **[www.local-oversight.org](http://www.local-oversight.org)**
- **[www.eteba.org](http://www.eteba.org)**
- **[www.eteonline.org](http://www.eteonline.org)**

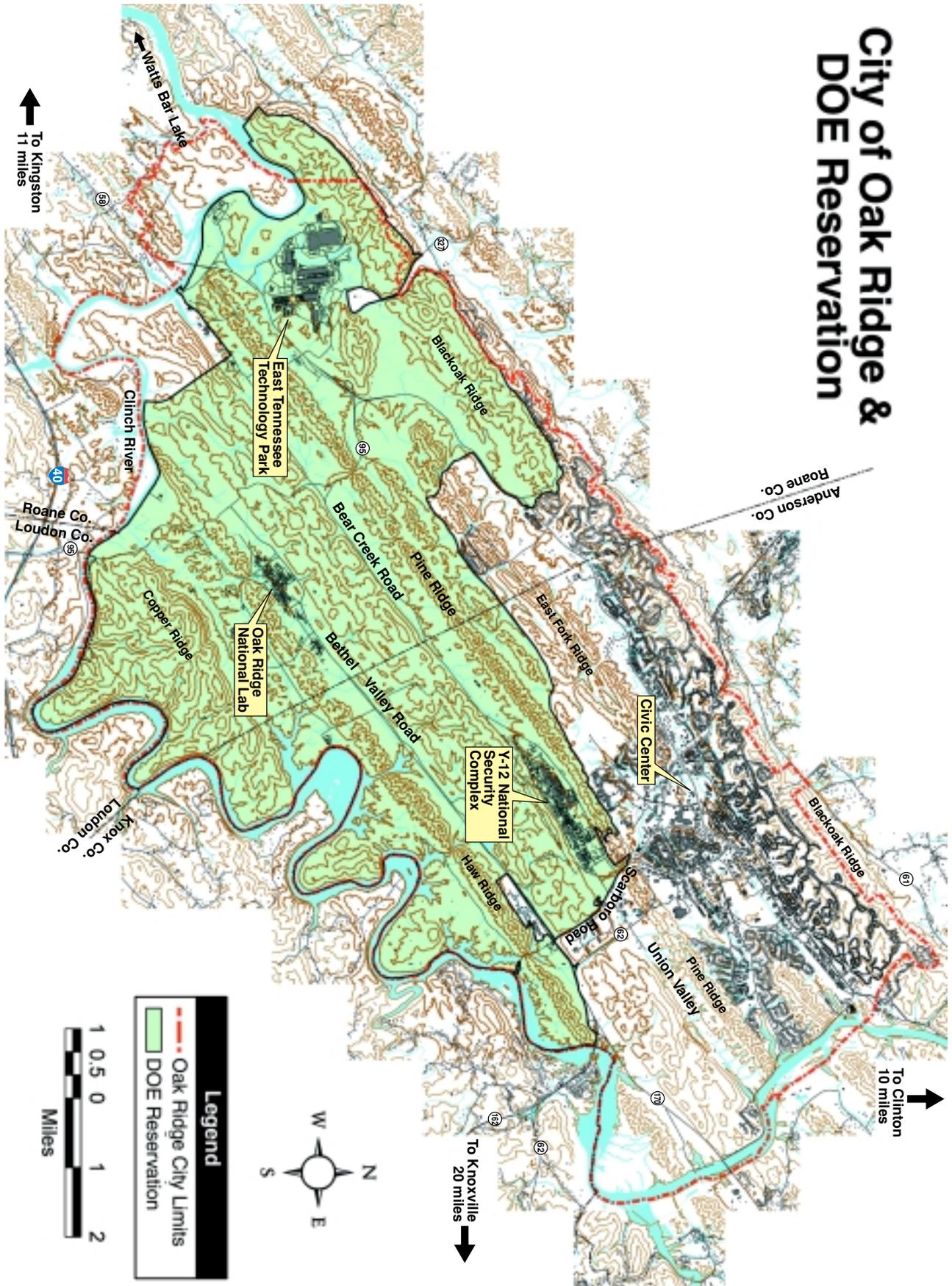
### ***Oak Ridge, Tennessee and Environs***



*Location of Oak Ridge in the Southeastern United States.*



# City of Oak Ridge & DOE Reservation





*Oak Ridge is situated next to the Clinch River in the ridges and valleys of eastern Tennessee.*



### **Oak Ridge History**

Oak Ridge lies along the Clinch River in the ridges and valleys of East Tennessee, between the Great Smoky Mountains and the Cumberland Plateau. The city is about 20 miles west of Knoxville and 170 miles east of Nashville. Most of the residential and commercial areas of Oak Ridge are in Anderson County, but a portion on the west end extends into Roane County. The natural setting supports diverse native plants and wildlife that are attracted to the abundant forested areas in and around the city.

This area saw the earliest homesteads in the Clinch River Valley, opened to European settlers by treaty with the Cherokee Indians in 1798. The area remained remote, sparsely populated, and largely agricultural until World War II.

In early 1942, the U.S. Army began discussions with the Tennessee Valley Authority (TVA) regarding the need for unusually large amounts of electrical power for a secret manufacturing plant. Army agents chose this area to build Manhattan Project facilities that would supply special materials needed for the first

*Scenes from the area of Oak Ridge prior to 1942.*





Construction scenes in the 1940's.



Y-12



K-25



atomic bomb. The site provided a series of isolating ridges, a source of water from the Clinch River, a labor pool from nearby Knoxville, and easy access to TVA-generated electricity from the nearby Norris Dam.

On September 29, 1942, Undersecretary of War Henry Stimson authorized the acquisition of 58,575 acres of land in Tennessee at an estimated cost of \$3.5 million. The "Secret City" was born. Within weeks, the people who farmed the land and lived in the area were bought out, and construction of facilities began. In early 1943, the project was named the Clinton Engineer Works, and in mid-1943 the town site became known as Oak Ridge. Housing and dormitories were built in less than a year to accommodate tens of thousands of workers. In its early years, the entire site was surrounded by a security fence, and access was limited to seven gates with armed guards.

In record time, three huge industrial complexes were created. K-25, now called East Tennessee Technology Park (ETTP), contained enormous structures to enrich uranium, boosting its content in the fissionable uranium-235 isotope through the gaseous diffusion process. X-10, now Oak Ridge National Laboratory (ORNL), housed the world's first full-scale nuclear reactor. This reactor, known as the Graphite Reactor, was used to develop techniques for producing plutonium used at Hanford, Washington, in the weapons program. At Y-12, now known as the Y-12 National Security Complex, a huge electromagnetic plant produced the enriched uranium used in the first atomic bomb. Over the span of three years, the government spent more than \$1 billion (equivalent to nearly \$20 billion in 2000), employed as many as 82,000 people, and transformed Oak Ridge from a rural farming community to the world's most modern manufacturing facility.



Now these facilities have new missions, and both Y-12 and ORNL are undergoing major renovations and facility modernization that will result in even safer operations and better environmental quality.



*The Y-12 National Security Complex.*

Y-12 now supports national defense by maintaining the viability of nuclear weapons, disassembling surplus weapons, and storing highly enriched uranium. It has also been designated the National Prototype Center by Congress in recognition of the unique expertise of its technical and manufacturing staff. The center develops first-of-a-kind, complex manufacturing items for other government agencies.

The immediate goal for ETTP is to complete the cleanup necessary for transition to an industrial park. Surplus facilities at ETTP are being leased to private industry under a plan known as “reindustrialization” (see page 23).

ORNL currently conducts research and development in a wide variety of scientific fields; it is widely known for its contributions to neutron science, and it is home to the nation’s newest large-scale research facility, the Spallation Neutron Source. ORNL is a leader in high-performance computing, environmental and carbon cycle research, complex biological sciences, and materials science, and it is heavily involved in all aspects of the nations’ progress and well-being.

*Research facilities at Oak Ridge National Laboratory.*



*East Tennessee Technology Park.  
Current views of the facilities built at Oak Ridge in the 1940s.*

Companies in Oak Ridge employ more than 200 Ph.D. ecologists and environmental scientists. These scientists have studied the environs and ecological system of the Oak Ridge Reservation for more than 50 years, making it one of the most studied ecosystems in the world. Many of these knowledgeable scientists live in Oak Ridge as well as work here,



demonstrating their belief that the city is a safe and healthy place.

During its early years, Oak Ridge lacked a municipal government, although residents could vote in state and county elections. In the 1950s, a town council was appointed, and in 1955 the *Atomic Energy Community Act* allowed Oak Ridge residents to establish local self-government and buy their homes and property from the government. In May 1959, the City of Oak Ridge

was incorporated under Tennessee law, and a local government was officially installed. Today, almost all of the DOE reservation is within the city's 92 square miles. However, the 24 square miles of residential, commercial, and light industrial areas that make up the community have distinct boundaries, with buffers separating them from the federal facilities.

Oak Ridge's 27,000 residents enjoy world-class education as well as social, recreational, health care, business, and professional opportunities.

*The City of Oak Ridge is home to a wide variety of resources and activities.*





**Oak Ridge's Melton Hill Lake serves as host to many prestigious national rowing events, including the Scholastic Rowing Association of America's 2002 championship regatta, and is a training site for the U.S. Olympic team.**

- In September 2000, The *Wall Street Journal's Offspring Magazine* ranked the Oak Ridge school system as one of the top 100 in the country and second in the South. The system has for decades been known for its academic excellence and rich extracurricular activities.
- The Oak Ridge Civic Music Association is recognized as the oldest continuing symphony orchestra in the state.
- The city maintains 15 parks, including three lakeside parks with boating, fishing, and swimming at Melton Hill Lake on the Clinch River. City parks occupy 1,068 acres, and Oak Ridge has greenbelt areas covering 1,300 mostly forested acres. Oak Ridge greenways include four hiking trails covering 12 miles in the greenbelts, two greenways totaling 9 miles on the DOE reservation, and the 3.6-mile multi-use Melton Lake Greenway.
- The city recently hosted the Cabela REALTREE Tennessee Pro/Am Championship for more than 1,300 archers, and Oak Ridge regularly hosts national and regional rowing events on its world-class course on Melton Hill Lake.
- Methodist Medical Center of Oak Ridge (MMC) is the center of regional health care services in a five-county area. MMC is fully accredited by the Joint Commission on Accreditation for Health Care Organizations and has the highest percentage of board-certified physicians of any hospital in the region.

## **Environmental Issues within Residential and Commercial Areas**

Many studies have shown that risks to Oak Ridge residents from the DOE operations are negligible. In its 2000 "Status Report to the Public," the Tennessee Department of Environment and Conservation (TDEC) stated, "there are no immediate threats to public health from current operations on the ORR" (Oak Ridge Reservation).

Oak Ridge is one of the safest cities in which to live because it is one of the most monitored, sampled, and analyzed. Sensitive aerial surveys of the city and DOE facilities were conducted in 1959, 1973, 1980, and 1989. These showed the residential and commercial areas of Oak Ridge to be largely free of man-made radioactivity. (The exception was a small amount of cesium spilled along a railroad track; this area has been completely cleaned up.) DOE and TDEC conduct extensive sampling and analysis around the DOE Reservation to ensure that contaminants from the reservation do not reach the public. The public has



access to the data, and local citizen groups regularly comment on monitoring procedures and results.

In addition to the TDEC Division of DOE Oversight annual "Status Report to the Public," DOE publishes an "Annual Site Environmental Report." These reports outline DOE activities on the Oak Ridge Reservation and the extent to which these activities affect human health and the environment. These reports present detailed information on the topics addressed in this section. The U.S. Environmental Protection Agency (EPA) reviews and independently approves all cleanup operations (see page 20). The Agency for Toxic Substances and Disease Registry (ATSDR) and the Tennessee Department of Health review the health impacts of releases from the DOE plants.

With few exceptions, contamination is confined to the immediate process areas at the plants and to waste disposal sites on the DOE reservation. Contamination on the reservation does not affect the commercial and residential sections of the city. The DOE reservation contains 55 square miles of mostly forested land. These vast forests adjoin the residential areas of Oak Ridge. Along with natural barriers such as ridges and rivers, the forests provide safety and security buffers around the DOE plants. They are also home to a rich diversity of plants and wildlife, with more than 200 bird species, more than 1,100 plant species (including 21 state-listed threatened species), and a rich variety of animal species, including deer, raccoon, fox, coyote, opossum, woodchuck, muskrat, beaver, otter, and mink. While it is taken seriously, this contamination does not now present a threat to Oak Ridge residents. Contamination on the DOE reservation is discussed starting on page 14.



*The DOE reservation is home to many rare and endangered species, including these plants, from top, the Pursh's wild petunia (*Reullia purshiana*, listed as a species of special concern in Tennessee), the tall larkspur (*Delphinium exaltatum*, listed as endangered in Tennessee), and the Canada Lily (*Lilium canadensis*, listed as threatened in Tennessee). The reservation is home to one of the world's largest populations of tall larkspur.*



*The Oak Ridge Playhouse in Jackson Square is in its 60<sup>th</sup> season.*

DOE is committed to an extensive and ongoing environmental monitoring and cleanup program to ensure the protection of the Oak Ridge community. Oak Ridge residents have taken an active and substantial role in DOE's planning. The activities responsible for past releases have been discontinued or modified, and contaminants have been cleaned up to the point that there is no current threat to public health or the environment.

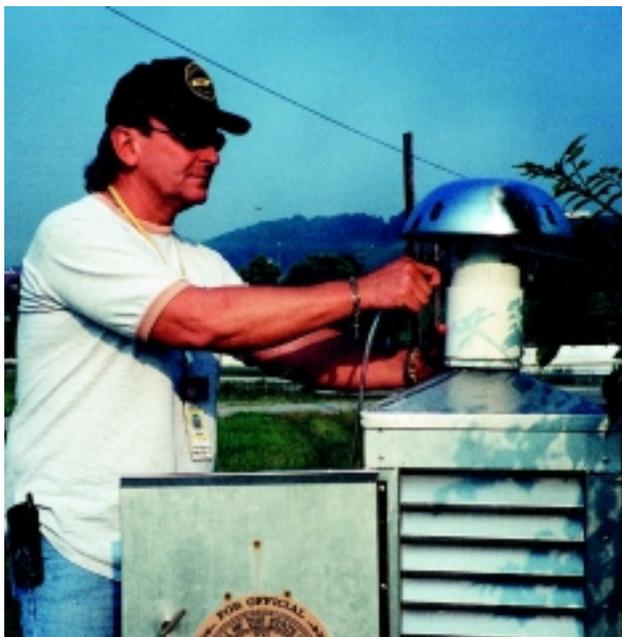
Current operations are a substantial improvement over past management of the reservation. Environmental controls in the plants' early decades were far less stringent than they are now, and hazardous materials were released into the environment. Most of these were remote from residential areas, but a few materials did reach public areas, and some residents may have been harmed in the past.

In 1992, the Tennessee Department of Health undertook a \$14 million research project to determine whether environmental pollutants released from the Oak Ridge Reservation had created public health problems. The agency appointed 12 individuals to the Oak Ridge Health Agreement Steering Panel to perform technical oversight of the work and provide some reflection of community opinion to guide activities. Results of the review suggest it is likely that some people were harmed by releases in the 1940s, '50s, and early '60s. The operations that released the pollutants responsible have long since been discontinued and therefore have no impact on the current health of residents.

Some former and current long-time workers at the DOE facilities have developed illnesses caused by past DOE operations. These illnesses are the result of less



stringent safety practices and equipment in place during earlier facility operations, a lack of industrial hygiene technology, and less protective government regulations. The safeguards were, however, the standard at the time. Stringent safety programs are now in place to prevent releases or worker exposures. The federal government established a program in 2000 to help qualified current and former workers with free lifetime health care for their occupational illnesses and tax-free financial compensation of \$150,000 each. These health conditions are confined to plant workers and are not communicable to other residents.



TDEC conducts a wide variety of monitoring throughout the Oak Ridge area.

**Community Health.** State Health Department statistics show that the City of Oak Ridge and the two counties in which it lies, Roane and Anderson, are healthy places to live. Compared to the state average, Roane and Anderson counties have fewer infant deaths and, adjusted for age, fewer cancer deaths, deaths from lung disease and deaths overall.

Table 1 presents the most recent, age-adjusted mortality rates for various counties in Tennessee. These counties contain the four major cities in Tennessee; for this document, we assume that each city has the same mortality rate as the county in which it is located. The mortality rates for Anderson and Roane counties are also shown, since Oak Ridge is located in both counties. The statewide rate is shown for comparison. The rates suggest that the overall health of Oak Ridge residents is as good as and may be better than that of the residents in these other counties and the state as a whole. Oak Ridge and its two host counties also rank better than average in most health categories when compared with the nation as a whole. In particular, cancer deaths in Oak Ridge are well below the national average.

**Table 1.**  
**Mortality rates for selected counties of Tennessee\***

County (City)	Mortality rate 1996-1998
Shelby (Memphis)	1,081.1
Davidson (Nashville)	1,042.4
Statewide average	979.4
Knox (Knoxville)	954.8
Hamilton (Chattanooga)	951.4
Roane (Oak Ridge)	931.0
Anderson (Oak Ridge)	908.9

Source: Tennessee Department of Health  
(<http://web.utk.edu/~chrg/deathrate.htm>)

\* Mortality rate per 100,000 residents from all causes of death. The rates shown include all races and both sexes, are adjusted for age, and are annualized for the period 1996-1998.

A very different impression was created several years ago when some media implied that the health of Oak Ridge citizens had been impaired by DOE operations.



Much has been done to investigate these allegations, but none of them can be verified. A similar impression was created in 1992 when, at the request of a local physician, ATSDR reviewed clinical data and medical histories of 45 of his patients. The physician believed that several categories of disease were elevated in patients of his practice as a result of chronic metal exposure. While he stated that he knew of no exposure pathways for this, he believed it was the result of heavy metals that might be in the area. ATSDR and the Tennessee Department of Health reviewed the data and concluded that the series of cases referred by the physician did not provide sufficient evidence to associate low levels of metals with the diseases present in the physician's patients. In addition, the Emory University School of Public Health conducted individual clinical evaluations of the physician's patients and reported no results of hazardous substance exposure.

Oak Ridgers live longer than most Americans. The data prove what residents know — that many of the people who came to Oak Ridge during World War II chose to remain in the community and have lived long and productive lives. Census data show that the average age of Oak Ridge residents is 43.4 years, compared to 35.9 for Tennessee and 35.3 for the United States. Residents over 65 make up 21.1 percent of Oak Ridge's population, compared to 12.4 percent for Tennessee and the United States.

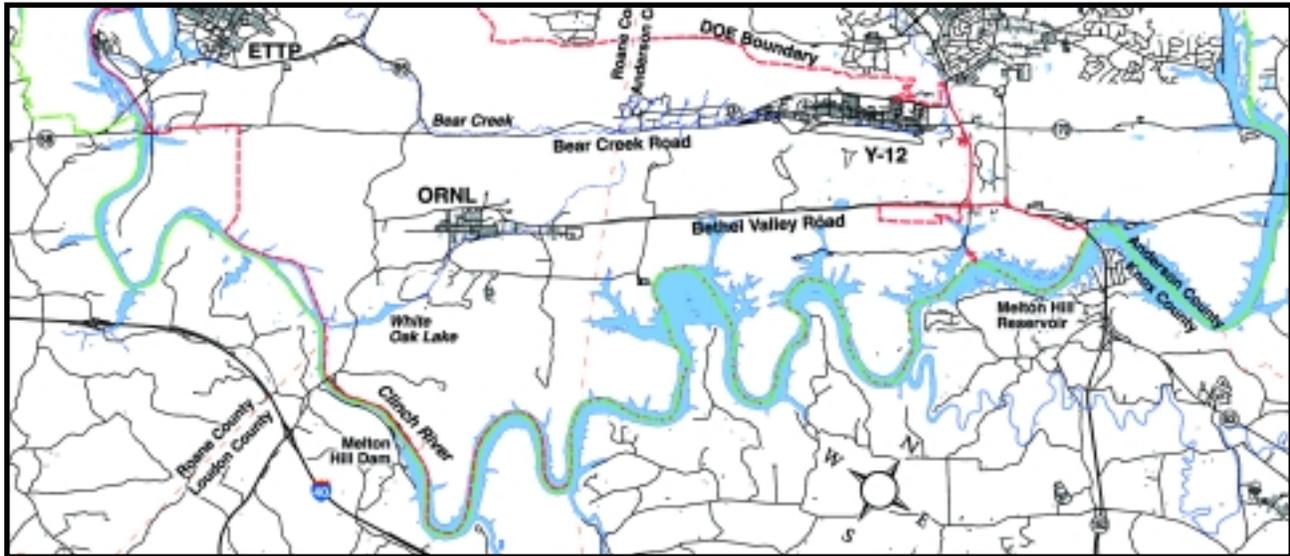
**Drinking Water.** Oak Ridge water meets or exceeds state and federal water quality standards. Drinking water for Oak Ridge comes from the Clinch River, about 15 miles downstream from TVA's Norris Dam and about a mile upstream from any DOE facility, and is pumped to the city's water treatment plant.

Drinking water is tested regularly for contaminants, including radionuclides. The city produces an annual "Water Quality Report," which is mailed to all Oak Ridge residents and shows the water to be of high quality and comparable to other cities in the state (see Table 2).

**Groundwater.** The vast majority of Oak Ridge residents use city water for drinking, but some nearby rural communities rely on well water. TDEC samples these wells to determine if contamination has migrated from the DOE reservation. Results are compared to maximum contaminant levels established by the Safe Drinking Water Act. Test results for chemicals and radioactivity indicate that the water in these wells is adequate for drinking and household uses. In addition, well users interviewed indicate no problem with groundwater quality.

A plume of groundwater contamination originating from Y-12 extends beneath Union Valley near Y-12 (see page 16). DOE monitors this plume and restricts use of the water by businesses in the area. This is the only contaminated groundwater known to extend beyond the DOE boundaries. There are no residences in the vicinity, and city water is supplied to all businesses.

**Surface Waters and Fishing** The vast majority of surface waters in and around Oak Ridge are safe for recreational uses. TDEC is responsible for monitoring state waters to determine their safety for drinking, fishing, and recreation. TDEC conducts sediment monitoring in the Clinch River at Melton Hill Park and in tributaries upstream of Clark Center Park, a popular swimming and recreational area. There is no significant contamination of sediments in these locations, and the water is safe for recreational uses.



However, fishing in a small portion of the Clinch River along the DOE reservation is restricted for a few species because of potential polychlorinated biphenyl (PCB) contamination. This portion of the river is downstream from residential areas of the city. In addition, the State has posted signs along Lower East Fork Poplar Creek to prevent consumption of fish that may be contaminated with mercury and PCBs. Lower East Fork Poplar Creek flows near some commercial and residential areas of the city. The creek is also

contaminated with fecal coliform bacteria, as are water bodies in many populated areas of the state. Because of this contamination, the creek is also posted to prevent contact with the water. Many other streams in the state are posted locally due to such contamination from industry and sewage.

Studies have shown that the creek's water quality is improving, and this trend is expected to continue. Updates to advisories can be found at [www.state.tn.us/environment/wpc/advisory.htm](http://www.state.tn.us/environment/wpc/advisory.htm).

**Table 2.**  
**Drinking water quality for Oak Ridge and other Tennessee cities (1999-2000)**

Impurity	Permissible	City			
		Oak Ridge	Knoxville	Chattanooga	Nashville
Alpha radiation (picocuries/liter)	15	2	1	2	ND
Beta emitters (picocuries/liter)	50	ND	3	7	ND
Barium (parts per million)	2	0.03	0.27	0.031	ND
Fluoride (parts per million)	4	1.07	1.5	1.03	1.05
Nitrate (parts per million)	10	0.41	1	0.61	0.25
TTHM (parts per billion)	80	59	67	62.3	48.5
Copper (parts per million)	1.3	0.054	0.012	0.094	0.33
Lead (parts per billion)	15	3	7	2.5	10

Notes: 1. No other contaminants reported by all communities. 2. No water system within 50 miles of Oak Ridge has had a health-based violation since at least 1993. ND = not detected. Source: <http://www.epa.gov/safewater/dwinfo/tn.htm>.



**Air Quality.** TDEC's annual air quality inspections show that air quality on the DOE reservation meets state air pollution control regulations. Air quality in Anderson County meets all regulatory criteria, although the region would not meet more stringent ozone regulations proposed by the EPA (see Table 3). Studies have also shown that current DOE operations have no important impact on levels of radioactivity in the city's air. TDEC also monitors overall levels of hazardous pollutants and the general level of radiation in the environment; it has found the levels of these contaminants to be in compliance with established standards. Typical off-site radiation exposures around the reservation are less than 1 percent of those allowed by regulations.

**Hunting and Wildlife.** Hunting is allowed by permit on the DOE reservation. It has been the practice for many years to test all game for contamination before it is released for human consumption. The Tennessee Wildlife Resources Agency oversees hunts for deer and wild turkey, and DOE samples the game for radionuclides. The deer hunts are the second most popular in the state, and requests for permits far exceed those available. Low levels of radioactive contamination are found in 1 to 2 percent of the 300 to 400 deer killed each year, and these animals are confiscated. In the three years that wild turkey hunting has been allowed, only one turkey was found to exceed criteria for release to the public. Canada geese are also captured and tested for radioactivity. No geese exceeded the game release limit in 1999, and none of the more than 230 geese tested in 2000 was contaminated at all. These few cases of contamination are found because wildlife are able to enter areas that are fenced off and inaccessible to people.

**Table 3.**  
**Comparison of air contamination (ozone) levels at various locations in Tennessee (days per year exceeding proposed regulatory limits)**

City (County)	CY 1999	CY 2000
Clingmans Dome (Sevier)	29	21
Knoxville (Knox)	20	12
Memphis (Shelby)	16	14
Oak Ridge (Anderson)	16	10
Nashville (Davidson)	15	3
Chattanooga (Hamilton)	11	9
Kingsport (Sullivan)	7	9

Source: <http://www.state.tn.us/environment/apc/03page.htm>.  
CY = calendar year.

**Agriculture.** Data show that there is no radiological contamination in locally produced milk or vegetables. Vegetables and milk are tested routinely to verify that they are not affected by contamination from DOE's facilities. Raw cow's milk samples are taken from four locations, and lettuce, tomatoes, and turnips are purchased from five gardeners in the vicinity of the DOE reservation and analyzed for contamination.

**Background Radiation.** Background gamma radiation varies markedly around the United States because of both natural features and human activity. Oak Ridge ranks very well in this area (see Table 4). Sampling in residential and commercial areas of Oak Ridge has not shown uranium levels that exceed federal health guidelines. In addition, current emissions from the DOE reservation are extensively monitored and are well below the regulatory limit.



**Table 4.**  
**Background gamma radiation**  
**at selected U.S. locations**

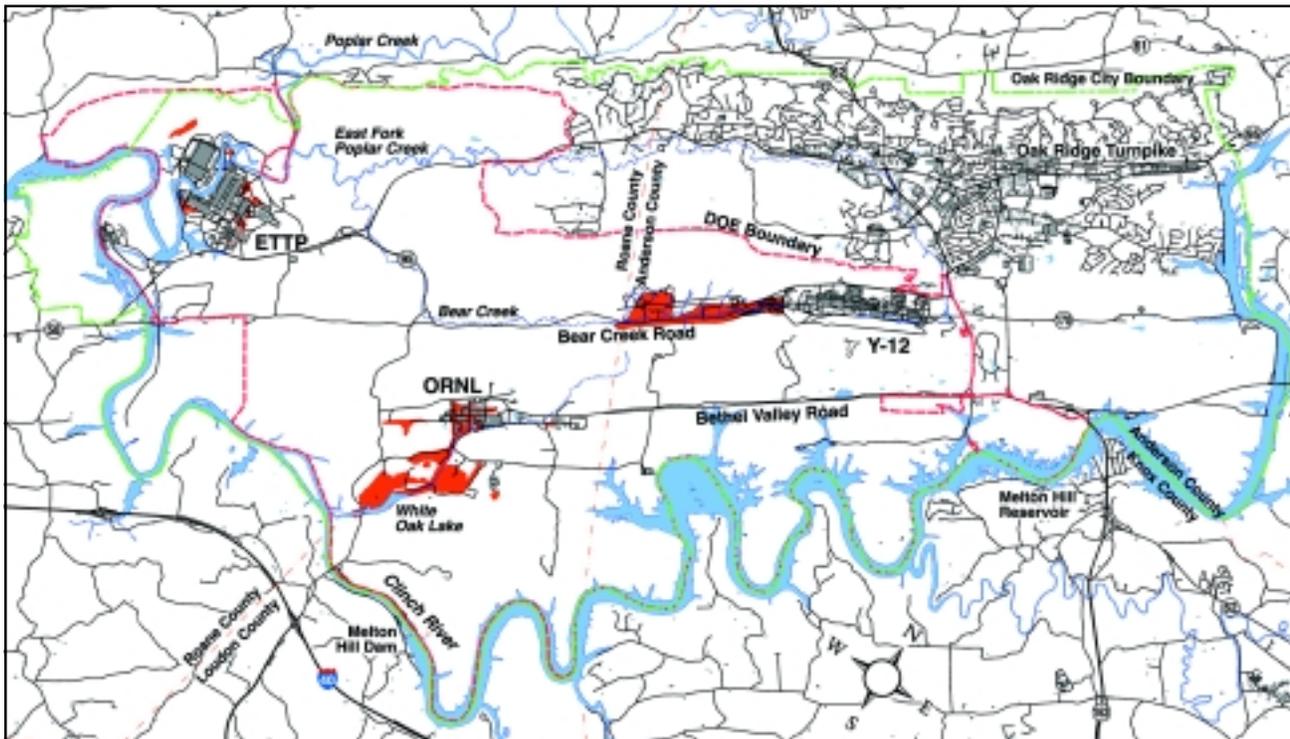
Location	Microrem/hour
Denver, CO	15.9
Pittsburgh, PA	13.4
Chicago, IL	9.5
Columbus, OH	9.0
Oak Ridge, TN	7.5
Orlando, FL	6.7

### Environmental Issues on the DOE Reservation

During World War II and the Cold War, the three federal plants generated waste that remained on the DOE reservation and released some toxins to the environment. Under a massive DOE effort (see page 20), these materials either have been or are being addressed according to state and federal requirements, with first priority given to the elimination of any potential risks to nearby residents. For the most part, contamination on the DOE reservation is still concentrated at the plant sites.

Contamination on the DOE reservation generally consists of low-level radioactive materials from production facilities and lesser amounts of other contaminants from research and development.

*Contamination on the DOE reservation is concentrated primarily in several main disposal areas and production sites, away from residential and commercial areas of the city.*

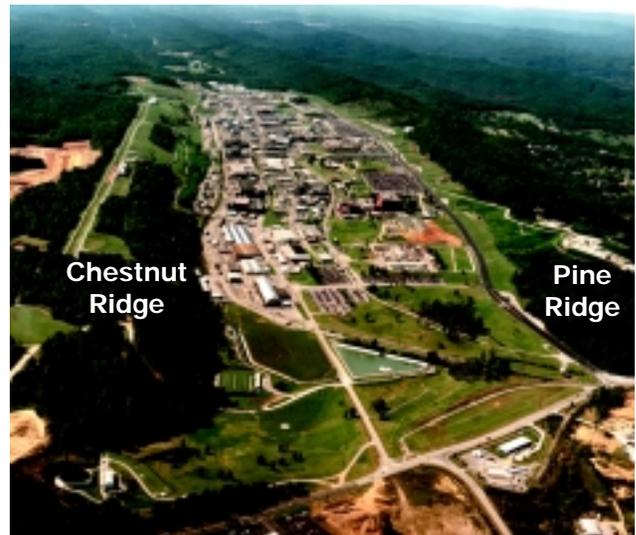




Hazardous industrial wastes typical of manufacturing plants were also produced. In the reservation's early operations, it was standard waste management practice throughout the world to place waste in unlined pits and trenches, evaporate water in unlined ponds, and direct the outflow of waste to rivers and streams. These practices would be unacceptable today, but they were normal at the time in all types of industry. Because of them, waste seeped into soils and groundwater on the reservation and must now be removed and isolated from the environment. The vast majority of the wastes today are contained in designated areas with limited access, buried in the ground, or contained in soils within the plant areas.

Any hazards to public health outside the DOE facility borders have been addressed, and the practices that caused them have ceased. From an environmental standpoint, the consequences have been primarily to the quality of surface water and groundwater on the DOE lands. Some of the land itself is occupied by buried waste, and these areas are restricted from public access.

While DOE has made substantial progress in controlling sources of contamination, small amounts do continue to leach from the soil and from some waste disposal facilities on the reservation. Except for those originating at Y-12, the pollutants leaving the reservation drain directly into the Clinch River, where they are diluted to nearly undetectable levels and carried away from the city. The water from most outflows meets drinking water standards even before it is diluted by the larger stream. However, water from a few outflows does not yet meet the environmental water standards designed to protect fish and other aquatic life.



*The Y-12 National Security Complex is located between Chestnut Ridge and Pine Ridge, isolating it from residential sections of the city.*

### ***The Y-12 National Security Complex and Bear Creek Valley***

The Y-12 National Security Complex is about 1 mile south of the Oak Ridge Civic Center and is separated from residential and business areas by Pine Ridge. The plant covers about 811 acres in the valley between Chestnut Ridge to the south and Pine Ridge to the north. Throughout its history, Y-12 has used various hazardous and radioactive materials, including volatile organic compounds, PCBs, uranium, thorium, beryllium, mercury, and other heavy metals.

***Mercury.*** Y-12 used mercury to separate isotopes of lithium for use in thermonuclear weapons. Over the years, an estimated 2 million pounds of this mercury was inadvertently released to the environment or otherwise unaccounted for. The vast majority of these releases took place in the 1950s, although small amounts continue to escape. Trapped in soil and porous spaces along building foundations, mercury is released slowly and carried by runoff to East Fork Poplar Creek, which flows out of the DOE reservation



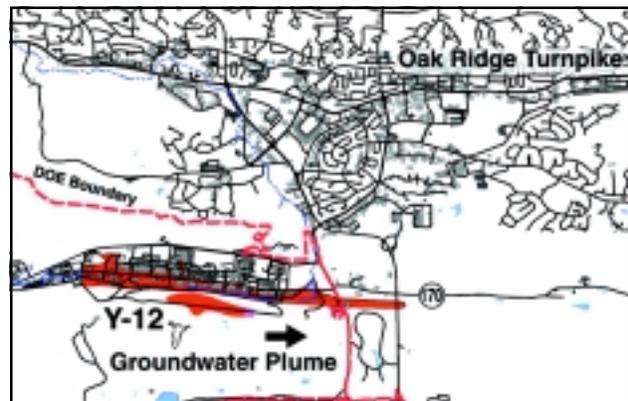
and through Oak Ridge before discharging into the Clinch River. The risk during times of heavy release was primarily to the unborn children of women who ate large amounts of fish from the Clinch River and Poplar Creek while they were pregnant. Mercury is no longer used at Y-12.

During the 1990s, DOE conducted a major study of mercury contamination in Lower East Fork Poplar Creek, the portion of the creek that winds through the Oak Ridge community. DOE and regulatory agencies were aided in this effort by a diverse working group of knowledgeable citizens who conducted an in-depth evaluation of issues critical to the creek cleanup. The group noted that most of the mercury found in the creek is in the relatively insoluble inorganic form, and it pointed to experimental results that showed no significant uptake of this form of mercury by people, plants, or farm animals. Based on its evaluation, the group recommended a method for deriving a cleanup level of the floodplain that was acceptable to the State, EPA, and DOE.

In 1996, DOE began excavating floodplain soils that had mercury concentrations higher than this cleanup level, a job that was completed in 1998. ATSDR concluded that the cleanup protects public health. While there is still some residual mercury in the creek, levels in the water are not a public health concern, according to ATSDR, and they are decreasing over time. Detailed studies found that levels of mercury in human hair and urine samples from residents were within normal levels. Aquatic wildlife in the creek has made a strong comeback in the last few years.

**Union Valley groundwater plume.** Organic fluids (such as carbon tetrachloride, which was once commonly used as a solvent in businesses and

residences throughout the United States) have leaked from Y-12 into a groundwater plume. This plume extends under Union Valley and slowly discharges exceedingly small amounts into a nearby stream. The amounts are at or below federal and state drinking water standards, and the stream does not flow through residential property. In addition, dilution, quick evaporation, and subsequent exposure to sunlight removes these chemicals in a short time. DOE imposes deed restrictions that prohibit use of the groundwater by businesses in Union Valley and is establishing a treatment system to reduce the material in the plume and serve as a barrier to its discharge.



Union Valley groundwater plume.

**Bear Creek and Bear Creek Valley.** Radioactive and toxic contaminants have in the past been released into Bear Creek or its tributaries, immediately west of Y-12, and to the groundwater below it. Nevertheless, water at the downstream mouth of the creek is suitable for drinking before it leaves the reservation. The contaminated groundwater is not expected to reach the boundary of DOE-owned land.



Bear Creek Valley contains much of the buried waste generated from Y-12.



Much of the waste material produced at Y-12 was disposed at facilities in Bear Creek Valley. The contaminants released from these disposal sites are at levels below regulatory standards before they leave the reservation, and they do not pass through residential or commercial areas of the city. About 20 percent of the 1,000 acres in the valley were used for waste disposal, including ponds, landfarms (surface spreading of wastes), landfills, trenches, and pits. The most significant challenges among Bear Creek Valley wastes include large volumes of uranium, with very long half-lives, and shock-sensitive and pyrophoric (easily combustible) materials.

**Uranium.** An additional environmental consideration at Y-12 was historical releases of uranium into the surrounding environment. It is estimated that as much as 100,000 pounds of uranium dust was released into the air from 1944 to 1995. Although Y-12 now complies with regulations, it is launching a major modernization program that will improve even further its ability to protect the environment.

### ***Oak Ridge National Laboratory and Melton Valley***



*Oak Ridge National Laboratory is located in Bethel Valley between Chestnut Ridge and Haw Ridge, 10 miles from the center of the city.*

**Bethel Valley.** ORNL occupies about 800 acres of Bethel Valley about 10 miles southwest of the Oak

Ridge Civic Center. Contaminants on-site are the result of a long history of nuclear research and development. Current ORNL employees are not threatened by the contaminants, which include tritium, fission products (primarily cesium-137 and strontium-90), and smaller amounts of other radioactive elements. The contamination is found in soil beneath some buildings and in pipelines, tanks, and other subsurface features such as sumps. Work is almost completed to remove, treat, and dispose of



*Melton Valley contains much of the waste generated by Oak Ridge National Laboratory and is separated from the lab by a ridge.*

contaminated sediments from four unlined waste ponds and several large waste tanks in the center of ORNL. In addition, there is a plume of groundwater contaminated with strontium-90 under the west end of ORNL that is being treated.

**Melton Valley.** Melton Valley occupies about 1,000 acres south and downstream from ORNL and is separated from Bethel Valley by Haw Ridge. Melton Valley was used largely for waste disposal, especially through the use of shallow land burial. The valley also contains seepage pits, contaminated floodplains, and deep waste disposal wells. Not all waste in the valley came from Oak Ridge. Beginning in the mid-1950s, Melton Valley was designated as the Southern Regional



Radioactive Burial Grounds and accepted industrial, medical, and commercial low-level radioactive waste from many non-DOE sources. From 1955 to 1963, various off-site installations sent about 1 million cubic feet of radioactive and hazardous solid waste for disposal in Melton Valley. Contaminants, some of which are slowly discharging into the Clinch River via White Oak Creek, include cesium-137, cobalt-60, strontium-90, tritium, other radionuclides, transuranic elements (heavier than uranium), and chlorinated organic compounds.

The tritium diffuses rapidly into the atmosphere and decays; the strontium remains in solution but is diluted to levels below concern by the much larger flow of the Clinch River. Cesium and other insoluble contaminants that accumulated over the past years in the sediments of Watts Bar Reservoir (downstream from ORNL and Melton Valley) are buried under approximately 18 inches of sediment. ATSDR has concluded that current contaminant levels in the water and sediment of the reservoir are not a public health concern and that the reservoir is safe for swimming, skiing, boating, and other recreational use. None of these radionuclides exceeds drinking water standards in waterways.

White Oak Creek was dammed in the 1980s to prevent contaminated sediments from entering the Clinch River; in 1992, an additional sediment control structure for suspended material was placed at the point of discharge into the Clinch River. The operations that caused radioactive and hazardous waste releases into the river have been discontinued, and cleanup operations are improving the situation even further. ATSDR has determined that the Clinch River is a good place to enjoy swimming, boating, and other



*The sediment control structure at the mouth of White Oak Creek reduces the outflow of contaminants into the Clinch River.*

water activities. There are no longer any restrictions on use of the Clinch River attributable to the Oak Ridge facilities, and discharges are carefully monitored and reported.

There is a fish consumption advisory for Watts Bar Reservoir because of PCBs. PCBs were once commonly used throughout industry, and many industries have contributed to their presence. Only about 20 percent of the PCBs in Watts Bar Reservoir have come from the DOE reservation. PCB advisories are common throughout the United States in rivers that flow through industrial areas. PCBs are long-lived, relatively insoluble chemicals that tend to stick to sediment particles and accumulate in the tissues of bottom-feeding fish, such as catfish, and in higher predatory fish such as bass and sauger. Panfish such as bluegill and crappie are not affected and are not included in the advisory.

To ensure that there is no unmonitored dredging or other disturbance of the deep sediments, a team of state and federal agencies reviews all projects in the reservoir, enforces restrictions, and issues permits as appropriate. Ongoing monitoring shows no threat to human health.



**Radioactive Iodine.** ORNL released radioactive iodine-131 from 1944 to 1956. The iodine made its way into the milk supply after it settled on grass that was eaten by dairy animals. High intake of contaminated milk may have, over a 70-year lifetime, caused thyroid abnormalities to as many as 80 persons, especially women who drank the milk as young girls. The operation producing iodine-131 was discontinued in 1956, and the released iodine-131 has long since disappeared by decay and no longer presents a health risk. (With a half-life of 8 days, iodine-131 decays to safe levels in approximately 3 months.)

amounts of neptunium, technetium-99, plutonium-239, beryllium, nickel, inorganic compounds, and other industrial pollutants such as PCBs and solvents.

Uranium, fluorine, and other toxic gases and fine particles were released into the atmosphere from ETTP while it was in operation, but releases over the last 15 years have been far below regulatory limits established to protect human health and the environment. Independent groups have analyzed these releases and concluded that they are not a hazard to current residents.



*East Tennessee Technology Park is located 13 miles from the Oak Ridge Civic Center along the Clinch River.*

### ***K-25/East Tennessee Technology Park***

ETTP occupies 1,500 acres about 13 miles west of the Oak Ridge Civic Center. The plant was built in the early 1940s to produce uranium enriched in the fissionable uranium-235 isotope. It was shut down permanently in 1987 and has, since then, focused on cleanup and waste management. As facilities at ETTP are cleaned to suitable levels, many are being leased to commercial tenants for reuse (see page 23).

Contaminants at ETTP include chemical compounds of uranium and fluorine, as well as much smaller

Contaminants at ETTP that are transferred by groundwater find their way primarily to nearby Mitchell Branch, Poplar Creek, and the Clinch River. Groundwater plumes of organic compounds, radionuclides, and some metals are mostly captured and treated on-site. While tests have shown release off-site, EPA has determined these levels are not a potential threat to human health or the environment.

DOE stores about 70,000 tons of depleted uranium hexafluoride at ETTP in steel containers. While plans have been developed to remove this material, work has not begun. Risk analysis shows that any reasonably



expected accident involving the uranium hexafluoride would not harm the existing residential area of Oak Ridge.

ETTP is also the site of a DOE-operated incinerator. The Toxic Substances Control Act (TSCA) Incinerator is the only incinerator in the United States permitted and designed to burn wastes containing both radioactive and hazardous components contaminated with PCBs. The incinerator accepts waste generated in Oak Ridge as well as waste from several other DOE sites around the country.

Two independent studies of the TSCA Incinerator were completed in 1997. One study, by the Governor's Independent Blue Ribbon Panel, concluded that the incinerator was being operated in accordance with regulatory requirements and that its operation did not pose an unacceptable risk to the public. The other study, sponsored by the Oak Ridge Reservation Local Oversight Committee, concluded that the incinerator was safe and that emissions from the incinerator were insignificant compared to emissions from commercial power plants and other incinerators. A new permit application is being reviewed by the state and EPA, and numerous very stringent tests have been performed in support of the application.



*The TSCA Incinerator.*

The incinerator is operated under a number of regulatory restrictions, and it incorporates many safety features to protect the public and workers during its operation. The incinerator is regularly inspected by TDEC to confirm that it is being operated in compliance with its permits. In addition, off-site air monitors are operated to ensure that site air permit requirements are met. Any resulting ash and cooling water is collected, managed, and disposed of as hazardous waste.

### **Cleanup and Waste Management on the Oak Ridge Reservation**

Since the DOE reservation was placed on EPA's National Priorities List in 1989, there has been intense focus on finding, characterizing, and cleaning up areas of contamination, both on and off the reservation. Through that process, independent government regulators have concluded there is no current threat to public health and the environment of the residential and commercial sections of the city.

DOE is working to clean up specific areas of its reservation to allow for uses that have been identified as acceptable to the public (see page 23) and to eliminate emissions from the reservation. Cleanup decisions are described in documents that are legally binding and subject to public comment. The DOE program includes the following:

- cleanup of waste areas and groundwater, beginning with high-priority projects;
- comprehensive cleanup of groundwater; and
- long-term maintenance, monitoring, and control of areas that will have residual contamination, to ensure protection of the city.

Much of the buried waste remaining on the reservation is being handled through a combination of treatment



in place and isolation from the surrounding environment. Contaminated sediments will be stabilized, burial grounds will be either excavated or capped and isolated from groundwater and surface water, and buildings will be decontaminated and dismantled. Controls such as caps will help prevent migration of the contamination off-site, and controls such as deed restrictions will help prevent people from coming into contact with these areas.

If these goals are to be met, Congress must continue funding Oak Ridge environmental cleanup projects. The Oak Ridge public has taken considerable interest in cleanup of the reservation. It is working with DOE, the State, and Congress to ensure that the government provides sufficient funding to satisfy its obligation to the Oak Ridge community. Continued visible improvements will occur only if the planned work is funded.

Cleanup of the reservation is governed primarily by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (also known as CERCLA or Superfund). The CERCLA process, managed by EPA, requires that cleanup decisions be documented in a series of standard, approved public reports:

- “remedial investigation” determines the extent of contamination.
- “feasibility study” identifies alternatives for cleanup.
- “proposed plan” identifies the preferred cleanup alternative.
- “record of decision” legally selects the cleanup approach.
- “remedial design work plan” and a “remedial action work plan” present designs and plans for implementing the selected cleanup approach.

In addition, CERCLA defines the cooperative interaction of government agencies and the role of the public in reviewing, commenting on, and approving each phase of the cleanup process. DOE is responsible for implementing the process. The State and EPA oversee and regulate the process and ensure that human health and the environment are protected.

### ***Cleanup Progress***

Much work has been done on the DOE reservation in the last 13 years. At first, this work consisted primarily of studies into the contamination, how it might be affecting people and the environment, and how problems might best be corrected. These studies have, for the most part, been completed, and the work now focuses on the active cleanup of contaminated sites and buildings.

DOE uses a plan called the Lifecycle Baseline to arrange cleanup projects by priority. This plan, which will be used for the duration of cleanup on the reservation, notes the expected timing and cost of specific projects. The highest priority has gone to contamination that may be an immediate risk on or near the reservation, and many of these projects have been completed.

Now that the immediate risks from contamination are under control, cleanup on the reservation focuses on the original sources of contamination. This approach prevents any further spread of contamination and prepares land and buildings on the reservation for future use. Projects currently under way include cleanup of soil and groundwater, demolition and decontamination of buildings, and treatment and disposal of wastes. This type of cleanup project will continue well into the future.



Since 1989, more than 50 major cleanup projects have been completed to control immediate risks, prevent the spread of contamination, and clean up contamination sources. More than 10 acres of contaminated facilities have been demolished, reducing risk further and making land available for reindustrialization of the ETTP site. Most of the waste containing both hazardous and radioactive elements (called mixed low-level waste) has already been disposed out of state, and the rest is scheduled for



*Large quantities of waste material have been shipped off the DOE reservation for disposal.*



*Building K-1001 at East Tennessee Technology park before . . .*

disposal in the near future. Waste generated in the cleanup process will be disposed in a modern, specially designed facility in Bear Creek Valley.

Each year, DOE produces a Remediation Effectiveness Report, and CERCLA requires a review every five years of completed remediation efforts for which the area has not been returned to unrestricted use.



*. . . and after demolition.*



*The S-3 Ponds at Y-12 before closure, containing acid, uranium, and other toxic materials.*



*The S-3 Ponds after closure.*



### **Reindustrialization of ETTP**

DOE is by far the largest economic force in the community, with current expenditures of approximately \$2.5 billion a year. To offset inevitable budget cuts, the city and local organizations have worked for many years to diversify the local economy.

In the mid-1980s, DOE shut down uranium enrichment operations at the K-25 Site, also known as the Oak Ridge Gaseous Diffusion Plant. In the early 1990s, the community worked with DOE and its contractors to study ways to reuse the site, now known as ETTP, in order to diversify the local industrial base after the cleanup work is completed. A reindustrialization program was created to accelerate cleanup of the site and allow for reuse of existing facilities and equipment by new industrial ventures. The Community Reuse Organization of East Tennessee (CROET) works with DOE to diversify the economy by recruiting private non-DOE businesses to the area, thereby offsetting the effect of DOE jobs lost to downsizing.

In the first five years of the program, DOE reported that more than 70 leases were signed with more than 30 companies to occupy facilities no longer essential to ongoing DOE programs. DOE also reports that more than 1,000 jobs have been created in total at ETTP, a number that includes the employees of contractors hired to decontaminate the facilities. As part of this process, tons of contaminated materials have been removed from the site.

Protection of the health and safety of workers and the community is an important aspect of reindustrialization. DOE and CROET—working with the State and regulatory agencies—have developed a detailed process to deal with these environmental concerns.

### **Public Involvement in Cleanup of the DOE Reservation**

Citizens have many opportunities to get involved in the Oak Ridge cleanup program. The DOE “Public Involvement Plan” includes a brief history of public involvement in Oak Ridge and details about environmental challenges on the reservation. It also outlines how and where stakeholders can participate. Other information sources include the monthly DOE “Public Involvement News” [to obtain copies or get on the mailing list, call DOE Public Affairs at (865) 576-0885 or contact the DOE web site at [www.oakridge.doe.gov/em/](http://www.oakridge.doe.gov/em/)].

Residents can get involved through several organizations that focus on environmental issues.

- The Oak Ridge Environmental Quality Advisory Board, created following the first Earth Day in 1970, provides environmental leadership to the community and advises City Council, the city manager, and the Regional Planning Commission on environmental matters. Twelve citizen volunteers serve on this official city board.
- The Citizens’ Advisory Panel was created in 1995 to advise local public officials through the Oak Ridge Reservation Local Oversight Committee.
- The 20-member Oak Ridge Site Specific Advisory Board (ORSSAB) was created to advise and make recommendations to DOE’s Environmental Management Program. The board has two non-voting student participants who represent the viewpoints and concerns of area youth.
- The Oak Ridge Reservation Health Effects Subcommittee was created in 2000 by ATSDR. The subcommittee advises ATSDR and the Centers for Disease Control and Prevention on public health activities related to the Oak Ridge Reservation.



*Public meetings and workshops are a common sight in Oak Ridge.*

A fifth initiative involved more than 100 local citizens in an effort to help DOE plan for the future use of contaminated sites on the reservation. The End Use Working Group grew out of concerns raised in 1996 by EPA and the State, which believed DOE needed more broad-based community involvement in its cleanup decisions. In response, DOE asked ORSSAB to launch an effort to collect community viewpoints on future land use.

A public meeting was held in January 1997 to attract volunteers for the End Use Working Group. More than 100 people attended some of the group's meetings, and about 20 individuals participated actively over the next 18 months. The "Final Report of the Oak Ridge Reservation End Use Working Group" was published in 1998 with a set of community values and recommendations for future land use. These recommendations continue to influence DOE cleanup decisions. The report is available at [www.oakridge.doe.gov/em/ssab/pubs.htm](http://www.oakridge.doe.gov/em/ssab/pubs.htm).

### **Long-Term Environmental Stewardship**

Some waste materials will necessarily remain on the DOE reservation for the foreseeable future because of financial, technological, or safety issues.

As a result, long-term strategies will be required to ensure that remaining contamination does not threaten people or the environment. These strategies will include the following:

- physical/engineering controls,
- institutional controls (i.e., laws and regulations that limit how a site can be used or who can have access to it),
- preservation of information,
- designation of caretakers,
- assurance of public information and public input, and
- provisions for funding.

The responsibility for these measures is known as "stewardship."

Citizen groups have been working with DOE, EPA, TDEC, and local governments since 1997 to develop an effective stewardship program for contaminated areas on the DOE reservation. These efforts have resulted in two Stakeholder Reports on Stewardship, one in July 1998 and the other in December 1999. These reports, written entirely by local citizens, were widely distributed and have influenced DOE stewardship planning at both the local and national level. They are available at [www.oakridge.doe.gov/em/ssab/pubs.htm](http://www.oakridge.doe.gov/em/ssab/pubs.htm). A citizen's group under the auspices of ORSSAB continues to provide stewardship advice and recommendations to DOE.



## CONCLUSION

The authors of this guide are unanimous in our belief that the City of Oak Ridge is a healthy and environmentally safe place to live. We made many positive discoveries as we prepared the guide. Foremost, we were struck by the level of involvement Oak Ridgers have in their community. The residents of Oak Ridge have a sense of pride and commitment to the city that speaks more clearly to its value as a hometown than any description of its safety or many amenities. Citizens are involved at every level and in every aspect of the community. The multitude of opportunities for direct involvement in the decisions that affect life in Oak Ridge provides its citizens with the kind of direct democracy that makes communities work.

It was also clear in doing the research for this guide that Oak Ridge is one of the most closely monitored cities in the country. Its air, water, and natural resources are so closely watched and so completely understood by so many different groups that residents are far more informed about and protected from environmental pollution than in a typical community.

This is not to say that Oak Ridge is free of the environmental, health, economic, and social problems that face all communities. But the city has highly informed and involved residents, and there are few problems that are not being addressed in positive and effective ways. We have little doubt that Oak Ridge will remain an outstanding place to make a home long into the future.

*Oak Ridge has had a farmer's market pretty much since the city's creation. The current market at Jackson Square is open Saturday mornings and Wednesday afternoons from May through October. Local growers sell fruits, vegetables, plants, cut flowers, and honey.*





## ACKNOWLEDGMENTS

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- East Tennessee Environmental Business Association

- Environmental Quality Advisory Board, City of Oak Ridge
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- Oak Ridge Convention and Visitors Bureau
- Oak Ridge Environmental Justice Committee
- Oak Ridge Reservation Local Oversight Committee/Citizens' Advisory Panel
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## RESOURCES

Thousands of documents comprising hundreds of thousands of pages have been produced that elaborate on environmental and health issues surrounding the Oak Ridge Reservation. The following documents and web sites will give you a well-rounded understanding of these issues and will point you to further information if you are interested.

An excellent source for most resources is the DOE Information Center at 475 Oak Ridge Turnpike in Oak Ridge. Additional resources may be identified through the Oak Ridge Site Specific Advisory Board at (865) 241-3665.

Data for the guide were also drawn from reports issued by the Tennessee Department of Environmental and Conservation Office of DOE Oversight, 761 Emory Valley Road, Oak Ridge. Interpretation of all data was done by authors of the guide.

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## **Internet Resources**

### **DOE Oak Ridge**

- DOE Oak Ridge Operations, Home Page: <http://www.oro.doe.gov/>
- DOE Oak Ridge Environmental Management: <http://www.oakridge.doe.gov/em/>

### **Government Agencies**

- Agency for Toxic Substances and Disease Registry: <http://www.atsdr.cdc.gov/>
- U.S. Environmental Protection Agency, Region 4: <http://www.epa.gov/region4>

### **City of Oak Ridge**

- Oak Ridge web site: <http://www.cortn.org>

### **State of Tennessee**

- Tennessee Department of Environment and Conservation: <http://www.state.tn.us/environment>
- Tennessee Department of Health: <http://www.state.tn.us/health/>