CHAPTER 6: CUMULATIVE IMPACTS

This chapter considers past, present, and reasonably foreseeable actions that could, along with the Y-12 Site-Wide Environmental Impact Statement (SWEIS) alternatives, result in cumulative impacts to the environment.

6.0 OVERVIEW

The Council on Environmental Quality (CEQ) regulations that implement the procedural provisions of the *National Environmental Policy Act* (NEPA) defines cumulative impact as the "impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 *Code of Federal Regulations* (CFR) Part 1508.7). Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity is taking the actions. The cumulative impact analysis in this chapter is based on continued operations at Y-12, other actions associated with ORR, and offsite activities with the potential to contribute to the cumulative environmental impact.

6.1 METHODOLOGY AND ANALYTICAL BASELINE

Based on the analysis presented in Chapter 5, a cumulative impact analysis focuses on those resources, ecosystems and human communities with the greatest potential for cumulative impacts. These resource areas include land use, traffic and transportation, socioeconomics, waste management, health and safety and air quality. The analysis has been conducted in accordance with CEQ NEPA regulations and the CEQ handbook, "Considering Cumulative Effects Under the National Environmental Policy Act (CEQ 1997a)," on the preparation of cumulative impact assessments.

Cumulative impact assessment is based on both geographic (spatial) and time (temporal) considerations. Historical impacts at Y-12 are captured in the existing No Action Alternative as are those associated with the decisions made in the Records of Decision on the *Complex Transformation Supplemental Programmatic Environmental Impact Statement* (73 *Federal Register* [FR] 77644 and 73 FR 77656, December 19, 2008) and other U.S. Department of Energy (DOE) decisions already made, including those considered in the Y-12 Modernization Environmental Assessment and Finding of No Significant Impact (DOE/EA 1548) that will affect future impacts. Future impacts will be analyzed for the same timeframe as the alternatives analyzed in this SWEIS (2009 – 2019). Geographic boundaries vary by discipline depending on the time an effect remains in the environment, the extent to which the effect can migrate, and the magnitude of the potential impact. These geographic areas are referred to as regions of influence (ROIs) Based on these factors, DOE has determined that for impacts to waste generation and public and worker health, a 50-mile radius surrounding ORR is the potential impact area. The impact area for transportation and socioeconomics is a four-county area in Tennessee where

more than 90 percent of ORR workforce resides: Anderson, Knox, Loudon, and Roane. The impact area for land use is ORR and adjoining properties.

6.2 POTENTIALLY CUMULATIVE ACTIONS

In addition to this SWEIS, actions that may contribute to cumulative impacts include on- and offsite projects conducted by Federal, state, and local governments, private sector, or individuals that are within the ROIs of the actions considered in this SWEIS. Information on present and future actions was obtained from a review of city, county, state and Federal information as well as any known plans in the private sector. *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and NEPA documents were reviewed to determine if current or proposed projects could affect the cumulative impact analysis at Y-12. The potentially cumulative actions discussed below are those that may contribute to cumulative impacts on or in the vicinity of Y-12. For those actions that are speculative, not yet well defined, or are expected to have a negligible contribution to potential aggregated cumulative impacts, the actions are described but not included in the cumulative effects.

6.2.1 Potential Future Modernization Projects

Several new facilities have been proposed as part of the integrated modernization efforts at Y-12 and are expected to be constructed after 2015. These facilities are included in the Y-12 Master Site Plan which represents a vision of the end state that the National Nuclear Security Administration (NNSA) wants to achieve in the next 20 to 25 years (Figure 1.2-2). Table 3.3-1 lists the future modernization projects that would replace old, outdated existing facilities. Because planning for these facilities has not been initiated, no detailed quantitative impacts have been assessed. However, modernized facilities would be expected to reduce health impacts to workers and the public, incorporate pollution prevention/waste minimization measures in their operation, and reduce emissions to the environment compared to the facilities that are currently operating.

The need to deactivate and decommission NNSA current and future excess facilities is expected to increase as a result of modernization. Over the next 10 years, over 1.6 million gross square feet of space will become excess to NNSA. Some of this space is process-contaminated. An additional 1 million gross square feet of excess space would be available for decontamination and decommissioning (D&D) once DOE's Office of Science (DOE-SC) has completed its final phase of relocation from the Y-12 Site to the Oak Ridge National Laboratory (ORNL). This has left seven buildings which will undergo D&D by the DOE Office of Environmental Management (EM) under the Integrated Facilities Disposition Plan (IFDP). In addition one DOE Office of Nuclear Energy (DOE-NE) facility, four EM facilities, and seven NNSA facilities are vacant and will undergo D&D by EM under the IFDP. To the extent that some of these activities have already occurred or decisions have already been made to proceed, some impacts from these activities are reflected within data provided for the No Action Alternative. Cleanup and D&D activities conducted under CERCLA are reviewed through the CERCLA process (see sections 5.13 and 5.16). The deactivation of process-contaminated facilities has the potential to significantly reduce surveillance and maintenance.

6.2.2 Operation of the Spallation Neutron Source

In 1999, DOE issued a *Final Environmental Impact Statement for the Construction and Operation of the Spallation Neutron Source* (SNS EIS) (DOE/EIS–0247) (DOE 1999), and a Record of Decision (ROD) to construct and operate the SNS (64 FR 35140). Construction of SNS conventional facilities began in 1999 and was completed in 2004. The SNS conducted a commissioning run on April 28, 2006, and is currently operational. The SNS is an accelerator-based research facility that provides the United States scientific and industrial research communities a high-energy proton source that generates pulses of neutrons to examine the atomic properties of a variety of materials.

The potential impacts from the construction and operation of the SNS were identified for wetlands, protected species, cultural resources, transportation, infrastructure and research projects in the Walker Branch Watershed. The SNS EIS estimated that construction of the SNS would affect 0.23 acres of wetlands. A mitigation action plan was developed to address the potential environmental impacts, including cumulative effects. In 2000, a supplement analysis evaluated the potential impacts from incorporating superconducting accelerator technology at SNS (DOE 2000b). The addition of a superconducting technology was found to have no significant environmental impacts (DOE 2005a).

6.2.3 Lease of Parcel ED-6 and Land and Facilities within the ETTP

DOE issued the *Environmental Assessment U.S. Department of Energy Conveyance of Parcel ED-6 to the City of Oak Ridge, Tennessee* (DOE/EA-1514) (DOE 2007a) and a Finding of No Significant Impact on May 9, 2007. Parcel ED-6 is primarily undeveloped land located within the city of Oak Ridge, west of Wisconsin Avenue, south of Whippoorwill Drive, north of Oak Ridge Turnpike (SR 95) and east of the Horizon Center Industrial Park. The property being conveyed is part of the National Environmental Research Park (NERP) and is within the Poplar Creek Road Unit of the Oak Ridge Wildlife Management Area (WMA). The Environmental Assessment (EA) analyzes the potential impacts associated with three action alternatives–Proposed Action, Mixed Development Alternative, and Conservation Easement Alternative and the No Action alternative. All of the action alternatives involve the conveyance of approximately 362 acres under 10 CFR Part 770 to the city of Oak Ridge but differ in how and the amount of the land that will eventually be developed. Under the Proposed Action, only a portion of the land transferred (i.e., land located west of Wisconsin Avenue and north of East Quarry Road) would be used for residential development due to topography and utility right-of-way (ROW) constraints on other portions of the parcel. The Mixed Development Alternative would involve both commercial and residential development. Under the Conservation Easement Alternative, portions of the transferred land located west of Wisconsin Avenue would be included in the Black Oak Ridge Conservation Easement.

The potential impacts from development under the Proposed Action are primarily to land use, ecological resources, and socioeconomics. Development under the Proposed Action, while compatible with local zoning requirement, would result in a change to the present land use of the ED-6 parcel as well as remove area from the NERP and the Oak Ridge WMA. Development also could result in potential elimination of up to 174 acres of deep forest habitat and adversely

impact neo-tropical migratory birds that use the area for breeding and migration. Potential positive impacts could be realized from additional tax revenues depending on the number of housing units built or potential negative impacts could also be realized from the loss of DOE payment-in-lieu-of-tax revenues due to the transfer.

6.2.4 Surplus Highly Enriched Uranium Disposition Activities

DOE issued the *Storage and Disposition of Weapons-Usable Fissile Materials, Final Programmatic Environmental Impact Statement* (DOE/EIS-0229) (DOE 1996b) in December 1996. In the Final Environmental Impact Statement (EIS), DOE considered the potential environmental impacts of alternatives for a program to reduce global nuclear proliferation risks by blending up to 221 tons of U.S.-origin surplus highly enriched uranium (HEU) down to low enriched uranium (LEU) to make it non-weapons usable. Because of the huge amount of recoverable energy stored in the HEU and its great economic value, DOE plans to convert approximately 165 tons of the surplus HEU to commercial or research reactor fuel. A substantial quantity of the HEU has already been converted to LEU reactor fuel. The remainder will be converted by about 2015. DOE has transferred 14 metric tons of uranium in the form of highly-enriched UF6 and 51 tons of HEU metal and oxides as required by the United States Enrichment Corporation (USEC) Privatization Act. Down blending of this material was completed in the summer of 2006. Additional off-specification material, not suitable for sale on the open market, will be transferred to the Tennessee Valley Authority (TVA) for use in reactors. In addition, there is also approximately 11 tons of surplus HEU under the International Atomic Energy Agency (IAEA) safeguards at Y-12 since 1994. The facility where it is stored is to be decommissioned around the year 2010 in order to enhance security and reduce costs at Y-12. The IAEA-safeguarded HEU must be removed from Y-12 before the facility can be decommissioned. The NNSA Office of Fissile Material Disposition will contract for down blending approximately 19 tons of surplus HEU for use in commercial power reactors. Down blending this material will enable disposition of the material subject to international safeguard monitoring. Approximately 11 tons of HEU has been reserved for use as fuel in foreign research reactors. This material will be down blended to low enriched uranium fuel and sold through NNSA contracts for use as fuel. The HEU Disposition Program will continue to develop disposition pathways for the remaining material which can be down blended and used as fuel in power or research reactors. Approximately 25 tons of the surplus HEU is not usable for commercial-grade fuel and will be disposed of as waste at a high-level geologic waste repository or a low-level waste (LLW) facility. DOE is preparing detailed plans for the disposal of the remaining surplus HEU. Only a small portion of this material is stored at Y-12.

6.2.5 Oak Ridge Integrated Facility Disposition Project

As part of the environmental cleanup strategic planning, DOE-Oak Ridge Office (ORO) and EM in coordination with the DOE-SC, DOE-NE, and the NNSA are developing an IFDP. The IFDP is a strategic plan for disposing of legacy materials and facilities at ORNL and Y-12 using an integrated approach that results in risk reduction, eliminates $70 to $90 million per year in cost of operations, provides surveillance and maintenance of excess facilities, and management of other legacy conditions. The IFDP includes facilities currently in the ORO EM life-cycle baseline and newly identified excess (or soon to be excess) facilities. Under the IFDP, the D&D

of approximately 188 facilities at ORNL, 112 facilities at Y-12, and remediation of soil and groundwater contamination would occur over the next 30 to 40 years. The IFDP will be conducted as a remedial action under CERCLA. Benefits of the IFDP include reduced risk to workers and the public from potential exposure hazardous and radioactive materials; and the reduction of surveillance and maintenance costs for obsolete, inactive facilities. On June 21, 2007 a Critical Decision (CD)-0 was approved. Approval of the CD-1 package is expected in early 2009.

6.2.6 General Area-Wide Growth and Infrastructure Upgrades and Expansion

Area-Wide Economic Growth. DOE operations in Oak Ridge continue to be a significant contributor to the State of Tennessee and the ROI economies. DOE employment and spending generate additional jobs and have fueled development in the ROI. In 2004, spending by DOE and its contractors led to an increase of approximately $3.7 billion in the state's gross state product (UTenn 2005). Continued modernization activities at Y-12 and ORNL, reindustrialization activities at East Tennessee Technology Park (ETTP) and new construction at Y-12 and ORNL will continue to fuel economic growth in the ROI and the State of Tennessee for the foreseeable future. Some of the major projects considered in this cumulative impact analysis include the Rarity Ridge development, the renovation of Oak Ridge Mall, and the development of the Horizon Center.

DOE wetland/floodplain properties at the former Boeing site across the Clinch River from the Oak Ridge K-25 plant were conveyed to develop approximately 1,200 acres. Rarity Communities Inc. is developing 1,500 homes inside the city limits of Oak Ridge at this site. The Horizon Center is a new business and industrial park located on 957 acres in Oak Ridge. The site is within the corporate city limits of Oak Ridge, and is 10 miles west of its central business district. The developers of Horizon Center plan to accommodate the development of approximately 4 million square feet of manufacturing, research and development, distribution, office, and support facilities.

Highway Improvement Projects. Several highway improvement projects have been proposed within the SWEIS ROI. In Anderson and Roane counties, a 4.1 mile section of State Route (SR)-95 from near Westover Drive to SR-62 in Anderson and Roane counties will undergo reconstruction and widening. This proposed improvement will reconstruct SR-95 from a four-lane undivided road to a four-lane divided road. In Loudon County, Tennessee Department of Transportation (TDOT) plans to improve the right-of-way of the intersection of SR-73 and SR-2.

In Knox County, three highway improvement projects are proposed along sections of Interstate (I)-40, SR-115 and SR-131. A 2.2 mile section of I-40 from I-275 to the Broadway Connector at Cherry Street will be widened. A 2.2 mile section of State Route 115 (Alcoa Highway) from north of the Bridge over the Little River to Maloney Road will be widened. Improvements to SR-115 will follow the existing alignment but the route will be improved from a four lane divided road with left turns to a six-lane divided road with no direct turns. In addition, a 3.5-mile section of SR-131 (Emory Road) from north of Bishop Road to SR-71 will be widened from a two-lane to a five-lane road. These three proposed project are expected to have a direct

positive impact on the flow of traffic, especially in the downtown Knoxville area, and ensure a safer, more efficient means of travel.

6.2.7 Tennessee Valley Authority Power Plants and Projects

The TVA is the nation's largest public power company with a multi-state service area, and 33,000 megawatts of dependable generating capacity. Through 158 locally owned distributors, TVA provides power to nearly 8.5 million residents of the Tennessee Valley. TVA operates 21 hydroelectric dams, seven coal-fired power plants, two nuclear power plants, and four combustion turbine sites in Tennessee, with a combined generating capacity of more than 19,000 megawatts. There are more than 9,200 TVA employees based in Tennessee. By 2010, TVA will have spent about $6 billion on emissions controls at its fossil-fuel plants to ensure that this power supply is generated as cleanly as possible, consistent with efficiency

6.2.7.1 *TVA Power Plants*

A description of the TVA power plants within 50 miles of Oak Ridge is as follows:

1. Norris Dam

- Norris provides 809 miles of shoreline and 33,840 acres of water surface.
- The recreational use of Norris Reservoir exceeds that of any other tributary reservoir in the TVA river system.
- Norris Dam is 265 feet high and stretches 1,860 feet across the Clinch River.
- The generating capacity of Norris is 131,400 kilowatts of electricity.

2. Douglas Dam

- Douglas provides 513 miles of shoreline and about 28,420 acres of water surface for recreation activities.
- Douglas Dam is 202 feet high and stretches 1,705 feet across the French Broad River.
- The generating capacity of Douglas's four units combined is 165,600 kilowatts of electricity.

3. Cherokee Dam

- Cherokee Reservoir provides nearly 400 miles of winding shoreline and about 28,780 acres of water surface.
- The dam is 175 feet high and stretches 6,760 feet from one end to the other.
- The generating capacity of the four hydroelectric units at Cherokee is 135,200 kilowatts of electricity.

4. Tellico Dam

- Tellico has 357 miles of shoreline and 15,560 acres of water surface for recreation activities.

- Tellico Dam is 129 feet high and reaches 3,238 feet across the Little Tennessee River.
- Water from Tellico helps drive the four generating units at Fort Loudoun Dam, which has a generating capacity of 145,000 kilowatts of electricity.

5. Fort Loudoun Dam

- Fort Loudoun provides 379 miles of shoreline and 14,600 acres of water surface.
- Fort Loudoun Dam is 122 feet high and stretches 4,190 feet across the Tennessee River
- The generating capacity of Fort Loudoun's four units is 155,600 kilowatts of electricity.

6. Melton Hill Dam

- The reservoir provides nearly 193 miles of shoreline and 5,470 acres of water surface for recreation.
- The dam is 103 feet high and stretches 1,020 feet across the Clinch River.
- The generating capacity of Melton Hill is 72,000 kilowatts of electricity.

7. Watts Bar Dam
   - Watts Bar provides 722 miles of shoreline and over 39,090 acres of water surface.
   - Watts Bar Dam is 112 feet high and stretches 2,960 feet across the Tennessee River
   - The generating capacity at Watts Bar is 175,000 kilowatts of electricity.

8. Great Falls Dam

- Great Falls provides 120 miles of winding shoreline and about 1,830 acres of water surface.
- The dam is 92 feet high and stretches 800 feet across the Caney Fork River.
- The generating capacity of Great Falls Dam is 33,800 kilowatts of electricity.

9. Bull Run Fossil Plant

Bull Run has a single coal-fired generating unit. The plant consumes about 6,300 tons of coal a day and generates more than 6.5 billion kilowatt-hours of electricity a year, enough to supply 460,000 homes. When the plant's generator went into operation in 1967, it was the largest in the world in the volume of steam produced. Bull Run was named the second-most-efficient coal-fired plant in the nation in 2004 by Electric Light & Power magazine. It's been ranked among the top 10 every year since 1995.

10. Kingston Fossil Plant

Kingston has nine coal-fired generating units. Construction began in 1951 and was completed in 1955. The plant consumes some 14,000 tons of coal a day and generates about 10 billion kilowatt-hours of electricity a year, enough to supply more than 700,000 homes.

11. Watts Bar Nuclear Plant

Watts Bar operates one nuclear generating unit. Construction at Watts Bar began in 1973 and was completed in 1996. The winter net dependable generating capacity is 1,167 megawatts.

6.2.7.2 *Watts Bar Reservoir Land Management Plan EIS*

In February 2009, TVA issued the *Final Watts Bar Reservoir Land Management Plan EIS* (TVA 2009a). The purpose of this EIS is to assess the potential environmental impacts of a reasonable range of alternatives for allocating 16,000 acres of TVA public land on Watts Bar Reservoir and provide a means to involve the public in the decisionmaking process. The purpose of the land planning effort is to apply a systematic method of evaluating and identifying the most suitable use of public land under TVA stewardship.

Three alternatives are proposed in the Amended Draft EIS. Under Alternative A (No Action) TVA would continue to use the 1988 Plan with minor updates to reflect the changes that have been made over the past 17 years. Alternative B (Modified Development and Recreation) would update the Plan to provide a stronger emphasis on economic development and developed recreation. Alternative C (Modified Conservation and Recreation) would update the Plan to provide a stronger emphasis on natural resource conservation and informal recreation activities.

6.2.8 The Tennessee State Recreation Plan, 2003–2008

In February 2004, the Tennessee State Recreation Plan, 2003-2008 (Tenn 2004) was prepared. This Plan assesses state-wide recreational resources and develops objectives and proposals for achieving these objectives. This Plan was reviewed to determine if there was any potential for cumulative impacts. The Plan identifies five primary objectives:

- Make the most of what we have.
- Set aside recreation resources for the future.
- Ensure consistent quality throughout the Tennessee Recreation System.
- Generate stronger support for conservation and recreation.
- Provide recreation programming to address critical needs.

To achieve these objectives, nineteen proposals were developed, ranging from organizing resources, to developing a comprehensive one-stop website for recreation information, to developing a comprehensive statewide plan for acquisition of recreation lands. There are no specific proposals in the Plan that lend themselves to a cumulative impact analysis related to the Y-12 SWEIS. None of the actions in the Y-12 SWEIS would be inconsistent with the objectives or proposals that are identified in the Tennessee State Recreation Plan, 2003-2008.

6.3 CUMULATIVE IMPACTS BY RESOURCE AREA

The following resource areas have the potential for cumulative impacts: land resources, traffic and transportation, socioeconomics, waste management, health and safety, and water. Cumulative impacts for these resources areas are presented below.

6.3.1 Land Use

Cumulative impacts on land use at Y-12 are presented in Table 6.3.1-1. Cumulative actions are expected to disturb approximately 289 acres or 5 percent of the 5,400 acres encompassed by Y-12. The addition of the UPF under Alternative 2, or the minimum Uranium Processing Facility (UPF) under the Capability-Based Alternative, would disturb approximately 35 acres but occupy an 8-acre footprint of previously disturbed land. Continued Infrastructure Reduction and D&D activities under the No Action Alternative would continue to contribute the amount of land available for future development in the developed area of Y-12. Activities under all four alternatives would be consistent with current industrial land uses at Y-12 and would not affect offsite land uses. There would be minimal cumulative impact to land use under the alternatives addressed in this SWEIS.

Table 6.3.1-1. Cumulative Land Use Impacts at Y-12.

Past, Present, and Reasonably Foreseeable Future Actions	Land Use Commitment (acres)
Existing site activities[a]	256
Production and Public Interface Facilities	20
Potable Water Supply Upgrade	1
UPF	8
Total	**289**
Total Site Capacity (developed area)	5,400 (800)

[a]DLA 2004.

Construction of the SNS on ORR required clearing a 110 acre greenfield site between Y-12 and ORNL and changing its use from Mixed Research/Future Initiatives to Institutional/Research. The transfer and development of Parcel ED-6 could result in a change in the present land use and could remove area from the NERP and Oak Ridge WMA. Use of the portions of the property for recreation purposes (i.e., deer and turkey hunts) would be lost with the transfer and development. However, the transfer of Parcel ED-6 would represent a transfer of less than 2 percent of the 20,000-acre NERP and about 1 percent of the 37,000-acre Oak Ridge WMA. The developments and projects would result in small area land use changes on ORR that would be adverse but would not affect land use or residential development outside the ORR boundary.

Depending upon the alternative selected, the *Watts Bar Reservoir Land Management Plan Draft EIS* could result in the use of 52 to 3,700 acres of public land for private Economic Development uses. The eventual use of approximately 3,400 acres of high quality terrestrial habitat to economic or recreation development would be a large loss of terrestrial habitat on Watts Bar Reservoir.

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC facility activities to ORNL.

6.3.2 Traffic and Transportation

Cumulative traffic impacts (i.e., traffic congestion and delays) are expected primarily along Bear Creek Road during construction due to the number of construction projects occurring

simultaneously at the site. These impacts are expected to be short-term, lasting the length of the construction period.

The addition of 400 permanent workers at SNS would have a minimal cumulative impact on traffic along primary roads serving ORR. The marginal increase in worker traffic due to the relocation of workers from offsite locations to the Production and Public Interface facilities is not expected to have a significant effect on traffic at Y-12. Increases to workforce traffic along primary roads serving ORR from the SNS and Production and Public Interface facilities would be offset once the UPF under Alternative 2, or the minimum UPF under the Capability-Based Alternatives are operational since employment at Y-12 is expected to decrease by approximately 750 workers, due to improvements in operational efficiency.

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC facility activities to ORNL. This would require a substantial amount of construction vehicles and with additional workers, traffic issues could transpire.

Depending upon the actual extent of development, activities associated with Rarity Ridge and the Horizon Center would likely have the highest potential adverse environmental impact from traffic and transportation, when compared to the Y-12 SWEIS alternatives. For example, the development of Rarity Ridge could add 1,500 new homes, which could add approximately 3,000 new cars to the area, assuming two cars per household. However, this would impact less than 1 percent of the existing population of the ROI, and would not be expected to have a significant impact on traffic/transportation within the ROI.

6.3.3 Socioeconomics

The ROI for the cumulative impact analysis is the four-county area in Tennessee consisting of Anderson, Knox, Loudon, and Roane Counties and considers income, population, housing, and community services. More than 90 percent of the ORR workforce resides in this area. Table 6.3.3-1 shows the cumulative employment for Y-12 and the total ROI employment. The construction employment is likely an overestimate, since construction of the SNS has been completed, but represents a small fraction of the total ROI employment. Construction activities from these proposed development projects are anticipated to overlap with most of the construction occurring between 2008 and 2011. The number of indirect jobs created in the ROI from these proposed development projects would primarily result from the construction of the UPF.

Table 6.3.3-1. Cumulative Employment for Y-12 and ROI.

Activity	Site (Operation) Employment (FTE)	Construction/D&D Employment
Past, Present, and Reasonably Foreseeable Future Actions		
Y-12 existing site activities	6,500[a]	
Production and Public Interface Facilities	(b)	(c)
Potable Water Supply Upgrade	(b)	40
UPF	-750	2,900
ED-6 Parcel Development	NA	(c)
Integrated Facility Disposition Project	(b)	NA
Surplus Highly Enriched Uranium	(b)	NA
Spallation Neutron Source	400	400
Total Employment	**6,150**	**3,300**
ROI Employment Total	**282,500**	

a – Site employment includes both Y-12 employees and contractors.
b – Employment for this activity is included in the 6,500 existing employees.
c – Construction employment numbers not available because property would be developed by a private developer.
NA – not applicable.

The operational workforce at Y-12 is expected to decrease with the addition of the UPF due to operational efficiencies and a consolidation of the PIDAS. There would be no net increase in the Y-12 operational workforce from the Public and Production Interface facilities and the Potable Water Supply Upgrade.

The operational workforce of the SNS is estimated to be 400 workers. SNS also is expected to host 1,000 to 2,000 visiting scientists each year (DOE 1999). More than 1,600 indirect jobs would be created because of the SNS. A positive cumulative socioeconomic impact would be realized from the construction of the UPF, development of Parcel ED-6, and the operation of the SNS. Since the temporary construction workforce would likely come from the existing ROI labor force, minimal cumulative impacts on housing and community service are anticipated. Development of the Parcel ED-6 and operation of the SNS would have a minor impact on the community services (i.e., schools, police and fire protection) depending on the housing density of the final development, the age distribution of the new residents, and the number of new workers moving into the ROI.

Development of the Horizon Center, which is planned to accommodate the development of approximately 4 million square feet of manufacturing, research and development, distribution, office, and support facilities, would likely add jobs and result in an influx of workers and their families to the ROI. A recent analysis developed for the land use planning estimated that if ETTP redevelopment and other initiatives succeed during the next 20 years, the cumulative impact could result in up to 25,000 direct and indirect jobs or an increase of 6.9 percent over the 2001 ROI employment figures (ORNL 2002). This rate is about 0.3 percent per year. Given the uncertainties surrounding future success of any of these initiatives, this is expected to represent an upper bound on the cumulative employment impacts. This increase falls well within historical growth rates for the ROI and is not expected to create an undue strain on local socioeconomic resources (DOE 2007a).

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC

facility activities to ORNL. The precise number of workers will not be known until the CD-1 budget and planning is prepared (see textbox in Section 3.2.2.1 for definitions of CD levels), but would probably be in the range of from 100 to 400. It is not expected that increased jobs of this magnitude would pose any disruptions to the region of influence.

6.3.4 Waste Management

The addition of the UPF is not likely to result in major impacts on the waste management infrastructure at Y-12 and ORR because the additional waste generated by the UPF mission would be a small percentage of the total wastes that would be generated at ORR.

The waste generated by other actions (e.g., 2.7 million cubic yards of CERCLA solid waste and 1.4 billion gallons of CERCLA liquid waste for ORR facilities in the next 10 years [DOE 2001a]) when combined with waste generated from other actions would not exceed existing ORR and offsite waste management facilities capacities and capabilities for treatment, disposal, and/or storage. Therefore, no cumulative impacts on waste management facilities are expected.

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC facility activities to ORNL. This clean up would be done under CERCLA and wastes disposed of in onsite, CERCLA created waste management facilities.

6.3.5 Health and Safety

The cumulative radiological health impacts on public and worker health from routine ORR operations and DOE actions are shown in Table 6.3.5-1. The values listed in this table describe the impacts from proposed DOE actions. In addition to the estimated radiological doses to the hypothetical MEI and the offsite population within a 50 mile radius of the ORR, Table 6.3.5-1 lists the potential LCFs for the public and workers due to exposure to radiation. The worker effects are not additive, but site-specific.

Table 6.3.5-1. Estimated Annual Radiological Impacts to Offsite Population and Facility Workers.

Activity	MEI Dose (mrem/yr)	Population Dose (person-rem/yr)	Population Latent Cancer Fatalities[b]	Collective Worker Dose (person-rem/yr)	Worker Latent Cancer Fatalities
Existing site activities	0.15	25.8	0.015	68.4	0.04
Surplus HEU Disposition[a]	0.039	0.16	9.6×10^{-5}	11.3	0.005
Watts Bar Nuclear Plant[a]	0.26	1.2	7.2×10^{-4}	NA	NA
Spallation Neutron Source[a]	1.5	1.3	7.8×10^{-4}	370	0.2
Cumulative Impact	**NA**	**28.5**	**0.017**	**NA**	**NA**

a - Source: DOE 2001a.
b – This represents the number of LCFs for each year of exposure.

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC facility activities to ORNL. The D&D of these facilities would increase the dose to both the public and workers. Estimates are not possible until more precise plans are finalized by the CD-1 process.

6.3.6 Air Quality

ORR's contribution to air pollution in the ROI is negligible compared to other sources. The major sources of criteria pollutants are the TVA fossil plants, which emit thousands of tons of sulfur dioxide, nitrogen oxides, and carbon dioxide annually. Table 6.3.6-1 shows the amount of sulfur dioxide, nitrogen oxides, and carbon dioxide that are emitted annually by the TVA fossil plants within the ROI and the Y-12 steam plant, which is responsible for 90 percent of the Y-12 pollutant emissions to the atmosphere. As can be seen from that table, the Y-12 steam plant emissions account for less than 10 percent of emissions compared to the TVA fossil plants. When the new Y-12 Steam Plant becomes operational in late 2010, the levels of emissions will be significantly less than those shown in Table 6.3.6-1.

Table 6.3.6-1. Air Emissions from TVA Fossil Plants in the ROI and the Y-12 Steam Plant Complex, 2004.

	Emissions (tons/year)		
	Sulfur dioxide	**Nitrogen oxides**	**Carbon Dioxide**
Bull Run Fossil Plant[a]	28,600	8,000	4,602,000
Kingston Fossil Plant[a]	75,000	14,900	10,384,000
Y-12 Steam Plant	2,286[b]	654[b]	89,921[c]

a Source: TVA 2006.
b Source: YSO 2007
c Calculated estimate based on 100 million Btu thermal input with bituminous coal fuel operating 24 hours per day 365 days per year.

TVA has made significant progress in reducing criteria pollutants from its fossil plants such as Bull Run and Kingston. For example, in 2004, sulfur dioxide emissions from Bull Run and Kingston were reduced by approximately 33 percent and 17 percent respectively compared to 2001 emissions. In 2004, nitrogen oxide emissions from Bull Run and Kingston were reduced by approximately 53 percent and 43 percent respectively compared to 2001 emissions. By 2010 TVA will have spent about $6 billion on emissions controls at its fossil-fuel plants to ensure that this power supply is generated as cleanly as possible, consistent with efficiency. To further reduce sulfur dioxide emissions, Bull Run burns a blend of low-sulfur coal, and construction on a scrubber to further reduce sulfur dioxide began in 2005. To reduce nitrogen oxides, it uses a selective catalytic reduction system as well as combustion and boiler optimization controls.

TVA has taken a number of steps to make the efficient generation of power at Bull Run as clean as possible:

- The use of low-sulfur coal from eastern Kentucky reduces emissions of sulfur dioxide.
- Construction of a scrubber began in the spring of 2005 to further reduce SO2. The scrubber should be operational in 2009.
- The plant is equipped with electrostatic precipitators that capture ash from the burning coal.

- Boiler optimization controls limit the production of nitrogen oxides which contribute to the formation of ozone and acid rain. A selective catalytic reduction system further reduces nitrogen oxide emissions by transforming them into harmless nitrogen and water vapor.

To reduce sulfur dioxide emissions at Kingston, all nine units use a blend of low-sulfur coal. Scrubbers will be added to the plant beginning in 2006 to further reduce sulfur dioxide. To reduce nitrogen oxides, Units 1 through 4 and Unit 9 use combustion controls and boiler optimization. Units 5 through 8 use low-nitrogen oxide burners. In addition, eight selective catalytic reduction systems have been installed to control nitrogen oxide emissions (TVA 2006).

The IFDP estimates that over the next 15-25 years, 3.9 million square feet of contaminated floor space will become excess as a result of NNSA Modernization and the relocation of NE and SC facility activities to ORNL. This clean up would result in temporary increases in pollutant emissions due to the use of machinery, the demolition process, and the disturbance of waste by the moving of debris.

A major source of manmade emissions of mercury to the environment in the United States is coal-fired power plants. The Y-12 Steam Plant, a coal-fired power plant, is a source of mercury emissions. As noted above, there are two TVA coal-fired power plants within the Y-12 ROI that are also sources of mercury emissions. Table 6.3.6-2 shows the amount of mercury emitted by the Y-12 Steam Plant and TVA's Bull Run and Kingston coal-fired power plants during 2007. As can be seen from the table, the Y-12 Steam Plant accounts for less than 3 percent of the total mercury emissions from coal-fired power plants in the ROI.

Table 6.3.6-2. Mercury Emissions from TVA Fossil Plants in the ROI and the Y-12 Steam Plant Complex, 2007.

	Mercury Emissions (lbs.)
Bull Run[a]	444
Kingston[a]	716
Y-12 Steam Plant[b]	32
Total	1,192

[a] TVA 2008

[b] DOE 2008

6.3.7 Water Resources

Because the quality and availability of water are critical to sustaining both the human and natural environment, potential cumulative impacts to water resources are addressed in this section. As noted in Section 4.3.5, raw water for ORR is obtained from the Clinch River and pumped into the water treatment plant, which is owned and operated by the city of Oak Ridge and supplies treated water to customers in the city, including ORNL, as well as Y-12. The water treatment plant has a capacity to deliver up to 24 million gallons per day (8.76 billion gallons per year). Treated water usage at Y-12 averages about 4.2 million gallons per day or about 1.54 billion gallons per year. This represents about 17.5 percent of the total amount of treated water capacity of the system. The remainder of the treated water is consumed by the residential and commercial customers of the Oak Ridge water treatment system.

Y-12 generates about 750,000 gallons of wastewater each day, as noted in Section 4.3.6. The wastewater flows to the city of Oak Ridge sewage treatment facility. The sewage treatment facility treats an average of 5.8 million gallons of wastewater per day. Wastewater generated at Y-12 represents about 13 percent of the total sewage treated.

6.3.8 Ecological Resources

Because none of the alternatives addressed for Y-12 would result in the disturbance of previously undisturbed land, it is unlikely that the proposed actions would adversely affect wildlife habitat or species beyond the impacts that have occurred in the past. Certainly, the presence of Y-12 affects wildlife by having displaced about 800 acres of former habitat, and the activities at Y-12 would create sufficient disturbance as to discourage most wildlife from reinhabiting the highly industrialized site. The wildlife habitat disturbed by Y-12 is only part of the overall direct impact on wildlife resulting from DOE development of the ORR. Approximately 12,250 acres of the 35,000-acre ORR are disturbed by development. Y-12 accounts for about 6.5 percent of the disturbed land on the ORR and 2.3 percent of the total area.

In addition to wildlife habitat directly affected by DOE and NNSA facilities and activities, the region around ORR has been and continues to be impacted by human development. Development in the region around ORR has resulted in wildlife habitat being directly displaced and the remainder being broken up into small isolated pockets with decreased value for supporting populations of larger species and those that require large unbroken areas of habitat.

Ongoing disturbance of existing wildlife habitat may occur in the region. As noted in Section 6.3.1, depending upon the alternative selected by TVA in the *Watts Bar Reservoir Land Management Plan Draft EIS, from* 52 to 3,700 acres of public land could be set aside for private economic development uses. The eventual use of up to 3,700 acres of high quality terrestrial habitat to economic or recreation development would be a large loss of terrestrial habitat on Watts Bar Reservoir.