
CHAPTER 6: CUMULATIVE IMPACTS

Consistent with NEPA, this chapter considers past, present, and reasonably foreseeable actions that could, along with the Y-12 proposed actions for the HEU Storage Mission and Special Materials Mission, result in cumulative impacts to the environment. It considers other ongoing operations at the ORR, actions that might occur in the future at ORR, and actions that are ongoing or planned within the ROI.

6.1 METHODOLOGY AND ANALYTICAL BASELINE

The CEQ regulations that implement the procedural provisions of NEPA define cumulative effects as impacts on the environment that result from the addition of the incremental impact of the action to other past, present, and reasonably foreseeable future actions. These impacts are considered regardless of what agency (Federal or non-Federal) or person undertakes the actions (40 CFR 1508.7). DOE based the cumulative impact analysis in this chapter on proposed Y-12 HEU Storage and Special Materials operations, other actions associated with the ORR, and off-site activities with the potential to contribute to the cumulative environmental impact.

Based on the analysis presented in Chapter 5, DOE has determined that the following resource areas have the greatest potential for cumulative impacts: (1) land use, (2) traffic and transportation, (3) socioeconomics, (4) water resources, (5) air resources, (6) utilities and energy consumption, (7) waste generation, and (8) public and worker health. For purposes of analysis, DOE has used the Y-12 Alternative 1B (No Action - Planning Basis Operations Alternative) as its basis for calculating cumulative impacts. 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. As mentioned above, past impacts are captured in the existing No Action - Status Quo Alternative. Future impacts will be analyzed for the same timeframe (2001 to 2010) as the No Action - Planning Basis Operations Alternative, as described in Section 1.5. Geographic boundaries vary by discipline depending upon the time an effect remains in the environment, the extent to which the effect can migrate, and the magnitude of the potential impact. Based on these factors, DOE has determined that for impacts to air, water, utilities, waste generation, and public and worker health, an 80-km (50-mi) radius surrounding the ORR is the potential impact zone. The impact zone for transportation and socioeconomic resources is a four-county region where over 90 percent of the ORR workforce lives: Anderson, Knox, Roane, and Blount Counties. The impact zone for land use is the ORR and adjoining properties.

The site-wide analysis presented for the Y-12 No Action - Planning Basis Operations Alternative in Chapter 5 may be considered by its scope, an analysis of cumulative impacts. To analyze the effects of continuing the Y-12 missions, ROIs were selected to identify the maximum extent of impacts while still providing a discussion of effects that can be evaluated meaningfully. The discussion that follows is not greatly influenced by the variation in impacts from the HEU Storage Mission or Special Materials Mission alternatives because the differences are not significant and/or there is little or no contribution to impacts from other sources that are in the same ROI as the Y-12 Plant.

Information was gathered from city, county, state, and other Federal organizations concerning future plans for development and to obtain information regarding regional planning efforts. CERCLA and NEPA documents including PEISs, EISs, EAs, FONSI, and RODs were reviewed to determine if current or proposed projects could affect the cumulative impact analysis for the Y-12 SWEIS. The reasonably

foreseeable future action descriptions, included in Section 6.2, were determined from planning documents through communications with ORO personnel and others to identify potential actions that may contribute to cumulative impacts on or in the vicinity of the Y-12 Plant.

6.2 POTENTIALLY CUMULATIVE ACTIONS

In addition to this SWEIS, DOE has prepared other recent NEPA documentation related to the ORR actions that could potentially contribute to the cumulative impact of Y-12 operations and modernization actions. DOE has also identified other reasonably foreseeable actions. The information was based on a review of city, county, state, and Federal information as well as any known plans in the private sector. The potential cumulative environmental impacts are quantified for each action that has available information (see Tables 6.4.4-1, 6.4.5-1, 6.4.7-1, and 6.4.8-1). For those actions which are not yet specifically defined, or are expected to have a negligible contribution to cumulative impacts, the actions are described but not included in the cumulative effects. A discussion of each potentially cumulative action is provided below.

6.2.1 TVA Plants

TVA operates three electric generating facilities within an 80-km (50-mi) radius of ORR: the Bull Run (Anderson County) and Kingston (Roane County) coal-fired steam plants, and the Watts Bar Nuclear Plant (Loudon County). Radiological impacts from the operation of the Watts Bar Plant, a two-unit commercial nuclear power plant, are minimal, but DOE has factored them into the analysis. The Watts Bar Plant is also the planned site for the generation of tritium in support of the Nation's nuclear stockpile. The potential environmental impacts of this action can be found in the *Production of Tritium in a Commercial Light Water Reactor EIS* (DOE 1999b).

6.2.2 Y-12 Site Integrated Modernization Program

As discussed in Section 3.3 of this SWEIS, DOE is considering a number of potential actions that may be implemented in the future as part of the effort to modernize the Y-12 facilities (referred to as Y-SIM). Table 3.3-1 lists the major potential actions including construction of an Enriched Uranium Manufacturing Facility, an Assembly/Disassembly/Quality Evaluation Facility, a Depleted Uranium Operations Facility, a Lithium Operations Complex, and other facilities as needed to meet Y-12 Site mission requirements. Planning and design of these modernized facilities are in the early stages and, thus, no detailed quantitative impacts have been assessed. However, modernized facilities would reduce radiation exposure to workers, incorporate pollution prevention/waste minimization measures in their operation, and reduce emissions to the environment compared to the facilities that are currently operating.

Environmental Restoration (ER) and D&D activities are currently proceeding at Y-12. To the extent that some of these activities have already occurred, some impacts from these activities are reflected within data provided for the No Action - Status Quo Alternative. Cleanup and D&D activities conducted under CERCLA are reviewed through the CERCLA process. While ER and D&D activities would continue to proceed regardless of modernization activities, the timing of some cleanup and D&D activities may, in some instances, be interrelated with the modernization program.

If modernization program actions are implemented, there would be short-term cumulative impacts due to construction activities, which may affect material resources, land use, traffic and transportation, and employment. However, once the potential modernized facilities are operating, DOE expects that through more efficient and safer processes, impacts on workers, the public, and the environment would be reduced. Therefore, implementation of the modernization program will not contribute to long-term cumulative impacts.

6.2.3 Lease of Parcel ED-1, ED-3, and Land and Facilities within the ETTP

DOE completed an EA (DOE 1996a) for the proposed lease of 387 ha (957 acres) of land (Parcel ED-1) within ORR to the East Tennessee Economic Council. The land is located on the ETTP Site about 21 km (13 mi) west of downtown Oak Ridge and Y-12. The East Tennessee Economic Council plans to develop an industrial park on the leased site to provide employment opportunities for DOE and contractor employees affected by decreased Federal funding. Plans are to create approximately 1,500 jobs over the next 10 years and to develop a total of about 202 ha (500 acres).

DOE determined that this action is not a major Federal action that would significantly affect the quality of the human environment. Since no specific industries have been announced, a quantitative assessment of impacts are not available to include in the SWEIS, with the exception of the job opportunities and total acreage described above.

DOE is also considering leasing the 182-ha (450-acre) parcel of land designated as ED-3 for development purposes. The land is located to the south and east of the ETTP. Under this action, the land would be leased through the Community Reuse Organization of East Tennessee to private companies. DOE is preparing an EA on the possible lease of this land. As with ED-1, no specific industries have been announced, and quantitative assessments are not available. Figure 6.2-1 shows the location of parcel ED-1 and ED-3 with respect to the ETTP.

DOE also has prepared an EA concerning the expansion of its leasing program at ETTP (DOE 1997d). DOE's leasing program was established to reindustrialize vacant, underutilized, and/or inactive facilities at the ETTP. The Community Reuse Organization of East Tennessee has subleased, or plans to sublease, these facilities to private sector firms or other organizations for industrial, commercial, office, R&D, manufacturing, and industrial applications.

6.2.4 Construction and Operation of the Spallation Neutron Source

DOE issued a ROD on June 30, 1999 (64 FR 35140) to proceed with the construction and operation of a SNS facility at ORNL. The SNS is an accelerator-based research facility that will provide the U.S. scientific and industrial research communities a source of pulsed neutrons. The facility will be used to conduct research in such areas as materials science, condensed matter physics, the molecular structure of biological materials, properties of polymers and complex fluids, and magnetism. Values for effluent emissions used in the cumulative impact analysis were obtained from the EIS for this action with the assumption that the source would be operating at the 4-MW power level (DOE 1999c). The SNS is currently in the early stages of site preparation and construction.

6.2.5 Surplus HEU Disposition Activities

DOE issued the *Disposition of Surplus Highly Enriched Uranium Final EIS* (DOE 1996b) on June 28, 1996. In the Final EIS, DOE considered the potential environmental impacts of alternatives for a program to reduce global nuclear proliferation risks by blending up to 200 metric tons (440,920 lb) of U.S.-origin surplus HEU down to low enriched uranium to make it nonweapons-usable. The resulting low enriched uranium could either be sold for commercial use as fuel feed for non-defense nuclear power plants, or disposed of as LLW.

Source: Tetra Tech, Inc.

FIGURE 6.2.3-1.—Locations of Parcels ED-1 and ED.

DOE issued a ROD to that EIS on August 5, 1996 (61 FR 40619) in which DOE decided to implement the proposed program, which involves gradually blending up to 85 percent of the surplus HEU to a ²³⁵U enrichment of approximately 4 percent for eventual sale and commercial use over time as reactor fuel feed, and blending the remaining surplus HEU down to an enrichment level of about 0.9 percent for disposal as LLW. These actions would take place over a 15- to 20-year period. Because one of the sites that could be used for blending purposes was the Y-12 Facility, DOE has considered the potential effects of disposition of surplus HEU on cumulative impacts.

6.2.6 Treating Transuranic/Alpha Low-Level Waste

DOE issued the *Transuranic Waste Treatment Facility EIS* in June 2000 and its ROD on August 9, 2000 (65 FR 48683). DOE has selected the Low-Temperature Drying Alternative (the preferred alternative in the Final EIS) and will proceed with the construction, operation, and D&D of the TRU Waste Treatment Facility at ORNL. The waste to be treated is legacy waste, i.e., waste generated from past isotope production and research/development that supported national defense and energy initiatives. TRU Waste generated from ongoing ORNL operations will also be treated at the facility. The facility is adjacent to the Melton Vally Storage Tanks, where the waste sludge and supernatant are currently stored. All treated TRU waste will be transported and disposed of at the WIPP while treated LLW transported and disposed of at NTS.

6.2.7 Oak Ridge Area Infrastructure Upgrades and Expansions

DOE Y-12 Water Plant. On May 1, 2000, DOE transferred the Y-12 Water Plant to the city of Oak Ridge. A 1997 feasibility report indicated that the transfer would assure DOE favorable water rates for its Y-12 and ORNL facilities while providing excess capacity to the city (DOE 1997e). The transfer requires approximately 11 new city employees to replace DOE employees at the plant. This transfer has no impact since there is no change in the total number of employees.

West End Utility Expansion. Partners for Progress, a group of public and private organizations, is working to extend the utility infrastructure to make industrial sites in western Oak Ridge more attractive to prospective industries. DOE-ORO has offered to transfer a 61-cm (24-in) water line to the city and to fund water and sewer lines through the Community Reuse Organization of East Tennessee. The plans for the utility expansions are not yet solidified and are not included. However, the transfer of the waterline has no additional impact.

Kerr Hollow Road. The Tennessee DOT is currently converting a section of State Highway 62 between Union Valley and Bethel Valley Roads into a four-lane highway. The work includes a fly-over to connect to Pellissippi Parkway. The section of road involved in the construction is a primary route for Y-12 traffic. Traffic congestion will occur during the 2-year construction period, but the completed project should ease congestion caused by additional traffic from SNS and TRU Waste Treatment Projects.

I-40 Connector. Within the next decade, a four-lane highway is planned from I-40 in Roane County to downtown Oak Ridge; however, the alternative routes have not yet been identified. The conversion of TSR 58 from a two-lane to a four-lane from I-40 to its intersection with TSR 95 is estimated to be completed in the late spring of 2001. The project would improve access to the ETTP. Traffic congestion will occur during the construction period, but the completed project should ease congestion caused by additional traffic from SNS and TRU Waste Treatment Projects.

6.3 ACTIONS CONSIDERED BUT NOT INCLUDED

The following actions were considered for inclusion in the cumulative effects analysis but were not pursued further for various reasons. Some were dropped due to the uncertainty of the action, while others due to the lack of relevant data such as resource consumption rates and effluent emission streams to evaluate. These actions are described in detail below.

6.3.1 Remediation of Contaminated Areas in the Melton Valley Watershed

Contamination in the Melton Valley Watershed originated from operations of ORNL and other ORR facilities, including Y-12, over a 50-year period. Numerous active and inactive waste management facilities used by operations at ORNL are located in Melton Valley. ORNL's historic missions of plutonium production and chemical separation during World War II and development of nuclear technology during the post-war era produced a diverse legacy of contaminated inactive facilities, research areas, and waste disposal sites throughout the Melton Valley Watershed that are potential candidates for remedial actions. Any remedial actions would be handled on a case-by-case basis with proper environmental documentation completed prior to the project initiation.

6.3.2 The Joint Institute for Neutron Sciences

The Institute for Neutron Sciences will be funded by the State of Tennessee. The facility will be collocated at the SNS site, the intersection of Bethel Valley Road and Chestnut Ridge Road on the ORR near ORNL. When completed, it will include a hotel, offices, and meeting rooms for visitors to the neutron facilities at ORNL. Impacts from this facility are a subset of the overall impacts from the SNS which have already been analyzed.

6.3.3 Receipt and Storage of Uranium Materials from the Fernald Site

DOE completed an EA and issued a FONSI for the receipt and storage of uranium materials at various DOE sites (DOE 1999e). The material has commercial market value and is currently stored at Fernald but needs to be transferred because of regulatory commitments. Y-12 and the ETTP are candidate sites for its maintenance until it can be marketed. The uranium inventory consists of approximately 6,800 metric tons (15 million lb) of which 800 metric tons (1.8 million lb) is currently in the process of being sold. Although the EA and FONSI have been issued, no decision as to the specific locations for storage have been made. Under the worst case scenario, the entire inventory is moved to the Y-12 Plant, impacts would be minimal since adequate storage facilities already exist for this option. In any event, due to the uncertainty of the action, no further analysis is warranted.

6.3.4 Alternative Strategies for the Long-term Management and Use of Depleted Uranium Hexafluoride UF₆

The long-term management and use of depleted uranium hexafluoride was assessed in a PEIS with the ROD issued on August 10, 1999 (64 FR 43358). The PEIS assessed alternatives for the management of UF₆ currently stored at three sites including ETTP (the old K-25 Site). The total inventory of depleted uranium at ETTP is stored in approximately 4,700 cylinders. DOE has decided to convert the depleted uranium to uranium oxide, depleted uranium metal, or a combination of both. The material at ETTP would be shipped to a conversion facility, possibly at Paducah, KY or Portsmouth, OH. Any proposal to proceed with the siting, construction, and operation of a facility or facilities will involve additional NEPA review. The impact of continued storage of the material at ETTP is included in the analysis of the No Action - Status Quo Alternative. Until completion of an EIS on the conversion facility, no information is available for further assessments.

6.3.5 Management of Potentially Reusable Uranium Materials at the DOE Management Center

DOE intends to prepare an EIS that addresses the packaging, transportation, receipt, and storage of large quantities of potentially reusable uranium materials that must be moved from various DOE sites due to remediation activities. The potential Oak Ridge storage sites include Y-12, ETTP, and ORNL. However, until DOE issues an NOI defining the scope of the proposed EIS, it is not reasonable to make any assumptions regarding this action and therefore, it is not included in this cumulative analysis.

6.3.6 Disposition of Stockpiled Mercury

The Defense Logistics Agency intends to prepare an EIS on the impacts associated with the disposition of excess mercury that was stockpiled for national defense purposes. Stockpiled mercury is now warehoused at five locations in the United States, including the Y-12 Site. Approximately 675,000 kg (1.5 million lb) of Defense Logistics Agency-managed mercury is collocated with approximately 675,000 kg (1.5 million lb) of DOE-managed mercury at Y-12. DOE is a cooperating agency for the EIS. The impact of continued storage of the mercury at Y-12 is included in the analysis of the No Action - Status Quo Alternative. Until completion of an EIS on the future disposition is completed, no information is available for further assessment.

6.3.7 Environmental Impact Statement - Proposed Route 475

The Federal Highway Administration, in cooperation with the Tennessee DOT, published an NOI on October 28, 1999 (64 FR 58123) to prepare an EIS on a proposal to connect I-40 with I-75. The proposed connection would be from near the current I-40/I-75 interchange in Loudon County, near Lenoir City, Tennessee, to an area north and east in Anderson County, near the interchange of I-75 and TSR 61. The proposed project is considered necessary to improve the operation and safety of these affected interstate highways. Alternatives to be considered include taking no action and three build alternatives consisting of different alignments. Information as to this proposed action's direct impact on the ORR will not be available until completion of the EIS.

6.3.8 Commercial Ventures

A number of independent commercial development ventures are planned in and around ORR in the foreseeable future. The majority of these involve using land at or near ETTP to take advantage of the excess utilities and the highly trained technical personnel available in the area. Most all involve using land rezoned for its intended use and targeting the experienced labor pool available from the ORR community due to the reductions in work done at the DOE facilities. The major impacts of these ventures would be beneficial, with increased employment for the region. As with any commercial undertaking, there is an element of risk involved, and not all may come to fruition. Since none of them directly affect the options for Y-12, it was felt to be too speculative to include them in the current analysis. The following ventures are being considered near ORR and may have a beneficial cumulative impact, but are not specifically included in the analysis for the reasons stated above.

Horizon Center. The Horizon Center has one tenant that has leased an 8.5 ha (21-acre) parcel at ETTP with options on a contiguous 8.5-ha (21-acre) parcel. The tenant, Thermagenics, produces medical isotopes and expects to have substantial R&D efforts in Oak Ridge. Thermagenics could add approximately 140 jobs in the first 3 years of operation.

Boeing Property. Oak Ridge Properties, a limited partnership, is pursuing purchasing from Boeing, Inc. a 492-ha (1,217-acre) undeveloped site located in Roane County north of TSR 58 on the west side of the Clinch River across from ETTP at the K-25 Site. Oak Ridge Properties has proposed a \$200 million mixed-use

development plan. The development would include approximately 1,500 residential units including houses, apartments, and condominiums, approximately 187 ha (450 acres) of industrially zoned property, and a shopping area. A full build-out of this area would pull infrastructure down TSR 58 to the Horizon Center.

The Boeing Property was rezoned from industrial to mixed-use in February 2000. The Oak Ridge Land Company is also pursuing the acquisition of a 74-ha (182-acre) floodplain strip abutting the Boeing Property for use as a buffer zone and green space. DOE controls the floodplain strip and is currently preparing an EA on the transfer of the property to the abutting landowner (86 FR 25711).

Roane Regional Business and Technology Park (Macedonia Site). The Roane Regional Business and Technology Park, also known as the Macedonia Site, consists of 265 ha (655 acres). The site is located in east Roane County, adjacent to I-40 and less than 3 miles from the I-40/I-75 interchange in Loudon County. It is directly across the Clinch River from the ORNL and the Center for Manufacturing Technology. The site's current predominant land use includes pasture and farmland, with approximately three homes scattered throughout the site. The technology park is an area proposed for medium industrial development (i.e., information technology, instrumentation, computers, and metal work). The total site area is 265 ha (655 acres), total lot area of 231 ha (570 acres), developable lot areas of 172 ha (426 acres), 41 lots, and 25 ha (61 acres) of greenbelt. Roane County officials have signed a contract with Highway Inc. of Cookeville, commencing the first of three construction phases of the technology park: Phase I includes clearing the site; widening, straightening and adding shoulders to Buttermilk Road; and installing sewer, water and gas services. Employment is speculative, but projected around 2,500-5,000 jobs with 500 - 600 as a result of the first phase.

ClientLogic. ClientLogic, a Canadian information technology company, has hired 412 people at its 1,393 m² (15,000 ft²) facility in Commerce Park. ClientLogic is in the process of constructing a new building in Commerce Park to house an additional 500 employees.

Home Depot. Home Depot has purchased property off Laboratory Road for a store that will open in the first quarter of 2001 and will employ between 120 to 200 full- and part-time employees.

Bechtel Jacobs Company. As part of Bechtel Jacobs Company's investment in the local economy, a total of 1,500 jobs now exist in Anderson, Roane, Knox, and Blount counties as the result of \$50 million generated in payroll. All jobs are in the private sector outside of ETPP.

6.4 CUMULATIVE IMPACTS BY RESOURCE AREA

The following sections indicate that future potentially adverse cumulative impacts contributed by the Y-12 Plant HEU Storage Mission and Special Materials Mission alternatives are minimal. Many components of the proposed actions would ultimately result in more efficient operations, resulting in potentially less air emissions, water pollution, and soil contamination due to the cleanup of contaminated sites. The population projections for the years 1990 through 2010 indicate that the surrounding counties will experience population growth from 7 percent to 31 percent (growth projection: Roane County 31 percent; Loudon County 17 percent, and Knox County 7 percent) with the exception of Anderson County, which is projected to decrease by approximately 3 percent (TEDC 1999c). Therefore, pressure will continue to be exerted on all resources and impact areas but continuing the Y-12 Plant Mission and alternatives associated with the HEU Storage Mission and Special Materials Mission would add very little to regional impacts.

6.4.1 Land Use

The ROI for cumulative effects to land use is the ORR and adjoining properties. No cumulative effects have been identified under the No Action - Planning Basis Operations Alternative since the continued operation of Y-12 do not represent a change in land use. The Y-12 Plant missions would continue to be compatible with the historical mission of industrial use and research. However, with the addition of the new Special Materials Complex, one of the sub-alternatives (Site 1) would result in a change in land use. Approximately 4 ha (10 acres) of this site is wooded and would require clearing. The change in land use will not result in an impact to cumulative effects as it would not affect land use activities outside the ORR boundary.

Construction of the SNS on ORR would require clearing a 45-ha (110-acre) greenfield site between Y-12 and ORNL and changing its use from Mixed Research/Future Initiatives to Institutional/Research. Construction of a TRU Waste Treatment facility adjacent to the Melton Valley Storage tanks at ORNL would require developing 5 acres of a brownfield site with no change in land use classification. Neither of these would impact land use on the Y-12 site or outside the ORR boundary.

6.4.2 Transportation

Transportation is not expected to be affected from the continuation of the Y-12 Plant missions. The Y-12 Plant work force is not forecasted to appreciably increase over current employment levels. Therefore, Y-12 Plant employees related traffic would increase, if any, minimally. The required construction work force tends to arrive earlier at the job site and is not expected to add notably to the number of vehicles during the workday rush-hours.

Construction of the SNS with a peak workforce of 578 will increase traffic on ORNL access roads by approximately 7 percent. Operation of the SNS at the 4-MW level with a workforce of 375 would increase traffic on the same roads by approximately 5 percent. The construction and operation of the TRU Waste Treatment facility will have less of an impact with only a peak construction workforce of 97 and operations workforce of 88. Traffic problems will arise due to the increase in construction traffic, which is unavoidable and short term, but to an extent, controllable. Increases in workers for the new facilities will cause more traffic congestion but the road improvements previously described will greatly help to alleviate this congestion.

Special shipments to and from ORR of materials such as TRU Waste, Surplus HEU, and cylinders containing depleted uranium hexafluoride can be controlled so as to avoid or minimize traffic congestion caused by the cumulative impact with other activities at ORR. Transportation problems of these shipments outside of ORR have been covered in their individual EIS's.

6.4.3 Socioeconomics

The ROI for the cumulative impact analysis is the four-county area in Tennessee consisting of Anderson, Knox, Loudon, and Roane Counties. More than 90 percent of the ORR work force resides in this area.

No adverse socioeconomic impacts, direct or indirect, have been identified from the continuation of the Y-12 Plant missions. Y-12 Plant operation and use of production, storage, and support buildings at the Y-12 Plant would not result in the hiring of substantial numbers of additional operational personnel. Therefore, there would be no cumulative impacts from continuation of the Y-12 Plant missions and operations under the No Action - Planning Basis Operations Alternative.

Under the HEU Storage Mission and Special Materials Mission Alternatives, DOE does not expect adverse cumulative impacts because the construction and operation work force associated with the missions could be supplied from within the ROI, as discussed in Section 5.3.

The separate analyses for the large projects, SNS and TRU waste treatment, have shown no adverse socioeconomic impacts from their construction and operation. Competition between these and other independent commercial developments for construction resources within the ROI could cause some project delays and perhaps a temporary influx of workers from outside of the region. Many of these developments are designed to create jobs to take advantage of the existing job pool resulting from the overall downsizing of the ORR workforce.

6.4.4 Water Resources

Table 6.4.4–1 summarizes the estimated cumulative radiological doses to human receptors from exposure to waterborne sources near ORR. Liquid effluents from Y-12 could contain small quantities of radionuclides that would be released to the UEFP. The exposure pathways considered in this analysis included drinking water, fish ingestion, shoreline exposure, swimming, and boating. As discussed in Chapter 5, the action alternatives would not cause increased releases of radiological contaminants.

TABLE 6.4.4–1.—Estimated Average Annual Radiological Doses and Resulting Health Effects to Off-site Population Due to Liquid Releases from Facilities in the Oak Ridge Area

Activity	MEI Dose (mrem per year)	Population Dose (person-rem per year)	Population Latent Cancer Fatalities
Oak Ridge Reservation ^a	2.7	48	0.024
Surplus HEU Disposition	0	0	0
Watts Bar Nuclear Plant ^b	0.26	1.2	0.0006
Spallation Neutron Source ^c	NR ^d	NR	NR
Cumulative Effect	NA	50	0.025

^a Values include contributions from Y-12, ETTP, and ORNL.

^b Includes contribution from tritium production at Watts Bar.

^c Values are conservatively based on the 4-MW power level.

^d NR=None reported. The Spallation Neutron Source is designed to have no releases of radioactive liquid effluents.

Source: DOE 1999k; DOE 1996b, DOE 1999c; DOE 1999b.

The estimated cumulative dose from all ORR activities to the maximally exposed member of the public from liquid releases would be 2.7 mrem per year from drinking water, fish ingestion, shoreline exposure, swimming and boating. By comparison, the DOE order 5400.5 standard for all exposure pathways is 100 mrem per year. Adding the population doses associated with current and projected ORR activities would yield a cumulative annual dose of 48 person-rem from liquid sources. This translates into 0.024 LCF for each year of exposure of the year 2000 estimated population of 880,000 living within an 80-km (50-mi) radius of the ORR. The addition of the dose from the Watts Bar Nuclear Plant cannot be directly added to the ORR MEI dose due to the spatial definition of the MEI dose. Operation of the TRU Waste Treatment Facility would eliminate the primary source of groundwater contamination in the Solid Waste Storage Area 5 North. This would reduce the overall values listed for ORR.

As discussed in Section 4.5, a number of Y-12 facilities discharge treated wastewater into EFPC via NPDES-permitted outfalls. NPDES Compliance Monitoring studies of water quality and biota downstream of these outfalls suggest that discharges from these facilities have not degraded the water quality (DOE 1999k).

6.4.5 Air Resources

DOE also evaluated the cumulative impacts of airborne radioactive releases in terms of dose to an MEI at the Y-12 Site boundary. Table 6.4.5–1 lists the results of this analysis. The cumulative dose to the maximally exposed member of the public would be 6.9 mrem per year, using the very conservative assumption that the same individual could receive the maximum dose from all activities.

The population doses from current and projected Y-12 activities, and other actions listed in Table 6.4.5–1 could yield a total annual cumulative dose of about 56 person-rem from airborne sources. The total annual cumulative dose translates into 0.03 LCF for each year of exposure for the year 2000 projected population of 537,708 living within an 80-km (50-mi) radius of the ORR.

TABLE 6.4.5–1.—Estimated Average Annual Radiological Doses and Resulting Health Effects to Off-Site Population from Airborne Releases

Activity	MEI Dose (mrem/yr)	Population Dose (person-rem/yr)	Population Latent Cancer Fatalities
ORNL	0.69	6.0	0.003
ETTP	0.068	2.0	0.001
Y-12	4.5	34	0.017
Surplus HEU Disposition	0.039	0.16	8x10 ⁻⁵
Watts Bar Nuclear Plant ^a	0.078	0.57	0.0003
Spallation Neutron Source ^b	1.5	13	0.0065
Tru Waste Treatment Facility	0.023	0.12	6x10 ⁻⁵
Cumulative Effect	6.9	56	0.03

^a Includes contribution from tritium production at Watts Bar.

^b Values are conservatively based on the 4-MW power level.

Source: DOE 1999k; DOE 1996b; DOE 1999c; DOE 1999b. DOE/EIS/0305.

DOE also evaluated the potential for cumulative impacts from nonradiological air emissions. As shown in Section 5.1.7, the operation of the Y-12 Steam Plant is the dominant source of nonradiological air emissions for Y-12. When the emissions from this facility are examined, the off-site concentrations are well below regulatory standards. Other facilities in the area that have the potential for nonradiological emissions have little or no spatial overlap with any emissions plume that originates from Y-12. Therefore, DOE does not expect adverse cumulative impacts due to nonradiological air emissions.

6.4.6 Utilities and Energy

As discussed in Chapter 5, the actions under any of the alternatives in this SWEIS would not cause appreciable increases in utility usage. TVA has excess electrical capacity to accommodate future uses at Y-12 and the ORR, and DOE would ensure that other site infrastructure needs were met. The installed capacity of site utilities is much greater than the current or projected usage, to include those actions considered in Section 6.2. Therefore, DOE does not expect adverse cumulative impacts to utility usage and infrastructure capacities.

6.4.7 Waste Generation

Table 6.4.7–1 lists cumulative volumes of LLW, mixed LLW, hazardous waste, and sanitary/industrial wastes that the Oak Ridge ROI would generate. The values are based on the *1998 Annual Report of Waste Generation and Pollution Prevention Progress* (DOE 1999i), the SNS EIS, and the *Production of Tritium*

in a Light Water Reactor EIS. The Y-12 waste volumes are based on the No Action - Planning Basis Operations Alternative values presented in Section 5.11.

As stated in Chapter 5, LLW would be generated from maintenance, radiological surveys, and production activities, and mixed and hazardous waste would be generated from maintenance and production activities. The waste volumes generated by other actions shown in Table 6.4.7-1 when combined with the waste generated from proposed actions in the Y-12 SWEIS would not exceed existing ORR and offsite waste management facilities capacities and capabilities for treatment, disposal and/or storage. Therefore, DOE does not expect any adverse cumulative impacts on waste management facilities. The impact of the large increases in LLW and hazardous waste from the SNS are covered in its own EIS (DOE 1999c).

TABLE 6.4.7-1.—Estimated Annual Volumes of Waste Generated by Actions in the Oak Ridge Area

Activity	Low-level waste (m ³ /yr)	Mixed low-level waste (m ³ /yr)	Hazardous waste (m ³ /yr)	Sanitary/Industrial waste (m ³ /yr)
ORNL ^a	290	33	42	1,592
ETTP ^a	120	800	4	1,105
Y-12 ^b	1,987	1,040	26	4,330
ORR Total (ORNL, ETTP, and Y-12)	2,397	1,873	72	7,027
Surplus HEU Disposition	825	50	90	19,800
Watts Bar Nuclear Plant ^c	41	<1	1.0	860 ^d
Spallation Neutron Source ^e	34,000	18	40	1,350
TRU Waste Treatment Facility ^f	556	4.6	<1	375
Cumulative Effect	37,819	1,946	203	29,412

^a Source: DOE 1999i.

^b Based on estimates for the Y-12 Site No Action - Planning Basis Operations in Chapter 5 and assuming a density of 1000 kg/m³.

^c Includes contribution from tritium production at Watts Bar. Source: DOE 1999b.

^d This value is expressed as kilograms instead of cubic meters in the source document. The conversion to cubic meters was done assuming a density of 1,000 kg/m³.

^e Values are conservatively based on the 4-MW power level. Source: DOE 1999c

^f Approximately 607 m³ of treated TRU waste would result from the 5 years of operation of this facility. In addition, 5,550 m³ of industrial waste would result from D&D of the facility after its operational life. Source: DOE/EIS/0305.

6.4.8 Public and Worker Health

Table 6.4.8-1 summarizes the cumulative radiological health effects of routine ORR operations and proposed DOE actions. The values listed in this table describe the impacts resulting from proposed DOE actions. In addition to estimated radiological doses to the hypothetical MEI and the off-site population, Table 6.4.8-1 lists potential LCFs for the public and workers due to exposure to radiation. The cumulative effect for the general population is shown as a small (less than 5 percent) increase over that from ORR alone. The worker effects are not additive, but site-specific.

TABLE 6.4.8-1.—Estimated Annual Radiological Impacts to Off-site Population and Facility Workers

Activity	MEI Dose (mrem/yr)	Population Dose (person- rem/year)	Population Latent Cancer Fatalities	Collective Worker Dose (person- rem/year)	Worker Latent Cancer Fatalities
ORR Total ^a	8.0	90	0.045	125 ^b	0.06
Surplus HEU Disposition ^c	0.039	0.16	8x10 ⁻⁵	11.3	0.005
Watts Bar Nuclear Plant ^d	0.34	1.8	0.009	110	0.045
Spallation Neutron Source ^e	1.5	1.3	0.0065	370	0.2
TRU Waste Treatment Facility ^f	0.023	0.12	6x10 ⁻⁵	6.2	0.003
Cumulative Effect	NA	94	0.047	NA	NA

^a Includes Y-12, ETTP, and ORNL. Source: DOE 1999k.

^b Includes 106.5 person-rem for 1998 ORR Operations (40.61 person-rem attributable to Y-12) and accounts for the Y-12 Site No Action - Planning Basis Operations contribution of 59.5 person-rem (see Table D.2.3.2-1).

^c Source: DOE 1996b.

^d Includes contribution from tritium production at Watts Bar. Source: DOE 1999b.

^e Values are conservatively based on the 4-MW power level. Source: DOE 1999c.

^f Values based on the preferred alternative (Low Temperature Drying). Source: DOE/EIS/0305