

CHAPTER 5: ENVIRONMENTAL CONSEQUENCES

In accordance with CEQ regulations, the environmental consequences discussions provide the analytical detail for comparisons of environmental impacts associated with the various Y-12 Site-wide alternatives and proposed actions. Discussions are provided for each environmental resource and relevant issues that could be affected. For each resource or issue in Chapter 5, the impacts of two No Action scenarios for Y-12 operations are presented: 1) Status - Quo and 2) Planning Basis Operations. Analysis is also provided for each of the action alternatives for the Y-12 HEU Storage Mission (Alternative 2) and Special Materials Mission (Alternative 3). The potential combined impacts, if both the HEU Materials Facility and the Special Materials Complex are constructed, in addition to the Y-12 planning basis operations level impacts, are also included (Alternative 4).

For comparison purposes, environmental concentrations of emissions and other potential environmental effects are presented with the appropriate regulatory standards or guidelines. However, compliance with regulatory standards is not necessarily an indication that the environmental impacts are significant for purposes of NEPA.

The following discussion is a brief summary of the Y-12 No Action - Status Quo Alternative, No Action - Planning Basis Operations Alternative, and the alternatives for the HEU Storage Mission and Special Materials Mission.

Alternative 1A (No Action - Status Quo Alternative)

The No Action - Status Quo Alternative represents the current level of operations at Y-12 as reflected by the most recent monitoring data (1998) for the Y-12 Site and reported in the ASER issued in 1999. Although approximately 40 percent of the types of operations associated with DP's assigned mission were operational ready in 1998 (following the Y-12 Plant stand-down in 1994), the Y-12 Plant was only operating at 10 percent capacity. This operating level is used in the SWEIS as a basis for comparison of the impacts associated with the No Action - Planning Basis Operations Alternative and other action alternatives that reflect full Y-12 DP mission operations at required levels and recently approved projects by EM and ORNL at Y-12. The No Action - Status Quo Alternative is not considered reasonable for future Y-12 operations because it would not meet Y-12 mission needs and would not reflect DOE's decision in the SSM PEIS ROD (61 FR 68014) to maintain and downsize the DP missions including the weapons secondary and case component fabrication capability at Y-12.

Alternative 1B (No Action - Planning Basis Operations Alternative)

Under the No Action - Planning Basis Operations Alternative, Y-12 would continue facility operations at historical levels in support of assigned missions. The No Action - Planning Basis Operations Alternative reflects the implementation of the DOE decision in the SSM PEIS ROD (61 FR 68014) to maintain the DP national security mission at Y-12, but to downsize the Plant consistent with reduced requirements. This includes DP capabilities to produce and assemble uranium and lithium components, to recover uranium and lithium materials from the components fabrication process and disassembled weapons, to produce secondaries, cases, and related nonnuclear weapons components, to process and store enriched uranium and to supply enriched uranium, lithium, and other material products; EM activities at Y-12 related to environmental monitoring, remediation, deactivation and decontamination, and management of waste materials from past and current operations; Office of Science activities operated by ORNL at Y-12; and DP support of other Federal agencies through the Work-for-Others program, the National Prototype Center, and the transfer of highly specialized technologies to support the capabilities of the U.S. industrial base. The No

Action - Planning Basis Operations Alternative also includes activities to store surplus enriched uranium pending disposition in accordance with the S&D PEIS ROD (62 FR 3014).

Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

This alternative includes the No Action - Planning Basis Operations Alternative plus a new HEU Storage Mission facility. There are two proposed options for the HEU Storage Mission at Y-12: (1) construct a new HEU Materials Facility at one of two potential candidate sites, and (2) construct an Upgrade Expansion to existing Building 9215. The preferred option is to construct and operate the new HEU Materials Facility, which would enable Y-12 to safely and securely store Categories I and II HEU, including canned subassemblies that contain HEU; HEU in metal and oxide forms in cans (part of the strategic reserve of excess inventories); and scrap metal that contains HEU awaiting recovery (Central Scrap Management Office scrap metal contaminated with HEU that is being returned from other DOE facilities and university programs).

Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

This alternative includes the No Action - Planning Basis Operations Alternative plus a new Special Materials Complex at one of three candidate sites. The proposed action is to construct and operate a new Special Materials Complex which would enable Y-12 to ensure efficient production of adequate quantities of special materials for all anticipated scenarios considered for the enduring nuclear weapons stockpile while providing for worker health and safety. A key component of the proposed Special Materials Complex is the construction of a new Beryllium Facility to house all beryllium production operation at Y-12. Facility design would incorporate strategies that enhance the current administrative, safety and health controls, and personal protection equipment with engineered controls.

Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

This alternative includes the No Action - Planning Basis Operations Alternative plus both a new HEU Materials Facility and a Special Materials Complex.

5.1 LAND USE

The land use resources analysis considers a ROI that includes the Y-12 area of responsibility, which covers 2,197 ha (5,428 acres), as well as the rest of the ORR (13,943 ha [34,513 acres]) and the adjoining properties of the city of Oak Ridge. The land use impacts of the No Action - Status Quo Alternative, No Action - Planning Basis Operations Alternative, and HEU Storage Mission and Special Materials Mission Alternatives are compared with existing land use patterns, plans and policies.

5.1.1 Alternative 1A (No Action - Status Quo Alternative)

The main area of Y-12 (328 ha [811 acres]) is largely developed and because of the Site's defense support, manufacturing, and storage facilities, the land is classified in DOE's industrial use category. The land surrounding the main Y-12 Plant area is used primarily for environmental restoration, waste management, and environmental field research activities. The No Action - Status Quo DOE missions activities at Y-12 are consistent with current land use plans, classifications, and policies. There would be no land use impacts over the 10-year planning period under the No Action - Status Quo Alternative.

5.1.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

Under Alternative 1B (No Action - Planning Basis Operations Alternative), activities associated with DP, Environmental Remediation, Nuclear Energy, Nonproliferation and National Security, the Work-for-Others Program, and Technology Transfer would not change and therefore, would not affect local short-term or long-term land use. Ongoing downsizing of the Y-12 Plant manufacturing and facility footprint may encourage more facilities to be declared surplus and recommended for D&D. If facilities declared surplus result in the reuse of the land and facilities for activities not related to weapons production operations, some local land use benefits may be realized.

Potential land use impacts from the Environmental Management Waste Management Facility and the ORNL NABIR Program Field Research Center component at Y-12 included in the No Action - Planning Basis Operations Alternative are described below.

Construction and operation of the Environmental Management Waste Management Facility at Y-12 could result in local short-term and long-term land use impacts from the commitment of the land for the disposal facility, and the potential benefit that local disposal capacity may impact the overall cleanup of ORR and resulting land use.

As discussed in Section 3.2.2.2, construction and operation of the new disposal facility would require clearing land within the Oak Ridge National Environmental Research Park (Research Park) (26 to 40 ha [64 to 99 acres]) and an increase of between 5 to 7 ha (12.4 to 17 acres) in the Y-12 West End Borrow Area. Construction, operation, and support activities in and around the facility could affect adjacent activities at the Research Park, such as research. Use of Research Park land for a disposal facility would represent a trade-off between current use of land for forest and use of land for waste disposal. The presence of the facility would influence the likelihood of that type of adjacent development likely, possibly increasing the chance of adjacent industrial development while decreasing the chance of extensive public use (e.g., recreation).

If local waste disposal capacity provided by the Environmental Management Waste Management Facility encourages cleanup of industrial sites, local land use benefits could be realized. The permanent commitment of land for the new facility (9 to 18 ha [22 to 44 acres]) may be at least partially affected by the cleanup and associated improvement or reuse of the land at individual CERCLA sites; however, these indirect potential benefits are uncertain and cannot be quantified. The overall beneficial or adverse impact, if any, depends on actions taken at those individual sites and on the willingness of future occupants to locate to these areas.

Potential impacts to Research Park environmental resources would be minimized by the buffer provided by the restricted area around the new Environmental Management Waste Management Facility and by use of best management practices including sufficient controls during cell operation. Following closure, much of the disturbed area would gradually be allowed to return to its natural forested state. No development of the cell or restricted area would be permitted, providing some future long-term habitat preservation and allowing environmental research to continue.

The Field Research Center component of the NABIR Program at Y-12 (see Section 3.2.2.6) is not expected to result in short-term or long-term land use impacts. The entire length of Bear Creek, from its beginning within the proposed contaminated area through the background area outside the Y-12 SWEIS analysis area, is designated as an Aquatic Natural Area. In addition, much of the land adjacent to the field research areas has been designated part of the Research Park. A portion of the contaminated area is contained within the Research Park. Activities needed to support site characterizations, to obtain research-quality samples, and in-situ research within the approximately 4 ha (10 acres) resource area would not impact or interfere with

these designated areas. Any ongoing research projects in areas considered part of the Research Park or Field Research Center Research Area would be avoided.

The only intrusion expected to impact existing land use would be the placement of trailers to support activities near the location of discrete research areas within the Field Research Center. In all areas, trailers would be part of an already developed area and would be compatible with the immediate surroundings.

Activities under this alternative are consistent with recommendations made by the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site appearing in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

5.1.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)

The new HEU Materials Facility, described in Section 3.2.3.2, would be compatible and consistent with the current land use at the Y-12 Plant and would not change the current industrial use classification that exists at both Site A and Site B (see Section 3.2.3.2 for a description of Sites A and B). Construction of and future operations at the HEU Materials Facility are consistent with recommendations made by the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

Impacts to land surrounding the new facility would be limited to the lay-down areas for construction. The lay-down area for construction of Site A would be north of Bear Creek Road, just west of the new parking lot being constructed as part of the project (see Figure 3.2.3-3). The Site would be sufficiently graded and developed to accommodate a number of temporary construction trailers, storage buildings, and storage yards. A security fence would surround the Site. A smaller lay-down area would be located in the parking lot area next to the construction site to accommodate daily work activities. The lay-down area for the construction of Site B will be in the S-3 Parking Lot (see Figure 3.2.3-5). During construction, temporary parking spaces would be developed in the west tank farm area and just south of old Post 17 to replace the parking spaces lost due to the construction lay-down area.

Once the construction of the new facility Site A is complete, the lay-down area would be re-graded and seeded after removal of any soil that may have been contaminated with construction-related materials. Once the construction of the new facility at Site B is complete, the lot will be paved and the spaces will be relined for its original parking purposes.

Construction for the HEU Materials Facility would occur outside the current PIDAS for both Site A and Site B. Upon completion of the project, the PIDAS would be extended to surround the new facility. The No Action- Planning Basis Operations Alternative Plus the Construction and Operation of the HEU Materials Facility would potentially disturb up to 5 ha (12.4 acres) during construction (both Sites), and result in a potential permanent land requirement of up to 33 ha (82 acres) for operations (both Sites), a small percentage of Y-12 undeveloped land.

When the new HEU Materials Facility is completed and HEU currently stored at Y-12 is relocated to the new facility, the current HEU storage facilities could be declared surplus, reused for other support activities, or recommended for D&D. The final disposition of these facilities would be determined by the Y-12 Facility Transition Process described in Appendix A.1.2. This could result in the reuse of the land and facilities for activities not related to weapons production operations possibly allowing some local land use benefits.

Specific usage of these facilities may change but the overall industrial use classification would remain the same.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

Impacts on land use as a result of the expansion of Building 9215 (see Section 3.2.3.3) would be minimal under this alternative since the current usage of the proposed construction site is limited to temporary facilities and trailers, which would be demolished or salvaged prior to initiation of construction activities. The expansion would require approximately 0.8 ha (2 acres), west of Building 9212 and 9998 and north of 9215, to accommodate construction activities as well as the current expansion footprint of approximately 0.4 ha (1 acre). Impacts to land surrounding the expansion site would be limited to the lay-down areas for construction. The lay-down area would be the S-3 Parking Lot and would be developed as described above. Once the expansion is complete, the lot would be paved and the spaces would be relined for its original parking purposes. The construction and operation of the Upgrade Expansion to Building 9215 plus the No Action - Planning Basis Operations Alternative would disturb up to 52 ha (128 acres) during construction, and result in a potential permanent land requirement of up to 29.5 ha (72 acres) for operations.

The expansion to Building 9215 would be compatible and consistent with the current land use at the Y-12 Plant and would not change the current industrial use classification that exists for the Y-12 Site. Construction and HEU storage operations within the expansion are consistent with recommendations made by the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

5.1.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Site 1 covers a total of 8 ha (20 acres) of land to the north of Bear Creek Road. There are no permanent or temporary structures located on the Site. Approximately 50 percent has already been cleared and the remaining 50 percent is covered with trees. The 0.8-ha (2-acre) construction lay-down area located to the east of the Site consists of a mixture of cleared and wooded land with no temporary or permanent structures. Surrounding development is limited to Building 9114 to the southeast while woodland extends to the north and northwest up to the DOE-ORR boundary.

There would be a change in land use for both the Site and the temporary construction lay-down area, but no change in the industrial use classification of the area. Following completion of construction, the construction lay-down area would be regraded and incorporated into the landscape design of the Special Materials Complex. Construction of the Special Material Complex at Site 1 would be outside the Y-12 Plant PIDAS. The proposed area is still within the recommended development area for this type of activity and would be consistent with recommendations made by the Oak Ride End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

Site 2 covers approximately 5 ha (12.4 acres) of land currently used as a Scrap Metal Yard for the Y-12 Plant, and is located southeast of Building 9114 and east of the westernmost portion of the PIDAS. The construction lay-down area for the project would be located at the S-3 Parking Lot. Temporary parking spaces would be provided in the west tank farm area to mitigate the lost parking used by the new construction lay-down area. Once the new Special Materials Complex is complete, the lot would be paved and relined for original parking purposes. Construction of the Special Materials Complex and future operations at Site

2 would be consistent and compatible with ongoing activities at the Y-12 Plant, would not change the current industrial use classification for the area, and is consistent with recommendations made by the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

Site 3 is the same location as Site B under the new HEU Materials Facility construction alternative and covers approximately 5 ha (12.4 acres). The 0.8 ha (2-acre) construction lay-down area for the construction at Site 3 would be in the S-3 Parking Lot. A temporary parking lot would be developed in the west tank farm area and just south of old Post 17 during construction of the Special Materials Complex. Once the construction of the new Special Materials Complex at Site 3 is complete, the S-3 Parking Lot would be paved and the spaces would be relined for original parking purposes. Construction of the Special Materials Complex and future operations at Site 3 would be consistent and compatible with ongoing operations at the Y-12 Plant, would not change the current industrial use classification for the area, and are consistent with recommendations made by the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

The No Action - Planning Basis Operations Plus the construction and operation of the Special Materials Complex would potentially disturb up to 59 ha (146 acres) (Site 1) and 56 ha (138 acres) (Sites 2 and 3) during construction, and result in a permanent land requirement of up to 33 ha (82 acres) for operations, a small percentage of available undeveloped Y-12 land.

When the new Special Materials Complex is completed, the facilities currently used for the mission at the Y-12 Plant could be declared surplus, reused for other support activities, or recommended for D&D. The final disposition of these facilities would be determined by the Y-12 Facility Transition Process described in Appendix A. This could result in reuse of the land and facilities for activities not related to weapons production operations, possibly allowing some local land use benefits. Specific usage of these facilities may change, but the overall industrial use classification would remain the same.

5.1.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Construction and operation of the HEU Materials Facility and the Special Materials Complex, when combined with the No Action - Planning Basis Operations activities, would result in land use impacts from temporary disturbance and the permanent commitment of land for new facilities. Construction activities would disturb up to 64 ha (158 acres). New facilities and support operations (i.e., Y-12 West End Borrow Area) would require the permanent use of a total of 26 to 37 ha (64 to 91 acres) of land. Only 18 to 29 ha (44 to 72 acres) would be land that did not have existing structures prior to construction. The siting of the proposed new facilities (i.e., Environmental Management Waste Management Facility, the Field Research Center, the HEU Materials Facility, and the Special Materials Complex) would be consistent with ORR and Y-12 land use plans and policies, and consistent with the recommendations of the Oak Ridge End Use Working Group (PEC 1998) as well as the planned and proposed projects for the site addressed in the *Oak Ridge Reservation Site Development and Facilities Utilization Plan 1990 Update* (DOE 1991a).

5.2 TRAFFIC AND TRANSPORTATION

Three major interstate highways (I-40, I-75, and I-81) and other state routes (TSR 61, TSR 62, and US 25W at Clinton) provide off-site access for traffic to and from the Y-12 Site. Primary roads on the ORR serving Y-12 include TSRs 95, 58, 62, and 170 (Bethel Valley Road), and Bear Creek Road. In its analysis of impacts, DOE examined the potential for the various alternatives to affect local traffic patterns. To

accomplish this, DOE reviewed the roadways that serve Y-12 and the surrounding Oak Ridge area and then used projections based on changes in worker population and construction activities to determine how traffic patterns could be affected.

DOE also performed an analysis of transportation of materials to and from the Y-12 Plant for each alternative to determine incident-free impacts and accident impacts of material transportation, including vehicular accident impacts. The transportation-related impact evaluation includes the calculation of:

- Incident-free radiological doses and corresponding potential latent cancer fatalities (LCFs) to the transportation crew and public from radiation exposure
- Dose risks due to transportation accidents
- Traffic fatalities that are independent of the cargo
- LCFs due to vehicle emissions

Appendix A.6 gives a detailed discussion of the methodology, models, and analyses for transportation impacts. To estimate these impacts, DOE determined the types of material that would be shipped and the origin and destination of the shipments. Radiological consequences were calculated using the RADTRAN computer program (SNL 1992). Nonradiological impacts were estimated using unit risk factors (SNL 1986), which express the risk per kilometer traveled and were developed from national statistics for high accident-related deaths. The unit risk factors used in this SWEIS are presented in Table 5.2–1 and include the risk of a LCF from vehicle emissions and the risk of traffic fatalities.

5.2.1 Alternative 1A (No Action - Status Quo Alternative)

Primary roads on the ORR serving Y-12 include TSRs 95, 58, 62, and 170 (Bethel Valley Road), and Bear Creek Road. All are public roads except Bear Creek Road which traverses the ORR. The traffic statistics associated with No Action - Status Quo Y-12 missions are presented in Section 4.2, Table 4.2.1–1. Average daily traffic on ORR and area roads serving Y-12 ranges from 3,200 vehicles per day on West Bear Creek Road (LOS A) to 28,320 vehicles per day on TSR 62 from TSR 170 to TSR 95 (LOS E). Major off-site area roads for long-distance transport of materials and waste include I-40, I-75, and I-81. There would be no change in traffic or transportation impacts over the 10-year planning period under the No Action - Status Quo Alternative.

TABLE 5.2–1.—Nonradiological Unit-Risk Factors for Truck Transport

Exposure	Rural	Suburban	Urban
Nonoccupational Latent Fatalities (fatalities/km)	–	–	1.0×10^{-7}
Nonoccupational Fatalities (fatalities/km)	5.3×10^{-8}	1.3×10^{-8}	7.5×10^{-9}
Occupational Fatalities (fatalities/km)	1.5×10^{-8}	3.7×10^{-9}	2.1×10^{-9}

Source: SNL 1986.

5.2.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

The No Action - Planning Basis Operations Alternative includes continuation of the present Y-12 missions as well as the construction and operation of the Environmental Management Waste Management Facility and implementation of the Field Research Center activities. The Field Research Center activities would result in a slight increase in traffic on those routes needed by staff members and researchers who travel to and from research locations within ORNL. However, because the number of people associated with this project is relatively small, DOE does not expect significant impacts on traffic from the Field Research Center activities. Some interruption of normal traffic flow might occur as a result of drilling rigs and on-site field trailer transport. This activity would be of short duration and would not result in long-term impacts. The construction and operation of the Environmental Management Waste Management Facility could result in some traffic increases. During the construction of the disposal facilities, the commuting workforce would result in a maximum of an additional 75 vehicles per day on Bear Creek Road. This workforce represents less than 1 percent of the total workforce on ORR, and the majority of construction workers would be from the existing workforce. This would have a negligible impact to Y-12 Site traffic and LOS on area roads.

Waste transportation to the disposal facility during operation would be at a maximum rate of 20 trucks per day. Most waste would originate and terminate within boundaries of the Y-12 Site and ORR; therefore, no appreciable change in use of public roads off-site is expected. In addition, up to eight truckloads per day of leachate would be transported to the ORR Technology Park Central Neutralization Facility. These additional vehicles could result in minor traffic delays to the Y-12 Plant workers, but no overall decrease in LOS or increased likelihood of on-site traffic accidents is expected.

TABLE 5.2.2-1.—Annual Incident-Free Doses to Crew and Public and Accident Risk to Public Under Alternative 1B (No Action - Planning Basis Operations Alternative)

Material Type	Incident-Free Doses (person-rem)				Accident Risk to Public* (person-rem)
	Crew	Offlink	Onlink	Stop	
Radioactive Materials	13.3	0.95	9.8	164.4	183.1
Radioactive Waste	1.4	0.08	0.9	11.3	11.3

Note: Offlink-Exposure of members of the public who reside adjacent to routes of travel, Onlink-Exposure of members of the public sharing the right-of-way.

Source: Appendix D based on SNL 1992.

*Probability weighted dose due to an accident

Under the No Action - Planning Basis Operations Alternative, transportation activities for the shipment of materials, wastes, and chemicals are projected to be the same as described under the No Action - Status Quo Alternative based on expected operational levels. A detailed analysis of transportation activities is presented in Appendix A.6.

The calculated incident-free radiological doses to crew and public, and the accident risk (probability weighted dose due to an accident) to the public due to annual radiological shipments for Y-12 under Alternative 1B (No Action - Planning Basis Operations Alternative) are presented in Table 5.2.2-1. The impacts for the No Action - Planning Basis Operations Alternative in terms of incident-free LCFs, LCFs due to radiological accident risk, latent fatalities due to exposure to potential vehicle emissions, and traffic fatalities are presented in Table 5.2.2-2.

The risk due to radiation exposure during incident-free transportation of all waste to the Environmental Management Waste Management Facility is estimated to be 0.001 LCF for local truck transport. Risk from

exposure to radiation materials that resulted from releases during a transportation accident is estimated to be 7.0×10^{-7} LCF for local truck transport. The risk of traffic fatalities due to a transportation accident is estimated to be 0.3 for local truck transport.

TABLE 5.2.2–2.—Annual Transportation Impacts for Y-12 Operations Under Alternative 1B (No Action - Planning Basis Operations Alternative)

Material Type	Latent Cancer Fatalities				Accident Risk	Traffic Fatalities	LCFs due to vehicle emissions
	Incident-Free						
	Crew	Offlink	Onlink	Stop			
Radioactive Materials	5.3×10^{-3}	4.8×10^{-4}	4.9×10^{-3}	0.082	0.092	0.150	4.8×10^{-3}
Radioactive Wastes	5.6×10^{-4}	4.0×10^{-5}	4.5×10^{-4}	5.7×10^{-3}	5.7×10^{-3}	0.017	4.0×10^{-4}
Nonradioactive Wastes & Chemicals	-	-	-	-	-	0.010	4.2×10^{-4}

Note: Offlink-Exposure of members of the public who reside adjacent to routes of travel, Onlink-Exposure of members of the public sharing the right-of-way.

Source: Appendix D based on SNL 1982.

5.2.3 Alternative 2 - (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)

Under this alternative, construction related impacts to local traffic could occur as the new HEU Materials Facility is being built. During peak construction, an estimated 220 workers would be needed for the new facility. Assuming the daily increase in worker traffic is 75 percent of the estimated peak construction workforce, approximately 165 additional vehicles per day are expected. An additional 8 trucks per day during the peak construction phase would be anticipated from concrete and steel trucks. DOE expects these construction-related transportation impacts to be temporary, localized to the general construction area, and minor since most construction traffic would occur during off-peak traffic periods. The operation of the HEU Materials Facility Plus the No Action - Planning Basis Operations Alternative would potentially add an additional 34 vehicles per day on area roads during construction. There will be no additional worker traffic associated with the HEU Materials Facility Operations because existing workforce would be used.

The existing inventory of stored HEU would be relocated to the new HEU Materials Facility or the Building 9215 Addition. There would be a one-time transportation risk associated with the relocation of the stored uranium to this new facility. It is anticipated that the relocation would be completed within one year and require an estimated 3,000 on-site truck trips using SSTs. The transportation impacts are based on the total relocation of the materials.

The incident-free radiological risk to the transport crew, based on the calculated dose of 8.7×10^{-2} person-rem, is estimated to be 3.5×10^{-5} LCF. The incident-free radiological risk to the Y-12 Plant population including the handlers, based on the calculated dose of 0.14 person-rem, is estimated to be 7.0×10^{-4} LCF. The risk to the Y-12 Plant population due to radiation release during an accident is estimated to be 7.5×10^{-5} LCF. The risk to the public due to traffic fatalities is calculated to be 1.3×10^{-4} .

After the transfer of the existing inventory of stored HEU material is complete, DOE expects that the routine shipment and receipt of various materials and waste would be comparable to that under Alternative 1B (No Action - Planning Basis Operations Alternative). Therefore, no appreciable change in transportation impacts from the No Action - Status Quo Alternative is expected.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

Under this alternative, construction related impacts to local traffic could occur as the Upgrade Expansion is being constructed. An estimated 220 workers would be required during peak construction for the Building 9215 expansion. Assuming the daily increase in worker traffic is 75 percent of the estimated peak construction workforce, approximately 165 additional vehicles per day are expected. An additional three trucks per day during the peak construction phase would be anticipated from concrete and steel trucks. DOE expects these construction-related transportation impacts to be temporary, localized to the general construction area, and not significant since most construction traffic would occur during off-peak traffic periods. The operation of the Upgrade Expansion to Building 9215 plus the No Action - Planning Basis Operations Alternative would potentially add an additional 34 vehicles per day on area roads during construction. There will be no additional worker traffic associated with the Upgrade Expansion of Building 9215 because existing workforce would be used. During operation of the upgraded facility, DOE expects that the routine shipment and receipt of various materials and waste would be comparable to that under the No Action - Status Quo Alternative. Therefore, no appreciable change in transportation impacts from the No Action - Status Quo Alternative is expected.

5.2.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Under this alternative, short-term construction related impacts to local traffic impacts could occur as the new facilities are being built. An estimated 210 workers would be required during peak construction for the Special Materials Complex. Assuming the daily increase in worker traffic is 75 percent of the estimated peak construction workforce, approximately 157 additional vehicles per day are expected. An additional five trucks per day during the peak construction phase (lasting approximately 1 year) would be anticipated from concrete and steel trucks. The No Action - Planning Basis Operations Alternative combined with the operation of the Special Materials Complex would potentially add an additional 34 vehicles per day on area roads during construction. There will be no additional worker traffic associated with the Special Materials Complex because existing workforce would be used. DOE expects these worker transportation impacts to be temporary, localized to the general construction area, and not significant since most construction traffic would occur during off-peak traffic periods. No change in area road LOS is expected.

5.2.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Construction of the HEU Materials Facility and the Special Materials Complex when combined with the No Action - Planning Basis Operations Alternative would result in an additional 420 vehicles per day on area roads. This would represent approximately a 3 percent increase in traffic on East Bear Creek Road (if all traffic entered the Y-12 Site from that one road) and would not be expected to change the existing LOS C rating. DOE expects these worker and construction traffic impacts to be minor since most construction traffic would occur during off-peak traffic periods. There will be no additional worker traffic associated with the HEU Materials Facility and the Special Materials Complex because existing workforce would be used. Operations traffic under this alternative would result in approximately 34 additional vehicles per day on area roads and would have no impact on the LOS of area roads.

5.3 SOCIOECONOMICS

Socioeconomic impacts are addressed in terms of both direct and indirect impacts. Direct impacts are changes in Y-12 employment and expenditures expected to take place under each alternative and include both construction-phase and operations-phase impacts. Indirect impacts include (a) the impacts to ROI businesses and employment resulting from changes in DOE purchase or nonpayroll expenditures, and (b) the impacts to ROI businesses and employment that result from changes in payroll spending by affected Y-12 employees. The total economic impact to the ROI is the sum of direct and indirect impacts. Both the direct and indirect impacts are estimated for the ROI described in Section 4.3. The direct impacts estimated in the socioeconomic analysis are based on project summary data developed by DOE in cooperation with Y-12 contractors and their representatives. Direct employment impacts represent actual increases or decreases in Y-12 staffing; they do not include changes in staffing due to reassignment of the existing workforce at Y-12. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System (RIMS II) multipliers developed specifically for the Y-12 ROI by the U.S. Bureau of Economic Analysis. These multipliers are based on national input-output tables developed by BEA and adjusted to reflect the regional industrial structure and trading patterns. These tables show the distribution of the inputs purchased and the outputs sold for each industry. Multipliers are used with information on initial changes in output, earnings, and employment associated with the proposed project to estimate the total impact of the project on regional output, earnings, and employment.

The importance of the actions and their impacts is determined relative to the context of the affected environment. Projected baseline conditions in the ROI, as presented in Section 4.3, Socioeconomics, provide the framework for analyzing the importance of potential socioeconomic impacts that could result from implementation of any of the new facility construction alternatives. Baseline employment and population represent socioeconomic conditions expected to exist in the ROI through 2025. Each HEU Storage Mission or Special Materials Mission alternative is expected to generate short-term increases in employment and income as a result of construction and longer-term decreases as a result of reductions in the Y-12 workforce.

5.3.1 Alternative 1A (No Action - Status Quo Alternative)

The ROI where more than 90 percent of the ORR workforce resides is a four-county area in Tennessee comprised of Anderson, Knox, Loudon, and Roane Counties. In 1997, almost 40 percent of the ORR workforce resided in Knox County, 29 percent in Anderson County, 16 percent in Roane County, and 6 percent in Loudon County. The remaining 9 percent of the workforce resides in other counties across Tennessee, none of which is home to more than 3 percent of the workforce (DOE 1999f).

ROI employment grew from 231,822 in 1990 to 268,748 in 1995, and continued to grow totaling 269,466 in 1998. The ROI labor force totaled 278,866 in 1998. The ROI unemployment rate was 3.4 percent in 1998. The unemployment rate in Tennessee was 4.2 percent in 1998 (BLS 1999). Per capita income in the ROI was \$23,520 in 1997, while the per capita income in Tennessee was \$22,699 (BEA 1999). Y-12 employs approximately 8,900 workers, including DOE employees and contractors. As a whole, DOE employees and contractors number more than 13,700 in Tennessee, primarily in the ROI.

Between 1990 and 1998, ROI population growth increased 1.1 percent annually while the state population increased 1.4 percent annually. Population in all counties in the ROI is projected to continue to grow at a somewhat slower rate between 1998 and 2020. Knox County is the largest county in the ROI with a 1998 population of 366,846. Loudon County is the smallest county in the ROI with a total population of 39,052.

There would be no change in the regional economic characteristics or the population of the ROI over the 10-year planning period under Alternative 1A (No Action - Status Quo Alternative).

5.3.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

Under this alternative, there would be no substantial change in the 8,900 person Y-12 Site workforce to resume uranium operations and other stand-down operations at Y-12. Therefore, there would be no change in the No Action - Status Quo Alternative regional economic characteristics or the population of the ROI.

Potential socioeconomic impacts from the Environmental Management Waste Management Facility and the Field Research Center included under Alternative 1B (No Action - Planning Basis Operations Alternative) are described below.

The socioeconomic impacts associated with the workforce required for construction, operation, and closure of the Environmental Management Waste Management Facility would not adversely affect nor would it benefit the region's economic conditions. The workforce would vary with project phases. For the high-end waste volume scenario, an average of about 75 workers per year would be needed during construction, peaking at 100 workers in FY 2000-2001. This peak, projected to occur during Phase II construction of the cell with Phase I still in operation, represents an increase of less than 1 percent of the current total ORR workforce. This workforce would likely be drawn from the local labor market, resulting in minimal influx of workers to the area. The 25 workers estimated to be needed for operation of the on-site disposal facility would also likely be drawn from the local workforce.

The workforce for the Field Research Center is anticipated to be small: a construction workforce of up to ten and a staff of up to six individuals during operations, some of whom would be part-time employees of the Field Research Center. Researchers from ORNL, other national laboratories, universities, and other research institutions would visit the Field Research Center to conduct experiments and collect samples. The numbers of visitors at any one time would be small, but could be as many as 24 on occasion. Visiting staff and scientists would contribute in a beneficial manner to the local economy by staying in local hotels and using local services. There would be no negative impact to the socioeconomics of the Oak Ridge area as a result of ORNL Field Research Center activities.

5.3.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternative)

Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)

For the construction of the HEU Materials Facility at Site A or Site B construction activities would require approximately 220 workers (see Table 3.2.3-1), generating a total of 460 jobs (220 direct and 240 indirect) in the ROI during the peak year of construction, an increase of 0.1 percent in ROI employment. This would increase total ROI income by approximately \$12 million, approximately 0.2 percent of ROI income. These changes would be temporary, lasting only the duration of the 4-year construction period. The existing ROI labor force could likely fill all of the jobs generated by the increased employment and expenditures. Therefore, there would be no impacts to the ROI's population or housing sector. Because there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI.

Operation of the HEU Materials Facility at any of the sites would not result in any change in workforce requirements. As shown in Table 3.2.3-2, the facility would require a workforce of 100 during the first year transition period and approximately 30 for normal operation at Sites A or B. The additional workers in the first year (e.g. 70 workers) would be primarily security forces related to the movement of the material. The facility would be staffed by the existing Y-12 workforce. Therefore, there would be no change from baseline Y-12 Site employment and no impacts to ROI employment, income, or population.

The No Action - Planning Basis Operations Alternative plus the construction of a new HEU Materials Facility would require a total of approximately 330 construction workers. A total of 690 jobs (330 direct and 360 indirect) would be generated. This would increase No Action - Status Quo Alternative ROI employment by approximately 0.2 percent. Total No Action - Status Quo Alternative ROI income would increase by approximately \$17.8 million, or 0.1 percent.

The new HEU Materials Facility would be operated by the existing Y-12 workforce. Therefore, the only impacts during operation would be from the No Action - Status Quo Alternative, as discussed in Section 5.3.2.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

Impacts from construction-related activities for the Upgrade Expansion of Building 9215 would be the same as for Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility).

As shown in Table 3.2.3–4, operation of the facility would require a workforce of 100 for the first year transition period and 49 for normal operations. The facility would be staffed by the existing Y-12 workforce. Therefore, there would be no change from No Action - Planning Basis Operations Y-12 Site employment and no impacts to ROI employment, income, or population.

Because construction and operations employment requirements for the Upgrade Expansion of Building 9215 would be similar to the requirements to construct and operate a new HEU materials facility, the impacts from the Upgrade Expansion of Building 9215 plus the No Action - Planning Basis Operations would be similar to the impacts from the construction and operation of a new HEU materials facility plus the No Action - Planning Basis Operations Alternative.

5.3.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Construction of the Special Materials Complex at Site 1, Site 2, or Site 3 would require 210 workers at the peak of construction (see Table 3.2.4–1), generating a total of 440 jobs (210 direct and 230 indirect) in the ROI, an increase of 0.1 percent in current ROI employment. This would increase total ROI income by approximately \$12 million, approximately 0.2 percent of ROI income. These changes would be temporary, lasting only the duration of the 3.5-year construction period. The existing ROI labor force could fill all of the jobs generated by the increased employment and expenditures. Therefore, there would be no impacts to the ROI's population or housing sector. Because there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI.

Operations of the Special Materials Complex at the sites would not result in any change in workforce requirements. As shown in Table 3.2.4–2, the facilities would require a workforce of 36 for normal operations. The facilities would be staffed by the existing Y-12 workforce. Therefore, there would be no change from the No Action - Status Quo Alternative Y-12 Site employment and no impacts to ROI employment, income, or population.

The No Action - Planning Basis Operations plus the construction of a new Special Materials Complex would result in a total of approximately 320 construction workers. A total of 670 jobs (320 direct and 350 indirect) would be generated. This would increase ROI employment by approximately 0.2 percent. Total No Action -

Status Quo ROI income would increase by approximately \$17.2 million, or 0.1 percent.

The new Special Materials Complex would be operated by the existing Y-12 workforce. Therefore, the only impacts during operation would be from the No Action - Planning Basis Operations activities, as discussed in Section 5.3.2.

5.3.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

The construction periods of the HEU Materials Facility and the Special Materials Complex could overlap with the construction activities included under the No Action - Planning Basis Operations. In that case, there would be a greater construction workforce at Y-12 at one time, resulting in a greater increase in ROI employment, and income in any one year. The peak construction employment could reach approximately 540 direct employees, generating a total 1,130 jobs (540 direct and 590 indirect). This would be an increase of approximately 0.4 percent in No Action - Status Quo Alternative ROI employment and would result in an increase in ROI income of almost \$30 million, or 0.2 percent. These changes would be temporary, lasting only the duration of the construction period. The existing ROI labor force could likely fill all of the jobs generated by the increased employment and expenditures. Therefore there would be no impacts to the ROI's population or housing sector. Because there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI.

Because both the HEU Materials Facility and the Special Materials Complex would be staffed by the existing Y-12 workforce during operations, there would be no change from the No Action - Status Quo Alternative Y-12 workforce and no impacts to ROI employment, income, or population.

5.4 GEOLOGY AND SOILS

The geology and soils analysis considers a ROI which includes the Y-12 area of analysis as well as the rest of the ORR. Impacts to these resource areas were determined by assessing potential changes in existing geology and soils that could result from construction activities and operations under each of the alternatives.

5.4.1 Alternative 1A (No Action - Status Quo Alternative)

Y-12 is located within Bear Creek Valley, which is underlain by Middle to Late Cambrian strata of the Conestoga group. The Conestoga Group consists primarily of highly fractured and jointed shale, siltstone, calcareous siltstone, and limestone in the Site area. The bedrock at the Y-12 Site is adequate to support structures using standard construction techniques. Bedrock in the Y-12 area is overlain by alluvium, colluvium, man-made fill, fine-grained residuum from the weathering of the bedrock, saprolite, and weathered bedrock. The overall thickness of these materials in the Y-12 area is typically less than 12 m (40 ft).

Bear Creek Valley lies on well to moderately-well-drained soils underlain by shale, siltstone, and silty limestone. Y-12 lies on soils of the Armuchee-Montevallo-Hamblen, the Fullerton-Claiborne-Bodine, and the Lewhew-Armuchee-Muskinghum associations. Soil erosion due to past land use has ranged from slight to severe. Wind erosion is slight and shrink-swell potential is low to moderate. The soils at the Y-12 Site are generally stable and acceptable for standard construction techniques. Because no new construction or land disturbing activities are expected under the No Action - Status Quo Alternative no impacts to soils and geology are anticipated.

The Oak Ridge area lies at the boundary between seismic Zones 1 and 2 of the Uniform Building Code, indicating that minor to moderate damage could typically be expected from an earthquake. Y-12 is cut by

many inactive faults formed during the late Paleozoic Era (DOE 1996e). There is no evidence of capable faults in the immediate area of Oak Ridge, (surface movement within the past 35,000 years or movement of a recurring nature within the past 500,000 years) as defined by the NRC's "Reactor Site Criteria" (10 CFR 100). The nearest capable faults are approximately 480 km (300 mi) west of the ORR in the New Madrid Fault zone. No change in seismic related impacts are expected.

5.4.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

Under the No Action - Planning Basis Operations Alternative, activities associated with DP, Nuclear Energy, Nonproliferation and National Security, Work-for-Others Program, or Technology Transfer would not discernibly affect local short-term or long-term geologic or soil resources. No new construction or land disturbing activities are expected during the 10-year planning period for these missions. Ongoing Environmental Remediation activities would employ best management practices. All soil disturbing activities would be performed in accordance with RCRA and CERCLA regulations, and project plans/procedures.

Construction and operation of the Environmental Management Waste Management Facility at Y-12 could result in minimal local short-term soil impacts. Since the site where the Environmental Management Waste Management Facility would be constructed is within an existing waste management/industrial area, no adverse geologic impacts are expected.

As discussed in Section 3.2.2.2, construction and operation of the new disposal facility would require clearing land within the Research Park and the Y-12 West End Borrow Area. Construction, operation, and support activities could lead to a possible temporary increase in erosion as a result of stormwater runoff and wind action.

Impacts to geologic or soil resources from the Field Research Center component of the NABIR Program at Y-12 are expected to be minor. Soils within the project contamination area are previously disturbed and, therefore, impacts to soils would be minimal. Activities would disturb these soils only in areas where drilling, boring, or well installation would occur. Additional contamination would be minimal with current waste management procedures.

5.4.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

Alternatives 2A and 2B (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility or Upgrade Expansion of Building 9215)

Construction and operation of a new HEU Materials Facility at Site A, Site B, or the Upgrade Expansion of Building 9215 would have no impact on geological resources, and the hazards posed by geological conditions are expected to be minor.

Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other nontectonic events are unlikely to affect Site A, Site B, or the expansion site for Building 9215. Sinkholes are present in the Knox Dolomite, but it is unlikely that they would impact the project, as the Knox Dolomite is not present in the Y-12 Plant area.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not impact the construction and operation of the HEU Materials Facility at either Site A, Site B, or the expansion site for Building 9215. The foundation soils are not susceptible to liquefaction during or after seismic events. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1, *Facility Safety*, and accompanying

safety guidelines.

During construction activities, excavation of spoil, limestone, and shale bedrock would occur. There is sufficient capacity to either stockpile these materials or dispose of them during the construction at Site A, Site B, or the expansion site for Building 9215. Soil disturbance from new construction would occur at building, parking, and construction lay-down areas, and lead to a possible temporary increase in erosion as a result of storm water runoff and wind action. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of ground disturbance; and the duration of time the soil is bare. A small volume of spoil, limestone, and shale bedrock may be excavated during the construction process. However, this material could be stockpiled for use as fill.

Existing soil contamination found in the Site B project area is due to past waste handling practices. The contamination includes volatile organic compounds (VOCs), metals, and radionuclides from nearby former S-3 Ponds and the Y-12 Scrap Metal Yard (DOE 1998b). The potential for additional soil contamination from project activities at Site A, Site B, or Building 9215 would be minimized by current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate the hazardous material releases that could impact soil resources. In addition, the potential for soil contamination during the movement of HEU from existing Y-12 storage facilities to a new facility would be minimal due to required safe transportation and packaging practices.

5.4.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Construction and operation of a new Special Materials Complex would have no impact on geological resources; hazards posed by geological conditions are expected to be minimal. Site 1 is an undisturbed area and impacts to soil resources would be greater in this area. Soil disturbance at Site 1 from new construction would alter the soil profile. Sites 2 and 3 are previously disturbed areas and the impacts to soils from construction would be minimal.

Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other nontectonic events are unlikely to affect Site 1, 2, or 3. Sinkholes are present in the Knox Dolomite, but it is unlikely that they would impact the project, as the Knox Dolomite is not present in the Y-12 Plant area.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not impact the construction and operation of the Special Materials Complex at either Site 1, 2, or 3. The foundation soils are not susceptible to liquefaction. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1, *Facility Safety*, and accompanying safety guidelines.

During construction activities, excavation of spoil, limestone, and shale bedrock would occur. There is sufficient capacity to either stockpile these materials or dispose of them during construction at Site 1, 2, or 3. Soil disturbance from new construction would occur at construction lay-down areas, altering the soil profile, and leading to possible temporary erosion as a result of stormwater runoff and wind action. Initial soil disturbance will also occur at Site 1 altering the soil profile and leading to possible temporary increase in erosion. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of ground disturbance; and the duration of time the soil is bare.

The potential for soil contamination from the project activities at Site 1, 2, or 3 would be minimal under current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate hazardous material releases that could impact soil resources.

5.4.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Construction of the HEU Materials Facility and the Special Materials Complex, when combined with the No Action - Planning Basis Operations, would have minimal impact on geological resources; the hazards posed by geological conditions are expected to be minor.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. This should not hinder the construction and operation of the proposed new facilities (i.e., the HEU Materials Facility and the Special Materials Complex). All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1, *Facility Safety*, and accompanying safety guidelines.

During construction activities, there is sufficient capacity to either stockpile the materials excavated or dispose of them. Soil disturbance from new construction would occur at building, parking or construction lay-down areas, and lead to possible temporary increase in erosion as a result of stormwater runoff and wind action. Soil loss would depend on the frequency of storms; wind velocities; size and location of the facilities with respect to drainage and wind patterns; slopes, shape, and area of ground disturbance; and the duration of time the soil is bare.

Soils within the proposed project areas, with the exception of Site 1, are previously disturbed, and therefore, impacts to soils would be minimal. The potential for additional soil contamination from the project activities would be minimal under current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate the hazardous material releases that could impact soil resources.

5.4.6 Mitigation

Potential impacts to soil resources would be minimized by the design features and the buffer provided by the restricted area around the new Environmental Management Waste Management Facility. Best management practices would include sufficient controls of surface water drainage during construction and cell operation to minimize soil erosion. Following closure, much of the disturbed area would gradually return to its natural state. Any contaminated sediment soils collected in storm drainage basins would be disposed of in accordance with site-specific management plans.

5.5 HYDROLOGY

Potential impacts to surface water for each alternative include:

- Changes in surface water quality due to runoff or contamination releases from specific land areas
- Stormwater control measures
- Water requirements for construction and operation of proposed projects compared with the capacity of the existing water supply resource (Clinch River) and the capacity of the water supply system

Impacts to groundwater conditions include:

- Pathways through which groundwater contamination could occur
- The types and levels of existing groundwater contamination

A qualitative assessment of water quality impacts from wastewater (sanitary and process), stormwater runoff, and soil erosion is identified and described in the following sections. Proposed candidate sites for new facilities are compared with the 500-yr floodplain (see Figure 4.5.1-2).

5.5.1 Surface Hydrology

5.5.1.1 *Alternative 1A (No Action - Status Quo)*

Y-12 Surface Drainage Systems. The major surface water body in the immediate vicinity of the ORR, the Clinch River, borders the Site to the south and west. Within the Y-12 area the two major surface water drainage basins are those of Bear Creek and East Fork Poplar Creek (EFPC). The upper reaches of EFPC drain the majority of the industrial facilities of Y-12. The in-plant portion of EFPC has been designated as Upper East Fork Poplar Creek (UEFPC). The natural drainage pattern of the UEFPC has been radically altered by the construction of Y-12. Portions of Y-12 lie within the 100- and 500-year floodplains of EFPC; however, proposed alternative facilities are located outside the 500-year floodplain (see Figure 4.5.1-2).

As a result of reduced operations and elimination of inadvertent direct discharges of contaminated water to UEFPC, flow in UEFPC decreased from 38 to 57 MLD (10 to 15 MGD) in the mid-1980s to about 9 MLD (2.5 MGD) in the mid-1990s. Since mid-1996, water has been added to the western portion of the open channel in order to maintain flow of 26 MLD (7 MGD) at Station 17. Raw water usage has still remained well within historic water use levels and well below Y-12 capacity. No change in the UEFPC water flow from current levels is expected during the 10-year planning period under the No Action - Status Quo Alternative. Therefore, no change in UEFPC impacts is expected.

Bear Creek Valley west of Y-12 is drained by Bear Creek. Bear Creek flow is maintained by inputs from tributary streams flowing in from the north (mostly) from Pine Ridge. The channel of Bear Creek is less modified than that of UEFPC, but several short reaches have been relocated to accommodate construction (e.g., Bear Creek Road) at the west end of Y-12. No change in Bear Creek Valley surface water flows is expected.

The Clinch River and connected waterways supply all raw water for the ORR and provide potable water for Y-12. Y-12 uses approximately 7,530 MLY (1,989 MGY) of water. The ORR water supply system, which includes the city of Oak Ridge treatment facility and the ETTP treatment facility, has a capacity of 44,347 MLY (1,716 MGY). No impacts to Clinch River water resources is expected during the 10-year planning period under the No Action - Status Quo Alternative.

The streams and creeks of Tennessee are classified by TDEC and defined in the State of Tennessee Water Quality Standards. The Clinch River is the only surface water body on ORR classified for domestic water supply. Most of the streams at ORR are classified for fish and aquatic life, livestock watering, wildlife, and recreation. At Y-12, there are six treatment facilities with NPDES-permitted discharge points to UEFPC. The current Y-12 Plant NPDES permit, issued on April 28, 1995, and effective on July 1, 1995, requires sampling, analysis, and reporting at approximately 100 outfalls. Discharges to surface water allowed under the permit include storm drainage, cooling water, cooling tower blowdown, and treated process wastewaters, including effluents from wastewater treatment facilities. The effluent limitations contained in the permit are based on the protection of water quality in the receiving streams. Y-12 is also permitted to discharge wastewater to the city of Oak Ridge Wastewater Treatment Facility. The water quality of surface streams

in the vicinity of Y-12 is affected by current and past operations. No additional adverse impacts to surface water quality are expected under the No Action - Status Quo Alternative.

5.5.1.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

The source of water for activities at the Y-12 Plant is the Clinch River. Under Alternative 1B (No Action - Planning Basis Operations Alternative), surface water usage at the Y-12 Plant would increase slightly from the No Action - Status Quo Alternative (20.8 MLD to 21.1 MLD [5.5 MGD to 5.6 MGD]) due to the resumption of enriched uranium operations and other stand-down operations. This would represent less than a 2 percent increase in raw water use. Infrastructure maintenance and repairs planned as part of normal Y-12 Plant activities would continue. Other programs, particularly the Environmental Restoration Program, would continue to address surface water contamination sources and, over time, improve the quality of water in both UEFPC and Bear Creek, the two surface water bodies most directly impacted by activities at the Y-12 Plant. The new Environmental Management Waste Management Facility in eastern Bear Creek Valley is included under the No Action - Planning Basis Operations Alternative. The selection of a preferred site and evaluation of the environmental impact have been presented in the *Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee* (DOE 1999j). Potential short-term impacts to surface water resources could result from sediment loading to surface water bodies or migration of contaminants. Land clearing and construction activities would expose varying areas depending on the ultimate size of the facility. Best management practices, including standard erosion controls such as siltation fences and buffer zones of natural riparian vegetation, during construction activities would minimize the potential impacts to surface water resources. Vegetation preserved in the riparian zone (adjacent to tributaries) would serve as a filter strip for eroded soil, help prevent stream banks from eroding or slumping, and moderate water temperatures through shading. Grass would be planted in cleared areas to minimize the time that soils are exposed, stabilize the soil, and control erosion. Some impacts to surface water would be expected. Tributary NT-4 would be rerouted and partially eliminated during construction at the East Bear Creek Valley Site. Construction and rerouting of NT-4 would impact some areas of wetland (approximately 0.4 ha [1 acre]) which will be mitigated as part of a wetlands mitigation plan for all CERCLA activities in Bear Creek Valley (DOE 1999j).

Sediment detention basins would control surface water runoff from uncontaminated areas of the waste cell. These basins would prevent increased sediment discharge to the streams and even out discharge during storms. A perimeter ditch would be constructed around the waste cell to prevent surface run-on and direct the water to the sediment basins before release to local streams.

Potentially contaminated runoff from the disposal cell, water used for decontamination, water from the leachate detection/collection system, and other wastewater would be collected in storage tanks. This water would be sampled and transported to an appropriate treatment facility, as required. The potential for impact to surface water resources from the migration of contaminants from the disposal cell in groundwater would be exceedingly low because of engineered and active controls. Little or no overall short-term impacts to surface water resources would be expected with the exception of direct impacts to any water course or wetlands displaced or eliminated by construction.

The new disposal cell would be designed, constructed and maintained to prevent releases that could adversely affect surface water quality in the long term. After the period of active institutional controls, erosion of the cell could eventually expose waste, resulting in release to surface water; however, the cell is designed to resist erosion with minimal maintenance, and only extensive erosion would breach containment. Contaminant releases to groundwater from leachate migrating from the cell are unlikely but could also eventually impact surface water quality.

The No Action - Planning Basis Operations Alternative also includes activities of the Field Research Center at the Y-12 Site. The Field Research Center includes use of an area of contaminated groundwater near the headwaters of Bear Creek Valley (in the vicinity of the former S-3 Ponds). Activities of the Field Research Center include small area studies in support of developing in-situ groundwater remediation technologies. As part of these studies, minor ground-surface disturbances may occur such that surface runoff to Bear Creek would be controlled by standard construction practices (e.g., silt fencing). This is particularly important in the headwaters of Bear Creek Valley where near surface soils often contain contaminants (DOE 1997a).

The primary activities of the Field Research Center at Y-12 comprise subsurface injections of possible treatment additives into the groundwater at the contaminated area. Additives may include small quantities of nontoxic tracers, nutrients, electron donors (e.g., glucose, acetate, molasses) or acceptors (e.g., oxygen, sulfate), and microorganisms. Although only small volume injections are planned, it is possible that the groundwater additives might pass through the subsurface and reach the surface waters of Bear Creek. However, previous experiences with larger tracer injections near Bear Creek (DOE 1997a, LMER 1999c) and close monitoring of environmental conditions at the contaminated area suggest that the impacts to surface waters are predictable and would be minor.

5.5.1.3 *Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)*

Alternatives 2A and 2B (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility or Upgrade Expansion of Building 9215)

Y-12 Plant surface water withdrawals and discharges would not increase substantially during construction of the HEU Materials Facility whether at construction Sites A or B or during Upgrade Expansion of Building 9215.

Construction water requirements are very small and would not raise the average daily water use for the Y-12 Plant. During construction, stormwater control and erosion control measures would be implemented to minimize soil erosion and transport to UEFFPC. Neither of the proposed construction sites (Sites A or B) or the Upgrade Expansion Site (Building 9215) is located within either the 100-year or 500-year floodplains.

HEU storage operations, whether located in a new HEU Materials Facility or in the upgraded/expanded Building 9215, would require an estimated 550,000 L to 720,000 L (146,000 GPY to 190,000 GPY), a small percentage of the No Action - Status Quo Alternative Y-12 Plant water usage of approximately 5,680 MLY (1,500 MGY).

The No Action - Planning Basis Operations Alternative plus the operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would increase water use requirements by approximately 140 MLY (37 MGY) from the 5,680 MLY (1,500 MGY) water use under No Action - Status Quo. This represents an increase of approximately 2.5 percent. Sufficient excess water capacity exists to accommodate the additional 140 MLY (37 MGY). No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits.

5.5.1.4 *Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)*

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Surface water withdrawals and discharges would not increase substantially during construction of the Special Materials Complex. Construction water requirements are very small and would not raise the average daily

water use for the Y-12 Plant. During construction, stormwater control and erosion control measures would be implemented to minimize soil erosion and transport to surface water (UEFPC). None of the proposed sites (Sites 1, 2, or 3) are located within either the 100-year or 500-year floodplains (see Figure 4.5.1-2).

Operations of the Special Materials Complex would require an estimated 59 MLY (15.5 MGY) (approximately 53 MLY [14 MGY] for cooling tower make-up water and 6 MLY [1.5 MGY] for processes). This would be approximately 1 percent of No Action - Status Quo Y-12 Site water usage of 5,680 MLY (1,500 MGY). This water use would potentially be offset by the vacating of operations in existing special materials operations facilities. No adverse impacts to surface water or surface water quality are expected because all discharges would be monitored to comply with the NPDES permit limits.

The No Action - Planning Basis Operations Alternative plus the operation of the Special Materials Complex would increase water use requirements by approximately 197 MLY (52 MGY) from the 5,680 MLY (1,500 MGY) water use under No Action - Status Quo. This represents an increase of approximately 3.5 percent. Sufficient excess water capacity exists to accommodate the additional 197 MLY (52 MGY). No adverse impacts to surface water resources or surface water quality are expected because all discharges would be monitored to comply with NPDES permit limits.

5.5.1.5 *Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)*

Under the alternative, surface water withdrawals and discharges for operations would increase slightly. Water requirements would increase by approximately 197 MLY (52 MGY) from the 5,680 MLY (1,500 MGY) water usage under the No Action - Status Quo Alternative. This represents an increase of 3.5 percent. Historical water used by Y-12 has been on high or 8,328 MLY (2,200 MGY). Sufficient excess water capacity exists to accommodate the additional 197 MLY (52 MGY) increase. No adverse impacts to surface water or surface water quality are expected because all discharges would be maintained to comply with the NPDES permit limits.

5.5.2 Groundwater

5.5.2.1 *Alternative 1A (No Action - Status Quo Alternative)*

Y-12, bound on the north by Pine Ridge and on the south by Chestnut Ridge, is located near the boundary between the Knox Aquifer and the ORR Aquitards. ORR Aquitards underlie Pine Ridge and Bear Creek Valley, which contains the main Plant area of Y-12 and the disposal facilities of western Bear Creek Valley.

Groundwater at Y-12 has been divided into three hydro geologic regimes: UEFPC, Bear Creek, and Chestnut Ridge. A surface water divide at the west end of Y-12 effectively separates the UEFPC and Bear Creek hydro geologic regimes with groundwater flow directions generally to the west in the Bear Creek regime and toward the east in the UEFPC regime.

In Bear Creek Valley, depth to groundwater is generally 6 to 9 m (20 to 30 ft) but is as little as 2 m (7 ft) in the area of Bear Creek near Highway 95. On Chestnut Ridge, the depth to the water table is greatest (>30m [100 ft] below ground surface) along the crest of the ridge, which is a groundwater flow divide and recharge area. Recharge occurs over most of the area but is most effective where over burden soils are thin or permeable. Although most active groundwater flow occurs at a depth less than 30 m (100 ft) below ground surface, contaminants in groundwater more than 61 m (200 ft) below ground surface in the Aquitard indicate permeable flowpaths at depth. In the main Plant area of Y-12, the surface water drainage system has been drastically altered by construction.

There are no Class I sole-source aquifers that lie beneath ORR. Because of the abundance of surface water and its proximity to the points of use, very little groundwater is used at ORR. No change in groundwater use is expected during the 10-year planning period under the No Action - Status Quo Alternative.

Groundwater in Bear Creek Valley west of Y-12 has been contaminated by hazardous chemicals and radionuclides (mostly uranium) from past weapons production waste disposal activities (DOE 1997a). The contaminant sources include past waste disposal facilities sited on Aquitard bedrock north of Bear Creek. Former disposal facilities include the S-3 Ponds, the Oil Land farm, the Boneyard/Burnyard Site, and the Bear Creek Burial Grounds, all closed since 1988.

Historical monitoring of groundwater in the UEFPC Y-12 area has been used to define an area of contamination that extends throughout Y-12 and east into Union Valley. The groundwater contamination is the result of a commingling of releases from multiple sources within Y-12. The most widespread contaminant types are VOCs, such as solvents PCE, TCE, DCE, carbon tetrachloride, and chloroform; and fuel components such as benzene, toluene, ethylbenzene, and xylenes. Other groundwater contaminants include nitrate, gross alpha activity (primarily uranium isotopes), gross beta activity (primarily uranium isotopes and ⁹⁹Tc). The most frequently detected metals are boron, beryllium, cobalt, copper, chromium, lead, lithium, mercury, manganese, nickel, and total uranium (DOE 1998b).

The Chestnut Ridge hydro geologic area is dominated by several closed and operating disposal facilities including the closed Chestnut Ridge Security Pits, Chestnut Ridge Sediment Disposal Basin, United Nuclear Corporation Site, and five nonhazardous waste landfills. Groundwater monitoring data collected since the mid-1980s indicate limited groundwater contamination. Contaminants consist primarily of VOCs detected in scattered watering wells.

No change in groundwater impacts are expected during the 10-year planning period for Alternative 1A (No Action - Status Quo Alternative), because of discharge compliance measures and ongoing remediation and monitoring.

5.5.2.2 *Alternative 1B (No Action - Planning Basis Operations Alternative)*

Under this alternative, all water would be taken from the Clinch River, with no plans for withdrawal from groundwater resources. All process, utility, and sanitary wastewater would be treated prior to discharge into UEFPC in accordance with NPDES permits. Minimal impact to groundwater quality is expected from Y-12 Site mission activities, except as noted below.

As described in Section 5.5.1, the Environmental Management Waste Management Facility in eastern Bear Creek Valley is included in the No Action - Planning Basis Operations Alternative (See Section 3.2.1.2 for a description of the new facility.) The selection of a preferred site and evaluation of the environmental impact has been presented in the *Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee* (DOE 1999j). The engineered disposal cell is the key element of the Environmental Management Waste Management Facility. The disposal cell would be designed to comply with requirements for disposal of RCRA-hazardous waste and low level radioactive waste. The cell design includes a multi-layer basal liner with a double leachate collection/detection system to isolate the waste from groundwater and a multi-layer cap to reduce infiltration and subsequent leachate production. The cell design also includes a clay-fill geologic buffer up to 3-m (10-ft) thick below the basal liner to provide added groundwater protection. Groundwater monitoring would begin during construction activities to establish a baseline database for comparison with post-operational monitoring data.

Groundwater resources could be degraded by contaminant releases during construction and operation of the surface or disposal cell that migrate to groundwater. Contaminant sources include construction materials (e.g., concrete and asphalt), spills of oil and diesel fuel, releases from transportation or waste handling

accidents, and accidental releases of leachate from the disposal cell. Compliance with an approved erosion and sedimentation control plan and a spill prevention, control, and countermeasures plan would mitigate potential impacts from surface spills. Engineered controls and active controls, including the leachate collection system, would drastically reduce the potential for impact to groundwater resources that could result from contaminant migration from the disposal cell. Construction and operation of the disposal cell would result in few or no overall short-term impacts to groundwater resources.

In the long-term, the design, construction, and maintenance of the new disposal facility would prevent or minimize contaminant releases to groundwater. These control elements would include a multi-layer cap to minimize infiltration, synthetic and clay barriers in the cell liner, a geologic buffer, and institutional controls that would include monitoring and groundwater use restrictions. If releases were detected during the period of active institutional controls, mitigative measures would be implemented to protect human health and the environment. Long-term impacts to groundwater quality resulting from the disposal cell are expected to be insignificant.

As described in Section 5.5.1, research activities of the Field Research Center at the Y-12 Site would focus on injections of additives to the groundwater at both the background and contaminated areas. The intent of the research activities is to evaluate in-situ remediation methods. Although the additives would modify the chemistry of the groundwater in the immediate study area, injections of additives would be so small that impacts would be limited to the immediate study areas. Previous experience with larger tracer studies in Bear Creek Valley suggests that the impacted area of the injections can be predicted.

Groundwater would be extracted in the Field Research Center contaminated area at Y-12 as part of characterization-related hydraulic tests. However, groundwater extractions associated with major hydraulic tests would collect no more than 76,000 L (20,000 gal) of groundwater per year (DOE 2000b). Sampling activities in years with no major hydraulic testing would collect no more than 7,600 L (2,000 gal) of groundwater. All extracted groundwater would be collected and treated in on-site facilities prior to surface water discharge to meet existing NPDES permit limits.

5.5.2.3 *Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)*

Alternatives 2A and 2B (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility or Upgrade Expansion of Building 9215)

All water for construction and operation of the HEU Materials Facility would be taken from the Clinch River as part of the normal water uses at the Y-12 Plant. Some groundwater may be extracted during construction activities at either construction site (Sites A or B) or during the Upgrade Expansion of Building 9215 to remove water from excavations. Based on the results of the Remedial Investigation of UEFPC (DOE 1998b), groundwater extracted from excavations at Site A and in the area of the Upgrade Expansion of Building 9215 probably would not be contaminated. Groundwater extracted from excavations at Site B would probably be contaminated with VOCs, metals, and radionuclides from the nearby former S-3 Ponds and the Y-12 Scrap Metal Yard (DOE 1998b). Construction at Site B may require plugging and abandonment of groundwater monitoring wells. The monitoring wells should be replaced as part of the long-term monitoring program for remediation of that portion of the Y-12 Plant. Minimal impacts to groundwater quality are expected because, regardless of site, extracted groundwater would be collected and treated in on-site treatment facilities to meet the discharge limits of the NPDES permit prior to release to surface water; no plans exist for routine withdrawal from groundwater resources; as a storage facility there would be no process water; and utility and sanitary wastewater would be treated prior to discharge into UEFPC in accordance with the existing NPDES permits.

5.5.2.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

All water for construction and operation of the Special Materials Complex would be taken from the Clinch River as part of the normal water uses at the Y-12 Plant. Some groundwater may be extracted during construction activities to remove water from excavations. Based on the historical site use and the results of the Remedial Investigation of the UEFPC (DOE 1998b), groundwater extracted from excavations at Site 1 probably would not be contaminated. Construction at Site 1 would probably require plugging and abandonment of several groundwater-monitoring wells in the area. The monitoring wells have not been sampled recently and are not part of any routine groundwater monitoring program at the Y-12 Plant. Groundwater extracted from excavations at Sites 2 and 3 would be the same as that described for the HEU Materials Facility Site B. The groundwater is contaminated with VOCs, metals, and radionuclides from the nearby former S-3 Ponds and the Y-12 Scrap Metal Yard (DOE 1998b). Construction at either Sites 2 or 3 would require plugging and abandonment of groundwater monitoring wells. The monitoring wells should be replaced as part of the long-term monitoring program for remediation of that portion of the Y-12 Plant. Minimal impacts to groundwater quality are expected because, regardless of site, extracted groundwater would be collected and treated in on-site treatment facilities to meet the discharge limits of the NPDES permit prior to release to surface water; utility and sanitary wastewater would be treated prior to discharge into the UEFPC in accordance with the existing NPDES permits; and no plans exist for routine withdrawal from groundwater resources to support either construction or operation of the Special Materials Complex.

5.5.2.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Under this alternative, all water requirements would be taken from the Clinch River. No groundwater would be used for construction or operations of facilities. Some groundwater may be extracted during construction, from excavation and field research activities. Depending on the construction site, extracted groundwater may be contaminated with VOCs, metals, and radionuclides. Minimal impacts to groundwater and groundwater quality are expected because extracted groundwater would be collected and treated in on-site treatment facilities to meet discharge limits of the NPDES permit prior to release to surface water; no plans exist for routine withdrawal from groundwater resources; and utility and sanitary wastewater would be treated prior to discharge into UEFPC in accordance with the existing NPDES permits.

5.6 BIOLOGICAL RESOURCES

This analysis focuses on Y-12 and the area within the SWEIS study area boundary (see Figure 1.1.3-1). Potential impacts are assessed based on the degree to which various habitats or species could be affected by Y-12 proposed actions and alternatives. Where possible, impacts are evaluated with respect to Federal and state protection regulations and standards.

Impacts to wildlife are evaluated in terms of disturbance, displacement, or loss of wildlife. Impacts are assessed based on proximity of wetlands to Y-12 current mission operations, the proposed construction and operation of new facilities, and any related discharge. A list of species potentially present at Y-12 was obtained from USFWS and was used in the process of assessing whether Y-12 current mission operations or proposed new facilities would impact any plant or animal under Section 7 of the *Endangered Species Act* (USFWS 1999c).

5.6.1 Alternative 1A (No Action – Status Quo Alternative)

Biological resources at Y-12 include terrestrial resources, wetlands, aquatic resources, and threatened and endangered (T&E) species.

Within the fenced, developed portion of Y-12, grassy and devegetated areas surround the entire facility. Buildings and parking lots dominate the landscape in Y-12, with limited vegetation present (ORNL 1992a). Fauna within the Y-12 area is limited by the lack of large areas of natural habitat. Impacts on terrestrial resources are minimal.

A Biological Monitoring and Abatement Program was established in conjunction with the NPDES permit issues to Y-12 in 1992. The program includes toxicity monitoring, bioaccumulation studies, biological indicator studies, and ecological surveys. Toxicity testing and bioaccumulation studies indicate that the exposure of aquatic organisms in UEFPC to toxicants has been steadily decreasing as a result of remedial activities such as implementations of flow management and continuing mercury reductions at Y-12 (LMER 1999a).

Existing impacts to biological resources would continue and are not expected to increase during the 10-year planning period under Alternative 1A (No Action - Status Quo Alternative) because no new construction or implementation of new processes or missions is expected. The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

5.6.2 Alternative 1B (No Action - Planning Basis Operation Alternative)

Under Alternative 1B (No Action - Planning Basis Operation Alternative), most current Y-12 mission operations would continue as described in Section 3.2.2. Existing impacts to biological resources described under the No Action - Status Quo Alternative would not change because resumption of enriched uranium and other operations still in stand-down mode would not involve new construction, or new processes or emissions. Two activities included under the No Action - Planning Basis Operations Alternative, however, would result in potential impacts to biological resources. The Environmental Management Waste Management Facility and the Field Research Center are described in Sections 3.2.2.2 and 3.2.2.6, respectively.

The Environmental Management Waste Management Facility will be constructed at the East Bear Creek Valley Site just west of the Y-12 Plant main area, immediately south of Pine Ridge, and located between tributaries NT-3 and NT-5 well north of Bear Creek (DOE 1999j).

Impacts to terrestrial biotic resources would result primarily from land clearing and result in the loss of grassland and old-field successional regimes that provide browse and cover, as well as the loss of mixed-hardwood/conifer forests (see Figures 3.2.2-7 and 3.2.2-9). Clearing of forest at the selected site, use of the haul road, and the Y-12 West End Borrow pit would increase forest fragmentation. Consequently, some small animal dislocation and reduction in abundance could be expected. Large animals would be largely excluded from controlled areas by access control fences. The presence of surrounding forested areas would somewhat reduce the impact that clearing would have on habitat continuity and biological diversity.

The Environmental Management Waste Management Facility site contains suitable habitat for several sensitive plant and animal species. The Remedial Investigation/Feasibility Study (DOE 1998a) provides a detailed discussion of these species. Forest clearing would directly impact portions of Habitat Area 2 and could directly impact the western portions of RA5 and the eastern portions of NA28, depending on the exact design and size of the cell (See Figure 3.2.2-7). Habitat Area 2 hosts the Tennessee endangered species pink lady slipper. NA28, Eastern Bear Creek Rein-Orchid Wetland, hosts a small population of the Tennessee threatened species tubercled rein-orchid. RA5, Quillwort Temporary Pond, hosts Carolina quillwort and may be an important amphibian breeding site. While best management practices, including various engineering and administrative controls, would reduce potential impacts to these areas, noise, the loss of adjacent forest habitat, and possibly dust and exhaust emissions may impact the adjacent sensitive resources.

The disposal facility construction site would be surveyed for the presence of listed species before construction and the USFWS and TWRA consulted. Impact mitigation plans would be developed.

Since construction would require rerouting of 330 m (1,000 ft) of NT-4, the associated wetland (approximately 0.4 ha [1 acre] in size) would be impacted by potential construction-related sediment and loss of adjacent wooded areas. A programmatic wetlands mitigation plan covering all activities in Bear Creek Valley will be included as part of the remedial action work plan, a post-ROD document. This includes mitigation of wetlands impacted by the new disposal facility as well as other activities in Bear Creek Valley (DOE 1999j).

The Field Research Center would be located within 80 ha (200 acres) of the Bear Creek Valley. However, most portions of the Field Research Center contaminated area within the Y-12 Site area would involve plots less than 0.4 ha (1 acre) in size. Where possible, these research test plots would be located in areas where site clearing and past construction have occurred or past construction activities have already changed the predominate landscape (see Figure 3.2.2-10). Therefore, few terrestrial species would be affected by the project (DOE 2000b). In the event that previously unknown sensitive resources were discovered during planning activities (e.g., site plan evaluations or site design construction), efforts to avoid impacts would be conducted and specific reserved sites would be away from sensitive resources.

The USFWS has indicated that the gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*) might live near the proposed Field Research Center (USFWS 1999b). Although EFPC and Bear Creek Valley offer riparian habitat suitable for these species, neither species was captured in mist net surveys conducted specifically for bats in the EFPC (DOE 2000b). In February 2000, ORNL completed an assessment and evaluation of potential roosting and foraging habitats for the gray and Indiana bats (DOE 2000b). The assessment concluded that the Field Research Center would not adversely affect either bat species. Also, since no proposed or designated critical habitats are present on the Site, none would be affected. The USFWS concurred with this conclusion in a letter dated February 10, 2000 (DOE 2000b).

Much of the proposed contaminated area and background area for the Field Research Center is situated either in the riparian zone of Bear Creek or adjacent to it. The Tennessee dace (*Phoxinus tennesseensis*), a minnow, listed by the TWRA as a species in need of management is the only aquatic protected or special status species likely to occur in the proposed site area. Although Bear Creek is still considered impaired, recent research has indicated an improvement in species diversity within the upper reaches of this body of water. The small scale of disturbance required for Field Research Center research plots in the contaminated area should preclude impact to this species (DOE 2000b). While it is not anticipated that Field Research Center related activities would have any impact on aquatic resources, the sensitive status of the Tennessee dace in Bear Creek makes it likely that additional measures to protect the species might be required if a specific research plot is chosen in proximity to Bear Creek. Any such additional measures would be determined and documented during the project's environmental review process. Other evaluations could include conducting and monitoring activities to determine the pre-existing condition of specific reaches of Bear Creek in proximity to selected research plots. Periodic monitoring by ORNL of aquatic and benthic resources within adjacent reaches might be conducted to determine if Field Research Center activities would result in impact to the Tennessee dace or its forage base (DOE 2000b).

The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during construction and operation activities associated with this alternative.

5.6.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)

Under this alternative, potential impacts to biological resources from the construction and operation of a new HEU Materials Facility would be minimal because both candidate sites (Site A is the Y-12 West Portal Parking Lot; Site B is located at the Y-12 Scrap Metal Yard) are located in areas of Y-12 that have been previously disturbed. Some dislocation of small urban type species (i.e., rodents) could be expected because of the presence of humans.

In conjunction with the construction and operation of a new HEU Materials Facility, other ancillary actions would include the temporary use of construction staging or “lay-down” areas, a parking lot, and utility relocation. In the case of Site A, a construction staging area would occupy about 0.8 ha (2 acres) of land north of Bear Creek Road. A 200-space parking lot would be built to replace the parking spaces lost to the proposed HEU Materials Facility, if it is located at Site A. The new parking lot would be an expansion of the existing Polaris Parking Lot, which is also located north of Bear Creek Road, just northwest of the HEU Materials Facility Site. A short stretch of Bear Creek Road could be relocated and a new lane added. In the case of Site B, the S-3 Ponds Parking Lot would be used as a construction staging area. New parking space would not be required, except on a temporary basis for construction workers. The temporary lot, about 0.8 ha (2 acres), would be developed in the west tank farm area just south of old Post 17. The construction and operation of an HEU Materials Facility at either Site A or Site B would require the relocation of utilities. Section 3.2.3.2 provides details of the potential utility relocation requirements.

The location of ancillary actions associated with the HEU Materials Facility candidate site, as described above, is in previously disturbed or heavily industrialized portions of the Y-12 Site that do not contain habitats sufficient to support a biologically diverse species mix. Some dislocation of small urban type species (i.e., rodents) could be expected because of the presence of humans.

The forest vegetation on the northwest side of Bear Creek Road has been cleared approximately one-quarter to one-half the distance up the side of Pine Ridge. The cleared areas are now maintained in grass and other nonnative herbaceous species. Kudzu has covered some of the steep slopes. EFPC tributary streams originate on the lower slopes of Pine Ridge in the altered areas. All of the tributaries have had large portions of their lower reaches piped and/or filled. Those sections of the stream bottoms not filled or piped have been filled with rock. Emergent wetlands and scrub/shrub wetlands have been identified in the stream bottom remnants. Three wetlands identified in the Wetland Survey of Selected Areas in the Oak Ridge Y-12 Plant Area of Responsibility report prepared in 1997 (ORNL 1997a) could be potentially impacted or altered by ancillary actions associated with Site A (see Figure 3.2.3–3). The construction staging area and parking lot could either eliminate the wetland or result in a temporary increase of sedimentation from construction activities. Each of these wetlands is surrounded on three or four sides by grass that is regularly mowed. All the wetlands are and dominated by black willow, rice cutgrass, seedbox, and dotted smartweed.

The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during construction and operation activities associated with this alternative.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

The 0.8 ha (2 acres) of land required for the Upgrade Expansion of Building 9215 would occupy a parcel of land located west of Buildings 9212 and 9998 and north of Building 9215. The parcel is currently occupied by trailers and temporary facilities within the heavily industrialized portion of the Y-12 Site. The parcel does

not contain habitat sufficient to support a biologically diverse species mix. There would be no impacts to biological resources.

The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during construction and operation activities associated with this alternative.

5.6.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternatives)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex Facility

Under this alternative, a new Special Materials Complex would be constructed at Site 1, Site 2, or Site 3 (Site 3 is the same as HEU Materials Facility Site B). Sites 2 and 3 are located in lightly developed areas of Y-12 that have been previously disturbed and contain minimal biological resources. The impact associated with ancillary actions, construction of parking lots, and construction staging areas would be the same as described under Alternative 2A. In the case of Site 2, only temporary parking would be needed during construction. Sites 2 and 3 do not have the habitat to support a biologically diverse species mix. Some dislocation of small animals could be expected.

However, Site 1 is located in an approximately 8-ha (20-acre) area north of Bear Creek Road and in relatively close proximity to wetlands K and L identified in a wetland survey for Y-12 (ORNL 1994). Construction of the Special Materials Complex at Site 1 would eliminate up to 4 ha (10 acres) of vegetation. Vegetation on the remainder of the Site has been previously removed to accommodate the power line corridor and past Y-12 support activities. Vegetation in cleared areas consists of grass and nonnative herbaceous species (ORNL 1994).

The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during construction and operation activities associated with this alternative.

5.6.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Under this alternative, current operations would continue in conjunction with the construction of the HEU Materials Facility and the Special Materials Complex. The impacts of this alternative represent the sum of the impacts described in Sections 5.6.2, 5.6.3, and 5.6.4 above.

No adverse impacts to federally-listed T&E species are anticipated as discussed in Section 5.6.2. Depending on the final design and size of the Environmental Management Waste Management Facility, potential impacts could occur to the Tennessee endangered species pink lady slipper in Habitat Area 2, and the Tennessee threatened species tubercled rein-orchid in the Eastern Bear Creek Rein-Orchid Wetland.

Activities associated with the Environmental Management Waste Management Facility, Field Research Center activities, and construction and operation of the HEU Materials Facility and Special Materials Complex is anticipated to disturb natural habitat as discussed above during land cleaning activities for new facilities. If the HEU Materials Facility is constructed at Site A, potential impacts may occur to three man-made wetlands approximately 0.4 ha (1 acre) in size. Additionally, construction of the Environmental Management Waste Management Facility would require rerouting of 330 m (1,000 ft) of NT-4, and the associated wetland, approximately 0.4 ha (1 acre) in size, would be impacted by potential construction related sediment and loss of adjacent wooded areas.

The mitigation measures discussed in Section 5.6.6 are intended to minimize the impacts to biological resources that might occur during construction and operation activities associated with this alternative.

5.6.6 Mitigation

For any of the alternatives discussed in Sections 5.6.1 through 5.6.5, potential impacts to terrestrial plant and animal species and wetland areas would be mitigated to avoid or minimize potential impacts. Proposed construction sites would be surveyed for the presence of special status species before construction begins, and mitigation actions would be developed, if appropriate, in consultation with the USFWS and TWRA. Appropriate runoff and siltation controls would be implemented to minimize potential impacts during construction and operation to adjacent wetland areas. Following construction, temporary structures would be removed and the sites reclaimed.

5.7 AIR QUALITY/NOISE

Airborne discharges from Y-12 facilities are subject to regulation by the EPA, TDEC Division of Air Pollution Control, and DOE Orders. Y-12 has a comprehensive air regulation compliance assurance and monitoring program to ensure that airborne discharges meet all regulatory requirements and therefore do not adversely affect ambient air quality. Common air pollution control devices employed include exhaust gas scrubbers, baghouses, and other exhaust filtration systems designed to remove contaminants from exhaust gases before their release to the atmosphere. Process modifications and material substitutions are also made to minimize air emissions.

5.7.1 Nonradiological Air Quality

The assessment of nonradiological air emissions at Y-12 is used to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) and the rules of Tennessee Department of Environment and Conservation (TDEC) (TDEC 1999a) for criteria pollutants and guidelines for chemical concentrations. Nonradiological air quality impacts were determined by modeling site emissions of criteria and chemical pollutants from the applicable Y-12 mission facility operations. These site-specific emissions were modeled in accordance with the guidelines presented in the EPA Guideline on Air Quality Models (40 CFR 51, Appendix W) using the EPA-recommended Industrial Source Complex model, Version 3 (EPA 1995b) as the most appropriate model to perform the air dispersion modeling analysis from stationary continuous emission sources.

Nonradiological airborne discharges from Y-12 facilities consist of those criteria and chemical pollutant emissions from the Y-12 Steam Plant and chemical emissions that are specific to the alternative under consideration.

Section 176 (c)(1) of the *Clean Air Act* (CAA) requires Federal agencies to assure that their actions conform with applicable implementation plans (in most cases the State implementation plan) for achieving and maintaining the NAAQS for the criteria pollutants, ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and PM-10 (particulate matter with an aerodynamic diameter less than or equal to 10 microns). In 1993, the EPA issued general conformity regulations (40 CFR 93, Subpart B) that included procedures and criteria for determining whether a proposed Federal action would conform with the State implementation laws. In the first phase a conformity review is undertaken to establish whether conformity regulations would apply to a proposed action/alternatives. If such a review determines the proposed action/alternatives is in an attainment area, the action/alternative is exempt from conformity requirements. The Y-12 site associated with the proposed alternatives lies within an attainment area for all criteria pollutants. Consequently, no further reviews of the proposed action/alternatives are required under the CAA general conformity requirements (DOE 2000c).

Criteria Pollutants Impact Analysis Methodology

Y-12 is classified as a Major Source having the potential to emit 90,720 kg (100 tons) per year or more of regulated air pollutants in accordance with *Rules of the TDEC Chapter 1200-3-9-.02(11)(b)(14)(ii)*. Allowable emissions at the Y-12 Steam Plant are greater than 90,720 kg (100 tons) per year of regulated air pollutants for particulates, sulfur oxides, and nitrogen oxides.

Maximum concentrations of the six criteria pollutants included in the primary and secondary NAAQS (40 CFR 50) were assessed, including carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), particulate matter less than 10 microns in diameter (PM₁₀), sulfur dioxide (SO₂), and ozone (O₃). Gaseous fluorides such as HF, included in the *Rules of TDEC*, were also assessed. Ambient air monitoring data were used to supplement modeled pollutant concentrations for those pollutants for which no emission data were available.

Chemical Emissions Impact Analysis Methodology

In accordance with *Rules of the TDEC Chapter 1200-3-9.02(11)(b)(14)(i)*, Y-12 is classified as a major source under Section 112 of the CAA; that is, Y-12 has a potential to emit 9,000 kg (10 tons) per year or more of a hazardous air pollutant (HAP) which has been listed in Section 112(b) of the CAA, or 22,500 kg (25 tons) or more of combined HAPs. For example, Y-12 emits greater than 9,000 kg (10 tons) per year of methanol and greater than 22,500 kg (25 tons) per year for a mixture of HAPs such as benzene, chlorine, hydrochloric acid, hydrogen fluoride (hydrofluoric acid), toluene, etc., where no one pollutant exceeds the 9,000 kg (10 ton) single pollutant threshold (LMES 1997a).

Chemical pollutant concentrations were compared with human health guidelines derived from occupational exposure limits and concentrations corresponding to cancer risks of 10⁻⁸ risk levels in lieu of established regulatory ambient air quality standards. The chemicals were categorized into two groups, noncarcinogenic chemicals and carcinogenic chemicals, to address the differences in health effects. Each group was evaluated using a screening technique comparing each chemical's estimated emission rate to a health-risk based Threshold Emission Value (TEV). Current dose-to-risk conversion factors and the "best available technology" were used in assessing impacts to human health (Appendix D). Consistent with the human health impacts assessment methodology, appropriate health risk values were used in the chemical process to derive chemical-specific TEVs. Because of different health effects (noncarcinogenic and carcinogenic), two methods were applied to derive chemical-specific TEVs. Chemicals that failed the screening process were assessed in more detail. This approach is consistent with EPA guidance and focuses detailed analyses only on those chemicals of concern that have the potential to cause adverse health effects. Appendix Section E.3 describes in detail the screening methodology used for both noncarcinogenic and carcinogenic chemical emissions.

5.7.1.1 *Alternative 1A (No Action - Status Quo Alternative)*

The following describes the impacts of the No Action - Status Quo Alternative at Y-12 and the surrounding region with respect to nonradiological air quality.

Airborne discharges from DOE Oak Ridge facilities, both radioactive and nonradioactive, are subject to regulation by EPA, the TDEC Division of Air Pollution Control, and DOE Orders. Each ORR facility has a comprehensive air regulation compliance assurance and monitoring program to ensure that airborne discharges meet all regulatory requirements and therefore do not adversely affect ambient air quality.

The TDEC performs ambient air monitoring throughout the State of Tennessee and within the vicinity of the ORR. Concentration of regulated pollutants observed during 1999 at locations near the ORR indicate that only the 1-hr ozone concentration exceeds the standards.

The observed concentrations of mercury vapor at Y-12 under the No Action - Status Quo Alternative are well below the ACGIH threshold limit value of $50 \mu\text{g}/\text{m}^3$. Annual average mercury vapor concentrations have declined in recent years when compared with concentrations measured from 1986 through 1988. The decrease in ambient mercury recorded at Y-12 since 1989 is thought to be related to the reduction in coal burned at the Y-12 Steam Plant beginning in 1989 and to the completion prior to 1989 of several major engineering projects (e.g., New Hope Pond closure, the PIDAS, Reduction of Mercury in Plant Effluent, and Utility Systems Restoration).

Under the No Action - Status Quo Alternative (for 1998), the average 7-day concentration of uranium at the three Y-12 monitored locations ranged from a low of $0.00001 \mu\text{g}/\text{m}^3$ at Station 5 and 8 to a high of $0.00044 \mu\text{g}/\text{m}^3$ at Station 4.

The release of nonradiological contaminants into the atmosphere at Y-12 occurs as a result of Plant production, maintenance, and waste management operations and steam generation. TDEC has issued over 50 air permits that cover Y-12 emission sources. The allowable level of air pollutant emissions from emission sources in 1997 under the No Action - Status Quo Alternative was approximately 10,033 tons per year of regulated pollutants. The actual emissions are much lower than the allowable amount (DOE 1999k).

The level of pollutant emissions is expected to decline in the 10-year planning period under Alternative 1A (No Action - Status Quo Alternative) because of the reduced activity levels of Y-12, consolidation efforts, and downsizing of production areas. More than 90 percent of the pollutants under the No Action - Status Quo Alternative are attributed to the operation of the Y-12 Steam Plant. The nonradiological air quality for the criteria pollutants under this alternative is represented by the Y-12 Steam Plant operating at the calculated heat input capacity of 522 million Btu/hr. This heat input capacity represents the actual fuel consumption (coal and natural gas) on February 6, 1996, the coldest day in the last 5 years according to local meteorological data. The calculated criteria pollutant emissions based upon this Y-12 Steam Plant operation are assumed to represent a reasonable upper limit for estimating criteria pollutant concentrations at or beyond the site boundary.

Concentrations of chemical pollutants during normal operations are represented by chemical emissions from the combustion of coal by the Y-12 Steam Plant at the calculated heat input capacity of 522 million Btu/hr and estimates of chemical concentrations based upon the conservative assumption that 100 percent of the chemicals during 1998 are released to the atmosphere from Y-12 facilities. Nonradiological airborne emissions of materials for Y-12 under the No Action - Status Quo Alternative have been estimated and are provided in Chapter 4, Tables 4.7.2-5 and 4.7.2-6.

5.7.1.2 *Alternative 1B (No Action - Planning Basis Operations Alternative)*

Criteria Pollutants

The nonradiological air quality for criteria pollutants at Y-12 under Alternative 1B (No Action - Planning Basis Operations Alternative) was represented by the Y-12 Steam Plant emissions using Alternative 1A (No Action - Status Quo Alternative) as a baseline. This is due to the fact that more than 90 percent of the criteria pollutants from Y-12 can be attributed to the operation of the Y-12 Steam Plant (DOE 1999k). The No Action - Planning Basis Operations Alternative provides for Y-12 to operate at planned mission and workload levels.

Emissions from the Y-12 Steam Plant vary throughout the year depending on the demand for steam. To assess the maximum impact to air quality from operation of the Y-12 Steam Plant, the emission rates associated with operation of the facility at the calculated heat input capacity input of 522 million Btu/hr was used as input to the ISC3 model (see Appendix E). The calculated heat input capacity of 522 million Btu/hr

represents actual fuel consumption on February 6, 1996, the coldest day in the last 5 years according to local meteorological data.

Maximum background concentrations of criteria pollutants from Tennessee air quality monitors located in Anderson, Knox, and Roane Counties are presented in Table 5.7.1–1. These background concentrations represent concentrations from all nearby sources including the Y-12 Steam Plant. The modeled pollutant concentrations from the Y-12 Steam Plant emissions were added to the background concentrations for the respective pollutant to calculate the percent of standard. The maximum modeled criteria pollutant concentrations do not occur at the location of the monitor for which background concentrations are presented. Therefore, not only do the background concentrations contain contributions from the Y-12 Steam Plant, but the maximum modeled and background concentrations occur at different locations. In addition, the Y-12 Steam Plant emissions are based upon the maximum daily facility operation in the last 5 years, which used twice the average annual rate for use of natural gas at the Steam Plant. The sum of the modeled and background concentrations therefore overestimates the cumulative pollutant concentrations resulting from the background and modeled Y-12 Steam Plant concentrations.

As shown in Table 5.7.1–1, ozone (which is not directly emitted from the Y-12 Plant), exceeds the 1-hour standard at the monitor located at Freels Bend Study Area at Melton Lake. All other criteria pollutant concentrations are below the national and TDEC standards. As discussed above, the criteria pollutant concentrations listed in Table 5.7.1–1 represent a conservative bounding case for Alternative 1B (No Action - Planning Basis Operations Alternative). DOE therefore believes that no adverse direct or indirect air quality impacts are expected for criteria pollutants from activities associated with continuation of Y-12 missions under the No Action - Planning Basis Operations Alternative.

Chemical Emissions

The combustion of coal produces emissions of HAPs as well as criteria pollutants. The Y-12 Steam Plant noncarcinogenic HAP emissions are presented in Table 5.7.1–2. The emission rates are based upon operation of the facility at the calculated heat input capacity of 522 MBtu/hr, AP-42 emission factors for pulverized coal boilers (uncontrolled HAP emissions) (EPA 1995a), and the baghouse efficiency (99 percent) except for mercury, for which no emission controls were assumed.

TABLE 5.7.1-1.—Modeled Criteria Pollutant Concentrations from the Y-12 Steam Plant Under Alternative 1B (No Action - Planning Basis Operations Alternative)

Pollutant	Averaging Time	NAAQS Standard ($\mu\text{g}/\text{m}^3/\text{ppm}$)	Tennessee Standard ($\mu\text{g}/\text{ppm}$)	Maximum Concentration ($\mu\text{g}/\text{m}^3/\text{ppm}$)	Background Concentration ($\mu\text{g}/\text{m}^3/\text{ppm}$)	Percent of Standard
Ozone (O ₃)	1-hour	235/0.12	235/0.12	NA	240/0.122 ^a	102
Carbon Monoxide (CO)	8-hour	10,000/9	10,000/9	52.5/0.002	4,466/39	45
	1-hour	40,000/35	40,000/35	4.3/0.004	12,712/11,1	32
Nitrogen Dioxide	Annual	100/0.053	100/0.53	19.1/0.005	11.3/0.006	20
Sulfur Dioxide (SO ₂)	Annual	80/0.03	80/0.03	20.7/0.008	7.9/0.003	36
	24-hour	365/0.14	365/0.14	174.6.8/0.07	49.7/0.019	61
	3-hour	1,300/0.5	1,300/0.5	523.8/0.02	240.8/0.092	59
	30-minute	—	1,021/0.4	NA	NA	NA
Particulate Matter (PM ₁₀)	Annual	50 $\mu\text{g}/\text{m}^3$	50 $\mu\text{g}/\text{m}^3$	0.2 $\mu\text{g}/\text{m}^3$	30.6	62
	24-hour	150 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$	1.5 $\mu\text{g}/\text{m}^3$	71	48
Lead	Calendar Quarter	1.5 $\mu\text{g}/\text{m}^3$	1.5 $\mu\text{g}/\text{m}^3$	NA	0.33 $\mu\text{g}/\text{m}^3$	22
Gaseous Fluorides Expressed as (HF)	30-day	—	1.2/1.5	NA	NA	NA
	7-day	—	1.6/2.0	NA	NA	NA
	24-hour	—	2.9/3.5	0.72/0.0009	NA	25
	12-hour	—	3.7/4.5	NA	NA	NA

^a Maximum 1-hour ozone concentration for 1998 from Tennessee air quality monitor located in Anderson County at Freels Bend Study Area Melton Lake.

Note: NA - Not Available.

Source: LMES 1997a, 40 CFR 50, TDEC 1999a.

Table 5.7.1-2.—Y-12 Facility Operations Maximum Boundary and On-Site Noncarcinogenic Hazardous Air Pollutant Chemical Concentrations

CAS Number	Chemical	Maximum Boundary Concentration ($\mu\text{g}/\text{m}^3$)	Maximum On-site Concentration ($\mu\text{g}/\text{m}^3$)
007440-48-4	Cobalt and Compounds	3.31 x 10 ⁻²	58.8
007439-92-1	Lead Compounds	3.43 x 10 ⁻²	61.0
007439-97-6	Mercury	1.99 x 10 ⁻²	35.4
000101-68-8	Methylene Bisphenyl Isocyanate	9.82 x 10 ⁻²	175

Note: CAS - Chemical Abstracts Service Registry Number.

Source: LMES 1997a.

Noncarcinogenic chemical emissions from Y-12 operations were also evaluated. An annual chemical concentration was calculated for the Y-12 Site boundary while an 8-hr concentration was calculated for evaluation of impacts to the on-site worker. A 1 gram per second emission rate was modeled from a stack located centrally within the Y-12 complex of facilities. Appendix Table E.3.1–1 presents the stack parameters used in the modeling analysis of Y-12 facility operations.

The noncarcinogenic HAP emission rates for the Y-12 Steam Plant and for Y-12 operations were compared with the respective TEVs as discussed in Appendix Section E.3. If the HAP emission rates were greater than the respective TEV, then the chemical concentration was considered a chemical of concern; conversely, if the concentration was less than the TEV, then the chemical was not considered a threat to public health.

The screening results for the Y-12 Steam Plant are included in Appendix Table E.3.1–2 and shows that none of the four noncarcinogenic HAP emissions (chromium, lead, manganese, and mercury) exceeded the TEV and therefore are not chemicals of concern. The screening results for Y-12 Plant operations, shows that 4 of the 61 evaluated noncarcinogenic HAPs exceed the TEV. Table 5.7.1–2 presents the maximum annual Y-12 Site boundary and on-site maximum 8-hr concentrations representing exposure to the general public and on-site worker, respectively, for those noncarcinogenic HAPs that exceed the screening criteria. The human health impacts of these HAPs are discussed in Section 5.12.

Carcinogenic chemicals released from the Y-12 Steam Plant from burning coal and from Y-12 operations were screened according to the criteria discussed earlier and described in Appendix Section E.3. The results of the screening analysis for the Y-12 Steam Plant are presented in Appendix Table E.3.2–1. In each case, the calculated emission rate is greater than the TEV. The site boundary carcinogenic chemical concentrations from the Y-12 Steam Plant are presented in Table 5.7.1–3, and the human health impacts of these concentrations are evaluated in Section 5.12.

Y-12 operations, in general, are also expected to result in the release of carcinogenic HAPs. Screening was performed on 18 carcinogenic HAPs from Y-12 operations as presented in Appendix Table E.3.2–3. The results of the screening indicate that one carcinogenic HAP (cadmium and cadmium compounds) from Y-12 exceeds the respective TEV. An annual chemical concentration was calculated for the Y-12 Site boundary while an 8-hr concentration was calculated for evaluation of impacts to the on-site worker. Maximum concentrations of cadmium and its compounds for Y-12 Site boundary and on-site locations are presented in Table 5.7.1–4. The human health impacts of these concentrations are discussed in Section 5.12.

Other Activities at the Y-12 Site

In addition to operation of the existing facilities at the Y-12 Site, other activities could affect air quality at Y-12, including the construction and operation of the Environmental Management Waste Management Facility (see Section 3.2.2.2) and the use of Y-12 for the Field Research Center activities (see Section 3.2.2.6). The construction of the Environmental Management Waste Management Facility could have short-term adverse impacts due to fugitive dust emissions with a large portion being due to earth-moving activities and traffic on non-paved roads. The fugitive dust emissions during the construction period could exceed TDEC fugitive dust emissions standards within a few hundred to approximately 1,400 meters of the construction activities if no dust control measures were implemented. However, engineered controls, such as the application of water or chemical dust suppressants and seeding of soil piles and exposed soils, would be implemented to minimize fugitive dust emissions. Based on the activities and the dust control measures, DOE expects that dust emissions at the Y-12 Site boundary would be below the PM₁₀ NAAQS at the DOE boundary and only negligible levels of airborne dust would be expected at the nearest residential area.

TABLE 5.7.1-3.—Y-12 Steam Plant Maximum Boundary Hazardous Air Pollutant Carcinogenic Chemical Concentrations

Building Number	CAS Number	Chemical	Maximum Boundary Concentration
Y-9401-3	7440-38-2	Arsenic	3.40×10^{-5}
Y-9401-3	7440-41-7	Beryllium	5.10×10^{-6}
Y-9401-3	7440-02-0	Nickel	8.14×10^{-5}

Note: CAS - Chemical Abstracts Service Registry Number.
Source: LMES 1997a.

Table 5.7.1-4.—Y-12 Facility Operations Maximum Boundary and On-Site Carcinogenic Hazardous Air Pollutant Chemical Concentrations

CAS Number	Chemical	Maximum Boundary Concentration ($\mu\text{g}/\text{m}^3$)	Maximum On-site Concentration ($\mu\text{g}/\text{m}^3$)
007440-43-9	Cadmium & Cadmium Compounds	1.42×10^{-2}	2.52×10^{-2}

Note: CAS - Chemical Abstracts Service Registry Number.
Source: LMES 1997a.

Drilling and associated sampling actions of the Field Research Center would not produce significant amounts of fugitive dust. It is expected that these activities would generate much less dust than normal farming practices (which is negligible) in the surrounding Oak Ridge area. Because of the larger number of existing wells and existing research support infrastructure at ORNL, it is anticipated that minimal land disturbance would be required.

Operation of the Field Research Center would use standard, construction best management practices to mitigate any airborne releases. Common measures include application of water for dust suppression and to control fugitive emissions during drilling and other activities. It is anticipated that these and other construction/drilling management practices should adequately control fugitive emissions of radionuclides and any other air pollutants. These actions are not expected to generate criteria pollutants that would not be adequately accounted for by the estimates presented above for the No Action - Planning Basis Operations Alternative. It is not anticipated the Field Research Center activities would result in additional radiological contaminants being released into the atmosphere. Final project plans would be evaluated for applicability of these best management practices and the requirements of any permits would be complied with if required.

Other substances, which could be released into the air at the Field Research Center, include oxygen, hydrogen, nitrogen, and methane. None of these are regulated under state or Federal air regulations. Groundwater collected during the research activities would not be expected to contain pollutants that would volatilize into the air. No adverse impacts to air quality would be expected from Field Research Center activities.

**5.7.1.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)
Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)**

Two potential sites have been proposed for the construction of the HEU Materials Facility: Site A and Site B. Site A (approximately 4 ha [10 acres] in size) is in the Y-12 West Portal Parking Lot, just north of Portal 16 located approximately 300 m (1,000 ft) from the Y-12 Site boundary. Site B, similar in size to Site A, is located in the Y-12 Scrap Metal Yard approximately 760 m (2,500 ft) from the Y-12 Site boundary.

Fugitive dust emissions would result from construction of the new facilities at Sites A or B. Demolition at Site B of Structures 9831, 9720-15, 9814, 9819, 9420, 9420-1, 9627, and 9626 would result in slightly more fugitive dust emissions at Site B compared to Site A.

Emissions during construction at these two sites would be associated with land clearing, drilling, ground excavation, earth moving, and construction of the facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operation, and the prevailing meteorological conditions. A large portion of the emissions would result from construction equipment traffic over temporary roads at the construction site. Construction at either site would result in dust emissions that may have a temporary adverse impact on local air quality.

Based on the size of the construction site and the expected construction activities, the 24-hr PM₁₀ standard may be exceeded by uncontrolled fugitive dust emissions. Effective control measures commonly used to reduce fugitive dust emissions include wet suppression, wind speed reduction using barriers, vehicle speed, and chemical stabilization. Chemical stabilization alone could reduce emissions by up to 80 percent (EPA 1998). Necessary control measures would be applied to ensure that PM₁₀ concentrations remain below applicable standards. The extent of land disturbance and construction equipment-related activity is expected to be less under this alternative than for the Environmental Management Waste Management Facility construction under Alternative 1B (No Action - Planning Basis Operations Alternative). Previous analysis indicates that fugitive dust emissions from the Environmental Management Waste Management Facility would not exceed applicable standards when dust suppression methods are used, and DOE therefore expects that construction of the new HEU Materials Facility would result in similarly low impacts (DOE 1998).

Impacts from operation of a new HEU Materials Facility would not depend on site location. No criteria or toxic pollutants would be generated from the new facility itself. Additional steam-generated heat would be required from the Y-12 Steam Plant; however, because of the conservative assumptions used in Alternative 1A (No Action - Status Quo Alternative), the additional heating requirements for the new HEU Materials Facility would not change the level of emissions estimated for Alternative 1B (No Action - Planning Basis Operations Alternative). Depending on the reuse of vacated HEU storage facilities (shutdown, cold standby, or reuse for some other Y-12 support activity), the additional heating requirement for the new facility could be offset by a reduction in heating requirements for the old facilities.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

The new addition to Building 9215 would have minimal impact to air quality at Y-12. Construction of the expanded facility would generate fugitive dust that would be mitigated with appropriate control measures similar to that described above for construction activities at Sites A and B to ensure that PM₁₀ concentrations remain below applicable standards. Because of the smaller construction area (approximately 2 acres), the type of structure proposed, and the construction activities expected with building the new addition, potential fugitive dust emissions would be less than what would be expected for constructing the new HEU Materials Facility at Site A or Site B.

Operation of the new storage addition to Building 9215 would require additional steam generated by the Y-12 Steam Plant for heating. No criteria or toxic pollutant emissions would be generated from the new building expansion itself. Because of the conservative assumptions used in Alternative 1A (No Action - Status Quo), DOE believes that the additional heating requirements for the building expansion would not change the level of emissions estimated for Alternative 1B (No Action - Planning Basis Operations). Depending on the reuse of vacated HEU storage facilities (shutdown, cold standby, or reuse for some other Y-12 support activity), the additional heating requirement for the upgraded facility could be offset by a reduction in heating requirements for the old facilities.

5.7.1.4 *Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)*

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Three potential sites are considered for the new Special Materials Complex. Site 1 consists of 8 ha (20 acres) and is located northwest of Building 9114 and on the north side of Bear Creek Road approximately 1,700 ft from the Y-12 Site boundary. Site 2 consists of approximately 8 ha (12.4 acres) and is located at the Y-12 Scrap Metal Yard inside the PIDAS approximately 762 m (2,500 ft) from the Y-12 Site boundary. Site 3 consists of approximately 8 ha (12.4 acres) and is located at the Y-12 Scrap Metal Yard west of the PIDAS approximately 2,500 ft from the Y-12 Site boundary.

Fugitive dust emissions would result from construction at any of the sites. Additional fugitive dust would be generated if Sites 2 or 3 were selected due to demolition of structures 9720-16 and 9720-24 at Site 2 and demolition of structures 9831, 9720-15, 9814, 9819, 9420, 9420-1, 9627, and 9626 at Site 3.

Emissions during construction at any of these three sites would be associated with land clearing, drilling, ground excavation, earth moving, and construction of the facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operation, and the prevailing meteorological conditions. A large portion of the emissions would result from construction equipment traffic over temporary roads at the construction site. Construction at the selected site would result in dust emissions that may have a temporary adverse impact on local air quality.

Based on the size of the construction site and the expected construction activities, the 24-hr PM₁₀ standard may be exceeded by uncontrolled fugitive dust emissions. Effective control measures commonly used to reduce fugitive dust emissions include wet suppression, wind speed reduction using barriers, vehicle speed, and chemical stabilization. Chemical stabilization alone could reduce emissions by up to 80 percent (EPA1998, Supplement E to AP-42). Necessary control measures would be applied to ensure that PM₁₀ concentrations remain below applicable standards. The extent of land disturbance and construction equipment-related activity is expected to be less under this alternative than for the Environmental Management Waste Management Facility activities included under Alternative 1B (No Action - Planning Basis Operations Alternative). Previous analysis indicates that fugitive dust emissions from the Environmental Management Waste Management Facility would not exceed applicable standards when dust suppression methods are used, and DOE therefore expects that construction of the New Special Materials Complex would result in similarly low impacts (DOE 1998a).

Emissions from the beryllium operations in the new Beryllium Facility would be exhausted through a newly designed 99.5 percent pre-filtration system prior to passing through a HEPA filtration system. This should further reduce beryllium emissions below those currently estimated under the No Action - Status Quo Alternative (modeled as 1 gram per year in Appendix E for conservatism). Impacts from operation of the new Special Materials Complex would not depend on site location.

In addition to beryllium emissions, approximately 380 L (100 gal) of acetonitrile emissions are expected from purification operations. Table 5.7.1–5 presents the modeled boundary and on-site concentrations from these emissions. The risk to human health from these pollutants is presented in the human health and worker safety section (Section 5.12).

TABLE 5.7.1–5.—Maximum Boundary and On-Site Chemical Concentrations from Special Materials Complex Operations

CAS Number	Chemical	Total Kilograms	Emissions (g/yr)	Emissions Rate (g/s)	Maximum Boundary Concentration ($\mu\text{g}/\text{m}^3$)		Maximum On-site Concentration ($\mu\text{g}/\text{m}^3$)	
					8-hr	Annual	8-hr	Annual
000075-05-8	Acetonitrile	297.42	2.97×10^5	4.19×10^{-2}	1.88	1.61×10^{-2}	28.6	1.65

Source: Appendix E.

5.7.1.5 *Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)*

Fugitive dust emissions would result from construction of the HEU Materials Facility and the Special Materials Complex. Demolition of structures at Site B for the HEU Materials Facility and Sites 2 and 3 for the Special Materials Complex would result in additional fugitive dust emissions.

Emissions during construction at potential sites would be associated with land clearing, drilling, ground excavation, earth moving, and construction of the facilities themselves. Dust emissions would vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions would result from construction equipment traffic over temporary roads at the construction sites. Construction at the related sites would result in dust emissions that may have a temporary adverse impact on local air quality. Because the schedule for construction of the Special Materials Complex would fall after the completion of the major portion of the HEU Materials Facility, the potential fugitive dust emissions would not be additive. Necessary control measures would be applied to ensure that PM_{10} concentrations remain below appropriate standards.

No criteria pollutant emissions would be generated from the HUE Materials Facilities or the Special Materials Complex facilities themselves. Because of the conservative assumptions used in Alternative 1A (No Action - Status Quo Alternative), DOE believes that the additional heating requirements for the new facilities would not change the level of emissions estimated for Alternative 1B (No Action - Planning Basis Operations Alternative). Depending on the reuse of vacated facilities (shutdown, cold standby, or reuse for some other Y-12 support activity), the additional heating requirement for the new facilities could be offset by a reduction in heating requirements for the old facilities.

Other hazardous emissions (i.e., beryllium and acetonitrile associated with various operations of the new Special Materials Complex would be the same as described in Section 5.2.1.4.

5.7.2 Radiological Impacts

Radiological discharges to the atmosphere would occur as a result of the operation of facilities at Y-12. To analyze the impacts of these emissions by alternative, DOE identified the facilities with the potential for radiological emissions and then estimated the amount of emissions that could result based on the projected use of the facilities.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding Y-12, and Y-12 workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR 61). Y-12 specific parameters including meteorological data, source characteristics, and population data were used to estimate the radiological doses. Detailed information on the CAP88 dispersion modeling is presented in Appendix E.4.

5.7.2.1 *Alternative 1A (No Action - Status Quo Alternative)*

The release of radiological contaminants, primarily uranium, into the atmosphere at Y-12 under Alternative 1A (No Action - Status Quo Alternative) occur almost exclusively as a result of plant production, maintenance, and waste management activities. An estimated 0.017 Ci (9.97 kg) of uranium was released into the atmosphere in 1998 as a result of Y-12 activities.

The radiological doses to the MEI and the population surrounding Y-12 were calculated using CAP88-PC model. The detailed input parameters used for the No Action - Status Quo Alternative for the Y-12 Plant are presented in the Radionuclide NESHAP report (DOE 1999k).

Under the No Action - Status Quo Alternative for 1998, six emissions points at Y-12 were modeled; each of these points included one or more individual sources of emissions. The total effective dose equivalent (TEDE) to the hypothetical MEI from Y-12 emissions was estimated at 0.53 mrem, which is 5.3 percent of the 10 mrem per year EPA standard. The MEI for Y-12 is located about 1,080 m (0.7 mi) north-northeast of the Y-12 release point. The collective (population) EDE due to Y-12 emissions was estimated at 4.3 person-rem, which is approximately 35 percent of the collective EDE due to emissions from the entire ORR (DOE 1999k).

5.7.2.2 *Alternative 1B (No Action - Planning Basis Operations Alternative)*

Under Alternative 1B (No Action - Planning Basis Operations Alternative), the annual enriched uranium emissions and other effluents for the period 2001-2010 was assumed to be 65 percent of the 1987 levels (see Section 3.1.2), an increase from Alternative 1A (No Action - Status Quo Alternative) emissions.

The radiological doses to the MEI and the population surrounding Y-12 were calculated using CAP88-PC model. The detailed input parameters used for the No Action - Planning Basis Operations Alternative for the Y-12 Plant are presented in Appendix E.4. The TEDE received by the hypothetical MEI for Y-12 was calculated as 4.5 mrem/yr for the No Action - Planning Basis Operations Alternative. The dose is well below the NESHAP standard of 10 mrem/yr. The MEI is located 1,080 m (3,543 ft) north-northeast of the Y-12 Plant release point. The collective EDE to the population residing within 80 km (50 mi) of Y-12 for Alternative 1B (No Action - Planning Basis Operations Alternative) was calculated to be 33.7 person-rem. The risk to human health associated with the above doses is discussed in the human health section (see Section 5.12). The uranium emission for the No Action - Planning Basis Operations Alternative includes all the emissions from the storage of HEU in existing facilities.

The nonradiological air quality for criteria pollutants under the No Action - Status Quo and No Action - Planning Basis Operations Alternative is represented by the Y-12 Steam Plant operating at the calculated heat input capacity of 522 million Btu/hr. This heat input capacity represents the actual fuel consumption (coal and natural gas) on February 6, 1996, the coldest day in the last 5 years according to local meteorological data. The calculated criteria pollutant emissions based upon this Y-12 Steam Plant operation are assumed to represent a reasonable upper limit for estimating criteria pollutant concentrations at or beyond the Site boundary.

Concentrations of chemical pollutants during normal operations are represented by chemical emissions from the combustion of coal at the Y-12 Steam Plant at the calculated heat input capacity of 522 million Btu/hr and estimates of chemical concentrations based upon the conservative assumption that 100 percent of the purchased chemicals during 1998 are released to the atmosphere from Y-12 facilities.

The collective population doses (person-rem) from air emissions for all the workers (radiological and nonradiological) for Alternative 1A (No Action - Status Quo Alternative) and Alternative 1B (No Action - Planning Basis Operations Alternative) are given in Table 5.7.2–1.

The summary of the radiological doses to the workers for the No Action - Status Quo and No Action - Planning Basis Operations Alternatives for each operation and the Y-12 Plant as a whole is presented in Appendix E.4.2. The risk to human health associated with the above doses is discussed in the human health section (Section 5.12).

TABLE 5.7.2–1.—Radiological Doses for Collective Y-12 Workers

Operations	Alternative 1A No Action - Status Quo (person-rem)	Alternative 1B No Action - Planning Basis Operations (person-rem)
Enriched Uranium ^a	3.14	5.71
Depleted Uranium	1.78	2.59
Assembly/Disassembly/Quality Evaluation	1.28	1.86
Product Certification	1.2	1.83
Analytical Services	1.30	2.09
Lithium	0.29	0.62
Special Materials Organization	0.36	0.52
Y-12 Plant	41.02	59.48

^a Includes HEU Storage.

Source: Appendix D and Y-12 1999b.

5.7.2.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

The construction and operation of either the new HEU Materials Facility (Alternative 2A) or the Upgrade Expansion to Building 9215 (Alternative 2B) would result in some radiological emissions. The current design for either option calls for appropriately sized filtered HVAC systems. In addition, the facilities would not have airborne uranium emissions under routine operations because material would be contained in appropriate storage containers. Therefore, DOE believes that the radiological emissions for Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives) would be the same as Alternative 1B (No Action - Planning Basis Operations Alternative). Until a final Safety Analysis Report has been completed for the new facilities, the actual radiological emissions will not be known. However, based on the new facility design and expected operations, these radiological emissions from HEU storage could be lower than the current radiological impacts described under the No Action - Status Quo Alternative. For purposes of analysis, DOE has assumed that the impacts under Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility) and Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215) would remain unchanged from the No Action - Planning Basis Operations Alternative impacts (i.e., 4.5 millirem per year for the MEI, and 33.7 person-rem for the off-site population). The collective dose to the workers (35) under the No Action -

Planning Basis Operations Alternative for the existing HEU Storage Mission is 0.74 person-rem. The collective dose to workers due to relocation of existing stored HEU to the new HEU storage facility is 5.25 person-rem. The collective dose to workers (14) during normal operations due to storage of HEU in the HEU Materials Facility is 0.29 person-rem. The risk to human health associated with the above doses is addressed in the human health section (Section 5.12).

5.7.2.4 *Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)*

The proposed Special Materials Complex would not contribute to the radioactive emissions at Y-12 as the facilities do not handle radioactive materials. Radiological impacts would be the same as described in Section 5.7.2.2 under Alternative 1B (No Action - Planning Basis Operations Alternative).

5.7.2.5 *Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)*

Under this alternative, the collective dose to workers at the Y-12 Plant would be the same as Alternative 1B (No Action - Planning Basis Operations Alternative) and shown in Table 5.7.2-1. There would be a slight decrease in HEU storage mission worker collective dose from 0.74 person-rem to 0.29 person-rem if the HEU Materials Facility were constructed and operated. This reduction is due to the decrease in number of workers from 35 under the No Action - Planning Basis Operations Alternative to 14 workers for the new HEU Materials Facility. The overall collective Y-12 worker dose however would not change from the 59.48 person-rem shown in Table 5.7.2-1 because of the increased production levels and radiological emissions associated with enriched uranium operations. The Special Materials Complex is a non-rad facility and does not handle radioactive materials.

The MEI and population dose within 80 km (50 miles) of the Y-12 Site under this alternative would be the same as those for Alternative 1B (No Action - Planning Basis Operations Alternative). The dose received by the hypothetical MEI is 4.5 mrem/yr. The collective population dose would be 33.7 person-rem. This would be a substantial increase from Alternative 1A (No Action - Status Quo Alternative) dose to the MEI and population of 0.53 mrem/yr and 4.3 person-rem, respectively. The increase is due to the Y-12 Plant enriched uranium and other stand-down operations resuming to planned and required workload levels under Alternative 1B (No Action - Planning Basis Operations Alternative).

5.7.3 Noise

The process of quantifying the effects of sound begins with establishing a unit of measure that accurately compares sound levels. The physical unit most commonly used is the decibel (dB). The decibel represents a relative measure or ratio to a reference pressure. The reference pressure is a sound approximating the weakest sound that a person with very good hearing can hear in an extremely quiet room. The reference pressure is 20 micropascals, which is equal to 0 (zero) dB.

A-weighted sound levels (dBA) are typically used to account for the response of the human ear. A-weighted sound levels represent adjusted sound levels that are made according to the frequency content of the sound. Figure 5.7.3-1 presents a comparison of decibel levels of everyday events with the threshold of human audibility.

5.7.3.1 *Alternative 1A (No Action - Status Quo Alternative)*

Major noise emission sources within Y-12 include various industrial facilities, equipment and machines (e.g., cooling systems, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Most Y-12 industrial facilities are at a sufficient distance from

the Site boundary so noise levels at the boundary from these sources would not be distinguishable from background noise levels.

The acoustic environment along the ORR Site boundary in rural areas and at nearby residences away from traffic noise is typical of a rural location, with the day-average sound level in the range of 35 to 50 dBA. Areas near the site within the city of Oak Ridge are typical of a suburban area, with the average day-night sound level in the range of 53 to 62 dBA. The primary source of noise at the Site boundary and at residences located near roads is traffic.

No change in noise impacts is expected during the 10-year planning period under Alternative 1A (No Action - Status Quo Alternative).

TABLE 5.7.3–1.—Permissible Noise Exposure

Duration Per Day, hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
½	110
0.25 or less	115

Note: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

5.7.3.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

The No Action - Planning Basis Operations Alternative includes Y-12 mission operations at planned levels, which would represent baseline background noise levels typical of industrial facilities ranging from 50 to 70 dBA. Manufactured noise generated in and around the Y-12 surrounding area includes traffic, generators, air conditioners, and ventilation systems. Under the No Action - Planning Basis Operations Alternative, Y-12 would not experience an appreciable change in traffic noise from the No Action - Status Quo Alternative because the number of workers is not expected to increase. On-site operational noise sources would increase due to increased operation levels from the No Action - Status Quo Alternative. Non-traffic noise sources are located at a sufficient distance from off-site receptors so the contribution to off-site noise levels would continue to be below off-site background levels.

Industrial and construction activities are another source of noise. Some of these activities could affect the occupational health of Y-12 personnel, but measures are in effect to ensure that hearing damage to personnel does not occur. These measures include regulations contained within the *Noise Control Act of 1972* (42 U.S.C.§4901), *Contractor Industrial Hygiene Program* (DOE Order 5480.10), and *Occupational Noise Exposure* (29 CFR 1910.95).

For Y-12 personnel, protection against effects of noise exposure is provided when the sound levels exceed those shown in Table 5.7.3–1 when measured on the A scale of a standard sound level meter at slow

response. When employees are subjected to sound exceeding those listed in Table 5.7.3–1, feasible administrative or engineered controls are used. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment (e.g., ear plugs) is provided and used to reduce sound levels within the levels of the table.

Continued compliance measures would be taken to ensure that hearing damage to personnel does not occur. Noise from traffic sources in and around Y-12 would continue unchanged under the No Action - Planning Basis Operations Alternative.

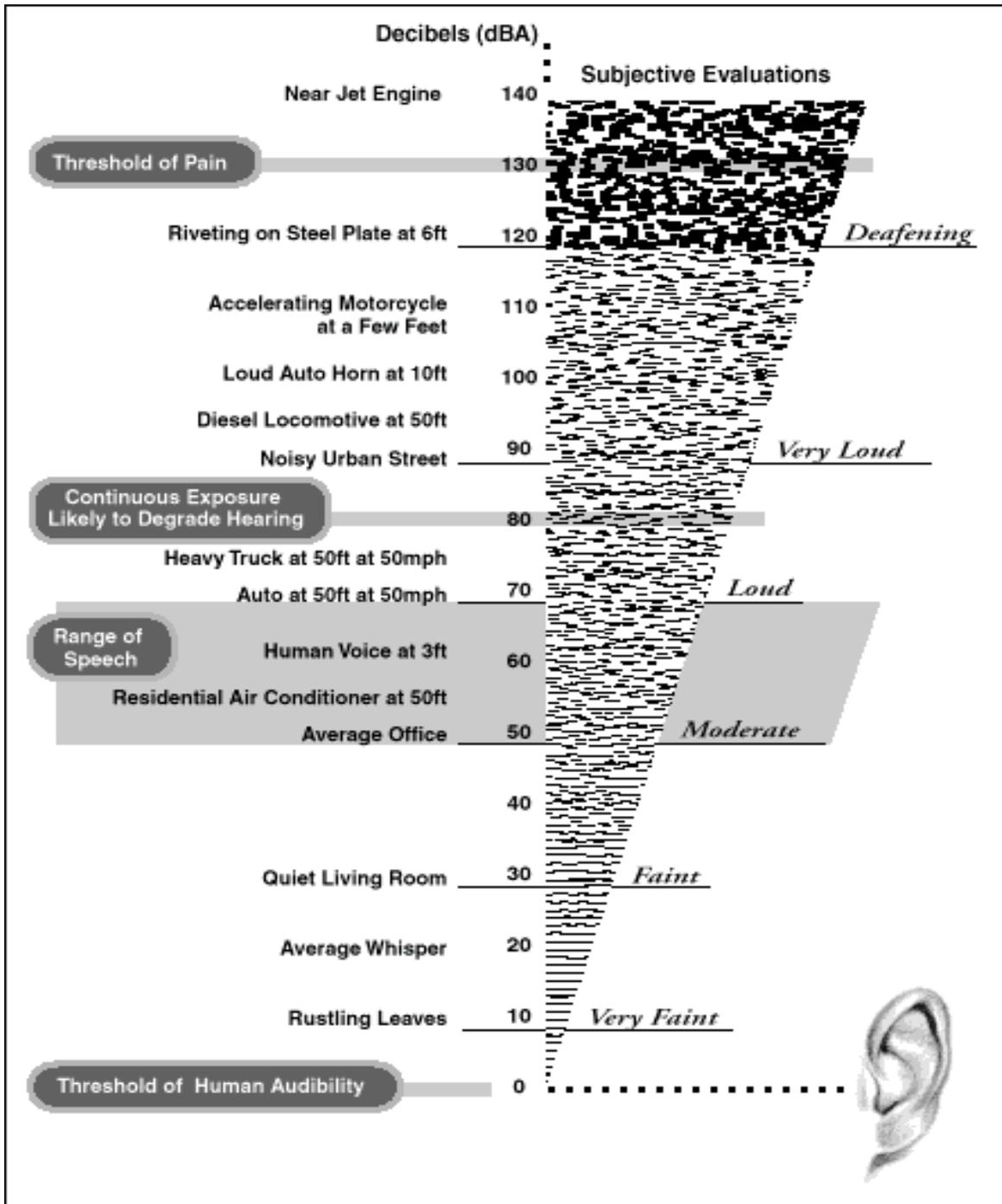
5.7.3.3 Alternatives 2 and 3 (No Action - Planning Basis Operations Plus HEU Storage Mission and Special Materials Mission Alternatives)

The on-site and off-site acoustical environments may be impacted during construction and operation of the proposed HEU Materials Facility and the Special Materials Complex. Construction activities would generate noise produced by heavy construction equipment, trucks, power tools, and percussion from pile drivers, hammers, and dropped objects. In addition, traffic and construction noise is expected to increase during construction on-site and along off-site local and regional transportation routes used to bring construction material and workers to the site. The levels of noise would be representative of levels at large-scale building sites. Table 5.7.3–2 describes peak attenuated noise levels expected from operation of construction equipment.

Relatively high and continuous levels of noise in the range of 89 to 108 dBA would be produced by heavy equipment operations during the site preparation phase of construction. However, after this time, heavy equipment noise would become more sporadic and brief in duration. The noise from trucks, power tools, and percussion would be sustained through most of the building construction and equipment installation activities on the proposed facility site. As construction activities reach their conclusion, sound levels on the proposed facility site would decrease to levels typical of daily facility operations (50 to 70 dBA). These construction noise levels would contribute to the ambient background noise levels for the duration of construction, after which ambient background noise levels would return to pre-construction levels.

Sites A and B for the HEU Materials Facility are approximately 520 and 760 m (1,700 and 2,500 ft), respectively, from the Y-12 Site boundary. Sites 1, 2, and 3 for the Special Materials Complex are 305 m (1,000 ft), 760 m (2,500 ft) and 760 m (2,500 ft), respectively, from the Y-12 Site boundary. Peak attenuated noise levels from construction of these facilities would be below background noise levels (53 to 62 dBA) at off-site locations within the city of Oak Ridge as shown in Table 5.7.3–2.

Operation of the HEU Materials Facility and the Special Materials Complex would generate some noise, caused particularly by site traffic and mechanical systems associated with operation of the facility (e.g., cooling systems, transformers, engines, pumps, paging systems, and materials-handling equipment). In general, sound levels are expected to be characteristic of a light industrial setting within the range of 50 to 70 dBA and would be within existing No Action - Status Quo levels. Effects upon residential areas are attenuated by the distance from the facility, topography, and by a vegetated buffer zone.



Source: DOE 1999c

FIGURE 5.7.3-1.—Decibel Levels Compared to the Threshold of Human Audibility.

TABLE 5.7.3–2. —Peak Attenuated Noise Levels (in dBA) Expected from Operation of Construction Equipment

Source	Peak Noise Level	Distance from Source						
		15 m (50 ft)	30 m (100 ft)	61 m (200 ft)	100 m (400 ft)	305 m (1,000 ft)	518 m (1,700 ft)	762 m (2,500 ft)
Heavy trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Dragline	105	85	79	73	67	59	55	51
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

Note: 1ft = 0.305 m

Source: Golden et al. 1980.

5.7.3.4 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Construction related noise impacts under Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex) would result from relatively high and continuous levels of noise in the range of 89 to 108 dBA. Because of the distance between construction sites and locations relative to Y-12 Plant facilities cumulative noise impacts to Y-12 employees population would be mitigated to acceptable levels (approximately 70 dBA). Noise impacts to Y-12 workers would be further mitigated by the buildings in which employees were working. However, the number of Y-12 Plant workers exposed to increased construction noise levels under this alternative would be larger (basically the west end of the Y-12 Plant) than under Alternative 1B (No Action - Planning Basis Operations Alternative), Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternative), or Alternative 3A (No Action - Planning Basis Operations Plus Construct and Operate Special Materials Complex). Potential construction activity locations under the alternative are at sufficient distance from the ORR boundary and the city of Oak Ridge to result in no change to background noise levels at these areas.

5.8 SITE FACILITIES AND SUPPORT ACTIVITIES

Changes to site facilities and support activities were assessed by comparing the support requirements of the No Action - Planning Basis Operations Alternative (continue Y-12 mission operations) and the proposed HEU Storage Mission Alternatives and Special Materials Mission Alternative with the existing Y-12 No Action - Status Quo Alternative and Y-12 Site infrastructure capacities and facilities. These assessments focus upon electrical power, fuel requirements, and water usage. Projections of electricity availability, site development plans, and other Y-12 mid- and long-range planning documents were used to project Site

infrastructure conditions for the evaluated alternatives. In addition, facilities that could be surplus to DP due to construction of new facilities were identified.

5.8.1 Alternative 1A (No Action - Status Quo Alternative)

The site facility and support requirements for this alternative are taken to be the same as those utilized during the most recent year when uranium operations were in stand-down and complete figures were available (i.e., 1998). Table 5.8.1-1 shows these requirements compared to the capacity of the Y-12 Site. The Site capacity in all cases is appreciably larger than requirements under the No Action - Status Quo Alternative. No adverse impacts are expected from operations under the No Action - Status Quo Alternative.

5.8.2 Alternative 1B (No Action - Planning Basis Operations Alternative)

Alternative 1B (No Action - Planning Basis Operations Alternative) would not result in major upgrades or new construction to DP facilities or operations. Under this alternative, DP and most site program missions would be performed in existing facilities. This alternative would require additional energy usage above that used under Alternative 1A (No Action - Status Quo Alternative) during 1998, principally due to the restart of uranium and other operations which were suspended in 1994. Table 5.8.2-1 shows the projected annual resource requirements for the No Action - Planning Basis Operations Alternative compared to usage under the No Action - Status Quo Alternative for the Y-12 Site.

5.8.3 Alternative 2 (No Action - Planning Basis Operations Plus HEU Storage Mission Alternatives)

Alternative 2A (No Action - Planning Basis Operations Plus Construct and Operate a New HEU Materials Facility)

Under this alternative, a new HEU Materials Facility would be built on either candidate Site A or Site B as described in Section 3.2.3.2. HEU materials storage operations currently located in Buildings 9204-2, 9204-2E, 9204-4, 9215, 9720-5, and 9998 (shown in Figure 5.8.3-1) would be relocated to the new facility regardless of which site is selected. Areas in these buildings vacated by HEU storage operations would be available for other uses or could be declared as excess.

If the new facility is constructed at Site A, electrical and water utilities would be relocated and a sanitary sewer main would be extended to the new facility from a point just west of Building 9703-11. A new comprehensive storm sewer system would be provided with capacity for a 100-year storm; and the system would also accommodate the simultaneous failure of two 5.7 million L (1.5 million gal) water tanks on the south side of Pine Ridge.

If the new facility is constructed at Site B, Buildings 9831, 9720-15, 9814, 9819, 9429, 9420-1, 9626, and 9627 would be demolished. In addition, existing utilities would need to be relocated, including steam and condensate lines that serve the Y-12 WETF and Building 9114; overhead electrical lines, and a 143.8-kV line that runs along Old Bear Creek Road. New utilities would be extended to the new facility from existing tie points.

**TABLE 5.8.1-1.—Y-12 Site Energy and Resource Requirements—Alternative 1A
(No Action - Status Quo Alternative)**

Resource	Units	Alternative 1A No Action - Status Quo Usage	
		(1998)	Y-12 Site Capacity
Electrical energy	MWh/yr	377,140	1,752,000
Natural gas	m ³ /yr	3,800,000	As needed
Coal	t/yr	78,500	As needed
Steam ^a	kg/hr @ 250 psi	83,900	363,000
Raw water	L/day	17,900,000	20,820,000
Treated water	L/day	15,700,000	26,500,000
Demineralized water	L/day	7,400	545,110
Sanitary sewer	L/day	2,880,000	5,680,000
Compressed air	m ³ /min	296	595
Nitrogen	m ³ /yr	5,465,000	33,980,000
Oxygen	m ³ /yr	94,000	1,388,000
Helium	m ³ /yr	63,150	As needed (5,550 m ³ Storage)
Hydrogen	m ³ /yr	10,100	As needed (2,550 m ³ Storage)

^a Average steam load.

Source: LMES 1999d, LMES 2000a.

**TABLE 5.8.2-1.—Y-12 Site Energy and Resource Requirements—Alternative 1B
(No Action - Planning Basis Operations Alternative)**

Resource	Units	Alternative 1A No Action - Status Quo Usage (1998)	Alternative 1B No Action - Planning Basis Usage
Electrical energy	MWh/yr	377,140	565,710
Natural gas	m ³ /yr	3,800,000	4,000,000
Coal	t/yr	78,500	81,000
Steam ^a	kg/hr @ 250 psi	83,900	103,000
Raw water	L/day	17,900,000	17,900,000
Treated water	L/day	15,700,000	20,200,000
Demineralized water	L/day	7,400	16,880
Sanitary sewer	L/day	2,880,000	2,650,000
Compressed air	m ³ /min	296	420
Nitrogen	m ³ /yr	5,465,000	8,380,000
Oxygen	m ³ /yr	94,000	116,400
Helium	m ³ /yr	63,150	67,110
Hydrogen	m ³ /yr	10,100	10,100

^a Average steam load.

Source: LMES 2000a, LMES 1999d.

Alternative 2B (No Action - Planning Basis Operations Plus Upgrade Expansion of Building 9215)

Under this alternative, a new two-story addition would be added to the north end of Building 9215 (see Section 3.2.2.3). HEU materials storage operations currently located in Buildings 9204-2, 9204-2E, 9204-4, 9215, 9720-5, and 9998 (shown in Figure 5.8.3-1) would be relocated to the new storage addition of Building 9215. Areas in these buildings vacated by HEU storage operations would be available for other uses or could be declared as excess.

Construction of the new addition to Building 9215 would not involve removing any major permanent structures since the proposed site is occupied by trailers and temporary facilities. Existing on-site utilities and infrastructure would be tied into the new facility with minimal relocation and modification necessary.

Table 5.8.3-1 shows the construction-related estimated resource requirements for HEU Storage Mission Alternatives. These requirements are small when compared to No Action - Status Quo or No Action - Planning Basis Operations usage and are well within existing Y-12 Site capacity.

Source: Tetra Tech, Inc./LMES 2000b.

FIGURE 5.8.3-1.—*Potentially Affected Facilities Due to Construction of Highly Enriched Uranium Materials Facility or Building 9215 Expansion.*

TABLE 5.8.3–1.—HEU Storage Mission Alternatives Construction Requirements

Requirements	New HEU Materials Facility	Upgrade Building 9215
Materials/Resource		
Electrical energy (MWh)	5,000	5,000
Concrete (m ³)	25,100	7,650
Steel (t)	2,100	1,100
Liquid fuel and lube oil (L)	568,000	265,000
Treated Water (L)	7,571,000	5,678,000
Land (ha)	5	1

Source: LMES 2000b.

Table 5.8.3–2 shows the long-term utility usage and resource requirements for the No Action - Planning Basis Operations Alternative along with the projected utility usage and resource requirements for the HEU Storage Mission Alternatives. The projected requirements in this table account only for the new facilities and do not account for potential reductions in utility usage or resource requirements due to demolition or reduced use of excess facilities. Because the existing utility and resource capacity at the Y-12 Site is sufficient to accommodate any projected changes resulting from the operation of a new storage facility, DOE expects no adverse impact on utilities or infrastructure due to the implementation of this alternative.

TABLE 5.8.3–2.—Annual Operation Requirements for the Alternative 1B (No Action - Planning Basis Operations Alternative) and the HEU Storage Mission Alternatives

Requirements	Alternative 1A No Action - Status Quo	Alternative 1B No Action - Planning Basis Operations	Alternative 2A HEU Materials Facility	Alternative 2B Upgrade Building 9215	Combined Alternative s 1B and 2A
Electrical energy (MWh)	377,140	565,710	5,900	10,900	571,610
Treated Water (L/day)	15,700,000	20,200,000	1,510	1,975	20,202,200

Source: LMES 2000a, LMES 2000b.

5.8.4 Alternative 3 (No Action - Planning Basis Operations Plus Special Materials Mission Alternative)

No Action - Planning Basis Operations Plus Construct and Operate a New Special Materials Complex

Under this alternative, a new facility would be constructed to fulfill the Special Materials Mission at one of three candidate sites as discussed in Section 3.2.4.2. Special Materials Operations currently located in Buildings 9202, 9731, 9204-4, 9204-2E, 9805-1, 9721-46, 612 (shown in Figure 5.8.4–1) would be relocated to the new facility regardless of which site is selected. Plant storm sewer system, and water, electrical, and other utilities would be extended from within the Protected Area of Y-12. When completed, the new facility would have no overhead utilities.

Source: Tetra Tech, Inc./LMES 2000b.

FIGURE 5.8.4–1. *Potentially Affected Facilities Due to Construction of Special Materials Complex.*

If Site 2 is selected, Buildings 9720-16, 9720-24, 9720-53, 9824-1, and 9824-2 would be demolished. As with Site 1, a comprehensive storm sewer system would be installed, and utilities would tie into existing systems at the Y-12 Plant.

If Site 3 is selected, Buildings 9831, 9720-15, 9814, 9819, 9420, 9420-1, 9626, and 9627 would be demolished. In addition, several trailers would be moved from the site. As with Sites 1 and 2, a comprehensive storm sewer system would be installed, and utilities would tie into existing systems at the Y-12 Plant.

Table 5.8.4–1 shows the construction-related estimated resource requirements for the proposed new Special Material Complex for the three candidate sites. These requirements are small when compared to usage under the No Action - Planning Basis Operations or No Action - Status Quo Alternative and are well within existing Y-12 Site capacity.

TABLE 5.8.4–1.—Special Materials Complex Construction Requirements

Requirements	Site 1	Site 2	Site 3
Materials/Resource			
Electrical energy (MWh)	8,000	8,000	8,000
Concrete (m ³)	13,800	14,500	14,500
Steel (t)	3,000	3,200	3,200
Liquid fuel and lube oil (L)	984,200	1,582,300	1,582,300
Industrial gases (m ³)	5,700	5,700	5,700
Treated Water (L)	5,700,000	5,700,000	5,700,000
Land (ha)	8	5	5

Source: LMES 2000c.

TABLE 5.8.4–2.—Annual Operation Requirements Special Materials Complex Annual Operation Requirements

Requirements	Alternative 1A No Action - Status Quo	Alternative 1B No Action - Planning Basis Operations	Alternative 3 New Special Materials Complex	Combined Usage
Electrical energy (MWh)	377,140	565,710	30,400	596,110
Steam kg/hr	83,900	103,000	3,262	106,300
Demineralized Water (L/day)	7,400	16,880	5,393	22,270
Industrial gas				
Helium (m ³)	63,150	67,110	14,725	81,840
Oxygen (m ³)	94,000	116,400	396	116,800
Nitrogen gas (m ³)	5,465,000	8,380,000	1,500,800	9,881,000
Treated Water (L/day)	15,700,000	20,200,000	228,600	20,430,000

Source: LMES 2000a, LMES 2000c.

Table 5.8.4–2 shows the long-term utility usage and resource requirements for Alternative 1B (No Action - Planning Basis Operations) along with the projected utility usage and resource requirements for the proposed new Special Materials Complex. The projected requirements in this table account only for the new facilities and do not account for potential reductions in utility usage or resource requirements due to demolition or reduced use of excess facilities. Because the existing Y-12 Site utility and resource capacity is sufficient to accommodate any projected changes resulting from the operation of a new Special Materials Complex, DOE expects no adverse impact on utilities or Y-12 infrastructure due to implementing this alternative.

5.8.5 Alternative 4 (No Action - Planning Basis Operations Plus HEU Materials Facility Plus Special Materials Complex)

Construction and operation of the new HEU Materials Facility and the Special Materials Complex when combined with No Action - Planning Basis Operations would not have an appreciable impact on the utility usage and resource availability at the Y-12 Site. These combined values are shown in Table 5.8.5-1 which shows that they are all within the Y-12 Site capacities shown on Table 5.8.1-1.

TABLE 5.8.5–1.—Y-12 Site Energy and Resource Requirements—No Action - Planning Basis Operations Plus the HEU Storage Mission and Special Materials Mission

Resource	Units	Alternative 1B No Action - Planning Basis Operations Usage	Alternative 4 Combined Usage
Electrical energy	MWh/yr	565,710	602,050
Natural gas	m ³ /yr	4,000,000	4,000,000
Coal	t/yr	81,000	81,000
Steam ^a	kg/hr @ 250 psi	103,000	106,300
Raw water	L/day	17,900,000	17,900,000
Treated water	L/day	20,200,000	20,430,000
Demineralized water	L/day	16,880	22,300
Sanitary sewer	L/day	2,650,000	2,650,000
Compressed air	m ³ /min	420	420
Nitrogen	m ³ /yr	8,380,000	9,881,000
Oxygen	m ³ /yr	116,400	116,800
Helium	m ³ /yr	67,110	81,835
Hydrogen	m ³ /yr	10,100	10,100

^a Average steam load.
Source: LMES 2000a, LMES 1999b, LMES 2000c.