

3.3 POTENTIAL FUTURE Y-12 SITE INTEGRATED MODERNIZATION PROJECTS

This section addresses the potential future new facilities of the Y-SIM program and presents the concepts for modernized facilities as they currently stand. Some of the potential new facilities are much further along in design development than others; a few represent only scoping studies at this point. The scope and development strategy for Y-SIM is still evolving; but this discussion is intended to provide the most current information on program activities.

The potential new facilities associated with the Y-SIM are summarized in Table 3.3–1. The potential new facilities in Table 3.3-1 are listed according to the current planning priority based on factors such as age and condition of the existing facilities and operations, projected workload requirements, ES&H issues, and funding requirements. None of the potential future modernization projects listed in Table 3.3-1 are included in The No Action - Planning Basis Operations Alternative or the action alternatives for the Y-12 HEU Storage Mission or Special Materials Mission. Also listed in Table 3.3–1 are the existing facilities that are currently used to perform the functions addressed by potential new facilities.

Siting

Initial space requirements for the manufacturing facilities proposed to constitute a modernized Y-12 were estimated to comprise approximately 139,355 m² (1.5 million ft²) of new space. It was estimated that a minimum of about 26 ha (65 acres) of land would be required to accommodate the new facilities. However, the terrain and other site constraints of much of the ORR in general and the Y-12 Plant site in particular are less than ideal. Therefore, it was further estimated that a minimum 53 ha (130 acres) could possibly be needed if Y-SIM projects were completely constructed.

Four major areas at the Y-12 Plant were initially identified by site planners as possible candidate site areas for modernization projects. Additionally, a greenfield option was considered. The site areas were labeled A - E. Sites A - D are shown in Figure 3.3–1 and described in the information that follows. As shown in Figure 3.3–1, there is some overlap in boundaries for the candidate site areas.

Site A is a 27-ha (67-acre) site area located primarily outside Y-12's PIDAS security area and encompasses uncontaminated parking lots containing approximately 2,100 parking spaces. Site A includes a site area (see Figure 3.2.2–2) for the proposed HEU Materials Facility. This site area possibly represents the most physically unconstrained of the available candidate sites.

TABLE 3.3-1.—*Summary of Potential Future Y-SIM Facilities [Page 1 of 2]*

New Y-SIM Facilities	Scope	Existing Facilities Currently Used to Perform Function
Enriched Uranium Manufacturing Facility	Contains metal processing, chemical recovery operations, and support functions required for the production of enriched uranium components. Specialized metallurgical and chemical operations include casting, rolling, forming, machining, chemical recovery, and conversion of salvage and scrap to uranium compounds and metal. Support functions including storage, maintenance and decontamination, laboratory analysis, product certification, inspection, and process development are also incorporated into the facility.	9212, 9215, 9980, 9981, 9204-2E, 9998, 9995, 9818, 9815, 9812, 9723-25, 9999
Assembly/Disassembly/ Quality Evaluation Facility	Contains the assembly, disassembly, and quality evaluation functions for the stockpile management program.	9204-2E, 9204-2, 9204-4
Depleted Uranium Operations Facility	Depleted uranium operations will be performed in a combination of new and upgraded facilities. The new facility will contain the metallurgical operations and support functions required for the production of depleted uranium components. Specialized metallurgical operations will include casting, rolling, and forming of cast and wrought depleted uranium and wrought uranium-niobium alloys. Existing machine shops in Buildings 9201-5W and 9201-5N will be upgraded to provide machining capability.	9215, 9204-4, 9998, 9201-5, 9201-5N, 9201-5W
Lithium Operations Complex	Would contain the chemical processes, fabrication operations, and support functions associated with the production of LiH and LiD components. Specialized operations include LiCl power production, Li metal production, salt production, forming, machining, inspection, and chemical recovery of lithium compounds from retired and rejected components. Ancillary facilities include deuterium production and tank farms for holding process chemicals.	9204-2, 9805-1, 9404-9, 9720
Administrative/ Technical Facilities	These facilities would provide space for LMES and DOE infrastructure and support functions including administrative and technical offices, records storage, cafeteria, medical, photography, reproduction, and other functions.	9710-2, 9706-2, 9739, 9734, 9733-1, -2, -3, 9704-2, 9766

TABLE 3.3-1.—*Summary of Potential Future Y-SIM Facilities [Page 2 of 2]*

New Y-SIM Facilities	Scope	Existing Facilities Currently Used to Perform Function
Development/Product Certification/Analytical Chemistry	If Assembly/Disassembly facilities are relocated from Building 9204-2E, consideration is being given to reuse of this facility to house the R&D function as well as centralized facilities needed for Product Certification and Analytical Chemistry laboratories.	9202, 9203, 9731, 9102-2, 9203A, 9205, 9625, 9720-34, 9824-4, 9723-24, 9995
Production Support Facility	Would provide general manufacturing support including can manufacturing, graphite machining, and other general fabrication support.	9201-1, 9215
Non-SNM Strategic Materials Storage Facility	Approximately 27,871 m ² (300,000 ft ²) in Building 9204-4 would be renovated and equipped for storage of non-SNM materials and other strategic assets.	9720-33, Drum Yard, 81-22, 9204-2, 9204-4, 9998, 9201-5, 9720-46, 9720-38, 9720-14, 9720-1, 9720-18, 9720-26, 98
Other facilities (To be determined)	A number of other facilities are also under evaluation including maintenance facilities, fire hall, emergency management, Plant shift Superintendent and others. Evaluations will continue in FY 2001.	Specific facilities have not yet been determined

Note: Li - lithium, LiCl - lithium chloride; LiD - lithium deuteride; LiH - lithium hydride.
Source: LMES 1999c.

Site B is a 32-ha (79-acre) site area located in Y-12's extreme western end. Current uses of the site area include construction services, non-SNM storage, and a scrap yard for contaminated metal. Use of this site would require demolition of approximately 13,935 m² (150,000 ft²) of existing low-value floor space and the provision of replacement space for functions displaced. Remediation of the contaminated metal scrap yard would be required. Site B includes a potential site area for the proposed HEU Materials Facility or the Special Materials Complex (see Figure 3.2.2-4 and 3.2.3-2). The scrap yard is currently scheduled to be cleaned to industrial standards by the end of FY 2005 by the EM program, assuming funding is in place. Site C is 26 ha (65 acres) in area and is wholly contained in the Y-12 Plant PIDAS security perimeter. This area contains three major Y-12 production buildings currently planned for D&D within the next 5-10 years. Building 9201-4, approximately 52,210 m² (562,000 ft²) and currently owned by the EM Program, is planned for demolition. This building is heavily contaminated with mercury. Buildings 9201-5 and 9204-4, 49,240 m² (530,000 ft²) and 28,520 m² (307,000 ft²), respectively, are still owned by DP but are planned for D&D within the next 10 years. Use of the Site C area would necessitate either demolition of or upgrades to these structures, all of which are nearly 50 years old.

The Site D area is approximately 28 ha (69 acres) and lies outside the PIDAS area in the Property Protection Area of Y-12. Much of the space in the Site D area is 1940s era construction and primarily houses Y-12's administrative and support functions. Examples of functions within the Site D area include DOE and LMES Plant Management, Engineering, the main Y-12 Cafeteria, Protective Services Organization, and Medical Services. Most of the site area is uncontaminated.

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

FIGURE 3.3-1.—*Potential Candidate Siting Areas for New Modernization Facilities at the Y-12 Plant.*

Site E is a generic greenfield site area located in concept on Y-12's Area of Responsibility. A greenfield site represents the ideal choice for maximizing the efficient layout of manufacturing facilities; however, extended construction schedules, the need to provide new infrastructure, and the prospect of possible future contamination of an existing "green" site are major constraints on this candidate site area.

Site screening and evaluation would be performed for each potential future modernization project, and alternative sites analyzed under appropriate NEPA reviews when proposals to construct these facilities are submitted.

Potential New Facilities

Enriched Uranium Manufacturing Facility. The current building concept for the Enriched Uranium Manufacturing Facility is a linear arrangement of process compartments served by a central transport corridor and a secure vault. The process compartments would house modern equipment to perform HEU metallurgical and chemical recovery processing. The facility would also house supporting and administrative functions including maintenance, decontamination, product certification, inspection, analytical services, security posts, shipping and receiving, and offices.

Enriched Uranium Manufacturing Facility Description

The core of the Enriched Uranium Manufacturing Facility would be the specialized chemical and metallurgical operations for enriched uranium processing. The full range of operations would include metal casting, rolling and forming, machining, chemical recovery, and conversion of salvage and scrap to uranium compounds and metals. Specific metal processing operations may be conducted in an inert atmosphere. Separate chemical processing streams would process high-enrichment, mixed-enrichment, and special materials. Inspections and certification activities would take place at appropriate times throughout the product stream.

The Enriched Uranium Manufacturing Facility processing compartments would include the following:

- *Casting Compartment.* Casting operations include breaking and shearing, batch makeup, weighing, billet and parts casting, billet cooling, mold knockout, sample drilling and preparation, and enrichment verification. Also included are crushing broken mold pieces, chip cleaning, drying and briquetting, solvent recovery, and appropriate in-process storage in a vault. Metal operations may be conducted in an argon (inert) environment inside gloveboxes and full enclosures with gloved or remote operation. The area would be served by a special dry vacuum system and possibly by an argon recovery system.
- *Metal Working Compartment.* Metal working includes billet salt-bath preheating, rolling, salt bath annealing, cleaning, leveling, shearing, blanking, oven preheating, forming, debrimming, pickling, and vacuum annealing. Metal operations may be conducted in an argon environment inside gloveboxes and full enclosures with gloved or remote operations. The area would be served by a special dry vacuum system and possibly by an argon recovery system.
- *Machining Compartment.* Machining operations include cast and formed part cropping; casting delugging, inner and outer contour, semi and finish machining, turn lugging, milling, parting, grinding, sawing, cutting, swaging, shearing, and annealing. Machine operations require special machine coolant and vacuum systems and may be conducted in an argon environment inside gloveboxes and full enclosures with gloved or remote operations. A dedicated chuck vacuum system also would be installed in the facility. Each machine tool that requires coolant would be supplied with a stand-alone coolant system.

- *Chemical Recovery (High-Enrichment) Compartments.* Relatively concentrated (high-enrichment) HEU scrap and salvage comprises the feed for high-enrichment chemical recovery. Chemical operations include chip burning, screening, dissolving, separation and filtration, evaporation, extraction, denitration, hydrogen reduction, and direct oxidation reduction (see Figure 3.2.1–4). Also included are selective effluent treatment processes and special vacuum services. Processes requiring hands-on highly enriched uranium operations would be contained in gloveboxes and full enclosures with gloved or remote operations. The new facility processes which will use anhydrous hydrogen fluoride (AHF) to convert uranium dioxide to uranium tetrafluoride would be state-of-the-art and designed for minimum hands-on operation. Engineered control measures and design features would minimize chemical emissions, worker exposure, and accidental releases.
- *Chemical Recovery (Mixed-Enriched and Special Processing) Compartments.* Low-concentration (low-enrichment) highly enriched uranium salvage from all sources, in liquid and solid form (both combustible and noncombustible), would be processed in the mixed-enrichment chemical recovery compartments. Processing is continued until discard limit concentrations are reached. In addition, a small-scale production capability of specialty oxide materials (referred to as special processing) would be provided. Chemical Recovery operations include crushing and grinding, multipurpose furnacing, leaching, sorting, shredding, thermal recovery, residue mixing and thermal treatment, multipurpose dissolution and separation, high-capacity evaporation, feed adjustment, extraction, evaporation, precipitation, and calcination. Also included would be selective effluent treatment processes and special vacuum services. Processes requiring hands-on HEU operations would be contained in gloveboxes and full enclosures with gloved or remote operations.

The processing compartments would be designed as secondary containment for the processes. Totally enclosed processes would allow operations personnel to fulfill their duties without the need for personal protective equipment, including donning and doffing of protective clothing. The design intent would be to require the use of personal protective equipment only during equipment maintenance activities. The processing compartments and other areas within the Material Access Area where SNM is processed would be designed to function as vault-type rooms for secure storage of SNM while it is being processed.

The vault storage area for solid Categories I and II SNM materials in the Enriched Uranium Manufacturing Facility would use an automated material retrieval and storage system. The vault would be designed to store special containers that fit the new storage racks and interface with process compartments and long-term storage in the HEU Materials Facility. Categories III and IV materials would be stored in a vault-type area separate from the vault just described. (See the Glossary for a definition of Categories I, II, III, and IV materials.)

The Enriched Uranium Manufacturing Facility is expected to be a multi-story, reinforced concrete building with average overall dimensions of approximately 221 x 7,632 x 15 m (725 x 250 x 50 ft) high. The main building is expected to be a shear-wall-type structure with reinforced concrete exterior walls, floor slabs, and roof. Exterior walls are expected to be a minimum 0.2-m (8-in)-thick reinforced concrete to protect the interior from tornado- and wind-borne missiles. The first- and second-floor slabs would be approximately 0.3-m (12-in)-thick and the building base slab 0.46-m (18-in)-thick reinforced concrete. The roof would be a minimum 0.15-m (6-in)-thick reinforced concrete.

The Enriched Uranium Manufacturing Facility primary structure would be designed for seismic-induced earthquake ground motions associated with a PC-3 (2000-year return period) earthquake and the loads from a PC-3 wind/tornado (50,000-year return period) plus design-basis tornado missiles defined in DOE-STD-1020-94. The facility would be designed to provide protection from stream flooding, local flooding (runoff), and roof ponding associated with a PC-3 level flood (10,000-year return period).

Liquid effluent recycle and treatment systems would recover and recycle high-use chemicals from process liquid effluents and treat all other liquid effluents to meet standards for acceptance by the Y-12 Plant central treatment facilities or for direct discharge to surface waters. The recovery for recycle systems include a nitric acid still for concentrating dilute acid from evaporator condensate and crystallizers for concentrating aluminum nitrate from process effluents.

Treatment systems include neutralizers for caustic solutions from process off-gas scrubbers. Some of these processes may be located outside the Enriched Uranium Manufacturing Facility security boundary. The chemical processing of uranium and its direct support processes consumes substantial amounts of nitric acid, and smaller amounts of other materials such as aluminum nitrate, sodium hydroxide, sulfuric acid, and possibly acetic acid. These chemicals would be purchased and/or prepared in bulk and stored outside the main building for distribution to the using processes in the new facility.

Utilities Description

Utilities to support the Enriched Uranium Manufacturing Facility would be extended to the location of the facility and supplied from existing Y-12 Plant infrastructure.

Potential Siting

Possible siting of the Enriched Uranium Manufacturing Facility is focusing on areas within Y-SIM alternative candidate Site A area described earlier. The facility would require some on-site services such as chiller tower, steam supply, sanitary sewer services, and potable and fire water services. Approximately 4 ha (10 acres) would be required to accommodate the Enriched Uranium Manufacturing Facility.

Assembly/Disassembly/Quality Evaluation Facility. This project would provide a modernized facility to perform Assembly, Disassembly, and Quality Evaluation activities for weapons components. In addition, supporting activities such as Container Refurbishment, Product Certification, Analytical Services, and select R&D would be included in the facility. All Assembly/Disassembly/Quality Evaluation Facility capabilities required to maintain the enduring stockpile described below would be integrated into the facility.

Assembly

The Assembly area would fabricate and assemble weapons secondaries and components. Activities are primarily divided into four general work areas: material preparation, assembly, additional assembly, and certification.

Disassembly

The main function of the Disassembly area is to dismantle components originally assembled at the Y-12 Plant. Dismantled components would be segregated into material streams for disposition.

Quality Evaluation

Quality Evaluation performs specially designed tests and inspections to collect data and determine the condition of units and components in order to assess the future reliability of the weapons systems in the stockpile. Activities include the disassembly and evaluation of weapons selected for retirement and, subsequently, long-term evaluation of weapon parts under controlled-temperature environments. Additionally, salvageable materials contained in selected weapons assemblies would be reclaimed.

Container Refurbishment

Container Refurbishment is an ancillary support function for Assembly/Disassembly/Quality Evaluation Facility activities. The primary mission is refurbishment and certification of off-site radioactive shipping containers to support both Assembly/Disassembly/Quality Evaluation Facility activities and SNM movements between DOE sites.

Assembly/Disassembly/Quality Evaluation Facility Description

The Assembly/Disassembly/Quality Evaluation Facility is expected to be a two-story, reinforced concrete structure, with a total area of approximately 21,370 m² (230,000 ft²) and an overall footprint of approximately 171 by 73 m (560 by 240 ft). Key features include:

- Assembly, Disassembly, and Quality Evaluations capabilities in one building
- Work space for facility staff and operations
- Additional space allocation for security
- Storage space in work areas
- Consolidated utility rooms
- Tooling storage in work areas

Two one-story vault structures, nondestructive evaluation vaults, and a storage vault—collectively 1,855 m² (20,000 ft²)—would be located adjacent to the primary structure. These vaults would be constructed of reinforced concrete with entrances only from the first floor of the primary structure.

The structure and vaults would be designed for seismic-induced ground motions associated with a PC-3 (2000-year return period) earthquake. The structure and vaults would be designed to withstand PC-3 wind/tornado and design-basis tornado missiles as defined in DOE-STD-1020-94. The facility would be designed to provide protection from stream flooding, local flooding (runoff), and roof ponding associated with a PC-3 flood (10,000-year return period) event.

Utilities Description

Utilities to support the Assembly/Disassembly/Quality Evaluation Facility would be extended to the location of the facility and supplied from existing Y-12 Plant infrastructure.

Potential Siting

Possible siting of the Assembly/Disassembly/Quality Evaluation Facility is focusing on areas within Y-SIM alternative candidate Site A area described earlier. The facility would require some on-site services such as chiller tower, steam supply, sanitary sewer services, and potable and fire water services. Approximately 4 ha (10 acres) would be required to accommodate the Assembly/Disassembly /Quality Evaluation Facility.

Depleted Uranium Operations Facility. The modernized Depleted Uranium Operations Facility would be a combination of a new facility, encompassing metal casting, rolling, and forming, and existing machining and plating operations now conducted in Buildings 9201-5W and 9201-5N. The current concept for the new building includes three primary production areas: the Foundry Area, the Rolling Mill Area, and the Press and Heat Treat Area. In addition, the facility would include operations support areas.

Depleted Uranium Operations Facility Description

The Depleted Uranium Operations Facility would be a partial two-story, reinforced-concrete building with overall dimensions of approximately 101 by 177 m (330 by 580 ft). The first floor would contain the Metal Preparation operations area with a 12-m (40-ft)-high-bay area that uses about 65 percent of the building footprint. Three 60-ton overhead bridge cranes would serve this high bay area. Offices, change houses, and other functions would be on the second floor, which extends over about 35 percent of the first floor area. A dock would be located on portions of two sides of the building. A 2,790 m² (30,000 ft²) tool storage building would be housed in a structure located adjacent to the primary Depleted Uranium Operations Facility.

The primary structure would be a reinforced concrete shear-wall type structure with reinforced concrete exterior walls, floor slabs, and roof. Exterior walls and the roof would be, at a minimum, 0.2-m (8-in)-thick reinforced concrete. The tool storage building would be a 48 by 49 m (160 by 180 ft) one-story reinforced masonry structure supported on an approximately 0.3-m (12-in)-thick reinforced concrete floor slab.

The Depleted Uranium Operations Facility primary structure would be designed for seismic-induced earthquake ground motions associated with a PC-3 (2000-year return period) earthquake and the loads from a PC-3 wind/tornado (50,000-year return period) and design-basis tornado missiles as defined in DOE-STD-1020-94. The tool storage building design would withstand seismic and wind effects from a PC-2 event. A PC-2 facility does not have to be designed for tornado missiles. The Depleted Uranium Operations Facility would be designed to provide protection from stream flooding, local flooding (runoff), and roof ponding associated with a PC-3 flood (10,000-year return period) and the tool storage building would be designed and constructed to PC-2 (2,000-year return) requirements.

Utilities Description

Utilities to support the Depleted Uranium Operations Facility would be extended to the location of the facility and supplied from existing Y-12 Plant infrastructure.

Potential Siting

Possible siting of the Depleted Uranium Operations Facility is focusing on areas within Y-SIM alternative candidate Sites A, B, and C areas described earlier. The facility would require some on-site services such as chiller tower, steam supply, sanitary sewer services, and potable and fire water services. Approximately 4 ha (10 acres) would be required to accommodate the Depleted Uranium Operations Facility.

Lithium Operations Complex. The core of the Lithium Operations Complex would be a building specializing in chemical operations and machining. The full range of operations would include wet chemistry, metal production, salt production, forming, inspection, machining, and chemical recovery of lithium compounds from retired and rejected weapons components. Wet chemistry processes would convert retired and rejected weapons parts and machine dust into lithium chloride powder. In metal production, dry lithium chloride powder is reduced to lithium metal. Salt production then converts the lithium metal to either lithium hydride or lithium deuteride powder. Forming presses the dry powder into a shaped part. A smaller building for deuterium production and a tank farm to hold process chemicals and provide temporary liquid storage would also be included.

Lithium Operations Complex Description

The Lithium Operations Complex would include an approximately 9,290 m² (100,000 ft²) one-story building with a mezzanine having overall dimensions of approximately 122 by 76 by 15 m (400 by 250 by 50 ft) high. A one-story Deuterium Plant with Gas Garage and four storage tanks with dikes and canopies would be located adjacent to the primary structure. Wet chemistry, lithium metal production, salt production, machining, salvage areas, a laboratory, a computer room, offices and storage areas, maintenance room, X-ray vault, and a mechanical room would be located on the ground floor of the Process Building. Forming areas, along with storage, office space, and room for a dehumidifying system would be on the mezzanine. Lithium Operations would share the use of an Isostatic Press proposed as part of the Special Materials Complex.

The Deuterium Plant would be a one-story structure with overall dimensions of approximately 17 by 35 m (55 by 114 ft). The building would be supported on an 8-in-thick reinforced concrete floor slab, its exterior walls would be reinforced concrete masonry units, and it would have a built-up roof. A mezzanine storage area would be included in one corner of the building. Adjacent to the Deuterium Plant would be a bottle storage area with overall dimensions of approximately 13 by 15 m (44 by 50 ft). The bottle storage area would be steel frame construction with corrugated metal siding.

There would be four storage tanks with dikes and canopies. The lithium hydroxide (LiOH) and the sodium hydroxide (NaOH) tank would share a 18 by 30 m (60 by 100 ft) dike and canopy. The hydrochloric acid (HCl) tank would have a separate dike and canopy measuring 6 by 15 m (20 by 50 ft). A sodium hypochlorite (NaOCl) storage tank would be surrounded by a 9 by 9 m (30 by 30 ft) dike and canopy. The three canopies would be steel frames with open sides supported on the dike walls. The diked area of the tanks would drain into a basin located at a lower elevation.

The natural phenomena design for the lithium facility has not been finalized; however, it is qualitatively judged to be at least PC-2 since there is clearly the potential for impact to workers from the accidental release of hazardous chemicals. It is possible that it could be PC-3 if the quantified consequence evaluations (to be performed in later stages of the project safety analysis) show that off-site chemical thresholds are exceeded for credible accidents.

Utilities Description

Utilities to support the Lithium Operations Complex would be extended to the location of the facility and supplied from existing Y-12 Plant infrastructure.

Potential Siting

Possible siting of the Lithium Operations Complex is focusing on areas within Y-SIM alternative candidate Sites A, B, and C areas described earlier. The facility would require some on-site services such as chiller tower, steam supply, sanitary sewer services, and potable and fire water services. Approximately 4 ha (10 acres) would be required to accommodate the Lithium Operations Complex.

Other Missions and Facilities Considered

Product Certification Organization. The Product Certification Organization mission is to provide independent test, inspections, and quality assurance for weapons program and other approved Y-12 customers. The organization provides testing and inspection services for all weapons materials, components, and subassemblies manufactured, assembled, disassembled, and stored in the Y-12 Plant. Within the organization are two major operating entities: Dimensional Metrology operations and Physical Testing operations.

Product Certification Description

All materials utilized in Y-12 weapons activities are inspected and tested by Product Certification operations, including fissile, nuclear, nonnuclear, and hazardous materials, as well as materials requiring special environmental handling. Precision dimensional inspection of machined components and assemblies is performed with sophisticated measuring equipment controlled and calibrated to be among the most accurate in the world. Large precision machines installed with special foundations, very closely controlled room temperature, and sophisticated data capture and analysis capabilities are required for these operations.

The physical testing requirements for weapons support include radiography, radiation gaging, ultrasonic testing, liquid penetrant inspection, magnetic particle testing, magnetic/eddy current testing, bulk density determination, pressure/leak testing, vibration testing, and dynamic analysis. In addition, a full range of mechanical properties testing capabilities for all materials is maintained, including tensile strength, hardness, impact strength, metallography, strain gaging, and other material tests. Special radiation facilities, unique special testing systems, special materials handling capabilities, and data capture and analysis capabilities are required for these operations.

There are 15 major Product Certification Organization facilities currently operational within the Y-12 Plant that occupy more than 9,290 m² (100,000 ft²). Many principal Product Certification facilities are located within Buildings 9204-2E and 9201-5N. Additional smaller support facilities or facilities that are no longer needed also exist. These facilities are generally located in proximity to production capabilities developed at Y-12. Many facilities were consolidated in the 1990s, and that consolidation is continuing.

Product Certification Mission Alternatives

Alternatives being considered for the continued Product Certification Organization mission for the long term include the following:

- Continue to maintain and upgrade existing facilities and add new capabilities as new requirements are defined.
- Plan and construct new Product Certification Organization facilities along with new manufacturing process facilities as they are developed.
- Plan and construct new Product Certification Organization facilities in a centralized complex that would serve the Y-12 Plant well into the 21st century.

The first alternative would incur the largest operating and maintenance costs and certain health and safety compromises and operational inefficiencies. In addition, the manufacturing processes supported by these product certification facilities will likely be relocated to modernized facilities as discussed earlier in this section.

The second alternative is the one being considered in the early stages of Y-SIM planning. It offers improved facilities and efficiencies associated with the manufacturing processes being upgraded. However, it does offer inefficiencies associated with Product Certification operations and would require some duplication of facilities and increased staffing requirements. If Product Certification facilities become a part of each new Y-SIM proposed facility, then duplicate testing and certification facilities must be constructed. For example, if X-ray facilities are separated, their support facilities such as film processing must be duplicated.

The third alternative incurs the least capital costs, less duplication of facilities, and reduced operating costs for Product Certification. However, weapons materials and components movements and health, safety, and

security considerations may cause this alternative to be less attractive. Safeguards and security considerations probably would dictate that the facilities serving enriched uranium be located near facilities they serve and inside the PIDAS area. Also, health and safety considerations require that some facilities be within the Special Materials Complex (i.e., certification of beryllium parts).

Analytical Chemistry. The Analytical Chemistry Organization mission is to provide comprehensive analytical services including project management, sampling, analyses, data evaluation, and technical solutions in support of DP and other customers. The organization provides analytical testing and certification for all weapons materials, components, and subassemblies manufactured, assembled, disassembled, and stored at the Y-12 Plant.

Analytical Chemistry Description

All materials used in Y-12 weapons activities are analyzed by Analytical Chemistry, including fissile, nuclear, nonnuclear and hazardous materials, as well as materials requiring special environmental handling. Samples received from various Y-12 Plant operations are not normally suitable for direct quantitative determination of elemental composition, compound identification, or analysis and therefore require pretreatment. Sample types submitted to Analytical Chemistry include, but are not limited to, ²³⁵U metal, alloys, compounds, and solutions; depleted uranium metal, alloys, compounds, and solutions; lithium metal, lithium hydride, lithium chloride, and lithium deuteride; steel; nickel alloys; plating solutions; oils; hydraulic fluids; plastics and polymers; water; air; waste; bioassay; soils; sludges; and beryllium and organometallic compounds. Preparation of this wide range of sample types requires a correspondingly wide variety of chemical or physical treatments.

Building 9995 houses a large portion of Analytical Chemistry Organization operations. Building 9995 is constructed with hollow clay tile and concrete block walls, with 0.05 m (2-in)-thick gypsum roof deck covering the majority of the building and concrete decking on the remainder. The primary operations area approximately 7,800 m² (84,000 ft²) is divided between first-floor and basement levels. The building presently houses Analytical Services Organization administrative services, approximately 3,345 m² (36,000 ft²) of operating laboratory space, and support spaces.

The building is divided into several functional areas: the Uranium Area, laboratories, support and storage areas, utility areas, and offices. The Uranium Area consists of a vault used to store enriched uranium samples and the adjacent laboratories. The other laboratories are typical analytical chemistry laboratories with benches, fume hoods, chemical sinks, and storage cabinets for reagents, etc. The support areas consist of nonenriched uranium samples receiving and storage areas, maintenance shops, storage rooms, and utility equipment rooms. The office areas consist of standard offices and records processing and storage rooms.

The other major Analytical Services Chemistry facility is the Union Valley Facility. The Union Valley Facility, where bioassay, radiochemistry, and some organic analyses are performed in support of health, safety, environmental, and waste programs, is a leased facility with 2,508 m² (27,000 ft²) of laboratory space 3,716 m² (40,000 ft² total). The analytical capability of this facility is not available elsewhere in Y-12.

Analytical Chemistry Mission Alternatives

Alternatives being considered for Analytical Chemistry Organization support to the Y-12 Stockpile Stewardship Program include:

- Continue to maintain and upgrade existing facilities and add capability as new requirements are defined.
- Plan and construct new Analytical Chemistry Organization facilities along with the new Y-SIM manufacturing process facilities as they are developed.

- Plan and construct a new Development/Product Certification/Analytical Chemistry facility in a centralized complex to serve the Y-12 Plant well into the 21st century.

The first alternative would incur significant cost to address infrastructure concerns, as well as major costs for maintenance and continuation of inefficient operations.

The second alternative is being reviewed for feasibility. While it offers new, modernized facilities efficiently located near production operations, it introduces significant quality concerns and laboratory inefficiencies. From a quality perspective, there is always a concern of cross-contamination between production operations and the supporting laboratory. There may be no new production facility that can provide the extremely low background levels required for analysis of bioassay and environmental samples. Inherent in this alternative are the inefficiencies associated with having low-throughput analytical capabilities located in multiple facilities, which would require redundant equipment and quality control programs and increased staffing. In addition, construction of laboratory facilities is extremely costly due to HVAC requirements and installation of laboratory fume hoods.

The third alternative would result in the least investment in capital equipment, less duplication of laboratory facilities, and fewer personnel and would offer efficiencies in maximizing sample throughput. Movement of SNM and health, safety, and security considerations may cause this alternative to be less attractive. Health and safety considerations would require some processes to be located within the Special Materials Complex.

Utilities and Other Services. The Y-12 Plant is supported by a broad range of utilities and other services including:

- Steam and condensate
- Raw and treated water
- Sanitary sewer
- Demineralized water
- Natural gas
- Plant and instrument air
- Industrial gases
- Electrical power
- Telecommunications systems

The Y-SIM study team evaluated each of these systems to determine how they could support a modernized Y-12 Plant and determined a planning base for further evaluation of alternatives and subsequent planning activities. Alternatives considered for each system generally included:

- Continued operation of current systems
- Replacement of the current systems with new capability
- A combination of continued use and replacement to support existing operations and provide new capability for new Y-SIM facilities

On the basis of an evaluation of the condition and age of the current systems and projected Y-SIM needs, recommendations were developed to establish a planning base for each service. A summary of these planning bases is shown in Table 3.3–2.

The only major new utilities facility under Y-SIM is the steam plant, recommended by 2010. The new plant would have a nominal on-line capacity of 272,155 kg/hr (600,000 lb/hr) and would be capable of supplying steam at a rate as low as 27,215 kg/hr (60,000 lb/hr). The new plant would include multiple boilers. During normal operations, one spare boiler would be available as a backup to the operating boilers. Two fuel sources also would be provided; the primary fuel would be natural gas and the backup would be fuel oil. At the same time the new steam plant would be installed, the existing steam distribution and condensate return systems would be renovated. Portions of the existing steam distribution system would be replaced with new piping and insulation to minimize loss of steam from condensation. Portions of the existing system that are no longer needed because of the reduced plant footprint would be eliminated. The condensate system would be refurbished.

Steam Plant Facility Description

A new, pre-engineered building, approximately 61 by 46 by 12 m (200 by 150 by 40 ft) tall, would house the boilers and steam generator auxiliaries. The building would have steel framing and metal siding and include a mezzanine and access to stack levels. Areas for an office, control room, rest rooms, and electrical equipment would be provided within the building. Building utilities would include steam, condensate, sanitary sewer, instrument air, and treated water. The potential location of the proposed new steam plant is shown in Figure 3.3–2.

The new steam plant would consist of four packaged boilers, each with a capacity of 90,718 kg/hr (200,000 lb/hr) of saturated steam at 250 psig. The boilers would be designed to operate on either natural gas (primary fuel) or fuel oil (back-up fuel). Normal, full-load operation would have three boilers on-line; the fourth boiler would provide spare capacity for off-normal conditions.

Each boiler would include:

- Low-NO_x burners
- Fuel gas recirculation
- Air atomization
- Economizers
- Factory mutual approved burn management and combustion control systems
- Forced-draft fans
- Relief valves, blowdown, and vent connections

A central boiler feedwater system consisting of a supply water system, feedwater treatment system, deaerator system, and boiler feedwater system would support operation of the boilers. The makeup to the boiler feedwater system would be supplied from the Y-12 Plant treated water system. The supply water system would include a 7,571-L (2,000-gal) break tank, a backflow preventer, and supply water pumps.

TABLE 3.3-2.—*Summary of Y-SIM Planning Base for Utilities and Other Services*

Utility System/Service	Planning Base
Steam and condensate	<ul style="list-style-type: none"> • Continue to operate the current system through 2010. • Provide a new gas-fired steam generation plant sized for the existing and new facilities by 2010. • Refurbish the existing steam distribution piping systems. • Refurbish the existing steam condensate system.
Raw and treated water	<ul style="list-style-type: none"> • Improvement and upgrades to the existing treated water system are “to be determined” pending the transfer of the system to the city of Oak Ridge. • A new raw water supply to the plant would be added to supplement existing supply systems to ensure adequate flow to East Fork Poplar Creek.
Sanitary sewer	<ul style="list-style-type: none"> • Renovation of the sanitary sewer system was completed in FY 1999, and no additional system-level upgrades and replacements are planned. Each Y-SIM project would be responsible for connection to the current system.
Demineralized water	<ul style="list-style-type: none"> • The current system is mechanically adequate. New state-of-the-art controls will be provided.
Natural gas	<ul style="list-style-type: none"> • No system-level upgrades/replacements are planned. Each Y-SIM facility requiring natural gas would be responsible for connection to the existing system.
Plant and instrument air	<ul style="list-style-type: none"> • Continue to use current systems for existing facilities. • Provide new instrument air systems for new facilities. • Provide new independent breathing air systems, if required, for new facilities.
Industrial gases (argon, helium, hydrogen, nitrogen, and oxygen)	<ul style="list-style-type: none"> • Upgrade argon system to replace the pier-mounted vaporizers with the suspended vaporizers. Reuse the vaporizers originally installed for the oxygen system but never used. • The helium system would continue to be used as is. • The existing hydrogen system is adequate. The distribution system would be reduced to include only those facilities with a current need. • The current nitrogen gas system, which consists of vaporization liquid, would be replaced with a new, more efficient nitrogen gas generation system. A smaller liquid storage system will continue to be used. • The oxygen system would continue to be used as is.
Electrical power	<ul style="list-style-type: none"> • The existing 161-kV/13.8-kV system would continue to serve current Y-12 Plant facilities. • A new 161-kV/13.8-kV substation and 13.8-kV distribution system would be provided to serve new Y-SIM facilities.
Telecommunication systems	<ul style="list-style-type: none"> • Upgrade the unclassified Y-12 Intrasite Network fiber-optic backbone.

Source: LMES 1999d.

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

FIGURE 3.3–2.—*Candidate Site for a New Y-12 Steam Plant.*

The feedwater would be treated to prevent scale formation in the boiler using a cold zeolite softening system. After treatment, the boiler feedwater would go to a deaerator system where it would be heated to remove dissolved oxygen and other objectionable gases. The deaerator system would consist of two tanks and would include a flash tank, heat exchanger, and degassifier tanks. A blowdown system would be provided to reduce the concentration of impurities in the boiler water by continuously and intermittently “blowing down” the boiler. Blowdown water would be treated in the Steam Plant Wastewater Treatment Facility and then discharged to the Y-12 Plant sanitary sewer system. Each boiler would be equipped with a separate stack that would be equipped with a continuous emission monitoring system for NO_x and opacity.

Steam Plant Utilities Description

Natural gas fuel for the steam plant would be supplied by the Y-12 Plant natural gas system. The fuel-oil system would consist of storage tanks with a capacity of approximately 4,542,494 L (1.2 million gal) (a 7-day supply at full load); fuel-oil pumps; underground, double-contained supply piping; and a 4,542-L (1,200-gal) tank. Electrical power would be supplied by two separate feeder lines from the Y-12 Plant 13.8-kV system. A diesel generator and uninterruptible power source would supply backup power to critical system.

Potential Siting

Siting of the new steam plant would be near the existing steam plant (Building 9401-3) located in Y-SIM alternative candidate Site C area described earlier. Support and Infrastructure Facilities. The following functions and facilities have been identified as potentially needing upgrades and/or replacement as part of a long-term Y-12 revitalization program.

- Manufacturing support (can manufacturing, graphite shop, general machining)
- Non-SNM storage
- Development facilities
- Plant Shift Superintendent/Management facilities
- Fire Station
- Administrative and technical facilities (offices, records, storage, cafeteria, medical, photography, reproduction)
- Maintenance facilities (general shops, mobile equipment garage, fuel station)
- Change house facilities
- Material management facilities (shipping and receiving, material warehouse, stores, etc.)

An infrastructure study will be completed in FY 2001 to determine the needs, requirements, and scope of the infrastructure facilities needing upgrade or replacement and establish a planning base for the Y-SIM program. Until completion of additional work in FY 2001, the need and timing of these support facilities cannot be determined.

3.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

DOE is the Federal agency responsible for providing the Nation with nuclear warheads and ensuring that those weapons remain safe, secure, and reliable. By law, DOE is required to support the Nuclear Weapons Stockpile Plan. To do this, DOE must maintain a nuclear weapons production, maintenance, and surveillance capacity consistent with the President's *Nuclear Weapons Stockpile Plan*. For the proposed action (Continued Operation of Y-12 Missions), the following alternatives were considered but eliminated from detailed study for the reasons stated.

Site Closure with Complete Environmental Restoration. Members of the public have in the past and during public scoping for the SWEIS stated that DOE should analyze shutting down all operations at Y-12, deactivating some or all of the facilities, and cleaning up the site for other potential uses. DOE has already considered these suggestions in previous DOE programmatic NEPA documents, specifically the SSM PEIS (DOE 1996e) and the S&D PEIS (DOE/EIS-0229, DOE 1996h). DOE recognizes that Y-12 has unique capabilities and diverse roles supporting a variety of national programs, and that there is an essential near-term need to manage and maintain the safety and stability of the existing nuclear materials inventory. In addition, the *National Security Strategy for a New Century*, issued by the White House in October 1998, emphasizes the need to "ensure the continued viability of the infrastructure that supports U.S. nuclear forces and weapons." Until relieved of its mission to support the enduring nuclear weapons stockpile by the President and Congress, DOE must maintain its DP operations at the Y-12 Plant. Accordingly, the DOE view at this time is that a decision to shut down or further reduce Y-12 missions within the timeframe of the SWEIS would be highly unlikely and an unreasonable alternative.

Construction of an All New, Smaller Y-12 Plant. Some members of the public proposed that DOE analyze building an all new Y-12 Plant (implementing all of the Y-SIM Program projects), cleaning up the vacated facilities, and encouraging reindustrialization of the old Y-12 Site.

The long-term planning for the Y-12 Plant is being addressed in the Y-SIM Program; however, this program spans 30 years or more and includes many potential production, support, and infrastructure projects (see Section 3.3). The new smaller and more modern Y-12 envisioned by the Y-SIM Program is only conceptual at best. Although some components of the program are more defined and further along in the planning process, there is no proposal or data to support analyses of a "new" Y-12. Components of the program are prioritized based on Y-12 mission requirements and ES&H needs and are subject to limited funding levels. Therefore, creating an all new Y-12 Plant would be highly unlikely, financially remote, and unsupported by design information and data for analysis to be considered a reasonable alternative.

Upgrade Existing Facilities for Special Materials Missions. DOE considered the feasibility of renovating existing facilities needed to meet Special Materials Operations requirements as part of the Y-SIM Program. The review indicated that extensive and costly renovation of the facilities would be required to meet ES&H and mission requirements. The existing special materials facilities range from 27 to more than 50 years old and incur significant maintenance and operating costs while failing to meet future missions and safety requirements. Although renovation of some existing facilities is possible to meet capability, capacity, and ES&H requirements, other facilities cannot be upgraded. Those facilities that can be upgraded would incur extensive costs and inefficiencies because of the use of multiple aging facilities. Facilities that cannot be upgraded must be replaced by new facilities or newly constructed operations areas in existing buildings. Even though requirements could be satisfied, inefficiency from the use of multiple facilities, duplication of support services, and continued degradation of the structural integrity of old buildings and infrastructure renders this a nonviable alternative.

3.5 COMPARISON OF ALTERNATIVES AND ENVIRONMENTAL IMPACTS

This comparison of potential environmental impacts is based on the information in Chapter 4, Affected Environment, and analyses in Chapter 5, Environmental Consequences. Its purpose is to present the impacts of the alternatives in comparative form.

Table 3.5–1 (located at the end of this section) presents the comparison summary of the environmental impacts for construction and operation associated with the No Action - Status Quo Alternative, the No Action - Planning Basis Operations Alternative, and alternatives for the HEU Storage Mission and Special Materials Mission evaluated in this SWEIS. The No Action - Status Quo Alternative is presented in Table 3.5–1 as a benchmark for comparison of the impacts associated with the No Action - Planning Basis Operations Alternative and other alternatives that reflects full Y-12 DP mission operations at required levels, and activities by EM and the Office of Science 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. The following sections summarize the potential impacts by resource area.

3.5.1 Land Use

Construction. No new DP facilities or major upgrades to existing DP facilities would occur under the No Action - Planning Basis Operations Alternative. Potential land disturbance associated with construction of the Environmental Management Waste Management Facility and activities of the Office of Science Field Research Center would be approximately 31 to 47 ha (77 to 116 acres) and 4 ha (10 acres), respectively. The land disturbance would occur in areas that are already disturbed and designated for waste management and industrial use.

Potential land disturbance associated with the alternatives for the HEU Storage Mission range from 0 ha (No Action) to 5 ha (12 acres) (construct HEU Materials Facility). The Upgrade Expansion of Building 9215 would potentially disturb less than 1 ha. The No Action - Planning Basis Operations Alternative Plus the HEU Materials Facility would potentially disturb up to 56 ha (138 acres) during construction. The Upgrade Expansion of Building 9215 Plus the No Action - Planning Basis Operations Alternative would disturb up to 52 ha (128 acres).

Construction of the Special Materials Complex would potentially disturb between 0 ha (No Action) and 8 ha (20 acres) (Site 1 location). Site 2 and Site 3 locations for the proposed Special Materials Complex would disturb approximately 5 ha (12.4 acres). Except for a 2-ha (5-acre) portion of Site 1 which is covered by trees, all proposed sites are located in previously disturbed areas of Y-12 that are designated for industrial use. The clearing of the forest cover on Site 1 would result in a land use change for that area. The No Action - Planning Basis Operations Alternative Plus the Special Materials Complex would potentially disturb up to 59 ha (146 acres) (Site 1) and 56 ha (138 acres) for Sites 2 and 3.

The No Action - Planning Basis Operations Alternative Plus the HEU Materials Facility and the Special Materials Complex would disturb up to 64 ha (158 acres) during construction activities.

Operation. Under the No Action - Planning Basis Operations Alternative, the Environmental Management Waste Management Facility and the Field Research Center activities would require approximately 14 to 25 ha (35-62 acres) and less than 4 ha (10 acres) of land, respectively. These activities are consistent with ORR land use plans.

The potential permanent land requirement for the HEU Storage Mission alternatives range from 0.5 ha for the Upgrade Expansion of Building 9215 to 4 ha (10 acres) for the HEU Materials Facility. There would be no difference in land requirements between Site A or Site B for the HEU Materials Facility. Operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would be consistent with current

ORR land use plans, and Oak Ridge End-Use Working Group recommendations (PEC 1998). The No Action - Planning Basis Operations Alternative Plus the HEU Materials Facility would result in a potential permanent land requirements of up to 33 ha (82 acres) for operations. The Upgrade Expansion of Building 9215 plus the No Action - Planning Basis Operations Alternative would require up to 29.5 ha (73 acres).

Operation of the Special Materials Complex would require 4 ha of land. There would be no difference in land requirement between Sites 1, 2, or 3. Operation of the Special Materials Complex would be consistent with current ORR land use plans, and Oak Ridge End-Use Working Group recommendations (PEC 1998). The No Action - Planning Basis Operations Alternative plus the Special Materials Complex would result in a potential permanent land requirement of up to 33 ha (82 acres) for operations.

The No Action - Planning Basis Operations Alternative plus the HEU Materials Facility and the Special Materials Complex would result in a potential permanent land requirement of up to 37 ha for operations.

3.5.2 Transportation

Construction. Under the No Action - Planning Basis Operations Alternative, approximately 75 additional vehicles per day would use area roads to support construction of the Environmental Management Waste Management Facility. Less than 10 vehicles per day would be added to area traffic for the Field Research Center activities. The additional construction-related traffic for these two activities would have a negligible impact on area roads and traffic. The Level-of-Service (LOS) on area roads would not change under this alternative from the No Action - Status Quo Alternative.

Construction-related traffic for the HEU Storage Mission Alternative would range from 0 (No Action) to 165 additional worker vehicles per day to support construction of the HEU Materials Facility at either site or the Upgrade Expansion of Building 9215. In addition, three to eight trucks per day would be expected to bring construction materials to the project site. The No Action - Planning Basis Operations Alternative Plus the Construction of the HEU Materials Facility would potentially add 258 vehicles per day on area roads. The additional construction-related traffic would have a minor impact on area roads and traffic because most project traffic would occur at off-peak travel periods.

Construction-related traffic for the Special Materials Mission Alternative would range from 0 (No Action) to 157 additional worker vehicles per day to support construction of the Special Materials Complex at any of the 3 sites. An additional five trucks per day would bring construction materials to the project site. The The No Action - Planning Basis Operations Alternative Plus construction of the Special Materials Complex would potentially add 247 vehicles per day on area roads. The additional construction-related traffic would have a minor impact on area roads and traffic because most project traffic would occur at off-peak travel periods.

Operation. Under the No Action - Planning Basis Operations Alternative, an additional 28 vehicles per day and 6 vehicles per day would be expected from operation of the Environmental Management Waste Management Facility and the Field Research Center activities, respectively. Because a majority of this traffic would occur on the Y-12 Site, the additional traffic would have a negligible impact on area roads and traffic.

Radiological materials and waste transportation impacts associated with the Environmental Management Waste Management Facility would include routine and accidental doses of radioactivity. The risks associated with radiological materials transportation would be less than 0.1 fatality per year. The risks associated with radiological waste transportation would be less than 0.1 fatality per year.

Operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would result in no additional work traffic since the existing workforce would be used. The No Action - Planning Basis Operations Alternative plus the operation of HEU Materials Facility or the Upgrade Expansion of Building

9215 would result in approximately 34 additional vehicles per day on area roads. The additional traffic would not change the LOS on area roads. There would be a one-time relocation of stored HEU to the new facility (HEU Materials Facility or Expansion of Building 9215) which would require approximately 3,000 on-site truck trips to complete.

Radiological materials and waste transportation impacts would include routine and accidental doses of radioactivity. The risks associated with routine radiological materials transportation would be less than 0.1 fatality per year. The risks associated with radiological waste transportation would be less than 0.01 fatality per year. The one-time relocation of stored HEU to the new HEU Materials Facility or the Upgrade Expansion of Building 9215 would result in less than 0.001 fatality.

Operation of the Special Materials Complex would result in no additional worker traffic since the existing workforce would be used. The No Action - Planning Basis Operations Alternative plus the operation of the Special Materials Complex would result in approximately 34 additional vehicles per day on area roads. The additional traffic would not change the LOS on area roads.

There would be no additional radiological materials and waste transportation impacts associated with the Special Materials Complex since the facilities do not use radioactive materials.

3.5.3 Socioeconomics

Construction. A peak construction workforce of approximately 100 would be needed for the Environmental Management Waste Management Facility, and less than 10 would be needed for the Field Research Center activities included under the No Action - Planning Basis Operations Alternative. The workforce increase represents less than one percent of the The No Action - Status Quo Alternative ORR workforce and would have no substantial benefit or negative impact on the socioeconomics of the Oak Ridge area or regional economy.

The construction of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would have negligible impact on the socioeconomics of the Oak Ridge area or regional economy. Both projects would have a peak construction workforce of 220 workers and generate a total of 460 jobs (220 direct and 240 indirect) in the Region of Influence (ROI). This represents an increase of 0.2 percent in The No Action - Status Quo Alternative ROI employment. The existing ROI labor force is sufficient to accommodate the labor requirements and no change to the level of community services provided in the ROI is expected.

The No Action - Planning Basis Operations Alternative plus the construction of a new HEU Materials Facility or Upgrade Expansion of Building 9215 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 the No Action - Status Quo Alternative ROI employment by approximately 0.2 percent. The total No Action - Status Quo Alternative ROI income would increase by approximately \$17.8 million, or 0.1 percent.

The construction of the Special Materials Complex would have a peak construction workforce of 210 workers and generate a total of 440 jobs (210 direct and 230 indirect) in the ROI. This represents an increase of 0.2 percent in ROI employment. The existing labor force is sufficient to accommodate the labor requirements, and no change in the level of community services provided in the ROI is expected. The Special Materials Complex construction would have a negligible impact on the socioeconomics of the Oak Ridge area or regional economy.

The No Action - Planning Basis Operations Alternative 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 The No Action - Status Quo Alternative ROI

employment by approximately 0.2 percent. The Total No Action - Status Quo Alternative ROI income would increase by approximately \$17.2 million, or 0.1 percent.

The construction periods of the HEU Materials Facility and Special Materials Complex could overlap with the construction activities included under the No Action - Planning Basis Operations Alternative. 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 of 1,130 jobs (540 direct and 590 indirect). This would be an increase of approximately 0.4 percent in the 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.

Operation. Under the No Action - Planning Basis Operations Alternative, potential benefits of employment associated with the Environmental Management Waste Management Facility or the Field Research Center activities would be very small. Approximately 25 workers and 6 workers, respectively, would be needed for the two activities. Workers for the Environmental Management Waste Management Facility would be drawn from the local workforce. Some of the workforce associated with the Field Research Center would be researchers from outside the ROI. Visiting staff and scientists would contribute in a beneficial manner to the local economy, but the impact would be negligible.

The operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would result in no change in the No Action - Status Quo Alternative ROI employment, income, or population. The anticipated operation workforce of 30 for the HEU Materials Facility and 49 for the Upgrade Expansion of Building 9215 would come from existing employees. Operation of the Special Materials Complex would not result in any change in workforce requirements since existing workers would staff the facilities. No impacts to ROI employment, income, or population are expected.

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 - Planning Basis Operations Alternative Y-12 workforce and no impacts to ROI employment, income, or population.

3.5.4 Geology and Soils

Construction. The Environmental Management Waste Management Facility and the Field Research Center activities included under the No Action - Planning Basis Operations Alternative would result in a potential increase in soil erosion at the construction sites. However, soil impacts are expected to be small with proposed design controls. No impacts to geology are expected.

Construction of the HEU Materials Facility at Site A would result in a potential increase in soil erosion from the lay-down area and new parking lot. Detention basins and runoff control ditches would minimize soil erosion and impacts. No impacts to geology are expected because the facility is above ground and foundation construction would not disturb bedrock. Site B soil erosion impacts would be negligible with appropriate standard construction control measures. The Upgrade Expansion of Building 9215 would have negligible soil erosion impacts with standard construction control measures. No geology impacts are expected at Site B or at the Building 9215 expansion construction sites because the facility is above ground and foundation construction would not disturb bedrock.

Construction of the Special Materials Complex at Site 1 would result in a potential increase in soil erosion from the lay-down area and project site land clearing, detention basins, silt fences, and runoff control ditches

would minimize soil erosion and impacts. No impacts to geology are expected because the facility is above ground and foundation construction would not disturb bedrock.

Activities included under the No Action - Planning Basis Operations Alternative plus the construction of the HEU Materials Facility and the Special Materials Complex would result in a potential increase in soil disturbance and soil erosion from construction activities. Appropriate mitigation, including detention basins, runoff control ditches, silt fences, and protection of stockpiled soils would minimize soil erosion and impacts. No impacts to geology area expected because all new facilities would be above ground structures and foundation construction would not disturb bedrock.

Operation. Under the No Action - Planning Basis Operations Alternative, minor soil erosion impacts are expected from the Environmental Management Waste Management Facility. Detention basins, runoff control ditches, and cell design components would minimize impacts. The Field Research Center would have no impacts on geology and soils with standard construction-type soil erosion control measures.

The HEU Storage Mission Alternatives and Special Materials Mission Alternatives would have no impact on geology or soils during operation because of site design and engineered control measures.

The No Action - Planning Basis Operations Alternative plus the operation of the HEU Materials Facility and Special Materials Complex would have no impact on geology or soils. Appropriate facility site design and engineered control measures (e.g., detention basins) would be used to minimize soil erosion impacts.

3.5.5 Water Resources

Construction

Surface Hydrology. Under the 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 [5.5 MGD]) to (21.2 MLD [5.6 MGD]). This would represent less than a 2 percent increase in raw water use. 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 Environmental Management Waste Management Facility in eastern Bear Creek Valley activities are included under the No Action - Planning Basis Operations Alternative. 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. 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).

The No Action - Planning Basis Operations Alternative also includes activities of the Field Research Center at the Y-12 Site. 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. 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.

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 the 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 UEFPC. 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.

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) is located within either the 100-year or 500-year floodplains.

Groundwater. All water for the No Action - Planning Basis Operations Alternative 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.

Groundwater resources could be degraded by the Environmental Management Waste Management Facility in the short-term by contaminant releases from 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.

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 multilayer 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.

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. 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.

Groundwater would be extracted in the Field Research Center contaminated area at Y-12 as part of characterization-related hydraulic tests. In addition, groundwater sample collection would increase. 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.

All water for construction 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). 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.

All water for construction 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. 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). 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.

Under the No Action - Planning Basis Operations Alternative plus the construction of the HEU Materials Facility and Special Materials Complex, no groundwater would be used for construction activities. 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.

Operation

Surface Hydrology. Under the 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 [5.5 MGD]) to (21.2 MLD [5.6 MGD]). This would represent less than a 2 percent increase in raw water use.

HEU storage operations, whether located in a new HEU Materials Facility or in the Upgrade Expansion of 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 HEU Materials Facility or the Upgrade Expansion of Building 9215 would increase water use requirements by approximately 140 MLY (37 MGY) from the 5,678 MLY (1,500 MGY) water use under the No Action - Status Quo Alternative. 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.

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 the No Action - Status Quo Alternative 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 Special Materials Complex would increase water use requirements by approximately 197 MLY (52 MGY) from the 5,678 MLY (1,500 MGY) water use under the No Action-Status Quo Alternative. 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.

Under Alternative 4 (No Action - Planning Basis Operations Alternative Plus HEU Materials Facility plus Special Materials Complex), surface water withdrawals and discharges would increase slightly. Water requirements would increase by approximately 197.5 MLY (52.2 MGY) from the 5,678 MLY (1,500 MGY) water usage under the No Action-Status Quo Alternative. This represents an increase of 3.5 percent. Historical water use by Y-12 has been as high as 8,328 MLY (2,200 MGY). Sufficient excess water capacity exists to accommodate the additional 197.5 MLY (52.2 MGY) increase. 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.

Groundwater. All water for the No Action - Planning Basis Operations Alternative would be taken from the Clinch River, with no plans for withdrawal from groundwater resources at the Environmental Management Waste Management Facility. Sampling at the Field Research Center would remove a minimal amount (7,570 [2,000 gal]) a year for research purposes. All process, utility, and sanitary wastewater would be treated prior to discharge into UEFPC in accordance with NPDES permits.

All water for operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would be taken from the Clinch River. As a storage facility, there would be no process water; utility and sanitary wastewater would be treated prior to discharge into UEFPC in accordance with the existing NPDES permits.

All water for operation of the Special Materials Complex would be taken from the Clinch River. No plans exist for groundwater withdrawal to support operation of the Special Materials Complex. Utility and sanitary wastewater would be treated prior to discharge into the UEFPC in accordance with the existing NPDES permits.

Under Alternative 4 (The No Action - Planning Basis Operations Alternative Plus HEU Materials Facility Plus Special Materials Complex) no groundwater would be used for operations of facilities. No plans exist for routine withdrawal from groundwater resources; and utility and sanitary wastewater would be treated prior to discharge in accordance with NPDES permits.

3.5.6 Biological Resources

Construction. Under Alternative 1B (No Action - Planning Basis Operations Alternative), potential impacts to terrestrial, wetlands, and threatened/endangered species are expected. Land clearing activities for the Environmental Management Waste Management Facility and soil borrow area would remove grassland, old field habitat, forest habitat, and a 0.4-ha (1-acre) wetland. Potential threatened/endangered species affected by construction activities include the Tennessee endangered pink lady slipper and Tennessee threatened tubercled rein-orchid and carolina quillwort. There would be a minor impact on terrestrial resources from Field Research Center activities because test plots would be located in areas where site clearing and past construction have occurred.

Construction of the HEU Materials Facility at Site A would potentially impact terrestrial resources and three wetlands (0.4 ha [1 acre]) at the materials lay-down and new parking lot areas due to land clearing activities. No impact to aquatic resources or threatened/endangered species is expected at Site A. Impacts to biological resources from construction of the HEU Materials Facility at Site B or the Upgrade Expansion of Building

9215 are not expected because these areas have been previously disturbed and do not contain habitat sufficient to support a biologically diverse species mix.

If the Special Materials complex is constructed at Site 1, approximately 4 ha (1 acre) of terrestrial habitat would be eliminated and wildlife would be dislocated and/or disturbed. Two man-made wetlands (0.4 ha [1 acre]) would potentially be impacted due to construction land clearing and sedimentation from the construction site. No impacts to aquatic or threatened/endangered species are expected at Site 1. If the Special Materials Complex is constructed at Site 2 or Site 3, no impacts to biological resources are expected because of the highly disturbed and industrialized nature of these sites and the minimal biological resources present.

Operation. Under the No Action - Planning Basis Operations Alternative, minor impacts to terrestrial resources are expected due to operation noise and human activities associated with the Environmental Management Waste Management Facility and soils borrow area. No impacts to wetlands, aquatic, or threatened/endangered species are expected. The Field Research Center operations activities would have a minor impact on terrestrial resources due to noise and human activity but would have no impacts on aquatic, wetlands, or threatened/endangered species.

Operation of the HEU Materials Facility, the Special Materials Complex, or the Upgrade Expansion of Building 9215 would not impact biological resources because they would be located in previously disturbed or heavily industrialized portions of the Y-12 Site that do not contain habitat sufficient to support a biologically diverse species mix.

Activities associated with the Environmental Management Waste Management Facility, Field Research Center activities under the No Action - Planning Basis Operations Alternative, 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 impact 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.

3.5.7 Air Quality

Construction. Under the No Action - Planning Basis Operations Alternative, the Environmental Management Waste Management Facility and the Field Research Center activities would potentially have an impact on the project areas due to fugitive dust emissions. 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.

Construction of the HEU Materials Facility at Site A and Site B would result in small fugitive dust impacts in the construction area. Site A construction activities would generate slightly more fugitive dust emissions because of more earth moving activities associated with the materials lay-down area and new parking lot. If the expansion to Building 9215 is constructed, small fugitive dust impacts in the construction area would be expected. Effective control measures commonly used to reduce fugitive dust emissions include wet suppression, wind speed reduction using barriers, vehicle speed, and chemical stabilization. Necessary control measures would be applied to ensure that PM₁₀ concentrations remain below applicable standards.

Construction of the Special Materials Complex at Site 1, Site 2, or Site 3 would generate fugitive dust emissions which would have a small impact in the construction area. Site 1 construction would generate more fugitive dust emissions than Site 2 or Site 3 due to the larger scale of land clearing and earth moving activities to prepare the site for construction. All fugitive dust emissions would not exceed applicable standards when dust suppression methods are used.

Operation. Under the No Action - Planning Basis Operations Alternative, nonradiological air pollutant concentration would be well within established criteria under normal operations. Radiological dose to the MEI and off-site population under the No Action - Planning Basis Operations Alternative would increase from the No Action - Status Quo Alternative due to the restart of all Y-12 mission operations. The dose to the MEI (1,080 m [3,543 ft] from Y-12) would increase from 0.53 mrem/yr (under the No Action - Status Quo Alternative) to 4.5 mrem/yr, and the dose to the population within 80 km (50 mi) would increase from 4.3 person-rem/yr (under the No Action - Status Quo Alternative) to 33.7 person-rem/yr. Statistically, this equates to 0.017 latent cancer fatality (LCF) for each year of Y-12 normal operation.

The impacts under Alternative 2A (No Action - Planning Basis Operations Alternative Plus Construct and Operate a New HEU Materials Facility) and Alternative 2B (No Action - Planning Basis Operations Alternative 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 Alternative 1B (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.

There would be no radiological material associated with the Special Materials Complex operation. No change from the No Action - Planning Basis Operations Alternative radiological emissions described above at Y-12 are expected.

Under Alternative 4 (No Action - Planning Basis Operations Alternative Plus HEU Materials Facility Plus Special Materials Complex), the collective dose to workers at the Y-12 Plant would be the same as Alternative 1B (No Action - Planning Basis Operations Alternative). 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 under the No Action - Planning Basis Operations Alternative 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 mi) of the Y-12 Site under this alternative would be the same as 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 the 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 operating at planned and required workload levels under Alternative 1B (No Action - Planning Basis Operations Alternative).

3.5.8 Visual Resources

Construction. No additional impact to visual resources is expected under the No Action - Planning Basis Operations Alternative or from the HEU Storage Mission and Special Materials Mission Alternatives because of the design of the proposed new facilities and the existing setting of Y-12.

Operation. No additional impact to visual resources is expected under the No Action - Planning Basis Operations Alternative or from the HEU Storage Mission and Special Materials Mission Alternatives because of the design of the proposed new facilities and the existing setting of Y-12. Alternative 4 (No Action - Planning Basis Operations Alternative Plus HEU Material Facility Plus Special materials Complex) would have no additional impacts to visual resources.

3.5.9 Noise

Construction. Under the No Action - Planning Basis Operations Alternative, small noise impacts are expected from construction equipment and activities associated with the Environmental Management Waste Management Facility and the Field Research Center activities. Impacts would be limited to the general construction area. Feasible administrative or engineered controls would be used in addition to personal protective equipment (e.g., ear plugs) to protect workers against the effects of noise exposure.

Construction of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would have small noise impacts in the general construction area. Construction of the Special Materials Complex would have small noise impacts in the general construction area. Feasible administrative or engineered controls would be used in addition to personal protective equipment (e.g., ear plugs) to protect workers against the effects of noise exposure. No off-site noise impacts are expected because 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.

Construction related noise impacts under Alternative 4 (No Action - Planning Basis Operations Alternative 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 commutative noise impacts to Y-12 employees population would be mitigated to acceptable levels (approximately 70 dBA). 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.

Operation. Under the No Action - Planning Basis Operations Alternative, small noise impacts are expected from heavy equipment and activities associated with the Environmental Management Waste Management Facility and the Field Research Center. Impacts would be limited to the general operation areas.

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 for all action alternatives 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 Alternative levels. Effects upon residential areas are attenuated by the distance from the facility, topography, and by a vegetated buffer zone.

3.5.10 Site Infrastructure

Construction. There would be no measurable change in Y-12 Site energy usage or other infrastructure resources under the No Action - Planning Basis Operations Alternative due to the construction of the Environmental Management Waste Management Facility or the Field Research Center activities. Existing site infrastructure would be used and energy usage would be minimal during the construction phase.

Construction of the HEU Materials Facility at Site A would result in less infrastructure impacts than Site B since no buildings would be demolished and utility relocation would be minimal. Site B would require demolition of eight buildings and realignment of Old Bear Creek Road. Construction materials and resources

for the HEU Materials Facility would be the same for Site A and Site B. If the Upgrade Expansion of Building 9215 is constructed, some utility relocation would be necessary but no permanent buildings would require demolition. Construction materials and resources for the HEU Materials Facility would be the same for Site A and Site B. Construction materials and resources requirements for the Expansion of Building 9215 would be less than that for the HEU Materials Facility.

Construction materials and resource requirements for the Special Materials Complex would be the same for Site 1, Site 2, or Site 3. Construction of the Special Materials Complex at Site 1 would result in the least impact to infrastructure since no buildings would be demolished and only small utility relocation would be required. At Site 2, five buildings would be removed. At Site 3, eight buildings would be removed and a portion of Old Bear Creek Road would be realigned.

Operation. Under the No Action - Planning Basis Operations Alternative, there would be a slight increase from the No Action - Status Quo Alternative in energy and resource requirements. Electrical energy consumption would increase by approximately 189,000 MWh/yr to 566,000 MWh/yr and water use would increase by 4.5 MLD (1.2 MGD) to 20.2 MLD (5.3 MGD).

Operation of the HEU Materials Facility would require approximately 5,900 MWh/yr of electricity and 1,510 L/day (400 gal/day) of water. Operation of the Upgrade Expansion of Building 9215 would require approximately 10,900 MWh/year and 1,975 L/day (520 gal/day) of water. Sufficient electrical energy and water capacity exists at Y-12 to support the expected increases. Combined with the No Action - Planning Basis Operations Alternative, the preferred alternative (new HEU Materials Facility) would require a total of 572,000 MWh/yr of electricity and 20.2 MLD (5.38 MGD) of water.

Operation of the Special Materials Complex would require approximately 30,400 MWh/yr and 228,600 L/day (63,000 gal/day) of water. Sufficient electrical energy and water capacity exists at Y-12 to support the expected increases. Combined with the No Action - Planning Basis Operations Alternative, this alternative would require a total of 596,000 MWh/yr of electricity and 20.43 MLD (5.4 MGD) of water.

Operation of the new HEU Materials Facility and the Special Materials Complex when combined with The No Action - Planning Basis Operations Alternative would require an increase in electrical usage to 602,000 MWh/yr and an increase of water usage to 20.43 MLD (5.4 MGD).

The vacating of existing HEU storage facilities and special materials operations facilities, if new projects are constructed, could potentially effect the projected increases and minimize potential impacts on site infrastructure and resources.

3.5.11 Cultural Resources

Construction. No impacts to cultural resources are expected under the No Action - Planning Basis Operations Alternative. NRHP-eligible properties in the proposed historic district encompassing the Y-12 Plant would continue to be actively used for DOE mission activities.

The impacts to cultural resources resulting from the Environmental Management Waste Management Facility and Field Research Center activities has been assessed in consultation with the SHPO (DOE 1999j; DOE 2000b). Although there are no known archaeological resources in the Y-12 Site area, there would be a remote possibility of encountering buried cultural resources during ground-disturbing activities. Procedures for addressing the unanticipated discovery of cultural resources are described in the Y-12 Cultural Resource Management Plan (CRMP).

No impacts to cultural resources are expected from construction of the HEU Materials Facility at Site A or Site B. The Upgrade Expansion of Building 9215 would be considered a major alteration of a historic

property and require consultation with the SHPO in accordance with the Y-12 CRMP. Although there are no known archaeological resources in the Y-12 Site area, there would be a remote possibility of encountering buried cultural resources during ground-disturbing activities. Procedures for addressing the unanticipated discovery of cultural resources are described in the Y-12 CRMP.

No impacts to cultural resources are expected from construction of the Special Materials Complex at Site 1, Site 2, or Site 3. Because use of Site 1 would probably involve ground disturbance in an undisturbed area and may involve disturbance exceeding the depth and extent of previous ground disturbances the DOE-ORO would consult with SHPO and other parties to determine whether an archaeological survey is warranted. If a survey is conducted, any resources found would be evaluated for NRHP-eligibility and the effects determined in consultation with the SHPO and other parties. Although there are no known archaeological resources in the Y-12 Site area, there would be a remote possibility of encountering buried cultural resources during ground-disturbing activities. Procedures for addressing the unanticipated discovery of cultural resources are described in the Y-12 CRMP.

Operation. No impacts to cultural resources are expected under the No Action - Planning Basis Operations Alternative because NRHP-eligible properties would not be modified or demolished and ground-disturbing activities would be minimal. No impacts to cultural resources are expected from operation of HEU Materials Facility, the Upgrade Expansion of Building 9215, or the Special Materials Complex. Upon completion of the new HEU Materials Facility or Upgrade Expansion of Building 9215, NRHP-eligible buildings (9204-2, 9204-2E, 9204-4, 9215, 9720-5, and 9998) would no longer be used for the HEU storage mission. Upon completion of the Special Materials Complex, NRHP-eligible buildings (9201-5, 9202, 9731, and 9995) would no longer be used for the Special Materials Mission. Depending on the disposition of these historic properties, there could be impacts associated with moving the HEU Storage Mission and Special Materials Operations from these buildings. Potential impacts include changes in the character of the properties' use, the physical destruction of historic properties, and the neglect of properties leading to deterioration. If adverse effects on historic properties could result from the change of mission or subsequent disposition of these buildings, the SHPO must be consulted regarding the application of the criteria of adverse effect and in mitigation efforts to avoid or reduce any impacts in accordance with 36 CFR 800.

3.5.12 Waste Management

Construction. The Environmental Management Waste Management Facility and the Field Research Center activities would generate small amounts of nonhazardous construction waste under the No Action - Planning Basis Operations Alternative.

If the HEU Materials Facility is constructed at Site A, construction waste would be less than Site B. At Site A, approximately 3,823 m³ (5,000 yd³) of nonhazardous construction debris and 14.8 million L (3.9 million gal) of nonhazardous sanitary waste would be generated during the 4-year construction period. At Site B an additional 22,707 m³ (29,700 yd³) of contaminated soil (mixed LLW) would be excavated before building construction could begin. Construction of the Upgrade Expansion of Building 9215 would generate the least amount of construction waste; approximately 3,058 m³ (4,000 yd³) of nonhazardous construction debris and 14.8 million L (3.9 million gal) of nonhazardous sanitary waste.

Construction of the Special Materials Complex at Site 2 would generate the most construction waste and Site 1 the least. At Site 2, approximately 46,867 m³ (61,300 yd³) of contaminated soil (mixed LLW) would be excavated and an additional 3,420 m³ (4,470 yd³) of nonhazardous construction debris and 1.4 million L (382,400 gal) of nonhazardous sanitary waste would be generated. At Site 3, approximately 22,707 m³ (29,700 yd³) of contaminated soil would be excavated. The amount of construction debris and sanitary waste would be the same as Site 2. No contaminated soil would be excavated at Site 1 and approximately 1,447,541 L (382,400 gal) of nonhazardous sanitary waste would be generated. Small amounts of hazardous waste would be generated by the use of construction equipment, etc.

If both a new HEU Materials Facility and a new Special Materials Complex were constructed, the waste generated would be added to waste generated under the No Action - Planning Basis Operations Alternative. The contaminated soils would be mixed LLW. Use of construction equipment would generate small amounts of hazardous waste. Non-hazardous waste would consist primarily of construction debris and wastewater.

Operation. Under the No Action - Planning Basis Operations Alternative, mixed LLW and hazardous waste are expected to increase slightly from the No Action - Status Quo Alternative. LLW generation rate is expected to remain approximately the same as the No Action - Status Quo Alternative. Sanitary/industrial wastes are expected to decrease by a small amount (see Table 3.5-1 for amounts). The operation of the Environmental Management Waste Management Facility would be a beneficial impact on Y-12 Waste Management operations because it would expand on-site CERCLA waste disposal capacity.

Operation of the HEU Materials Facility would be expected to generate small amounts of LLW, hazardous, and nonhazardous waste per year (see Table 3.5-1 for amounts). The Upgrade Expansion of Building 9215 would generate similar small amounts of the same types of waste (see Table 3.5-1 for amounts). Adequate waste management capacity exists to support the expected waste volumes. The No Action - Planning Basis Operations Alternative Plus the HEU Materials Facility operation waste generation is shown in Table 3.5-1.

Operation of the Special Materials Complex would generate small amounts of hazardous and nonhazardous waste per year (see Table 3.5-1 for amounts). Less than 1 yd³ of LLW would be generated per year from Analytical Chemistry testing in support of special materials operations. Special materials operations use no radiological materials. Adequate waste management capacity exists to support the expected waste volumes. The No Action - Planning Basis Operations Alternative Plus the Special Materials Complex operation waste generation is shown in Table 3.5-1.

Operation of both an HEU Materials Facility and a new Special Materials Complex would add to waste generated under the No Action - Planning Basis Operations Alternative (Table 3.5-1).

3.5.13 Environmental Justice

Construction. None of the proposed action alternatives would result in environmental justice impacts related to construction activities. There would be no significant health or environmental impacts on any populations. In addition, prevailing wind patterns are not in the direction of primarily minority or low-income populations. Therefore, any adverse impacts would not disproportionately affect these populations.

Operation. None of the proposed action alternatives would result in environmental justice impacts related to operation of Y-12 Plant facilities. There would be no significant health or environmental impacts on any populations. In addition, prevailing wind patterns are not in the direction of primarily minority or low-income populations. Therefore, any adverse impacts would not disproportionately affect these populations.

3.5.14 Worker and Public Health

Construction. Under the No Action - Planning Basis Operations Alternative, construction activities of the Environmental Management Waste Management Facility would be expected to result in approximately nine non-fatal occupational injuries/illnesses per year.

Construction of the HEU Materials Facility or the Upgrade Expansion of Building 9215 would be expected to result in approximately three additional non-fatal occupational injuries/illnesses per year. Both facilities would require a 4-year construction period.

Construction of the Special Materials Complex would be expected to result in approximately three additional non-fatal occupational injuries/illnesses per year. The construction period for the Special Materials Complex is 3.5 years.

Operation. Under the No Action - Planning Basis Operations Alternative, the estimated number of non-fatal occupational injuries/illnesses per year for the total Y-12 workforce is 440. Because of the restart of all Y-12 mission operations, radiological impacts are expected. The annual average dose to workers would increase from the No Action - Status Quo Alternative (8.0 mrem [0.016 LCF per year]) by 3.6 mrem and result in an estimated 0.024 LCFs per year. The MEI dose would increase from the No Action - Status Quo Alternative (0.53 mrem [2.65×10^{-7}]) by 3.17 mrem/yr to 4.5 mrem/yr and result in an estimated 2.25×10^{-6} LCFs per year. The dose to the population within 80km (50 mi) would increase from The No Action - Status Quo Alternative (4.3 person-rem/yr [2.15×10^{-6} LCFs per year]) by 29.4 person-rem/yr to 33.7 person-rem/yr and result in an estimated 1.69×10^{-5} LCFs per year.

Once constructed, the HEU Materials Facility or the Upgrade Expansion of Building 9215 would require the transfer of stored HEU in existing facilities to the new storage facility. This one-time transfer would expose workers involved in the transfer to an estimated dose of 150 mrem. An estimated 0.002 LCFs are expected from the transfer. For normal operation of the HEU Materials Facility or the Upgrade Expansion of Building 9215, the worker dose is expected to be 21 mrem/yr and the same as for The No Action - Planning Basis Operations Alternative or The No Action - Status Quo Alternative. The MEI dose and the dose to the population within 80km (50 mi) would not change from the No Action - Planning Basis Operations Alternative or the No Action - Status Quo Alternative.

Operation of the Special Materials Complex involves no radiological materials. The MEI dose and the dose to the population within 80km (50 mi) would not change from that described above for the No Action - Planning Basis Operations Alternative.

3.5.15 Facility Accidents

Operation. Under the No Action - Planning Basis Operations Alternative, the beyond-design-basis earthquake accident would result in an estimated 0.202 LCFs to the population living within 80km (50 mi), the same as The No Action - Status Quo Alternative. The MEI of the public would receive a dose of 17 rem and result in an estimated 0.008 LCFs.

The postulated criticality accident Under the No Action - Planning Basis Operations Alternative would result in an estimated 0.0043 LCFs to the population living within 80km (50 mi), the same as The No Action - Status Quo Alternative. The MEI of the public would receive a dose of 3 rem and result in an estimated 1.5×10^{-3} LCFs.

The fire accident scenario involving radiological materials would result in an estimated 9×10^{-5} to 0.28 LCFs to the population living within 80km (50 mi), the same as The No Action - Status Quo Alternative. The dose to the MEI of the public would be 0.01 to 16 rem and result in an estimated 5×10^{-6} to 0.008 LCFs.

The potential accident involving a chemical release due to loss of contaminant would potentially expose between 200 and 1,000 workers at Y-12 to ERPG-2 concentrations or greater, the same as The No Action - Status Quo Alternative (See Appendix Section D.7.2.3 for definition of ERPG-2).

Except for the potential release of chlorine from the water treatment plant, no off-site exposure is expected. The release of chlorine from the water treatment plant would potentially expose up to 6,500 members of the public to ERPG-2 concentrations or greater.

Due to the design and facility construction, the HEU Materials Facility or the Upgrade Expansion of Building 9215 is expected to reduce the likelihood of a beyond-design-basis earthquake accident by approximately a factor of 5, the criticality accident by a factor of 2 to 5, and the accident involving radiological material by a factor of 2 to 5 compared to the current situation under the No Action - Status Quo Alternative. There would be no change from The No Action - Planning Basis Operations Alternative for chemical accidents.

There would be no change from the No Action - Planning Basis Operations Alternative for radiological accidents if the Special Materials Complex is constructed. The likelihood of chemical accidents for the Special Materials Complex would be lower by approximately a factor of 2 to 5 compared to the current situation under the No Action - Status Quo Alternative due to design and facility construction.