CHAPTER 3: ALTERNATIVES

Chapter 3 begins with a description of the planning assumptions and basis for the Site-Wide Environmental Impact Statement analyses. Next, the reasonable alternatives are described and discussed. The alternatives considered and subsequently eliminated from detailed evaluation also are discussed. The Chapter also identifies future modernization projects that are not yet ready for decisionmaking. The Chapter concludes with a summary comparison of the environmental impacts associated with each of the alternatives and discusses the Preferred Alternative.

3.0 MAJOR PLANNING ASSUMPTIONS AND BASIS OF ANALYSIS

As explained in Section 1.2, decisions from previous *National Environmental Policy Act* (NEPA) documents provide the starting point for this *Site-Wide Environmental Impact Statement* (Y-12 SWEIS). In those decisions, the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) decided to downsize and modernize Y-12 while continuing to maintain the capability and capacity to fabricate nuclear weapons secondaries, limited-life components, and case parts in support of the nuclear weapons stockpile, and store nonsurplus highly enriched uranium (HEU) long term and surplus HEU pending disposition. Most recently, NNSA decided to build a Uranium Processing Facility (UPF) at Y-12 as stated in the Record of Decision (ROD) for the Complex Transformation Supplemental Programmatic Environmental Impact Statement (SPEIS) (73 FR 77644, December 19, 2008). This SWEIS evaluates the potential direct, indirect, and cumulative impacts associated with the reasonable alternatives to continue implementing those decisions. The planning assumptions and considerations that form the basis of the analyses and impact assessments presented in the SWEIS are listed below.

- The time-frame for new projects and activities or upgrades to existing facilities considered in this SWEIS is approximately the next 10 years. As such, this SWEIS evaluates modernization projects that could be implemented within approximately 10 years after the Record of Decision (ROD) for this SWEIS. These modernization projects have reached the stage of development in which they are ripe for decisionmaking. However, the potential full modernization of Y-12 will be a long term process, extending beyond the next ten years. Other potential modernization projects in the very early planning stages have been developed to the extent practical and are described in Section 3.3. The potential impacts of these projects are addressed qualitatively and are included in the cumulative impacts in Chapter 6. These potential future projects would be addressed under separate NEPA review when conceptual design information is available and the time is appropriate to make a decision on the need for a specific facility.
- The modernization projects defined by the alternatives in this SWEIS are in a preliminary design stage. As such, best available design information for the analysis is contained in this SWEIS (see the descriptions of alternatives in Section 3.2). For the purpose of the environmental impact analysis, assumptions have been used such that construction requirements and operational characteristics of the modernization projects would represent a conservative assessment of potential environmental impacts. Thus,

the actual impacts from the implementation of any final design are expected to be less severe than those analyzed in this SWEIS.

- In general, the affected environment includes the Y-12 site and the surrounding areas up to, for certain resources, a 50-mile radius from the center of Y-12.
- Both construction and operational impacts are considered for all resources. Construction impacts are generally short-term (e.g., would occur over a period of less than approximately 10 years), while operational impacts are expected to be long term (e.g., would occur annually over the 50-year operating period).
- Generated wastes would be managed in accordance with applicable Federal, state, and local laws, regulations, and requirements, as well as DOE/NNSA's waste management orders and pollution prevention and waste minimization policy.
- For radiological accidents, impacts are evaluated for the general population residing within a 50-mile radius (including the maximally exposed individual), involved workers to the extent possible, and non-involved workers in collocated facilities. The impacts of accidents analyzed for each alternative reflect and are expected to bound the impacts of all reasonably foreseeable accidents that could occur if the alternative were implemented. NNSA has also prepared a classified appendix to this SWEIS that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks.
- Y-12 capacity and workload requirements would be established by the following:

  a. Near-term production readiness and capacity will be driven by Production and Planning Directives (P&PDs) and, as deemed necessary, other workload planning guidance received from NNSA;
  b. Long term production readiness and capacity will be driven by the flexible response capabilities established in the Nuclear Posture Review, as well as any new requirements that may arise from future national security reviews. Workload at Y-12 in direct support of the Nuclear Posture Review would involve the following over the next 10 years:

     - The Stockpile Life Extension Programs (SLEPs) will be completed for the B61 and initiated for the W76;
     - The production of high-fidelity flight test units will continue to be required in the enduring stockpile;
     - Quality evaluation (surveillance)[1]rates will remain relatively constant during the 10-year planning period;
     - Dismantlements (see Section 2.1.1.1) have been accelerated in recent years and the pace should be relatively steady in follow-on years. Further reductions in the stockpile could result in a modest increase in the dismantlement rate and the time to reduce the backlog could be extended;

[1] Quality evaluation (surveillance) refers to specially designed tests and inspections to collect data and determine the condition of units and components to assess the future reliability of the weapons systems in the stockpile.

  - Other work scope will be driven by compliance, program plans, or other planning documents developed by NNSA and Y-12 organizations in support of NNSA activities (NNSA 2008a).

- The missions at Y-12 conducted by the DOE Office of Science (DOE-SC), Office of Nuclear Energy (DOE-NE), Office of Defense Nuclear Nonproliferation, Work-for-Others, and Technology Transfer programs are not expected to change significantly over the next 10 years and would generally be the same as described in Chapter 2 and reflected in the current affected environment shown in Chapter 4 (NNSA 2007). To the extent that these missions do change or additional buildings or facilities are needed, they would undergo the appropriate NEPA analysis once they become proposals ripe for analysis and decisionmaking.
- Office of Defense Nuclear Nonproliferation missions at Y-12 involve the management of surplus HEU. This mission also includes blending quantities of HEU with low enriched uranium (LEU) or natural uranium to produce a metal or oxide product suitable for use in various reactor programs, and for multiple supply orders to DOE customers. The HEU blending operations using existing Y-12 facilities and processes are included in the No Action Alternative. Additionally, this mission includes the potential shipment of HEU to offsite blending facilities.
- The current industrial use classification for Y-12 would likely remain the same. While some changes to land use will occur as a result of modernization projects, Y-12 will continue to require security and emergency response buffers that preclude release of any real estate for public use (NNSA 2007).
- Y-12 downsizing will continue through the planning period of this SWEIS. Surplus facilities, with no inherent value to DOE, NNSA, or the community, would ultimately be dispositioned or undergo decontamination and decommissioning (D&D) consistent with overall modernization plans. Separate project-specific NEPA reviews would be conducted for these facilities as appropriate. D&D impacts have been analyzed to the extent practicable and are discussed in Section 5.16 of this SWEIS.
- The operations at Y-12 would require transporting secondaries and cases to and from Pantex, where weapons assembly and disassembly operations occur. All transportation of secondaries and cases is assumed to occur via the NNSA transportation fleet of Safeguards Transporters (SGTs) over Federal and state highways to the extent practicable.
- The methodology used to assess the environmental impacts of the alternatives is described in Appendix E.
- Because a UPF would be designed for a service life of at least 50 years, this SWEIS assesses the environmental impacts associated with the operation of a UPF for a period of 50 years, at which time the facility would undergo D&D. D&D impacts have been analyzed and are discussed in Section 5.16 of this SWEIS.
- Under all alternatives analyzed, the UPF would have the capacity to support dismantlement and the resulting casting schedules as well as convert excess metal and uranium oxide for long term storage or disposition. This SWEIS evaluates the environmental impacts associated with single-shift operations five days per week, as this represents the most likely long term, normal operating scenario for the UPF

(B&W 2007). For Alternatives 4 and 5, a minimum-sized UPF is analyzed (see Section 3.2.4.1).

- Proven technology is used as a baseline for the UPF. No credit is taken for emerging technology improvements. The design goal of the UPF includes consideration of waste minimization and pollution prevention to minimize facility and equipment contamination, and to make future D&D as simple and inexpensive as possible. Once the UPF becomes operational, the existing EU and other processing facilities would be available for D&D. This SWEIS includes a general discussion of the environmental impacts from D&D, including a discussion of the D&D process, the types of actions associated with D&D, and the general types of impacts associated with D&D. Any discussion of specific D&D impacts are more appropriate for tiered NEPA documents, because the extent of contamination, the degree of decontamination, and the environmental impacts associated with performing D&D, cannot be known without performing a detailed study of the individual facilities at the appropriate time. D&D actions could potentially be conducted as a remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Cleanup and D&D activities conducted under CERCLA are reviewed through the CERCLA process.

3.1 DEVELOPMENT OF ALTERNATIVES

This SWEIS has been prepared in accordance with the Council on Environmental Quality (CEQ) NEPA regulations (40 *Code of Federal Regulations* [CFR] 1500–1508) and the DOE regulations implementing NEPA (10 CFR 1021). The SWEIS evaluates the reasonable alternatives, as well as the No Action Alternative. The term "reasonable" has been interpreted by CEQ to include alternatives that are practical or feasible from a common sense, technical, and economic standpoint (CEQ 1981).

The reasonable alternatives for this SWEIS assume that the missions assigned to Y-12, which are described in Chapter 2 of this SWEIS, will continue for the foreseeable future. Alternative 1 is the No Action Alternative, and represents the baseline conditions; i.e., what is currently going on at the site. Alternative 2 in this SWEIS is to construct and operate a new UPF. Alternative 3, the Upgrade in-Place Alternative, would also require additional capital investment and would utilize existing, but upgraded, facilities to accomplish the assigned missions. Alternatives 4 and 5 involve a reduction in the production throughput of Y-12 to support the requirements of a smaller stockpile. Section 3.2 describes the alternatives in more detail.

3.2 ALTERNATIVES

Alternatives analyzed in this Y-12 SWEIS include the No Action Alternative and four action alternatives. These alternatives are described below.

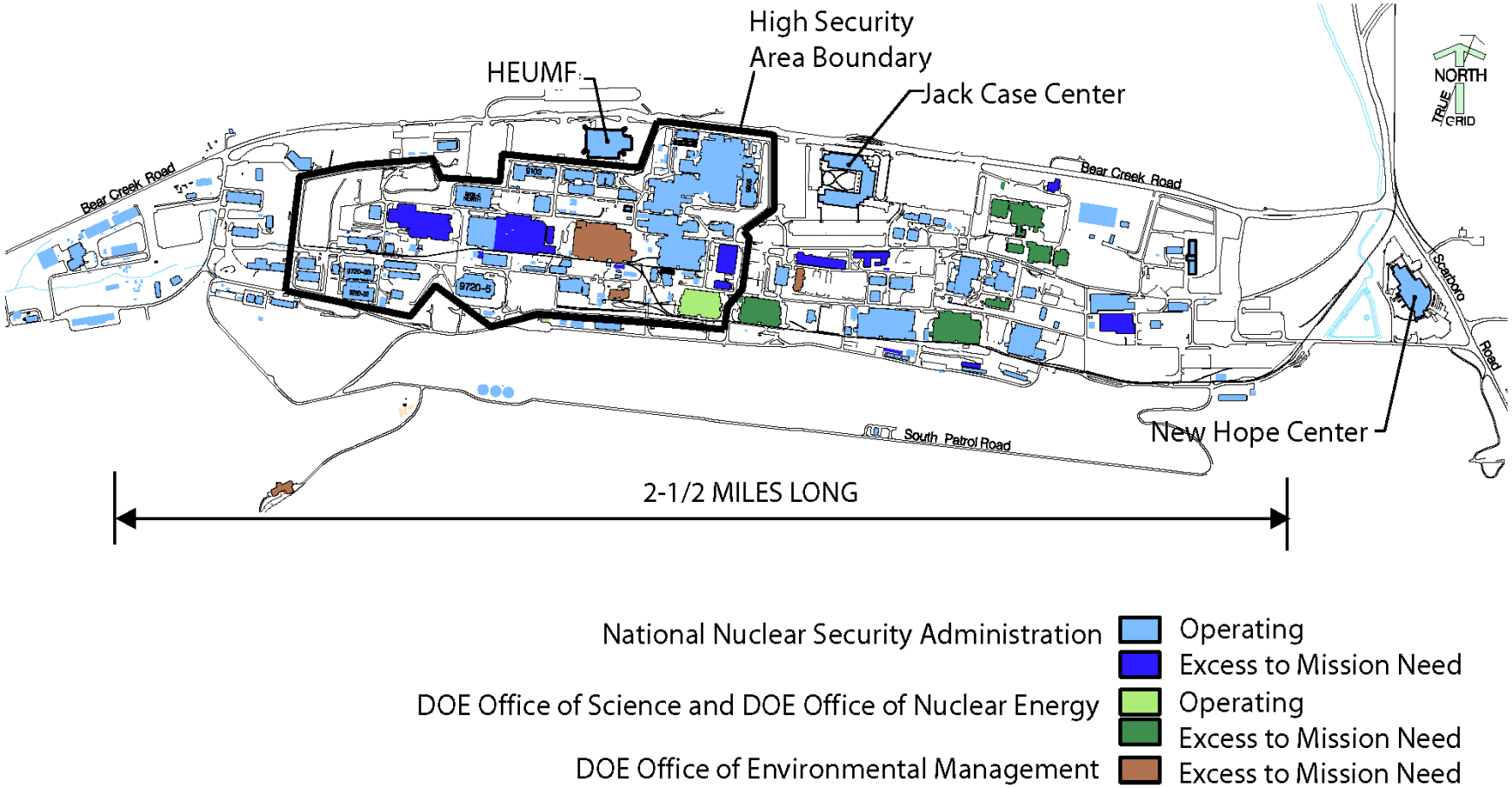
3.2.1 Alternative 1 – No Action Alternative

The No Action Alternative means no change in current plans, including approved projects. Under the No Action Alternative, operations at Y-12 would continue to support the DOE and NNSA programs described in Chapter 2. Figure 3.2.1-1 identifies the facility locations at Y-12 for the No Action Alternative. Unless noted otherwise, these missions are expected to continue for the foreseeable future. Construction of a UPF is not part of the No Action Alternative.

The No Action Alternative includes the continued implementation of planned modernization actions announced in the 2002 ROD for the 2001 Y-12 SWEIS (67 FR 11296, March 13, 2002) as modified by subsequent actions, as well as new actions subsequent to the 2002 ROD that have undergone separate NEPA review (see Section 1.7). The following actions announced in the 2002 ROD, modifications to the actions of the 2002 ROD, and actions undertaken since the 2002 ROD are included in the No Action Alternative.

1. **Highly Enriched Uranium Materials Facility (HEUMF).** The new HEUMF (now operational) stores HEU that is not being used in manufacturing activities. The HEUMF is reducing the current storage footprint, improving security and lowering operating costs (DOE 2001a).

2. **Special Materials Complex (SMC).** This project was cancelled because it was no longer required by the reduced manufacturing requirements of the smaller stockpile. The project was replaced by a new Purification Facility and installation of new equipment within an existing facility to allow reuse of existing special material parts (*Final Supplement Analysis for Purification Facility, Site-Wide Environmental Impact Statement for the Y-12 National Security Complex*, DOE/EIS-0309/SA-1, August 2002) (NNSA 2002). That Supplement Analysis (SA) assessed whether the potential environmental impacts of the stand-alone Purification Facility, a component of the SMC analyzed in the Y-12 SWEIS, would require the preparation of a Supplemental SWEIS. The determination was made that proceeding with the Purification Facility would either reduce or be bounded by the environmental impacts of the SMC identified in the Y-12 SWEIS, and therefore, no additional NEPA analysis was required.



Source: NNSA 2008a.

Figure 3.2.1-1. Major Operational Facilities Currently Supporting Y-12 Mission.

3. **Infrastructure Reduction.** A series of individual NNSA-managed projects have been underway to remove excess buildings and infrastructure with the ultimate goal of reducing the active footprint by more than 50 percent. Since 2002, NNSA has demolished approximately 1.3 million square feet of floor space (NNSA 2008a). Each demolition project was reviewed prior to initiation and found to fulfill the requirements of a **Categorical Exclusion** (CX) established by 10 CFR Part 1021, Appendix B, B1.23 (Demolition and Subsequent Disposal of Buildings, Equipment, and Support Structures).

> **Categorical Exclusion**
>
> A Categorical Exclusion (CX) is a NEPA determination applied to an action that DOE has determined does not individually or cumulatively have a significant effect on the human environment.

As part of the infrastructure reduction efforts, the No Action Alternative also includes facilities presently being contemplated for closure and D&D under the Integrated Facility Disposition Project (IFDP) (see Section 2.2.2.3), including the American Recovery and Reinvestment Act (see Section 2.2.2.4). The IFDP project is a joint effort on the part of DOE Oak Ridge Office (ORO), NNSA, UT-Battelle, DOE Office of Environmental Management (DOE-EM), and DOE Office of Science (DOE-SC), which have teamed to develop a consolidated project to complete the cleanup scope at Y-12 and ORNL for the disposition of contaminated excess facilities at Y-12 and ORNL (NNSA 2008a).

The IFDP would allow for the D&D of over 3.8 million square feet of DOE and NNSA excess space over the next 15-20 years. Existing as well as future facilities may ultimately be considered as part of the IFDP effort. Table 3.2.1-1 is a projection of the NNSA footprint that could be transferred to DOE-EM within the next 3-5 years. The potential Y-12 facilities which may be constructed, as well as the facilities which will be closed and become a part of The Oak Ridge Environmental Management Cleanup Program, may change as modernization plans and the IFDP are developed further (NNSA 2008a).

Table 3.2.1-1. Y-12 Facilities Planned to be Turned over to DOE-EM Within the Next 3-5 Years.

Facility	Gross Square Footage
9206, Former Uranium Facility	57,812
9731, Former Pilot Plant (deactivation only)	37,317
9769, laboratory	20,050
9201-5, Alpha 5	613,642
9204-4, Beta 4	313,771
9201-3, Alpha 3	191,978
9401-3, Steam Plant	32,124
Ancillary facility to above buildings	62,150
Total	**1,328,844**

Source: NNSA 2008a.

4. **Jack Case Center and New Hope Center.** These facilities, now operational, are technical, administrative, and engineering facilities built on Y-12 land. The managing and operating contractor of the Y-12 plant will lease these facilities. They were included in an Environmental Assessment (EA) and a subsequent Finding of No Significant Impact (FONSI) completed in January 2005 (*Alternate Financed Facility Modernization EA and FONSI*, DOE/EA-1510) (NNSA 2005d).

5. **Transportation of HEU from Foreign Locations to Y-12.** Subsequent to issuance of the 2002 ROD (67 FR 11296, March 13, 2002), the Y-12 site was given the additional mission of securing and storing small quantities of HEU transported from foreign locations to prevent proliferation of nuclear weapons and to minimize or eliminate the use of HEU in civilian reactors. Environmental Assessments were prepared and FONSI's issued for these actions (*Environmental Assessment for the Transportation of Highly Enriched Uranium from the Russian Federation to the Y-12 Security Complex*, DOE/EA-1471, January 2004 (DOE 2004d); *and Environmental Assessment for the Transportation of Unirradiated Uranium in Research Reactor Fuel from Argentina, Belgium, Japan and the Republic of Korea to the Y-12 National Security Complex*, DOE/EA-1529, June 2005) (DOE 2005h). In addition, a supplement analysis was prepared for the air and ocean transport of enriched uranium between foreign nations and the United States (DOE/EIS-0309-SA-2, August 2006) (DOE 2006b).

6. **Upgrade of Y-12 Potable Water System.** NNSA completed an EA and issued a FONSI in 2006 to upgrade the potable water system at Y-12 DOE/EA-1548 (DOE 2006a). Upgrades to the Y-12 potable water system would allow Y-12 to (1) meet regulatory requirements for safe drinking water by providing backflow protection for known cross connections and ensuring proper chlorine residual maintenance in the system; (2) provide Y-12 control and monitoring of water coming into the Y-12 distribution system to ensure adequate water flow and pressure to support current and future Y-12 operational needs; and (3) address deferred maintenance and ensure continued system reliability by inspecting, evaluating, and repairing or replacing deteriorated cast iron water mains and building feeds and obsolete fire hydrants. The upgraded potable water system became operational in September 2010.

7. **Y-12 Steam Plant Replacement Project.** In August 2007, NNSA completed an EA to replace the existing Y-12 steam plant with a new centralized steam plant. The new centralized steam plant would use natural gas boilers to produce steam to support Y-12 operations. Reliable and cost-effective steam generation is vital to the operation of Y-12. It is the primary source of building heat for personnel comfort and it provides freeze protection for critical services that include fire protection systems and heat tracing of exterior above ground water systems. Steam is also necessary to support current production operations. A FONSI was signed on September 6, 2007 (YSO 2007). The new steam plant became operational in June 2010.

8. **Compressed Air Upgrades Categorical Exclusion.** The Compressed Air Upgrades Project (CAUP) corrects deficiencies related to reliability and efficiency by providing new compressed air capability to meet the current and long-range needs of Y-12. The project upgrades the compressed air system by replacing obsolete equipment with state-of-the-art technology equipment and controls. CAUP installed a new instrument/plant air system in reuse facility 9767-13. During the conceptual design phase, NEPA reviews were completed and a determination was made in January 2003 that CAUP work fulfills the requirements of an existing CX.

9. **Security Improvements Project (SIP) Categorical Exclusion.** The purpose of the SIP is to replace the existing Y-12 security system with the NNSA preferred Argus security system, a special purpose, automated information system that will be continuously operating and monitored by Y-12 security personnel. The project would provide a comprehensive and integrated security system that performs the required security functions and meets applicable DOE and DoD requirements. Argus is currently installed (or being implemented) at one DoD site and five DOE sites. The project directly supports the mission by maintaining the security capabilities of Y-12 to protect national security by applying advanced technology to the nation's defense. SIP's scope is limited to installing the Argus technology backbone in the existing Central and Secondary Alarm Stations, installing software gateways to existing alarms, and installing new Argus components in the HEUMF. During the conceptual design phase, NEPA reviews were completed and a determination was made in May 2007 that the SIP fulfills the requirements of existing CXs.

10. **Nuclear Facility Risk Reduction (NFRR) Project Categorical Exclusion.** The NFRR line item project will directly contribute to the safety and reliability of Building 9212 and Building 9204-2E which are needed to continue NNSA current missions at Y-12. The NFRR Project will reduce risk of failure of infrastructure in these mission-essential Y-12 facilities by implementing practical, capital modifications determined prudent and necessary to ensure continued safe operations at existing levels. The project scope includes improving maintainability and reliability needed to address the risk of failure of selected, high priority, infrastructure utility systems, structures, and components through planned replacement of critical electrical control centers, switchgear, stacks, casting furnace vacuum system, and cooling tower and steam system pipes. Execution of this project will address the 2005 Defense Nuclear Facility Safety Board (DNFSB) risk review recommendations (except for natural phenomena concerns) and backlogged deferred maintenance by replacing failing and obsolete equipment with new equipment. During the pre-conceptual design phase, NEPA reviews were completed and a determination was made in December 2008 that NFRR work fulfills the requirements of existing CXs.

These projects are discussed in more detail in Section 1.7 of the SWEIS. Additionally, as discussed in Section 1.7.3 of the SWEIS, DOE is currently preparing an EIS for long term management and storage of mercury (74 FR 31723). NNSA will continue to store mercury at Y-12 unless a decision is made to relocate the material.

The environmental conditions described in Chapter 4 of this SWEIS reflect the baseline operational impacts of these missions for the foreseeable future. Chapter 5 of this SWEIS discusses operational impacts. To provide comprehensive baseline data from which operational levels could be projected, NNSA gathered the best available data for the current level of operation. In most instances, the data supporting the No Action Alternative are reflected by the most recent monitoring data as reported in the *Oak Ridge Reservation Annual Site Environmental Reports* (ASER) for 2003 through 2008 (DOE 2004e, DOE 2005a, DOE 2006b, DOE 2007b, DOE 2008, and DOE 2009b). Under the No Action Alternative, NNSA would continue to operate existing EU and nonnuclear processing facilities without any major upgrades or changes. Under this alternative there would be no UPF and the current high-security area would not be reduced.

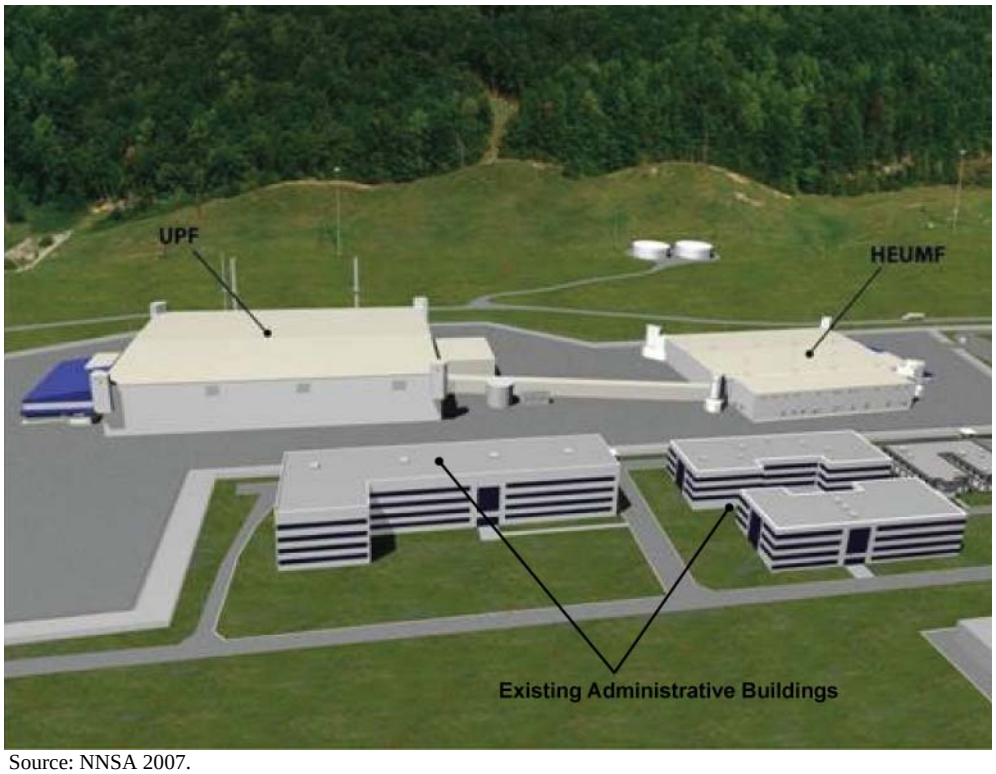
3.2.2 Alternative 2 – Uranium Processing Facility Alternative

Under this alternative, NNSA would take all actions in the No Action Alternative, construct and operate a modern UPF sized to support the smaller nuclear stockpile of the future (Section 3.2.2.1), and construct and operate a new Complex Command Center (CCC) (Section 3.2.2.2).

3.2.2.1 *Uranium Processing Facility*

The UPF would consolidate EU operations into an integrated manufacturing operation sized to satisfy programmatic needs and would be sited adjacent to the HEUMF to allow the two facilities to function as one integrated operation. Transition of EU production operations to the UPF and transition of EU storage operations into HEUMF (which has already occurred under the No Action Alternative) would enable the creation of a new high security protected area 90 percent smaller than the current high security protected area.

The UPF Project, which is one of the cornerstones of Y-12's Modernization Program, would replace multiple existing EU and other processing facilities. The current operating and support areas occupy approximately 633,000 square feet in multiple buildings, while the consolidated UPF would result in approximately a 33 percent reduction, to approximately 388,000 square feet in one building. Once the UPF becomes operational, some of those existing facilities could be available for D&D, while other facilities could be used for non-EU processes. Figure 3.2.2-1 shows an artist's rendering of the proposed UPF.



Source: NNSA 2007.

Figure 3.2.2-1. Artist's Rendering of the Proposed UPF Adjacent to the HEUMF.

Critical Decisions

The DOE project management system uses Critical Decisions (CDs) at specific points in the process to ensure a logical maturing of broadly stated mission needs into well-defined requirements resulting in operationally effective, suitable, and affordable facilities, systems, and other products. There are five CDs that are numbered from zero to five, as follows:

1. **CD-0, Approve Mission Need**, formally establishes a project and begins conceptual planning and design.
2. **CD-1, Approve Alternative Selection and Cost Range**, provides authorization to begin the project Execution Phase. Additionally, long-lead procurements may be approved during this phase provided an appropriate NEPA process has been completed.
3. **CD-2, Approve the Performance Baseline,** authorizes submission of a budget request for the total project cost.
4. **CD-3, Approve Start of Construction**, provides authority to execute the project.
5. **CD-4, Approve Start of Operations or Project Completion**, marks the approval of transition to operations.

Source: DOE O 413.3A.

In support of the proposed UPF, NNSA has prepared a CD-1, Approve Alternative Selection and Cost Range, which has been approved (NNSA 2005a). The proposed location for the UPF was based partially on cost and security requirements and would consolidate EU operations in two

designed-denial[2] facilities (UPF and HEUMF). This would significantly improve physical protection and meet the new **graded security protection policy**, optimize material accountability, enhance worker, public, and environmental safety and health (ES&H), and consolidate operations to greatly reduce operational costs.

Graded Security Protection Policy

The elements of a threat postulated for the purpose of establishing requirements for safeguards and security programs, systems, components, equipment, and information. Further details regarding the graded security protection policy are classified per DOE Order 470.3B.

The proposed UPF would include EU and EU-containing component and subassembly processing and manufacturing operations. The proposed UPF site is outside of, but adjacent to, the existing Perimeter Intrusion, Detection, and Assessment System (PIDAS). The PIDAS would be extended to encompass the HEUMF and the proposed UPF, if constructed. Figure 3.2.2-2 shows the location of the proposed UPF relative to other buildings at Y-12. The proposed location is close to the existing HEU processing complex, which provides cost and operational efficiencies for consolidating EU operations.

The proposed UPF site preparation involves site design, demolition and/or relocation of several small buildings on the site, relocation of existing utilities, and extension of utilities to the new site. The PIDAS would need to be extended to encompass this area after the UPF was completed.

An additional action under this alternative is to reduce the PIDAS footprint at the Y-12 site. This project will make the necessary modifications to the PIDAS fencing to allow the protected area to be limited to surrounding HEUMF and UPF. This project would be active following the construction of the UPF project.

3.2.2.1.1 UPF Construction

The new structures and support facilities that would comprise the UPF complex include the following:

- UPF building;
- Process Support Facility;
- UPF electrical switching center;
- chiller building and chiller building switch center;
- cooling tower;
- aboveground water tank for a seismic-qualified firewater system with a firewater pumping facility;
- electrical generators, and
- modified PIDAS to encompass the HEUMF and UPF complex.

The design of the UPF would meet Y-12 Conduct of Operations and Integrated Safety and Security Management requirements, minimize the number of personnel required for operations and security, and meet DOE requirements for Special Nuclear Material (SNM) accountability

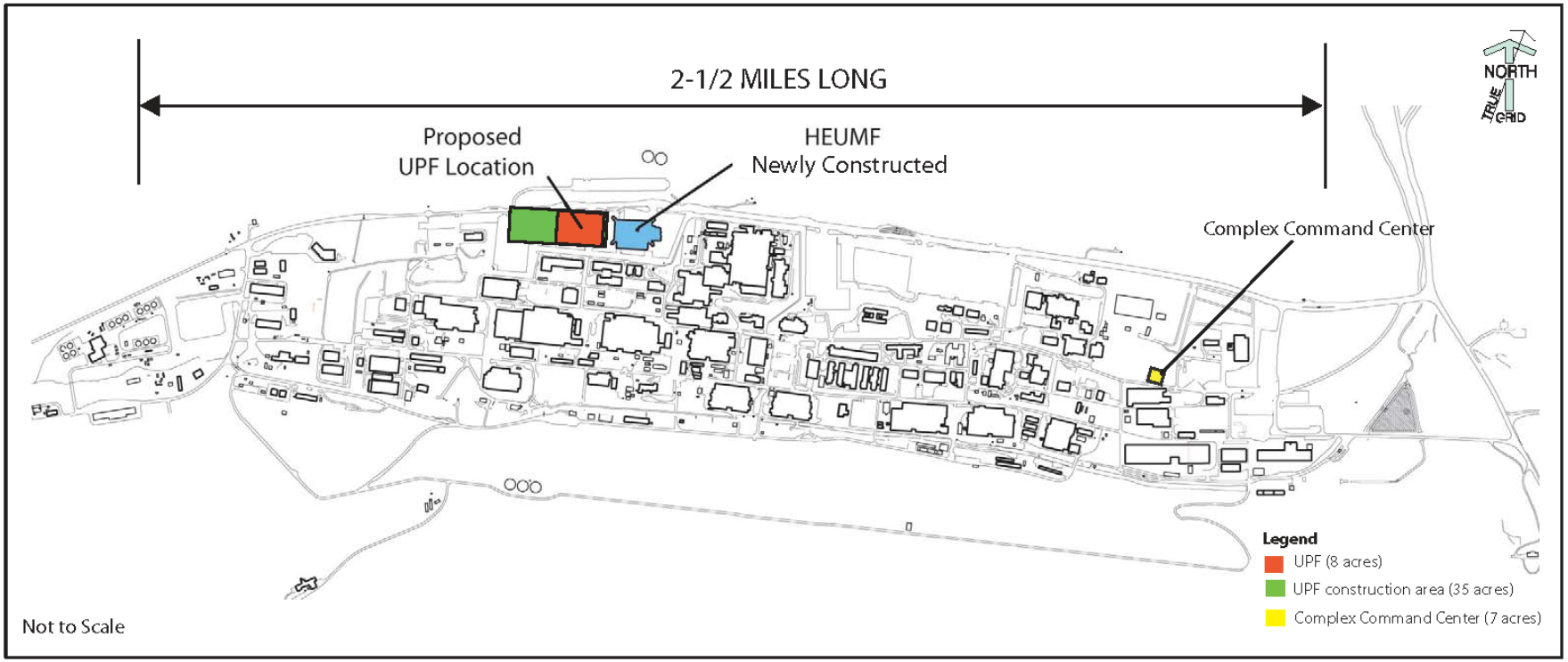
[2] "Designed-denial" refers to the utilization of security technologies in the facility design process to achieve a security posture that will meet security requirements

and control. The design service life of the proposed new facility would be 50 years. The UPF would be equipped with safety support systems to protect workers, the public, and the environment. The UPF would be housed in a multistory, reinforced concrete building designed and built for security. The main building would be a reinforced concrete structure with reinforced concrete exterior walls, floor slabs, and roof. The roof and exterior walls would be sized to protect the interior from tornado- and wind-borne projectiles and blast effects, as well as seismic events.

Conventional construction techniques would be used to build the UPF. Construction activities would be performed in a manner that assures protection of the environment during the construction phase. Disposal of construction debris would be made in accordance with waste management requirements in properly permitted disposal facilities. Throughout the construction process stormwater management techniques, such as silt fences and runoff diversion ditches, would be used to prevent erosion and potential water pollutants from being washed from the construction site during rainfall events.

As shown on Figures 3.2.2-2, 3.2.2-3, and 3.2.2-4, construction of the UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. In addition to construction of the main facility, there would be construction activities associated with minor construction support facilities, extension of an access/Haul Road, construction trailers, temporary utilities and roads, a concrete batch plant, a West Borrow Area, and a Wet Soils Disposal Area. The UPF footprint and the alignment of the new PIDAS would require Bear Creek Road to be closed to through traffic and re-routed slightly north of the existing road (see Appendix G, which refers to this re-routing as the "Site Access and Perimeter Modification Road"). Approximately 6 acres of land would be disturbed to construct the Haul Road extension and the Site Access and Perimeter Modification Road. The Wet Soils Disposal Area includes approximately 16.6 acres of property previously used for a controlled burn demonstration and pine reforestation project. The site is highly disturbed and would be used to disposition the wet and/or saturated soils that are expected to be encountered during initial site preparation and from the UPF foundation excavation. Wet soils would be placed at the site and graded according to the planned design for the area after necessary drying. The West Borrow Area is an 18.3 acre site that previously served as the source of clay for Y-12 landfill cap projects. This site would be utilized, as necessary, for the placement of excess soil from the UPF project with moisture content satisfactory for compaction (B&W 2010).

Once constructed, the UPF facilities would occupy approximately 8 acres. The construction laydown area for the UPF would be developed west of the proposed UPF site. This area would be finished with a compacted, stabilized base for the construction phase. Interim employee parking lots would be developed west of the proposed construction laydown area. The site would be sufficiently graded and developed to accommodate a number of temporary construction trailers, storage buildings, and materials storage yards. After construction of the UPF is complete, it may be feasible to rework the laydown area to provide for additional parking.



Source: NNSA 2007, modified.

Figure 3.2.2-2. Location of the Proposed UPF and CCC Relative to Other Buildings at Y-12.

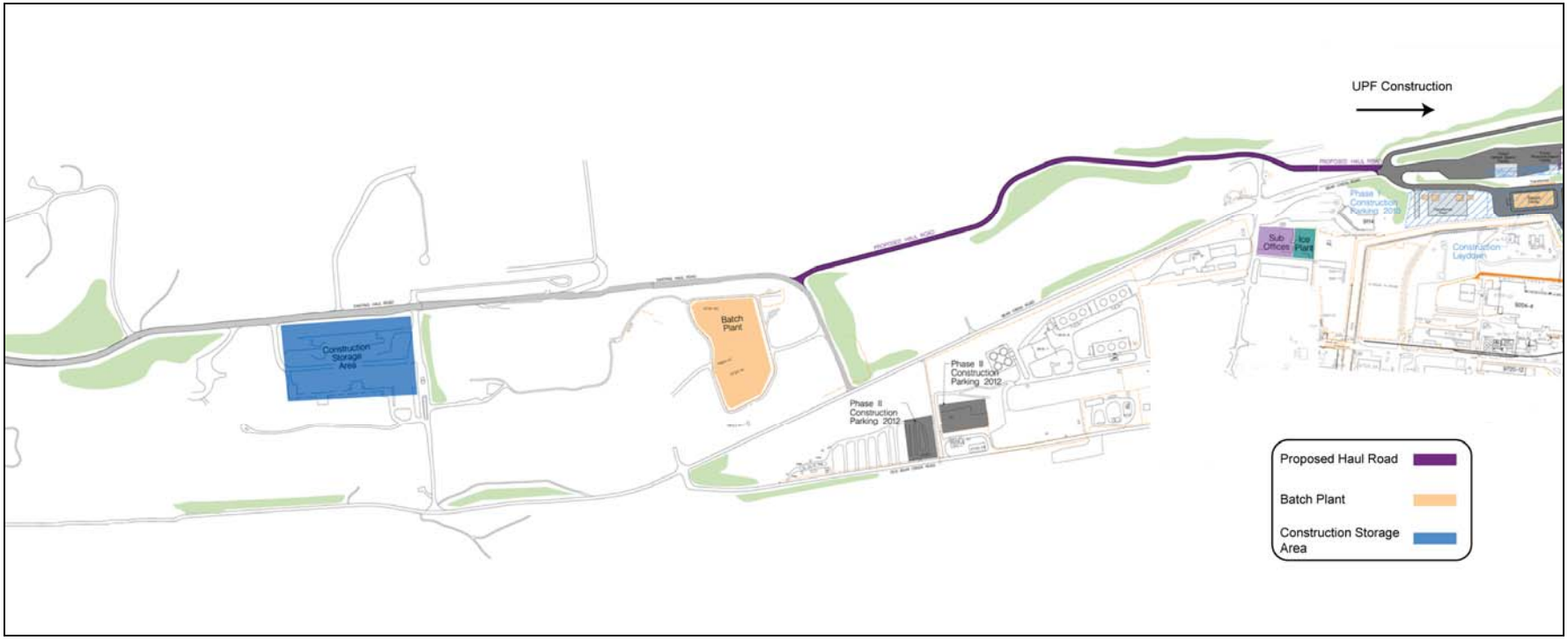


Figure 3.2.2-3. Temporary Haul Road, Batch Plant, Storage Area, and Temporary Parking for UPF Construction.

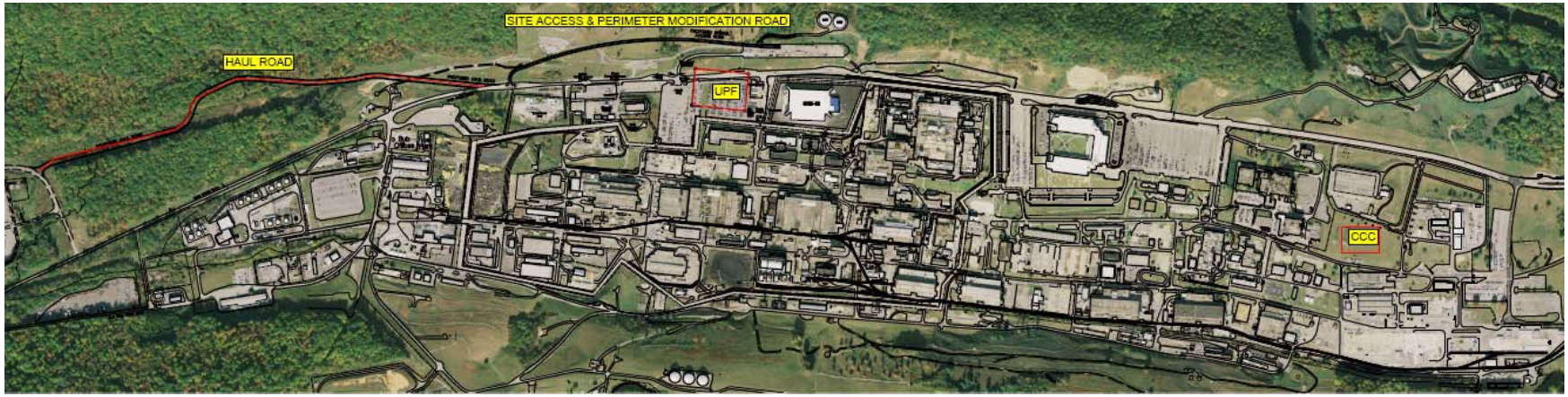


Figure 3.2.2-4. Proposed Haul Road and Site Access and Perimeter Modification Road.

Relocation of Utilities and Other Features. Prior to starting construction, it would be necessary to clear the UPF site of all existing electrical utilities that might interfere with construction of the facility. For example, pole-mounted lighting fixtures, public address speakers, and associated aerial cables and utility poles which are located on the existing parking lots and along Bear Creek Road would be removed. A section of overhead 161-kilovolt (kV) transmission line running along the north side of Bear Creek Road would be removed out of the construction zone. The high-mast lighting towers along the northern boundary of the site would be removed. An underground fiber-optic telephone line would be relocated. Area lighting would be added outside the construction zone where necessary to help compensate for lighting equipment that must be removed.

Temporary electrical services would be provided to support construction activities until permanent power sources can be brought on-line. Temporary power sources would be derived from existing 13.8-kilovolts (kV) yard feeders in the vicinity of the construction area. Temporary telephone and other telecommunication services would be installed as necessary to assist and support construction activities.

The existing 24-inch cast iron potable water line along the existing Bear Creek Road would be moved north to facilitate construction for the new site. Approximately 1,300 feet of the east-west main would be moved. The City of Oak Ridge owns this water line and holds adjacent rights of way for the utilities. The line is the sole source of potable water to ORNL. The new 24-inch potable water line would be ductile iron and feature air release valves where required and backflow preventers where existing Y-12 water lines tie into the new water line.

Storm drains already exist on site. The UPF storm sewer system would include a comprehensive collection system that would tie into the existing system near the northeast corner of the project site. Storm sewer pipe would be reinforced concrete and would be designed to collect a 100-year storm event. The UPF storm sewer system would have security barriers that comply with current DOE security standards and philosophy for the prevention of adversary movement through a storm sewer system. The new sanitary sewer system would meet the minimum standards for sanitary sewer collection systems established by the Tennessee Department of Environment and Conservation (TDEC).

Traffic Planning. The UPF footprint and the alignment of the new PIDAS would require Bear Creek Road to be closed to through traffic and re-routed slightly north of the existing road. The length of road to be re-routed would be approximately one-half mile. The entrance road to the existing Polaris parking lot would also be relocated to facilitate site work. Up to 1,200 car spaces may be built to replace the parking spaces lost when the proposed UPF is constructed. The resource requirements associated with these re-routings are included in Table 3.2.2.1-1.

Removal of Small Existing Facilities. The proposed UPF and the related support structures would be sited such that they can be built outside the current area encompassed by PIDAS. To facilitate siting of a construction laydown area and interim parking, the proposed UPF would require demolition and relocation of several small structures, including Buildings 9107 and 9720-37, their support facilities, and a Guard Tower. Both Buildings 9107 and 9720-37 are

outside of the current Y-12 protected area. A demolition plan would be developed during the preliminary design phase and would ensure that environmental resources are protected.

The demolition plan would define the extent of demolition, abandonment, and removal of existing facilities and utilities; methods of handling and disposing of hazardous waste materials if encountered; materials to be salvaged; backfilling of removed materials; and clean-up.

Site Preparation and Facility Construction. Table 3.2.2.1-1 lists the construction resource requirements, number of construction workers, and estimated waste generation of constructing the proposed UPF. Site preparation would include any excavation, filling, and grading needed to meet design requirements for an on-grade, reinforced concrete structure. Detailed testing would be conducted to fully characterize site geology, hydrology, and soil compaction, as well as to sample for radioactive contamination, mercury, and other materials of concern before construction. Excess soils would be managed in a manner to prevent environmental insult (i.e. hollow-fill, borrow areas, wet soils disposal areas and temporary soil piles).

Table 3.2.2.1-1. UPF Construction Requirements and Estimated Waste Volumes.

Requirements	Consumption
Materials/Resource	
Peak Electrical energy (MWe/month)[a]	2.2
Concrete (yd^3)	200,000
Steel (tons)	27,500
Liquid fuel and lube oil (gal)[a]	250,000
Water (gal)	4,000,000
Aggregate (yd^3)	5,000
UPF Land Disturbed/Facility Footprint (acres)	35/8
Haul Road Extension and Site Access and Perimeter Modification Road: Land Disturbed (acres)	6
Wet Soils Disposal Area Land Disturbed (acres)	16.6
West Borrow Area Land Disturbed (acres)	18.3
Employment	
Total employment (worker years)	2,900
Peak employment (workers)	950
Construction period (years)	8-9
Waste Category	**Amount Generated**
Low-level	
Liquid (gal)	0
Solid (yd^3)	70
Mixed Low-level	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous (tons)	4
Nonhazardous (Sanitary) (tons)	800

Source: B&W 2006a, NNSA 2008.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with construction.

Natural Phenomena Considerations. The UPF would be constructed with the same rigorous natural phenomena (NP) resistance design as the HEUMF, which is defined as Performance Category[3] (PC) 3. The UPF is currently in the design process and more detailed design activities would occur following the Y-12 SWEIS ROD. In designing the UPF, NNSA is using the most current seismic information available for the proposed UPF site. NNSA is also using a seismic site response methodology that will appropriately determine the potential ground motion at the UPF site, and ensure the UPF design and construction meets the PC3 performance goals.[4]

Based on the facility preliminary design data, NNSA intends to excavate down to a component material which has sufficient bearing capacity to minimize any building settlement after building construction. Based on the results of subsurface investigations, this component material would be weathered shale. Mass fill concrete would then be placed on top of the weathered shale up to the foundation level of the UPF building structures.

Security Considerations. Upon completion of construction, both the UPF and the HEUMF would be surrounded by a PIDAS security barrier. The PIDAS would be a multiple-sensor system within a 30-foot wide zone enclosed by two fences that surround the entire protected area. The encompassing PIDAS would be built and activated when more than 95 percent of facility construction is completed. The new system would tie into the existing system encompassing the HEUMF facility at its northwest corner. The UPF would incorporate Argus technology for security protection.

Cooling Tower. A chilled water loop would be installed to support the new UPF HVAC requirements. This also would require that a new cooling tower be completed and brought on-line. Piping would be laid in accordance with all necessary safety and security precautions. A chilled water booster pump and piping would be required in conjunction with the new chiller cell. Return chilled water would be used as condenser water.

Remediate Construction Laydown Area. Once the construction of the UPF is complete, the construction office trailers would be removed and material lay-down areas would be re-graded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel. Alternatively, it may be feasible to rework the laydown area to provide for additional parking.

Table 3.2.2.1-1 lists the construction material requirements for the UPF along with the associated waste values. It should also be noted that because the UPF design is not fully developed, minor support facilities and roads may be required to support construction. The construction data shown in Table 3.2.2.1-1 has been conservatively estimated to account for these minor changes that may occur as the UPF design is finalized.

[3] Performance Categories classify the performance goals of a facility in terms of facility's structural ability to withstand natural phenomena hazards (i.e., earthquakes, winds, and floods). In general, facilities that are classified as: PC 0 do not consider safety, mission, or cost considerations; PC 1 must maintain occupant safety; PC 2 must maintain occupant safety and continued operations with minimum interruption; PC 3 must maintain occupant safety, continued operations, and hazard materials confinement; and PC 4 must meet occupant safety, continued operations, and confidence of hazard confinement.

[4] On March 15, 2010, NNSA received a letter from the Defense Nuclear Facilities Safety Board (DNFSB) regarding seismic issues related to the design of the UPF. NNSA will consider the DNFSB comments in the UPF design process and will work with DNFSB to ensure all seismic issues are appropriately addressed.

As explained in Section 3.3, NNSA is not proposing to upgrade or otherwise change the non-EU manufacturing processing/production operations under the UPF Alternative. At some time in the future, NNSA may propose a Consolidated Manufacturing Complex (CMC) for the consolidation of these non-EU manufacturing processing/production operations.

3.2.2.1.2 UPF Operations

The core operations of the new consolidated UPF would be assembly, disassembly, Quality Evaluation, specialized chemical and metallurgical operations of EU processing, and product certification/inspection. The full range of operations would include:

- Assembly of canned subassemblies from refurbished and new components;
- Disassembly or dismantlement of returned weapons canned subassemblies resulting in recycle, refurbishment, surplus generation, and disposal of components;
- Product certification through dimensional inspection, physical testing, and radiography;
- Quality evaluation (specially designed tests and inspections to collect data and determine the condition of units and components to assess the future reliability of the weapons systems in the stockpile);
- Metallurgical operations, including EU metal casting, rolling, forming, and machining;
- Chemical processing, including conversion to uranium compounds and metal from salvage scrap and oxides. Chemical processing streams would be provided to process high enrichment, mixed enrichment, and special EU materials.

Utility and Safety Support Systems. The material processing areas within the UPF would incorporate the appropriate use of gloveboxes, inert atmosphere, negative air pressure, and other **engineered controls**, supported by **administrative controls**, to protect workers and the public from exposure to radiological and hazardous materials. Exhaust emissions for the facility would comply with the applicable Federal and state requirements. In conjunction with other engineered containment measures, the ventilation system barriers would provide a layered system of protection.

Other systems that would be included in the new UPF for facility operation and ES&H protection include:

- Criticality Accident Alarm System
- Emergency Notification System
- Alarm System
- Fire Suppression Alarm Systems
- Telephone and public address system
- Classified and unclassified computer network
- Personnel Monitoring System

Administrative Controls and Engineered Controls

Administrative controls are measures used to reduce potential hazards to workers, including work practices, labeling and warning devices and signs, training, monitoring, housekeeping, maintenance and management.

Engineered controls are systems used to reduce potential hazards by isolating the worker from the hazard or by removing the hazard from the work environment. Methods include substitution, ventilation, isolation, and enclosure. Engineered controls are preferred over administrative controls and personal protective equipment.

- Security-related sensors
- Automated inventory system with continuous real-time monitoring

The UPF would use a three-level negative air pressure approach to maintaining containment of particulate- and vapor-contaminated air, with the area having the lowest air pressure (i.e., highest negative air pressure) being primary containment. Secondary containment would be maintained at a lesser negative pressure, while the office and administrative areas would be maintained at a positive pressure. The primary containment ventilation system would consist of fans and collection ducts, scrubbers, mist eliminators, instrumentation, and high efficiency particulate air (HEPA) filter banks. A secondary containment ventilation system would provide containment, negative pressure confinement, monitoring, and treatment for exhaust air from secondary containment areas frequented or occupied by operating personnel as well as other areas subject to contamination.

HEPA filters would be used in all process exhaust air streams to limit releases of EU. HEPA filters installed for this purpose would be performance qualified to limit offsite exposures to the public and releases to the environment.

Current plans have moved from five exhaust stacks being used as central air emission points from the facility, to a total of two stacks that serve the primary and secondary confinement exhaust air systems, including the process off-gas system. All UPF process and exhaust air streams would be discharged from these stacks, which would be located and designed to optimize the effects of plume dilution from the prevailing winds as well as to minimize the possibility of cross-contamination through the UPF and other Y-12 facility ventilation air intakes. The UPF discharge stacks would be equipped with continuous emissions monitors for radiological emissions to meet Y-12 requirements for complying with environmental laws and reporting required data to the applicable regulatory agency.

Potable water, process water, and safety shower water would be supplied through the utility access corridors. The potable water would be used for sanitary purposes. Process water would be provided by a dedicated system. Safety shower water also would be provided by a dedicated system.

A dedicated breathing air system would be installed within the UPF and would consist of dedicated compressors, receivers, filters, dryers, monitoring instrumentation and alarms, distribution piping, and breathing air stations at points of use throughout the facility.

Liquid effluent monitors would be installed in all discharge lines from processes handling uranium metal or uranium compounds. Systems would be designed to detect and record concentrations in parts per million of uranium in solution. Discharge streams exceeding established limits for concentrations of uranium would be automatically diverted to geometrically safe holdup tanks.

The UPF would be designed, constructed, and operated to prevent the occurrence of a fire and ensure that sufficient means are provided to detect and suppress fires. The facility would be fully sprinklered. All systems, equipment, and processes would be designed in accordance with

appropriate fire protection codes, building codes, and other available safety documentation. In addition to the water suppression capabilities, fire extinguishers would be installed throughout the facility. The UPF would be built of noncombustible materials so that the building structure would not contribute to the fire loading. The process building would be separated from all other significant facilities. Roadways serving the UPF would provide access, from either direction, to any point on the exterior of the building and would be configured to allow emergency vehicles to maintain a standoff distance of 50 feet. Fire hydrants would be located 50 feet from the building with the pumper connection pointing to an accessible paved area. Extension of the current fire alarm system would support UPF fire alarm needs. All water flow, smoke, and heat detection would be alarmed. Use of flammable liquids and gases would be minimized to the extent practical. Bulk storage of flammable gases would be located outside the building, and appropriate excess flow valves would be installed in gas supply systems to stop flow in the event of a line break.

A new 161 kV/13.8 kV substation north of the UPF would provide electrical power to the UPF. Underground electric utility construction would be utilized. Auxiliary electrical power would be provided for safety and operational support utilizing hydrocarbon burning engine/generator sets. Table 3.2.2.1-2 lists the operations requirement, number of operations workers, and the expected waste generation for the proposed UPF.

Table 3.2.2.1-2. UPF Annual Operation Requirements and Estimated Waste Volumes.

Requirements	Data
Materials/Resource	
UPF Annual Electrical energy (MWh/year)	168,000
UPF Peak Electrical Energy Use (MWe) [a]	18.4
Site-wide Peak Electrical Energy Use (MWe)	36-48
Natural gas (yd^3) [a]	894,000
Water (million gallons/year)	105
Site-wide Water Use (million gallons/year)	1,300
UPF Plant footprint (acres)	8
Employment	
UPF Workers	600
Hands-On UPF Radiation Workers	315
Y-12 Site Employment (workers)	5,750
Waste Category	
Low-level	
Liquid (gal)	476
Solid (yd^3)	5,943
Mixed Low-level	
Liquid (gal)	679
Solid (yd^3)	81
Hazardous (tons)	12
Nonhazardous (Sanitary) (tons)	9,337

Source: B&W 2006a, NNSA 2008, Jackson 2008.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with operations.

3.2.2.2 *Complex Command Center*

An additional action proposed in this alternative is the Complex Command Center (CCC), which would house equipment and personnel for the plant shift superintendent (PSS), Fire Department, and Emergency Operations Center (EOC). Approximately 50,000 square feet of enclosed facility space would be required to accommodate operational needs. The facility would include offices to support Emergency Management personnel and provide habitability to accommodate 50 EOC personnel for a period of 48 hours; 15,000 square feet of pull-through garage space; redundant emergency power supply connections and/or supplemental dedicated emergency generators; records storage and processing areas; modern training and conference facilities; shower and changing facilities; specialized equipment storage; food service areas; janitorial closets; separate mechanical and electrical equipment rooms; and telecommunication rooms. The facility would have a dedicated loading dock with automated dock leveler and electric motor actuated overhead rollup door access to the building, to safely support delivery of supplies, equipment, and material. The facility would be located on the east end of Y-12 as shown on Figure 3.2.2-2.

The CCC would be a one-story structure located in a previously developed area. The proposed site for the CCC is undeveloped with no structures; NNSA has traced the history of the land, has not identified historical or known contamination, and will continue to be characterized prior to start of construction. The proposed location for the CCC was driven by emergency management response times, unencumbered land, absence of known contamination, and other site conditions that favored construction. Of all the sites examined, the one proposed best met the criteria (YSO 2010).

Construction of the CCC would employ approximately 300-500 construction workers.[5] The project would require excavation within the Y-12 industrial area for utility/communication lines. Approximately 7 acres of land would be disturbed for the CCC. Once operational, the facility would not increase water use or generate additional wastes at Y-12, as this facility would replace existing facilities that perform these functions.

3.2.3 Alternative 3 – Upgrade in-Place Alternative

Under this alternative, NNSA would continue the No Action Alternative and upgrade the existing EU and non-enriched uranium processing facilities to contemporary environmental, safety, and security standards to the extent possible within the limitations of the existing structures and without prolonged interruptions of manufacturing operations. Under this alternative there would be no UPF and the current high- security area would not be reduced in size. This alternative would, however, include construction of a new CCC (as discussed in Section 3.2.2.2).

The upgrade projects proposed would be internal modifications to the existing facilities and would improve worker health and safety, enable the conversion of legacy SNM to long term storage forms, and extend the life of existing facilities. For continued operations in the existing facilities, major investments would be required for roof replacements; structural upgrades;

[5] The socioeconoimic impact analysis uses the mid-point of this range (400) for the peak construction workforce.

heating, ventilating, and air conditioning (HVAC) replacements; and fire protection system replacement/upgrades. The projects would improve airflow controls between clean, buffer, and contamination zones; upgrade internal electrical distribution systems; and upgrade a number of building structures to comply with current natural phenomena criteria (B&W 2004a).

Upgrades would be performed over a 10-year construction period, following issuance of the ROD for this SWEIS. This would enable NNSA to spread out the capital costs associated with the upgrades, and minimize disruption of operations.

Conventional construction techniques would be used for upgrade projects. Upgrade activities would be performed in a manner that assures protection of the environment during the construction phase. Techniques would be used to minimize the generation of debris that would require disposal. Disposal of debris would be made in accordance with waste management requirements in properly permitted disposal facilities. Throughout the upgrade construction process, stormwater management techniques, such as silt fences and runoff diversion ditches, would be used to prevent erosion and potential water pollutants from being washed from the construction site during rainfall events.

Natural Phenomena: Structural. The current authorization basis for many of the EU buildings has been designated as PC 2, which means these buildings must maintain occupant safety and continued operations with minimum interruption. An assessment of the structural adequacy of the buildings indicates they do not meet current codes and standards related to natural phenomena (NP) events (e.g., tornados and earthquakes) required for a PC 2 designation. If the buildings are intended to operate an additional 50 years, they would require structural upgrades to bring the buildings into compliance (B&W 2004a).

Fire Protection. The existing fire protection systems for many of the EU buildings are primarily piping systems operating under the regulatory codes that were in effect at the time of installation. These codes have changed significantly over the years, and if the life of a facility is intended to be extended any significant length of time, the systems may need to be upgraded to meet current codes and standards if exemptions for continued operations are denied. Upgrades would likely require total replacement of sprinkler systems, risers, and underground supply lines (B&W 2004a).

Utilities Replacement/Upgrades: Mechanical Systems. HVAC systems have an expected life in the range of 25-30 years. Many of the systems serving the EU building are beyond or are approaching the end of their useful life and are in need of replacement. The majority of the HEPA filters are located in antiquated systems. These systems also do not include test sections that allow the systems to be tested without removal of the prefilters. This arrangement subjects the filter change crews to added exposures compared to currently available filters with test sections. The continued long term operations of existing facilities would require these filter systems to be replaced (B&W 2004a).

Roofing. A majority of the existing roofs for the EU buildings would need to be replaced (B&W 2004a).

Table 3.2.3-1 lists the construction requirements associated with the upgrades and Table 3.2.3-2 lists operation requirements, number of operation workers, and the expected waste generation for the upgraded facilities.

Table 3.2.3-1. Construction Requirements and Estimated Waste Volumes for Upgrading Existing Uranium Processing Facilities.

Requirements	Consumption
Materials/Resource	
Electrical energy use (MWh) [a]	350,000
Concrete (yd^3)	No change from current
Steel (tons)	No change from current
Liquid fuel and lube oil (gal) [a]	No change from current
Water (gal/day)	4.2 million
Aggregate (yd^3)	No change from current
Land (acre)/Laydown Area	2 acres/<7 acres
Employment	
Total employment (worker years)	1,000
Peak employment (workers)	300
Construction period (years)	10
Low-level Waste	
Liquid (gal)	0
Solid (yd^3)	0
Mixed Low-level Waste	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous Waste	
Liquid (gal)	0
Solid (tons)	0
Nonhazardous (Sanitary) Waste (tons)	400

Source: B&W 2006a, NNSA 2008, Jackson 2008.
Note: "No change from current" represents estimated 2006 usage.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with construction.

Table 3.2.3-2. Operation Requirements and Estimated Waste Volumes for Upgraded Uranium Processing Facilities.

Requirements	Consumption
Materials/Resource	
Electrical energy (MWh)	350,000
Liquid fuel (gal)	No change from current
Natural gas (yd^3)	No change from current
Water (gal/day)	4.2 million
Plant footprint (square feet)	5.3 million
Employment (workers)	6,500 (includes all contractors)
Low-level Waste	
Liquid (gal)	713
Solid (yd^3)	9,405
Mixed Low-level Waste	
Liquid (gal)	1,096
Solid (yd^3)	126
Hazardous Waste (tons)	12
Nonhazardous (Sanitary) Waste (tons)	10,374

Source: B&W 2006a, NNSA 2008, Jackson 2008.
Note: "No change from current" represents estimated 2006 usage.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with operations.

3.2.4 Alternative 4 – Capability-sized UPF Alternative

Under Alternative 4, NNSA would maintain a basic manufacturing capability to conduct surveillance, produce and dismantle secondaries and cases, as well as laboratory and experimental capabilities to support the stockpile. NNSA would reduce the production level of facilities to approximately 80 secondaries and cases per year (compared to 125 secondaries and cases per year for the UPF Alternative). To support this alternative, Y-12 would build a smaller UPF (approximately 350,000 square feet) compared to the UPF described under Alternative 2 (388,000 square feet) Although the UPF for Alternative 4 would be approximately 10 percent smaller than the UPF described for Alternative 2, the construction requirements shown in Table 3.2.2.1-1 are representative of the construction requirements for this alternative. In addition, this alternative would include construction of a new CCC (as discussed in Section 3.2.2.2). As discussed in Section 3.6, Alternative 4 is the preferred alternative.

The reduction in EU production workload that would occur under this scenario would reduce the number of employees, waste generation amounts, infrastructure needs, and the total worker dose. Estimates of these levels appear in Table 3.2.4-1. Safeguard and security expenditures would remain at current levels, and other operations conducted at Y-12, such as the storage of HEU and dismantlement of secondaries and cases, would be expected to remain at current levels, consistent with the expected levels described in the No Action Alternative in Section 3.3.

Table 3.2.4-1. Annual Operation Requirements and Estimated Waste Volumes for the Capability-sized UPF Alternative Compared to the No Action Alternative.

Requirements	No Action Alternative	Capability-sized UPF Alternative
Peak Electrical Energy Use (MWe) [a]	36-48	22-29
Water Use (million gallons/year)	2,000	1,200
Y-12 Site Employment (workers)	6,500	5,100 [b]
New Steam Plant Generation (billion pounds) [a]	1.5	0.9
Normal Radiological/Uranium Air Emissions (Curie)	0.01	0.006
Total No. of Y-12 Monitored Workers [a]	2,450	1,825 [b]
Average Individual Worker Dose (mrem)	19.9	10.0
Collective Worker Dose (person-rem)	49.0	18.2
Waste Category		
Low-level Waste		
Liquid (gal)	713	428
Solid (yd^3)	9,405	5,643
Mixed Low-level Waste		
Liquid (gal)	1,096	640
Solid (yd^3)	126	76
Hazardous (tons)	12	7.2
Nonhazardous Sanitary (tons)	10,374	8,140

Source: NNSA 2008, B&W 2009a, Jackson 2008.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with operations.
b – In the Draft Y-12 SWEIS, the Y-12 site employment number for Alternative 4 was 3,900 workers, and was taken from the Capability-Based Alternative in the Complex Transformation SPEIS (published in October 2008) which was programmatic in nature and provided bounding estimates based on information available at that time. NNSA has prepared the current site employment estimates for Alternative 4 based on better defined UPF information, program requirements, and required capacities that are now available. Therefore, NNSA has estimated that the Y-12 site employment levels for Alternative 4 would be 5,100. No change is required in the total number of Y-12 monitored workers from the Draft SWEIS to the Final SWEIS because that number was originally estimated for the SWEIS and is based on currently available information.

3.2.5 Alternative 5 – No Net Production/Capability-sized UPF Alternative

Similar to Alternative 4, under a No Net Production/Capability-sized UPF Alternative, NNSA would maintain the capability to conduct surveillance and produce and dismantle secondaries and cases. NNSA would reduce the production level of facilities to approximately 10 secondaries and cases per year (compared to 125 secondaries and cases per year for the UPF Alternative), which would support surveillance and dismantlement operations and a limited Life Extension Program (LEP) workload; however, this alternative, would not support adding replacement or increased numbers of secondaries and cases to the stockpile. This alternative would involve an even further reduction of production throughput at Y-12 compared to Alternative 4. To support this alternative, Y-12 would build essentially the same UPF described in Alternative 4. This would be a smaller UPF (approximately 350,000 square feet) compared to the UPF described under Alternative 2 (388,000 square feet). Although the UPF for Alternative 5 would be approximately 10 percent smaller than the UPF described for Alternative 2, the construction requirements shown in Table 3.2.2.1-1 are representative of the construction requirements for this alternative. Section 1.4.6 provides a summary of the major differences among the UPF throughputs assessed. In addition, this alternative would include construction of a new CCC (as discussed in Section 3.2.2.2). Table 3.2.5-1 presents the operational information for the Y-12 No Net Production/Capability-sized UPF Alternative.

Table 3.2.5-1. Annual Operational Requirements for the No Net Production/ Capability-sized UPF Alternative Compared to the No Action Alternative.

Requirements	No Action Alternative	No Net Production/ Capability-sized UPF Alternative
Peak Electrical Energy Use (MWe) [a]	36-48	20-26
Water Use (million gallons/year)	2,000	1,080
Y-12 Site Employment (workers)	6,500	4,500 [b]
New Steam Plant Generation (billion pounds) [a]	1.5	0.8
Normal Radiological/Uranium Air Emissions (Curie)	0.01	0.005
Total No. of Y-12 Monitored Workers [a]	2,450	1,600 [b]
Average Individual Worker Dose (mrem)	19.9	10.0
Collective Worker Dose (person-rem)	49.0	16.0
Waste Category		
Low-level Waste		
Liquid (gal)	713	403
Solid (yd^3)	9,405	5,314
Mixed Low-level Waste		
Liquid (gal)	1,096	619
Solid (yd^3)	126	71
Hazardous (tons)	12	7.2
Nonhazardous Sanitary (tons)	10,374	7,182

Source: NNSA 2008, B&W 2009a, Jackson 2008.
a – See Section 5.6.1.8 for a discussion of greenhouse gas emissions associated with operations
b – In the Draft Y-12 SWEIS, the Y-12 site employment number for Alternative 5 was 3,400 workers, and was taken from the Capability-Based Alternative in the Complex Transformation SPEIS (published in October 2008) which was programmatic in nature and provided bounding estimates based on information available at that time. NNSA has prepared the current site employment estimates for Alternative 5 based on better defined UPF information, program requirements, and required capacities that are now available. Therefore, NNSA has estimated that the Y-12 site employment levels for Alternative 4 would be 4,500. No change is required in the total number of Y-12 monitored workers from the Draft SWEIS to the Final SWEIS because that number was originally estimated for the SWEIS and is based on currently available information.

For either Alternative 4 or Alternative 5, although many of the current facilities at Y-12 would be operated at a reduced throughput, NNSA would need to maintain them in a "ready-to-use" state to accommodate surge production in the event of significant geopolitical 'surprise' (NPR 2010). This means unused capacity would be exercised periodically and standard preventative maintenance and minimal corrective maintenance would be performed on all equipment that could be required for future needs. The related effects on other plant operations would include a reduction in utility usage and waste generation and a reduction in staffing.

3.3 POTENTIAL FUTURE Y-12 MODERNIZATION PROJECTS

While the action alternatives in this SWEIS have progressed to the conceptual design level, other facilities considered for Y-12 modernization are still in the early planning phase, do not have conceptual design data to analyze at this time, and are not ripe for decision making. This section addresses several potential future facilities that may be considered as part of the integrated modernization efforts. These potential facilities may change as modernization plans are developed. These potential new facilities are summarized in Table 3.3-1. None of the potential

future modernization projects listed in Table 3.3-1 are included in the No Action Alternative or the action alternatives for this Y-12 SWEIS, and none have received CD-0 (mission need) approval. If ever proposed, these projects would be covered by future NEPA reviews.

Table 3.3-1. Summary of Potential Future Modernization Projects.

New Modernization Facilities	Scope
Consolidated Manufacturing Complex (CMC)	The CMC would replace multiple existing facilities with a single integrated facility that is much smaller, less expensive to operate and maintain, and reduces the risk of mission failure. Functions proposed for the new facility are depleted uranium operations, general manufacturing, non-enriched uranium (EU) analytical lab, non-EU development facilities, and lithium production. Tentative plans would be to construct the lithium production facility initially (by approximately 2020) and to construct the remaining portions of the CMC by approximately 2024.
Materials Receiving and Storage Facility	The Materials Receiving and Storage Facility would combine receiving and storage functions on-site, which would increase operational efficiency and reduce the annual cost of the combined functions. The bulk of Y-12's procurements and supplies are received at an off-site, leased facility. In addition, many vital non-enriched uranium materials are stored on-site in multiple aging facilities. If constructed, the facility could be operational by approximately 2020.
Waste Management Complex	The project would construct a waste management complex that would consolidate waste operations into one smaller, modern facility with greatly reduced annual operating costs. Such a facility would not be operational until approximately 2030.
Utility System Upgrades	Many of the Y-12 utility distribution systems are in poor repair with more than $200M in deferred maintenance. System studies would be completed to determine utility system priority, alternatives to upgrade versus replace, and cumulative impacts of system failure. Critical utility distribution systems planned for upgrade include steam, electrical, and storm drain, which are the most deteriorated systems at Y-12.
Maintenance Facility	The current maintenance facility was constructed in 1944, is oversized for the current mission, and is very expensive to operate and maintain. A modern facility would replace the current building. The new facility would be designed and sized for the current mission and would reduce operating and maintenance costs. The facility would house plant maintenance functions and staff.
Protected Area Reduction Project	Upon completion of the UPF, the Protected Area Reduction Project (PARP) would provide the final legs of the new PIDAS, equip the new Central Alarm Station inside the new PIDAS, and provide access and search facilities to accommodate the new, smaller PIDAS.

Source: Brumley 2005, Livesay 2010.

3.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

For this SWEIS, the following alternatives were considered but eliminated from detailed study for the reasons stated.

Stop Weapons Activities/Transfer Y-12 Missions to Another Site/Clean-Up Y-12/Fund Social Programs. During the public scoping period for the SWEIS, members of the public stated that NNSA should analyze shutting down all weapons activities at Y-12, transferring Y-12 missions to another site, clean-up the site, and/or use the money saved for social programs. DOE/NNSA has considered these suggestions in programmatic NEPA documents, specifically the Complex Transformation SPEIS (NNSA 2008), *Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (SSM PEIS) (DOE 1996a), and the *Storage and Disposition of Weapons-Usable Fissile Material PEIS* (DOE 1996b). NNSA has concluded that there is an essential near-term need to manage and maintain the safety and stability of the existing nuclear materials inventory. In December 2008, NNSA affirmed the decision to maintain the uranium missions at Y-12 in the ROD for the Complex Transformation SPEIS. Until relieved of its mission to support the enduring nuclear weapons stockpile by the President and Congress, NNSA must maintain its national security operations at Y-12. Accordingly, to propose shutting down or transferring the Y-12 nuclear weapons activities within the timeframe of the SWEIS (i.e., next 10 years) would be an unreasonable alternative. Y-12 has unique capabilities and diverse roles supporting a variety of national programs that could not easily be transferred or replaced.

Alternate Site Locations for the UPF. As described in Section 3.2.2, and shown on Figure 3.2.2-2, the proposed UPF would be located adjacent to the HEUMF, at a site just west of the HEUMF. In the 2001 Y-12 SWEIS, DOE evaluated alternative locations for the HEUMF, and in the ROD DOE decided to construct the HEUMF at the Y-12 West Portal Parking Lot Site (67 FR 11296, March 13, 2002). Construction of the HEUMF was initiated in 2005 and completed in 2008. The facility began full-scale operations in 2010. Locating a UPF adjacent to the HEUMF is consistent with the analysis performed in support of the 2001 Y-12 SWEIS, the Complex Transformation SPEIS, RODs based on these documents, and the Y-12 Modernization Plan. Siting a UPF at a location other than adjacent to the HEUMF would not allow for the operational efficiencies and reduced security footprint.

Alternative site locations were explored as part of the planning for the UPF. The main reasons why the UPF, if built, should be collocated with the HEUMF are as follows: (1) collocation maximizes the efficiency and minimizes the costs of feed and product material flows between the two facilities; (2) collocation improves the security posture by reducing the size of the protected area to 10 percent of the existing footprint and reduces the operational cost of the security force required to meet the latest graded security protection policy; and (3) collocation minimizes the number of employees who must enter the protected area, thus improving the productivity of workers assigned to non-SNM activities that are currently located in the protected area. As a result of these significant advantages, alternatives that would not result in the collocation of the proposed UPF and the HEUMF are not considered reasonable site alternatives for the UPF.

Curatorship Alternative. During the comment period on the Draft SWEIS, commentors stated that NNSA should consider an alternative that would involve “curatorship” of the current arsenal which could be achieved through consolidation, downsizing, and upgrading-in-place the current facility. Such an alternative, which commentors referred to as “Alternative 6,” would recognize a need for a Stockpile Stewardship mission that could be achieved through an upgrade in place to existing facilities. It would recognize the increasing demand for a verifiable safeguarded

dismantlement capacity which must be addressed. And if there is a need, [NNSA] could construct a new dismantlement facility with designed-in safeguards and transparency to process the current backlog and accommodate increased retirement of warheads and the eventual dismantlement of the entire U.S. arsenal. The benefits of such an alternative include workforce retention and the reduction of the high-security area.

NNSA considered the proposed Alternative 6, and believes that many of the elements of a Curatorship approach are embodied within existing SWEIS alternatives. For example, the SWEIS currently includes an alternative (Alternative 3, Upgrade in-Place) that would accomplish all required dismantlements (and any required assembly) in existing facilities that would be upgraded. As such, the SWEIS already includes an alternative that recognizes "a need for a Stockpile Stewardship mission that can be achieved through an upgrade in place to existing facilities." The SWEIS also includes an alternative that would provide the minimum assembly/disassembly capacity which NNSA thinks would meet national security requirements. Under this alternative (Alternative 5 – No Net Production/Capability-sized UPF Alternative), NNSA would maintain the capability to conduct surveillance and produce and dismantle secondaries and cases. NNSA would reduce the operational throughput of facilities to no more than 10 secondaries and cases per year, which would support surveillance operations and a limited LEP workload; however, this alternative would not support adding replacement or increased numbers of secondaries and cases to the stockpile.

Consolidate ORNL Special Nuclear Material to Y-12. During the public scoping period for the SWEIS, a suggestion was made that DOE should consolidate all SNM from ORNL to Y-12. SNM from ORNL is not used at Y-12 and NNSA does not have programmatic responsibility for the SNM at ORNL. The scope of the Y-12 SWEIS is limited to alternatives related to operations at Y-12, for which NNSA has programmatic responsibility. There is no need to develop a proposal or assess an alternative to consolidate SNM from ORNL to Y-12. This issue is beyond the scope of this SWEIS.

Comprehensive Land Use Planning for ORR. During the public scoping period for the SWEIS, suggestions were made that DOE should develop a comprehensive land use plan for ORR, and that the SWEIS should include an analysis of land use for ORR, including alternatives that would transfer lands to the private sector. The scope of the Y-12 SWEIS is limited to alternatives related to operations at Y-12, for which NNSA has programmatic responsibility. The NNSA does not have programmatic responsibility for other areas of ORR and has no need to develop a proposal or assess any alternatives related to ORR land use planning or land transfers. These issues are beyond the scope of this SWEIS. With respect to lands associated with Y-12 specifically, as discussed in this SWEIS, the land requirements at Y-12 will generally remain unchanged. While some changes to land use will occur as a result of modernization projects, Y-12 will continue to require security and emergency response buffers that preclude release of any real estate for public use. Chapter 6 of this SWEIS addresses land use cumulative impacts.

Other Miscellaneous Suggestions. During the public scoping period for the SWEIS, various suggestions were made regarding alternatives and analyses that NNSA has determined were beyond the scope of the Y-12 SWEIS. Some of the suggested alternatives included replacing Y-12 with an auto plant, storing equipment for the Tennessee Valley Authority at Y-12, and

replacing weapons with the Reliable Replacement Warhead. NNSA determined that these suggested alternatives would not meet the purpose and need for action and were beyond the scope of the Y-12 SWEIS. The public suggested that the SWEIS include an assessment of intentional destructive acts. NNSA has prepared a classified appendix to this SWEIS which analyzes intentional destructive acts (see Appendix E, Section E.2.1.4).

3.5 COMPARISON OF POTENTIAL 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 chapter) presents the comparison summary of the environmental impacts for construction and operation associated with the No Action Alternative and the action alternatives evaluated in this SWEIS. The following sections summarize the potential impacts by resource area.

3.5.1 Land Use

Construction. With the exception of land disturbance associated with projects that have been addressed in previous NEPA documents (e.g., *Alternate Financed Facility EA* [NNSA 2005d] and *Potable Water System Upgrade EA* [DOE 2006a]), no new facilities or major upgrades to existing facilities would occur under the No Action Alternative and no new land disturbance would result. Construction of the UPF and CCC under the UPF Alternative would affect approximately 42 acres of previously disturbed land (35 acres for the UPF and 7 acres for the CCC). In addition, the Haul Road extension and Site Access and Perimeter Modification Road would disturb a maximum of approximately 6 acres of land. The majority of the Haul Road extension, which would follow an existing power line corridor, would require widening the existing corridor by approximately 12-15 feet. A minimal number of trees would be affected by this widening. The Wet Soils Disposal Area includes approximately 16.6 acres of property previously used for a controlled burn demonstration and pine reforestation project. The West Borrow Area is an 18.3 acre site that previously served as the source of clay for Y-12 landfill cap projects. This site would be utilized, as necessary, for the placement of excess soil from the UPF project with moisture content satisfactory for compaction (B&W 2010).

The Upgrade in-Place Alternative would consist of internal modifications to existing facilities and 7 acres for the CCC. Under both the Capability-sized UPF and No Net Production/Capability-sized UPF Alternatives, construction of the UPF and CCC would affect about 39 acres of previously disturbed land (32 acres for the UPF and 7 acres for the CCC), as well as approximately 41 acres for the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area.

Operation. While specific land usage within Y-12 may change, the overall industrial use classification would likely remain the same for all alternatives. Under the UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives, about 8 acres of previously disturbed land would be used for the UPF and 7 acres for the CCC. For the Upgrade in-Place Alternative, 7 acres would be used for the CCC. Because Y-12 would continue to require security and emergency response buffers, real estate associated with eliminating excess facilities

would likely not be released for public use and there would be no local land use benefits. All of the alternatives would be consistent with current land use plans, classifications, and policies. Impacts on land use adjacent to Y-12 are not expected.

3.5.2 Visual Resources

Construction. Under all alternatives, although there would be some reduction in the density of industrial facilities, Y-12 would still remain a highly developed area with an industrial appearance, and there would be no change to the Visual Resource Management (VRM) Class IV, which is used to describe a highly developed area. Construction of the UPF (Alternatives 2, 4, and 5) and CCC (Alternatives 2, 3, 4, and 5) would use cranes that would create short-term visual impacts, but would not be out of character for an industrial site such as Y-12. The construction lay-down area, temporary parking, and temporary construction office trailers would also be typical for an industrial site. The Upgrade in-Place Alternative would consist mainly of internal modifications to existing facilities and construction of the CCC and would create short-term visual impacts, but would not be out of character for an industrial site such as Y-12.

Operation. Under all alternatives, Y-12 would remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected. All of the alternatives that include a UPF would allow the protected area at Y-12 to be reduced from approximately 150 acres to about 15 acres and would result in some reduction in industrial density.

3.5.3 Site Infrastructure

Construction. Construction activities under the No Action Alternative would cause minimal changes to the energy use and other infrastructure requirements (i.e., steam, industrial gases, etc) at the site. As Y-12 continues to downsize and become more efficient, trends indicate that energy usage and most other infrastructure requirements are decreasing by approximately 2 to 5 percent per year. This is expected to continue. During construction, any of the UPF Alternatives would require a peak of approximately 2.2 MW per month of electric power, which is less than five percent of the current electrical energy usage at Y-12, and less than one percent of available capacity. Water requirements would be less than 1 percent of current site usage. Construction of either the Capability-sized UPF Alternative or No Net Production/Capability-sized UPF Alternative would require about 90 percent of the electrical power as construction of the full UPF. The peak electrical energy requirement is estimated to be 1.9 MW per month and water usage 3.6 million gallons. These would be less than 1 percent of current site usage. Construction activities associated with the Upgrade in-Place Alternative would have negligible energy and infrastructure requirements.

Operation. Under the No Action Alternative, Y-12 energy usage and other infrastructure requirements (i.e., steam, industrial gases, etc) should continue to decrease as Y-12 continues to downsize and become more efficient. During operation, the UPF would require approximately 14,000 MWh per month of electric power, which is less than 5 percent of available capacity. Compared to the No Action Alternative, the UPF would decrease water demands by more efficient water usage. Steam usage would be reduced by 10 percent as inefficient facilities are

closed. Operation of the CCC under any of the action alternatives would not increase water use. Operations associated with the Upgrade in-Place Alternative would not significantly change infrastructure demands beyond the demands of the No Action Alternative, although efficiency improvements associated with the upgrades should lead to some minor decreases in demand, albeit not on the same order as those that could be achieved with new construction. Under the Capability-sized UPF Alternative and No Net Production/Capability-sized UPF Alternative, electricity usage would be about 90 percent of present usage (10 percent reduction) due to the reduced operations (relative to current) and smaller physical size of the facility. Under the Capability-sized UPF Alternative and No Net Production/Capability-sized UPF Alternative, water usage would be reduced about 7 percent and 17 percent, respectively, compared to the UPF Alternative. The reductions associated with the smaller-sized UPF would be in addition to the decreasing energy use and infrastructure demands at Y-12 under the No Action Alternative. The existing EU operations account for less than five percent of the energy and infrastructure usage at Y-12.

3.5.4 Traffic and Transportation

Construction. Construction activities under the No Action Alternative would not cause any significant change to the current workforce of approximately 6,500 workers. The Level-of-Service (LOS) on area roads would not change under the No Action Alternative. Under the UPF Alternative, construction-related traffic would add a maximum of 950 worker vehicles per day to support construction of the UPF and CCC during the peak year of construction. This increase would be similar to the increase that was experienced during construction of the HEUMF, which did not change the LOS on area roads. The Upgrade in-Place Alternative would add a maximum of 300 worker vehicles per day and would not change the LOS on area roads. Construction of either the Capability-sized UPF Alternative or the No Net Production/Capability-sized UPF Alternative would add a maximum of 850 worker vehicles per day to support construction during the peak year of construction. This increase would be less than the increase that resulted from the HEUMF construction, which did not change the LOS on area roads. There would be no radiological transportation impacts related to construction for any of the alternatives.

Operation. Under the No Action Alternative and the Upgrade in-Place Alternative, the Y-12 workforce is expected to remain relatively stable at approximately 6,500 workers. Consequently, the LOS on area roads would not change under the No Action Alternative. Operation of the UPF would result in a small decrease in workforce (approximately 11 percent) due to more efficient operations, and would not affect the LOS on area roads. Operation of the CCC, which is part of all of the action alternatives, would not add any new workers to the site and would not affect traffic or transportation. The Capability-sized UPF Alternative and the No Net Production/Capability-sized UPF Alternative would reduce traffic at Y-12 by approximately 20 to 30 percent based on potential reductions in the workforce. This reduction would have a minimally beneficial impact on traffic and transportation. During operations under all alternatives, transportation of radiological materials (EU, TRU waste and LLW) would occur, resulting in radiological impacts on transportation workers and the public. For all alternatives, the radiological impacts and potential risks of transportation would be small, e.g., less than one latent cancer fatality per year. Radiological materials and waste transportation impacts would include routine and accidental doses of radioactivity. The one-time relocation of HEU to a new

UPF would result in less than one fatality. The Capability-sized UPF Alternative and the No Net Production/Capability-sized UPF Alternative would reduce radiological impacts associated with transportation of materials by about 25 percent and 95 percent, respectively.

3.5.5 Geology and Soils

Construction. With the exception of land disturbance associated with projects that have been addressed in previous NEPA documents, no new facilities or major upgrades to existing facilities would occur under the No Action Alternative. No new land disturbance or impact to geology and soils would result. Potential land disturbance associated with the construction of the UPF and CCC would be approximately 42 acres of previously disturbed land. The Capability-sized UPF Alternative and the No Net Production/Capability-sized UPF Alternative would result in disturbance of about 39 acres of previously disturbed land. In addition, the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area would disturb approximately 41 acres of land. Construction of the new facilities would result in a potential increase in soil erosion from the lay-down area and new parking lot. Appropriate mitigation, including detention basins, runoff control ditches, silt fences, and protection of stockpiled soils would minimize soil erosion and impacts. No impacts on undisturbed geological resources are expected. The Upgrade in-Place Alternative would consist of internal modifications to existing facilities and would only affect previously disturbed geological resources or soils for construction of the CCC.

Operation. Under all alternatives, minor soil erosion impacts are expected, but detention basins, runoff control ditches, and cell design components would minimize impacts. Neither a UPF, under Alternatives 2, 4 and 5, nor the CCC, under any of the action alternatives would impact geology or soils during operation because of site design and engineered control measures.

3.5.6 Air Quality and Noise

3.5.6.1 *Air Quality*

Construction. Under the No Action Alternative, there would be no significant new construction and no changes in air quality or noise are expected. All criteria pollutant concentrations are expected to remain below the national and Tennessee Department of Environment and Conservation (TDEC) standards, with the exception of the 8-hour ozone levels and fine particulate matter ($PM_{2.5}$), which exceed standards throughout the region. Construction of a UPF and CCC would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxide, particulate matter, total suspended particulates, diesel particulate emissions, carbon monoxide, and greenhouse gases such as carbon dioxide. Additionally, construction of a UPF and CCC would result in small fugitive dust impacts in the construction area. Effective control measures commonly used to reduce fugitive dust emissions include wet suppression, wind speed reduction using barriers, reduced vehicle speed, and chemical stabilization. The temporary increases in pollutant emissions due to construction activities are too small to result in exceeding the National Ambient Air Quality Standards (NAAQS) or TDEC standards beyond the Y-12 boundary. Therefore, air quality impacts

resulting from construction under the UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives would be small. The Upgrade in-Place Alternative, which would involve internal upgrades to existing facilities and construction of the CCC, would have minimal impact on air quality at Y-12. Temporary increases in impact on air quality from construction equipment, trucks, and employee vehicles would be much less than the UPF, Capability-sized UPF, or No Net Production/Capability-sized UPF Alternatives, presented above, due to the significantly smaller workforce required for the Upgrades. There would be no radiological air impacts associated with construction under any of the action alternatives.

Operation. Under the No Action Alternative, emissions associated with the new steam plant are expected to be significantly lower for total particulate matter, sulfur dioxide, and nitrogen oxides. All criteria pollutant concentrations are expected to remain below the national and TDEC standards, with the exception of the 8-hour ozone levels and $PM_{2.5}$, which exceed standards throughout the region. For the UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives, no significant new quantities of criteria or toxic pollutants would be generated from the new facilities (UPF and CCC). The heating requirements for any of the UPF Alternatives would reduce the level of emissions compared to the No Action or Upgrade in-Place Alternatives. Any releases of nitrogen and argon, that are used to maintain inert atmospheres for glovebox operations, would be less than current releases from existing operations. No new hazardous air emissions would result under any of the UPF Alternatives. For the Upgrade in-Place Alternative, no change to air quality impacts beyond those presented for the No Action Alternative would result because there would be no significant change in the operating requirements of the facilities. For the Capability-sized UPF and No Net Production/Capability-sized UPF Alternatives, operations would be reduced compared to the other alternatives, as would emissions from the Y-12 steam plant, but likely not significantly enough to have a meaningful positive effect on air quality, which would remain well within NAAQS for all criteria pollutants, with the exception of the 8-hour ozone levels and $PM_{2.5}$, which exceed standards throughout the region. Reduction in EU operations are also expected to result in the reduction of carcinogenic Hazardous Air Pollutants (HAPs); however, the maximum concentrations of these HAPs are small and do not have significant impacts.

With respect to greenhouse gas emissions, because of the reduced level of operations and reduction in size of the operational footprint at Y-12, the Capability-sized UPF and No Net Production/Capability-sized UPF Alternatives would have significantly lower carbon dioxide (CO_2) emissions than the No Action, UPF, and Upgrade in-Place Alternatives. However, even the highest levels of CO_2 emissions (No Action and Upgrade in-Place Alternatives) would be relatively small (much less than one percent) compared to the state-wide CO_2 emissions in Tennessee.

Radiological air impacts under the No Action Alternative are expected to remain at or about current levels, i.e., 0.15 millirem per year to the maximally exposed individual (MEI), which is well below the annual dose limit of 10 mrem/yr under the National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61 Subpart H). Statistically, an annual dose of 0.15 mrem would result in a latent cancer fatality (LCF) risk of 9.0×10^{-8}. Radiological air impacts from Y-12 would result in a dose of 1.5 person-rem to the population living within 50 miles of Y-12, which would result in 0.0009 LCFs annually. Under normal operations, radiological

airborne emissions under the Upgrade in-Place Alternative would be no greater than radiological airborne emissions from the existing EU facilities, and would likely be less due to the incorporation of newer technology into the facility design; however, because of the unavailability of design data, they are assumed to be the same as those from the No Action Alternative.

NNSA has estimated that uranium emissions from the UPF would be reduced by approximately 30 percent compared to the No Action Alternative. Under the Capability-sized UPF Alternative and the No Net Production/Capability-sized UPF Alternative, activities that release radiological emissions would be reduced, resulting in lower emission levels relative to the No Action Alternative. NNSA estimates that uranium emissions would decrease by approximately 40 percent for the Capability-sized UPF Alternative and approximately 50 percent for the No Net Production/Capability-sized UPF Alternative.

3.5.6.2 *Noise*

Construction. Under the No Action Alternative, no significant construction would result and no change in noise impacts would be expected. For the UPF, Capability-sized UPF, No Net Production/Capability-sized UPF Alternatives, the onsite and offsite acoustical environments at Y-12 may be impacted during construction. Construction activities would generate noise produced by heavy construction equipment, trucks, power tools, and percussion from pile drivers, hammers, and dropped objects. In addition, traffic and construction noise is expected to increase during construction onsite and along offsite local and regional transportation routes used to bring construction material and workers to the site. The levels of noise would be representative of levels at large-scale building sites. The proposed site for a UPF is approximately 1,700 feet from the Y-12 boundary, and peak attenuated noise levels from construction would be below background noise levels at offsite locations within the city of Oak Ridge. For the Upgrade in-Place Alternative, construction activities would cause less noise impacts than the UPF Alternatives because construction would take place at the CCC site and within existing facilities, and the proposed CCC site and existing facilities are slightly farther from the site boundary than the proposed UPF site.

Operation. Major noise emission sources within Y-12 include various industrial facilities, equipment and machines (e.g., cooling systems, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Most Y-12 industrial facilities are at a sufficient distance from the site boundary so noise levels at the boundary from these sources would not be distinguishable from background noise levels. Implementation of any alternative would not change these operational noise impacts.

3.5.7 Water Resources

3.5.7.1 *Surface Water and Wetlands*

Construction. Under the No Action Alternative, annual surface water usage at Y-12 would remain within the current range (about 2 billion gallons). A number of contaminants are present and monitored in East Fork Poplar Creek (EFPC). Levels of mercury do remain above ambient

water quality criteria in the EFPC. Nickel levels were well below the Tennessee General Water Quality Criteria. The Upper East Fork Poplar Creek (UEFPC) contains most of the known and potential sources of surface water contamination. Surface water contaminants in UEFPC include metals (particularly mercury and uranium), organics, and radionuclides (especially uranium isotopes). Environmental restoration activities would continue to address surface water contamination sources and, over time, would be expected to improve the quality of water in both EFPC and Bear Creek, the two surface water bodies most directly impacted by activities at Y-12. Y-12 surface water withdrawals and discharges would not increase substantially during construction under any of the action alternatives. Construction water requirements are very small and would not substantially raise the average daily water use for Y-12. During construction, stormwater control and erosion control measures would be implemented to minimize soil erosion and transport to EFPC. Contaminated wastewater would be collected and disposed of in accordance with applicable regulations. The proposed UPF and CCC sites and the existing Uranium Facilities are not located within either the 100-year or 500-year floodplains.

For Alternatives 2, 4, and 5, which would construct a new UPF, a Haul Road extension would be constructed to link UPF site construction/excavation activities with supporting infrastructure located west of the proposed UPF site in the Bear Creek corridor. The road extension would accommodate the number and size of construction vehicles needed on site, as well as safely provide transportation away from occupied roadways. The designed alignment for the Haul Road extension follows the existing power line corridor and thus avoids forest habitat found to the north and south of the power line. The Haul Road would necessarily cross some headwater areas of small unnamed tributaries to Bear Creek, some of which contain wetlands. The Site Access and Perimeter Modification Road would disturb mowed areas, wetlands, limited early successional old field, and some forest. The greatest acreage potentially affected would be mowed turf grasses. It is anticipated that the Haul Road extension and the Site Access and Perimeter Modification Road would result in the loss of one acre of wetlands, and place two small stream segments (approximately 300 feet [total] of unnamed tributaries to Bear Creek) within culverts. A total of approximately three acres of wetland would be created as part of the proposed construction project. The mitigation wetlands would include expansion of some existing wetlands “upstream” and adjacent to the new Haul Road, as well as creating additional wetlands in the Bear Creek watershed. Appendix G contains a detailed wetland assessment that has been prepared in accordance with 10 Code of Federal Regulations (CFR) 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements" for the purpose of fulfilling NNSA’s responsibilities under Executive Order 11990, “Protection of Wetlands.”

Operation. Under the No Action, UPF, and Upgrade in-Place Alternatives, surface water usage at Y-12 would remain at approximately 2 billion gallons per year. The UPF Alternative would reduce water demands at the site to 1.3 billion gallons per year because EU operations would be phased out in the inefficient existing facilities once the UPF becomes operational and the CCC (under all of the action alternatives) would consolidate ongoing functions from numerous separate facilities. It is not anticipated that operations under the UPF or Upgrade in-Place Alternatives would impact surface water quality beyond impacts described for the No Action Alternative. The reduced operations associated with the Capability-sized UPF Alternative would reduce water use at Y-12 to approximately 1.2 billion gallons per year. The reduced operations

associated with the No Net Production/Capability-sized UPF Alternative would reduce water use at Y-12 to approximately 1.08 billion gallons per year.

Under the Capability-sized UPF and No Net Production/Capability-sized UPF Alternatives, reduction of EU operations would reduce releases of uranium and other contaminants to surface waters. Under all alternatives, routine operations would be expected to result in no adverse impacts on surface water resources or surface water quality because all discharges would be maintained to comply with National Pollutant Discharge Elimination System (NPDES) permit limits and minimized by appropriate mitigation measures.

3.5.7.2 *Groundwater*

Construction. Water for all of the alternatives 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 in accordance with applicable permits. All water for construction of the UPF, Upgrade in-Place, Capability-sized UPF, or No Net Production/Capability-sized UPF Alternatives would be taken from the Clinch River as part of the normal water uses at Y-12. Some groundwater may be extracted during construction activities at the CCC and a UPF site to remove water from excavations. Appropriate construction techniques would be implemented to minimize the seepage of groundwater into excavation sites. No impact on groundwater (direction or flow rate) would be expected from constructing a UPF or the CCC. Based on the results of constructing the HEUMF, groundwater extracted from excavations at a UPF or the CCC site is not expected to be contaminated. Minimal impacts on groundwater quality are expected because extracted groundwater would be collected and treated to meet the discharge limits of the NPDES permit prior to release to surface water.

Operation. Under all of the alternatives, water for Y-12 operations would be taken from the Clinch River. All process, utility, and sanitary wastewater would be treated prior to discharge in accordance with applicable permits. No groundwater would be used for operations of facilities. No plans exist for routine withdrawal from groundwater resources.

3.5.8 Ecological Resources

Ecological resources at Y-12 include terrestrial and aquatic resources, threatened and endangered (T&E) species and other special status species, and floodplains and wetlands.

Construction. Under the No Action Alternative, no impacts on ecological resources are expected because any construction activities would occur in areas where site clearing and past construction have occurred. Construction of a UPF under Alternatives 2, 4, or 5 would not impact ecological resources because a UPF would be sited on land that is currently used as a parking lot. However, the Haul Road that would be constructed to link UPF site construction/excavation activities with supporting infrastructure would necessarily cross some headwater areas of small unnamed tributaries to Bear Creek, some of which contain wetlands (see Appendix G for details regarding these wetlands). Construction of the CCC would not affect ecological resources because the proposed site is in a previously disturbed industrial area.

Mercury and polychlorinated biphenyl (PCB) levels in EFPC fish have historically been elevated relative to those fish in uncontaminated reference streams. Fish are monitored regularly in EFPC for these contaminants. Appropriate stormwater management techniques would be used during construction activities under all of the action alternatives to prevent pollutants from entering local waterways. No impacts on ecological resources from the Upgrade in-Place Alternative are expected because modifications would be internal to existing facilities. Moreover, all areas associated with the Upgrade in-Place Alternative have been previously disturbed and do not contain habitat sufficient to support ecological resources.

Operation. Under the No Action Alternative, continued minor impacts on terrestrial resources are expected due to operation noise and human activities. Operation under the UPF, Upgrade in-Place, Capability-sized UPF, or No Net Production/Capability-sized UPF Alternatives would continue to have minor impacts on biological resources due to operation noise and human activities. Although the Capability-sized UPF and No Net Production/Capability-sized UPF Alternatives would reduce EU operations, Y-12 would continue to operate, the site would remain heavily industrialized, and no change to ecological resources would be expected. Although the gray bat (*Myotis grisescens*), a Federally-listed endangered animal species is known to occur at Oak Ridge Reservation, no critical habitat for threatened or endangered species is known to exist at Y-12. NNSA will consult with the U.S. Fish and Wildlife Service, pursuant to Section 7 of the Endangered Species Act to ensure proposed actions would not impact Federally-listed threatened or endangered species.

3.5.9 Cultural Resources

Y-12 currently has no buildings in the National Register of Historic Places but does have a proposed historic district of buildings associated with the Manhattan Project. Preservation of cultural resources at Y-12, including the buildings in this proposed historic district, would continue under all alternatives. None of the alternatives would impact significant cultural resources at Y-12.

3.5.10 Socioeconomics

Construction. There would be no appreciable changes in the Region of Influence (ROI) socioeconomic characteristics over the 10-year planning period under the No Action Alternative. The construction of the UPF under Alternative 2 or a smaller UPF under the Capability-sized UPF or No Net Production/Capability-sized UPF Alternatives would have a similar impact on the socioeconomic characteristics of Y-12 and the ROI as the recently-completed HEUMF construction. The UPF (under Alternative 2) and CCC would require approximately 1,350 workers during the peak year of construction. A total of 5,670 additional jobs (1,350 direct and 4,320 indirect) would be created in the ROI during the peak year of construction. The Capability-sized UPF Alternative or No Net Production/Capability-sized UPF Alternative (including the CCC) would require approximately 1,250 workers during the peak year of construction. A total of 5,250 jobs (1,250 direct and 4,000 indirect) would be created in the ROI during the peak year of construction. The total new jobs would represent an increase of less than 1 percent in ROI employment. The number of direct jobs at Y-12 could increase by approximately 20 percent during the peak year of construction. Overall, these changes would be

temporary, lasting through the construction periods for the CCC and UPF. The Upgrade in-Place Alternative would have a peak construction workforce of 700 workers and generate a total of 2,940 jobs (700 direct and 2,240 indirect) in the ROI. 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.

Operation. Under the No Action Alternative and Upgrade in-Place Alternative, the operational workforce at Y-12 is expected to remain stable. Upon completion of the UPF construction, the operational workforce for the UPF would be expected to be smaller than the existing EU workforce due to efficiencies associated with the new facility. NNSA estimates that the total workforce reduction could be approximately 750 workers, which is approximately 11 percent of the total Y-12 workforce. These reductions are expected to be met through normal attrition/retirements, as about 50 percent of the work force at Y-12 is eligible to retire within the next 5 years. The change from baseline Y-12 employment would be minor and no noticeable impacts on ROI employment, income, population, housing, or community services would be expected. Under the Upgrade in-Place Alternative, operation of facilities would not result in any change in workforce requirements since existing workers would staff the facilities. Under the Capability-sized Alternative, the workforce at Y-12 could decrease to approximately 5,100 jobs, a reduction of approximately 20 percent compared to the No Action Alternative baseline. Combined with the indirect jobs that would be lost, under the Capability-sized UPF Alternative the ROI employment could be reduced by about 5,880 jobs, or about 1.9 percent. Under the No Net Production/Capability-sized UPF Alternative, NNSA estimates that the site employment could decrease to approximately 4,500 workers. This would represent a decrease of approximately 2,000 jobs; a reduction of approximately 30 percent compared to the No Action Alternative baseline. Combined with the indirect jobs that would be lost, the ROI employment could be reduced by about 8,400 jobs, or about 2.7 percent. Under Alternatives 4 and 5, although some EU operations would be reduced, the NNSA would continue to maintain the safety and security for nuclear materials or other hazardous materials. The reduction in the workforce would likely be met through normal attrition/retirements.

3.5.11 Environmental Justice

Construction. The short-term socioeconomic impacts during any construction activities would be positive and not result in any disproportionately high and adverse effects on minority populations, low-income, or American Indian populations. With respect to human health, occupational impacts during construction would be expected (see Health and Safety, Section 5.12 of the SWEIS), but would not be significant. Therefore, no disproportionately high and adverse effects on minority populations, low-income, or American Indian populations would be expected.

Operation. None of the proposed alternatives would pose significant health risks to the public and radiological emissions would remain below the annual dose limit of 10 mrem (the maximum MEI dose is 0.4 mrem/yr). Results from ORR ambient air monitoring program show that the hypothetical effective dose (ED) received within the Scarboro Community (an urban minority community that is the closest community to an ORR boundary) is typically similar to, or lower

than, other monitoring stations of Y-12. There are no special circumstances that would result in any greater impact on minority or low-income populations than the population as a whole.

3.5.12 Health and Safety

Construction. There are occupational hazards associated with any construction activity. During construction, the UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives would have the highest potential for occupational injuries due to the fact that construction of a UPF would require the largest construction workforce. Statistically, approximately 70 recordable cases of injuries per year may be expected during the peak years of construction. The Upgrade in-Place Alternative would be expected to result in 37 recordable cases of injuries during the construction period. No radiological impacts are expected from construction activities for any of the alternatives.

Operation. During normal operations, radiological impacts on workers and the public would occur. Under the No Action Alternative, impacts are expected to be similar to the impacts that are currently occurring. All radiation doses from normal operations would be well below regulatory standards and would have no statistically significant impact on the health and safety of either workers or the public. Statistically, for all alternatives, radiological impacts would be expected to cause less than one latent cancer fatality (LCF) to the 50-mile population surrounding Y-12. The No Net Production/Capability-sized UPF Alternative would result in the lowest uranium releases to the environment, which would translate into the lowest dose to the public.

Under the No Action Alternative, worker dose would not change significantly. The Y-12 total worker dose in 2009 was approximately 49 person-rem, which equates to an average dose of 19.9 mrem for all Y-12 employees. This dose is well below regulatory limits and limits imposed by DOE Orders. For the UPF Alternative, the dose to workers would be reduced by about 60 percent to 20.5 person-rem. Under the Capability-sized Alternative, worker dose would be reduced to approximately 18.2 person-rem and under the No Net Production/Capability-sized UPF Alternative worker dose would be reduced to approximately 16.0 person-rem. Under all alternatives, less than one LCF to the workforce would be expected annually.

3.5.13 Waste Management

Under all alternatives, Y-12 would continue to generate and manage wastes, including low-level radioactive waste (LLW), mixed LLW, hazardous waste, and sanitary/industrial (nonhazardous) waste. During construction, the action alternatives would each result in small quantities of wastes being generated. These amounts of additional waste would be well within the capability of the existing Y-12 waste management processes and facilities to handle. Waste generation under the Upgrade in-Place Alternative would be the same as the No Action Alternative. The UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives would result in progressively lower generation of the volume of all classes of waste at Y-12. Under any of the alternatives, the waste management treatment and disposal capabilities at Y-12 would be adequate to handle wastes generated by operations.

3.5.14 Facility Accidents

Radiological. Potential impacts from accidents were estimated using computer modeling for a variety of initiating events, including fires, explosions, and earthquakes. For all alternatives, the accident with the highest potential consequences to the offsite population is the aircraft crash into the EU facilities. Approximately 0.4 LCFs in the offsite population could result from such an accident in the absence of mitigation. An MEI would receive a maximum dose of 0.3 rem. Statistically, this MEI would have a $2x10^{-4}$ chance of developing a LCF, or about 1 in 5,000. This accident has a probability of occurring approximately once every 100,000 years. When probabilities are taken into account, the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be $4.4x10^{-7}$, or about 1 in 2.3 million. For the population, the LCF risk would be $4x10^{-4}$, or about 1 in 2,500.

The UPF, Capability-sized UPF, and No Net Production/Capability-sized UPF Alternatives would decrease the overall Y-12 facility accident risks discussed above. This is because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into a UPF, reducing the accident risks associated with those older facilities. However, detailed design descriptions for a UPF are not available. Without these detailed descriptions, the reduction in accident risks cannot be quantified. New facilities such as the UPF would be constructed to current building standards and would be designed and built to withstand anticipated seismic accelerations and thus would prevent any significant earthquake damage. These new facilities would not experience significant damage from earthquakes and other external initiators. Also, controls would be incorporated into the design of new Y-12 facilities to reduce the frequency and consequence of internally initiated accidents. Therefore, the risks presented above for the current Y-12 facilities (both individually and additive) would be conservative for a UPF.

Nonradiological. The impacts associated with the potential release of the most hazardous chemicals used at Y-12 were modeled to determine whether any impacts could extend beyond the site boundaries. Based upon those modeling results, it was determined that no chemical impacts would cause adverse health impacts beyond the site boundary. In any event, emergency preparedness procedures would be employed to minimize potential impacts.

Most of the accidents analyzed in this SWEIS do not vary by alternative because the same facilities are potentially involved in the accidents and subsequent consequences. However, the construction and use of a UPF under Alternatives 2, 4, or 5 would replace existing facilities that were originally designed for other purposes with facilities that incorporate modern features to prevent the occurrence of accidents, as well as mitigate any accident consequences. Due to the design and facility construction, a UPF is expected to reduce the likelihood and severity of many accidents associated with the EU mission; however, the decreased risk cannot be quantified until specific safety analysis documents are prepared. Such documents would be prepared during detailed design activities, if the decision is made to proceed with any one of the alternatives that include a UPF.

The Y-12 Emergency Management Program incorporates all the planning, preparedness, response, recovery, and readiness assurance elements necessary to protect onsite personnel, the public, the environment, and property in case of credible emergencies involving Y-12 facilities,

activities, or operations. Provisions are in place for Y-12 personnel to interface and coordinate with Federal, state, and local agencies and with those organizations responsible for offsite emergency response. In the event of an emergency at Y-12, a number of resources are available for mitigation, re-entry, and recovery activities associated with the response.

3.5.15 Intentional Destructive Acts

NNSA has prepared a classified appendix to this SWEIS that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. Appendix E (Section E.2.14) discusses the methodology used to evaluate potential impacts associated with a terrorist threat and the methodology by which NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems. As discussed in that section, NNSA's strategy for the mitigation of environmental impacts resulting from intentional destructive acts, has three distinct components: (1) prevent or deter successful attacks; (2) plan and provide timely and adequate response to emergency situations; and (3) progressive recovery through long term response in the form of monitoring, remediation, and support for affected communities and their environment.

The classified appendix evaluates several scenarios involving intentional destructive acts for alternatives at Y-12 and calculates consequences to the noninvolved worker, maximally exposed individual, and population in terms of physical injuries, radiation doses, and LCFs. In general, the potential consequences of intentional destructive acts are highly dependent upon distance to the site boundary and size of the surrounding population—the closer and higher the surrounding population, the higher the consequences. In addition, it is generally easier and more cost-effective to protect new facilities, as new security features can be incorporated into their design. In other words, protection forces needed to defend new facilities may be smaller due to the inherent security features of a new facility. New facilities can, as a result of design features, better prevent attacks and reduce the impacts of attacks.

3.6 PREFERRED ALTERNATIVE

The CEQ regulations require an agency to identify its preferred alternative to fulfill its statutory mission, if one or more exists, in a Draft EIS (40 CFR Part 1502.14[e]). In the Draft SWEIS, NNSA identified Alternative 4, the Capability-sized UPF Alternative, as the preferred alternative. In this Final SWEIS, NNSA affirms Alternative 4, the Capability-sized UPF Alternative, as the preferred alternative.

The benefits of executing the Capability-sized UPF Alternative include reliable, long term, consolidated EU processing capability for the nuclear security enterprise with modern technologies and facilities; improved security posture for SNM; improved health and safety for workers; and a highly attractive return on investment. While operational today, the reliability of the existing facilities will continue to erode because of aging facilities and equipment. The UPF would replace multiple aging facilities with a modern facility that would be synergistic with the

new HEUMF to provide a robust SNM capability and improve responsiveness, agility, and efficiency of operations (B&W 2007).

With the consolidation of SNM operations, incorporation of integral security systems, and the 90 percent reduction of the protected area, the security posture would be greatly improved under the Capability-sized UPF Alternative. The use of engineered controls to reduce reliance on administrative controls and personal protection equipment to protect workers would improve worker health and safety. In addition, use of new technologies and processes may eliminate the need for some hazardous materials, reduce emissions, and minimize wastes. Cost savings and cost avoidance as a result of building the Capability-sized UPF would include the following[6]:

- Savings from consolidation related to right-sizing of facilities/footprint, more efficient operations, and simplification of SNM movement;
- Operating and maintenance cost reductions of approximately 33 percent from current operations;
- Reducing the number of workers required to access the protected area, which would improve the productivity of workers assigned to non-SNM activities that are currently located in the protected area. By reducing the size of the PIDAS, it is forecast that approximately 600 employees would not have to enter the PIDAS. It is conceivable that a 20 percent efficiency in non-SNM operations could be realized by not being encumbered with access requirements and restrictions of the PIDAS. Projects that support non-SNM operations would be less expensive because of improved productivity; and
- Reducing the footprint of the PIDAS protected area by 90 percent (from 150 acres to about 15 acres), which would allow better concentration of the protective force over a smaller area (B&W 2007).

Significant improvements in cost and operational efficiency would be expected from a new Capability-sized UPF. These improvements would include the expectation that new, reliable equipment would be installed, greatly reducing the need for major corrective maintenance (e.g., less than half of the existing casting furnaces are normally available because of reliability problems). In addition, security improvements would be an integral part of the new facility, reducing the number of redundant personnel (e.g., two-person rule) currently required and improving the mass limitation on the items worked in an area. New facilities built within the Material Access Areas (MAAs) such as break rooms and rest rooms, are expected to greatly increase efficiencies over the current practice of multiple entries and exits daily into the MAAs. It is also expected that the inventory cycle would be greatly reduced because of more effective means of real-time inventory controls. A more efficient facility layout is expected to decrease material handling steps, including structurally, physically, and operationally integrated material lock-up facilities (B&W 2007).

[6] The projections of cost savings and cost avoidance in this SWEIS are a snapshot in time of what NNSA expects to achieve, given a specific set of requirements over a given period of years. At this early stage in the process of estimating costs, it should be acknowledged that cost savings and avoidances would be reconsidered on an ongoing basis as the design matures and as more information is known about costs. As planning for the modernization of Y-12 proceeds, NNSA would continue to review all appropriate options to achieve savings and efficiencies in the construction and operation of these facilities (White House 2010).

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative.

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Land Use	Land uses at Y-12 would be compatible with surrounding areas and with land use plans. No change to existing land uses or total acreage of Y-12.	Land disturbance of 42 acres of previously disturbed land during construction of the CCC and a UPF. In addition, the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area would disturb approximately 41 acres of land. Land uses would remain compatible with surrounding areas and with the land use plans. No impacts on offsite land use.	Upgrading existing EU facilities and construction of the CCC would not alter existing land uses at Y-12 nor affect offsite land use.	Potential land disturbance of approximately 39 acres of previously disturbed land during construction of the CCC and a UPF, and approximately 41 acres for the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area. Land uses at Y-12 would remain compatible with surrounding areas and with the land use plans. No impacts on offsite land use.
Visual Resources	Y-12 would remain a highly developed area with an industrial appearance, with no change to VRM classification.	Cranes would create short-term visual impacts during construction of the CCC and the UPF. UPF would reduce protected area from 150 acres to about 15 acres, resulting in minor industrial density reduction, but no change to VRM classification.	Construction of the CCC would result in temporary visual impacts due to use of cranes. Otherwise, the visual impacts would be the same as No Action Alternative.	Cranes would create short-term visual impacts during construction of the CCC and a UPF. UPF would reduce protected area from 150 acres to about 15 acres, resulting in minor industrial density reduction, but no change to VRM classification.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Site Infrastructure	As Y-12 continues to downsize, trends indicate that energy usage and most other infrastructure requirements will reduce by 2-5% per year.	No increased demand on site infrastructure. Would use less than 5% of available electrical capacity and less than 1% of current site water usage. Reduces steam usage by at least 10% as inefficient facilities are closed.	Same as No Action Alternative.	Under Alternative 4, water usage would decrease by about 7% and electricity usage would decrease by about 10% compared to the UPF Alternative. Under Alternative 5, water usage would decrease by about 17% and electricity usage would decrease by about 10% compared to the UPF Alternative.
Traffic and Transportation	No significant change to the current workforce of approximately 6,500 workers, therefore, Level-of-Service (LOS) on area roads would not change. The impacts associated with radiological transportation would be insignificant (i.e., much less than one latent cancer fatality [LCF] annually).	Construction-related traffic would add maximum of 950 worker vehicles per day. Increased traffic would be similar to the HEUMF construction, which has not changed LOS on area roads. Operational impact on Y-12 traffic would be a minor reduction but would not affect LOS on area roads. The impacts associated with radiological transportation would be insignificant (i.e., much less than one latent cancer fatality [LCF] annually).	Construction-related traffic would add maximum of 300 worker vehicles per day. Increased traffic would be less than HEUMF construction, which has not changed LOS on area roads. Operational impacts on Y-12 traffic would be the same as the No Action Alternative. The impacts associated with radiological transportation would be insignificant (i.e., much less than one latent cancer fatality [LCF] annually).	Construction-related traffic would add maximum of 850 worker vehicles per day. Increased traffic would be similar to the HEUMF construction, which has not changed LOS on area roads. Reduction of operational workforce by approximately 1,400-2,000 workers would not change LOS on area roads under either alternative. Impacts from transportation of radiological materials under the Capability-sized Alternative would be approximately one-fourth as much as the impacts from the No Action Alternative; and for the No Net Production/Capability-sized Alternative approximately one-twentieth as much.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Geology and Soils	No significant disturbance or impact to geology and soils.	Construction of the UPF and CCC would disturb approximately 42 acres of previously disturbed land. In addition, the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area would disturb approximately 41 acres of land. Appropriate mitigation measures would minimize soil erosion and impacts.	Construction of the CCC would disturb about 7 acres of previously disturbed land. Appropriate mitigation measures would minimize soil erosion and impacts.	Construction of the CCC and a UPF would disturb about 39 acres of previously disturbed land. In addition, the Haul Road extension, Site Access and Perimeter Modification Road, Wet Soils Disposal Area, and West Borrow Area would disturb approximately 41 acres of land. Appropriate mitigation measures would minimize soil erosion and impacts.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Air Quality and Noise	Steam Plant would continue to be primary source of criteria pollutants. All criteria pollutant concentrations expected would remain below national and TDEC standards, except 8-hour ozone and $PM_{2.5}$, which exceed standards throughout the region. Greenhouse gases would be less than 0.12 percent of the statewide CO_2 emissions in Tennessee. Radiological air impacts from Y-12 are expected to remain at or about current levels, i.e., 0.15 millirem/year (mrem/yr) to the maximally exposed individual (MEI), which is well below the annual dose limit of 10 mrem/yr under the National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61 Subpart H). The dose to the population living within 50 miles of Y-12 would be 1.5 person-rem. **Noise:** Most Y-12 facilities at sufficient distance from the Site boundary so noise levels are not distinguishable from background noise levels.	Temporary increases in pollutants would result from construction equipment, trucks, and employee vehicles; emissions would be less than one-half of regulatory thresholds for all criteria pollutants. Reduces toxic pollutants generated during operations. Greenhouse gases would be less than 0.12 percent of the statewide CO_2 emissions in Tennessee. Reduces radiological air impacts compared to the No Action Alternative as follows: MEI: 0.1 mrem/yr; Population: 1.0 person-rem. **Noise:** Construction activities and additional traffic would generate temporary increase in noise; noise levels would be representative of large-scale building sites. Noise levels would be below background noise levels at offsite locations within the city of Oak Ridge.	During construction of the CCC, there would be some temporary increases in pollutants but these would be much less than similar emissions under the UPF Alternative. Operational emissions would be the same as the No Action Alternative. Radiological air impacts are expected to be the same as the No Action Alternative. Greenhouse gases would be less than 0.12 percent of the statewide CO_2 emissions in Tennessee. **Noise:** Minor additional noise impacts because construction would take place at the CCC site and within facilities that are slightly farther from site boundary than UPF site.	Temporary increases in pollutants would result from construction equipment, trucks, and employee vehicles; emissions would be less than one-half of regulatory thresholds for all criteria pollutants. No significant new quantities of criteria or toxic pollutants would be generated during operations. Greenhouse gases would be less than 0.07 percent of the statewide CO_2 emissions in Tennessee. Reduces radiological air impacts compared to the No Action Alternative as follows: MEI: 0.08-0.09 mrem/yr; Population: 0.8-1.0 person-rem. **Noise:** Construction activities and additional traffic associated with a UPF and the CCC would generate temporary increase in noise; noise levels would be representative of large-scale building sites. Noise levels would be below background noise levels at offsite locations within the city of Oak Ridge.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Water Resources	Water usage: 2 billion gallons per year. Discharges within NPDES requirements. Ongoing stormwater runoff and erosion control management. No impact to groundwater.	Increased water usage of approximately 4 million gallons per year during construction of the UPF. Once operational, water usage would decrease from 2 billion gallons/year to 1.3 billion gallons/year. Haul Road extension would result in the loss of one acre of wetlands. A total of approximately three acres of wetland would be created as mitigation.	Water requirements during construction would not raise the average annual water use for Y-12 or cause any appreciable water resource impacts or changes beyond those described for the No Action Alternative. Operations impacts would be the same as No Action Alternative.	Increased water usage of approximately 3.6 million gallons during construction of the Capability-sized UPF and CCC. Operational water use for the Y-12 Site is expected to be reduced to approximately 1.2 billion gallons per year under the Capability-sized UPF Alternative. Haul Road extension would result in the loss of one acre of wetlands. A total of approximately three acres of wetland would be created as mitigation. Increased water usage of approximately 3.6 million gallons during construction of the No Net Production/Capability-sized UPF and the CCC. Operational water use for the Y-12 Site is expected to be reduced to approximately 1.08 billion gallons per year under the No Net Production/ Capability-sized UPF Alternative. Haul Road extension would result in the loss of one acre of wetlands. A total of approximately three acres of wetland would be created as mitigation.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Ecological Resources	Site is highly developed, consisting mainly of disturbed habitat. Wildlife diversity is low (mostly species associated with areas of human development. Continued minor impacts on terrestrial resources due to operations and human activities. No federally-listed or state-listed threatened or endangered species are known to be present at Y-12 Site, although the gray bat has been sighted on ORR and the Indiana bat may also be present in the vicinity of Y-12.	Construction of the UPF and CCC would not impact ecological resources because new facilities would be sited on previously disturbed land. The Haul Road extension activities would result in the loss of one acre of wetlands; mitigation would create approximately three acres of wetlands. Continued minor impacts on terrestrial resources due to operations and human activities. No federally-listed or state-listed threatened or endangered species are known to be present at Y-12 Site, although the gray bat has been sighted on ORR and the Indiana bat may also be present in the vicinity of Y-12.	No impacts on ecological resources because construction activities would consist mostly of internal building modifications and the CCC in areas previously disturbed that do not contain habitat sufficient to support ecological resources. Continued minor impacts on terrestrial resources due to operations and human activities. No federally-listed or state-listed threatened or endangered species are known to be present at Y-12 Site, although the gray bat has been sighted on ORR and the Indiana bat may also be present in the vicinity of Y-12.	Construction of a UPF and the CCC would not impact ecological resources because new facilities would be sited on previously disturbed land. The Haul Road extension activities would result in the loss of one acre of wetlands; mitigation would create approximately three acres of wetlands. Continued minor impacts on terrestrial resources due to operations and human activities. No federally-listed or state-listed threatened or endangered species are known to be present at Y-12 Site, although the gray bat has been sighted on ORR and the Indiana bat may also be present in the vicinity of Y-12.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Cultural Resources	Y-12 currently has a proposed National Register Historic District of historic buildings associated with the Manhattan Project that are eligible for listing in the National Register of Historic Places. Preservation of cultural resources at Y-12, including the buildings in this proposed historic district, would continue under all alternatives. None of the alternatives would impact significant cultural resources at Y-12.	Same as No Action Alternative.	Same as No Action Alternative.	Same as No Action Alternative.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Socioeconomics	Operational workforce at Y-12 expected to remain stable with no significant increase or decreases. No appreciable changes in the regional socioeconomic characteristics over the 10-year planning period.	1,350 workers would be employed during the peak year of construction. This would result in a total of 5,670 jobs (1,350 direct and 4,320 indirect) created in the ROI, which would increase employment less than 3%. There would be an expected 11% decrease in operational workforce due to more efficient operations in UPF and reduced security area. These decreases in employment are not expected to change the regional socioeconomic characteristics.	700 workers would be employed during the peak year of construction. Total of 2,940 jobs (700 direct and 2,240 indirect) would be created in the ROI, which would increase employment less than 2%. Impact of operations would be the same as No Action.	About 1,250construction workers during peak year of construction of a UPF and the CCC. About 4,000 indirect jobs would be created. Operation of the Capability-sized UPF would result in a decrease of approximately 1,400 jobs (about 20% of current). About 5,880 total jobs in the ROI would be lost, representing a 1.9% total job loss for the ROI. Operation of the No Net Production/Capability-sized UPF would result in a decrease of about 2,000 workers (30% of current workforce). ROI total employment would decrease by about 8,400, resulting in a 2.7% decrease in jobs in the ROI. These decreases in employment are not expected to change the regional socioeconomic characteristics.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Environmental Justice	No significant health risks to the public. Radiological dose to the MEI would remain well below the annual dose limit of 10 mrem. Results from the monitoring program and modeling show that the maximum exposed individual would not be located in a minority or low-income population area. No special circumstances that would result in greater impact on minority, low-income, or American Indian populations than population as a whole.	Reduced impacts compared to No Action. Accident risks would decrease compared to No Action because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into the UPF, reducing the accident risks associated with those older facilities.	Same as No Action Alternative.	Reduced impacts compared to No Action Accident risks would decrease compared to No Action because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into the UPF, reducing the accident risks associated with those older facilities.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Health and Safety	All radiation doses from normal operations would be below regulatory standards with no statistically significant impact on the health and safety of workers or public. Dose from air emissions: MEI: 0.15 mrem/yr (9.0×10^{-8} LCFs). Population: 1.5 person-rem/yr (0.0009 LCFs). Dose from liquid effluents: MEI: 0.006 mrem per year (4.0×10^{-9}LCFs) Population:6.3 person-rem/yr (0.004 LCFs). Dose to Workers : 49.0 person-rem/yr (0.03 LCFs).	All radiation doses from normal operations would be below regulatory standards with no statistically significant impact on the health and safety of workers or public. Dose from air emissions: MEI: 0.1 mrem/yr (6.0×10^{-8} LCFs). Population: 1.0 person-rem/yr (0.0006 LCFs). Dose from liquid effluents would be same as No Action Alternative. Dose to Workers : 20.5 person-rem/yr (0.013 LCFs).	Same as No Action Alternative.	All radiation doses from normal operations would be below regulatory standards with no statistically significant impact on the health and safety of workers or public. **Capability-sized UPF** Dose from air emissions: MEI: 0.09 mrem/yr (5.0×10^{-8} LCFs). Population: 1.0 person-rem/yr (0.0005 LCFs). Dose to Workers : 18.2 person-rem/yr (0.01 LCFs). **No Net Production/Capability-sized UPF** Dose from air emissions: MEI: 0.08 mrem/yr (4.0×10^{-8} LCFs). Population: 0.8 person-rem/yr (0.0005 LCFs). Dose to Workers : 16.0 person-rem/yr (0.009 LCFs) For both the Capability-sized UPF and the No Net Production/Capability-sized UPF, the dose from liquid effluents would be same as No Action Alternative.

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Waste Management (Operational Waste Volumes)	Expected volume of waste generation: LLW liquid: 713gal LLW solid: 9,405 yd^3 Mixed LLW liquid: 1,096 gal Mixed LLW solid: 126 yd^3 Hazardous: 12 tons Nonhazardous: 10,374 tons	Expected volume of waste generation: LLW liquid: 476 gal LLW solid: 5,943 yd^3 Mixed LLW liquid: 679 gal Mixed LLW solid: 81 yd^3 Hazardous: 12 tons Nonhazardous: 9,337 tons	Expected volume of waste generation: LLW liquid: 713 gal LLW solid: 9,405 yd^3 Mixed LLW liquid: 1,096 gal Mixed LLW solid: 126 yd^3 Hazardous: 12 tons Nonhazardous: 10,374 tons	Expected volume of waste generation: **Capability-sized UPF:** LLW liquid: 428 gal LLW solid: 5,643 yd^3 Mixed LLW liquid: 640 gal Mixed LLW solid: 76 yd^3 Hazardous: 7.2 tons Nonhazardous: 8,140 tons **No Net Production/Capability-sized UPF:** LLW liquid: 403 gal LLW solid: 5,314 yd^3 Mixed LLW liquid: 619 gal Mixed LLW solid: 71 yd^3 Hazardous: 7.2 tons Nonhazardous: 7,182 tons

Table 3.5-1. Comparison of Environmental Impacts and Parameters Among No Action Alternative, UPF Alternative, Upgrade in-Place Alternative, Capability-sized UPF Alternative, and No Net Production/Capability-sized UPF Alternative (*continued*).

Site / Environmental Component	No Action Alternative	UPF Alternative	Upgrade in-Place Alternative	Capability-sized and No Net Production/Capability-sized UPF Alternatives
Facility Accidents	The, bounding accident with the most severe consequences would be an aircraft crash into the EU facilities. Approximately 0.4 LCFs in the offsite population could result. MEI dose: 0.3 rem MEI LCF risk: $2x10^{-4}$ chance of developing a LCF, or about 1 in 5,000. When probabilities are taken into account, the accident with the highest risk is the design-basis fire for HEU storage. For this accident, the maximum LCF risk to the MEI would be $4.4x10^{-7}$, or about 1 in 2.3 million. For the population, the LCF risk would be $4x10^{-4}$, or about 1 in 2,500.	No greater impacts than the No Action Alternative. Accident risks would decrease compared to No Action because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into the UPF, reducing the accident risks associated with those older facilities.	No greater impacts than the No Action Alternative. Accident risks would likely decrease compared to No Action because the existing EU facilities would be upgraded to contemporary environmental, safety, and security standards to the extent possible.	Accident risks would decrease compared to No Action because many of the operations and materials in the existing Y-12 nuclear facilities would be consolidated into the UPF, reducing the accident risks associated with those older facilities.

Note: The dose-to-LCF conversion factor is based on 6×10^{-4} LCFs per person-rem.