Chapter 5
ENVIRONMENTAL IMPACTS

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Chapter 5 describes the potential environmental impacts of the alternatives. The potential environmental impacts of the programmatic alternatives (Distributed Centers of Excellence [DCE] Alternative, Consolidated Centers of Excellence [CCE Alternative], Capability-Based Alternative, and the No Action Alternative) are assessed at Los Alamos, Nevada Test Site (NTS), Pantex Site (Pantex), Savannah River Site (SRS), and the Y-12 National Security Complex (Y-12). This Chapter discusses the impacts of each alternative by resource area, in a format consistent with Chapter 4. The potential impacts of the project-specific alternatives (High Explosives [HE] Research and Development [R&D], Tritium R&D, Major Hydrodynamic Test Facilities, Flight Testing, Major Environmental Test Facilities [ETFs], and Sandia National Laboratories (SNL) Weapon Support Functions) are also assessed in this chapter.

5.0 ENVIRONMENTAL IMPACTS

The environmental impacts analysis addresses potentially affected areas in a manner commensurate with the significance of the potential effects on each area. The methodologies used for preparing the assessments for the resource areas are discussed in Appendix B of this SPEIS.

Chapter 5 is organized by site. For example, Section 5.1 discusses the environmental impacts at Los Alamos. Los Alamos is potentially affected by the programmatic alternatives, which include the No Action Alternative, the Distributed Centers of Excellence (DCE) Alternative, the Consolidated Centers of Excellence (CCE) Alternative, and the Capability-Based Alternative. Sections 5.3, 5.5, 5.8, and 5.9 discuss the environmental impacts of the programmatic alternatives at the NTS, Pantex, SRS, and the Y-12. Because there are no programmatic alternatives for Lawrence Livermore National Laboratory (LLNL) (Section 5.2), Tonopah Test Range (TTR) (Section 5.4), Sandia National Laboratories (Section 5.6), and White Sands Missile Range (WSMR) (Section 5.7), there are no discussions of programmatic impacts for those sites. Section 5.10 discusses complex-wide transportation impacts. Section 5.11 provides a qualitative sensitivity analysis of hypothetically smaller stockpiles than the one established by the Moscow Treaty to identify any potential significant effects on the proposed actions and alternatives. Section 5.12 assesses the impacts of consolidating Category I/II special nuclear material (SNM).

A classified appendix to this SPEIS has been prepared 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 B (Section B.12.3) 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, the NNSA strategy for the mitigation of environmental impacts resulting from extreme events, including intentional destructive acts or terrorism, has three distinct components: 1) prevent or deter terrorists from making 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.

Depending on the malevolent, terrorist, or intentional destructive acts, impacts may be similar to or would exceed accident impact analyses prepared for the SPEIS. These data will provide NNSA with information upon which to base, in part, decisions regarding transformation of the Complex. The classified appendix evaluates several intentional destructive act scenarios for alternatives at the following sites (LANL [both at TA-16 and TA-55], LLNL, NTS, SRS, Pantex, and Y-12) and calculates consequences to the noninvolved worker, maximally exposed individual, and population in terms of radiation dose and LCFs. Although the results of the analyses cannot be disclosed in this unclassified SPEIS, the following general conclusion can be made: 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 inherent security features included in a new facility.

In addition to the discussion of the environmental impacts from the programmatic alternatives, Sections 5.13 through 5.18 discuss the potential impacts for the project-specific alternatives. These include the HE R&D, Tritium R&D, Flight Test Operations, Major Hydrodynamic Test Facilities, Major ETFs, and SNL/CA Weapon Support Functions. Section 5.19 presents the environmental impacts of tritium production in Tennessee Valley Authority reactors. Section 5.20 presents the environmental impacts of the SPEIS preferred alternatives.

5.1 LOS ALAMOS NATIONAL LABORATORY

This section discusses the potential environmental impacts associated with the following programmatic alternatives at Los Alamos:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. LANL would continue to perform its existing missions as described in Section 3.2.1, including production of up to 20 pits per year.
- **DCE Alternative.** This alternative includes a Consolidated Plutonium Center (CPC). For LANL, this SPEIS evaluates three approaches: 1) the Greenfield CPC in which an entirely new set of nuclear facilities would be constructed with a single-shift production capacity of 125 pits per year; 2) an Upgrade Alternative that would use existing and planned facilities at LANL with additional new construction to provide the capability to produce 125 pits per year; and 3) the 50/80 Alternative, which would use existing and planned facilities at LANL with minor additional construction that would be capable of producing approximately 50 to 80 pits per year (the "50/80 Alternative").
- **CCE Alternative.** This alternative includes two options: 1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, the Consolidated Uranium Center (CUC), and the Assembly/Disassembly/High Explosives (A/D/HE) Center at one site; and 2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC at one site, and the A/D/HE Center at Pantex or NTS. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE Center, 2020-2025).
- **Capability-Based Alternatives.** In the 2008 LANL SWEIS, NNSA assessed an alternative of establishing an interim pit fabrication capacity to provide 50 pits annually. Under the Capability-Based Alternative, NNSA would achieve that level of production but no more. Manufacturing pits in TA-55 at this level would likely cause only minor differences in impacts on land use, visual resources, water resources, geology and soils, air quality, noise, ecological resources, public health, cultural resources, and infrastructure (LANL 2008). As such, these resources are not discussed for the Capability-Based Alternative. This SPEIS focuses on impacts to worker health, socioeconomics, waste management, and transportation. Under the No Net Production/Capability-Based Alternative, LANL would decrease pit production to approximately 10 pits annually. Most changes at LANL for the No Net Production/Capability-Based Alternative would be minimal for all resource areas except worker health and waste management.

The impacts are presented below for each of the following resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management. Additionally, this section analyzes the potential impacts associated with phasing out Category I/II SNM operations at LANL if it is not selected for a CPC or CNPC/CNC. That analysis, which focuses on the changes to socioeconomics,

human health, accidents, and waste generation, is contained in the relevant resource areas within Section 5.1. For example, the discussion of socioeconomic impacts is contained in Section 5.1.9.5.

5.1.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.1.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.1.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
Greenfield Alternative	**Construction (acres)**	**Operation (acres)**	
	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	
CUC			
Construction (acres)	50		
Operation (acres)	Total Area: 35[b]		
	PIDAS	**Non-PIDAS**	
	15	20	
A/D/HE CENTER [d]			
Construction (acres)	300		
Operation (acres)	Total Area: 300[e]		
	PIDAS	**Non-PIDAS**	
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120	
CNC			
	Total Area: 195[f]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50	
CNPC			
	Total Area: 545[g]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100	

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.1.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional buildings or facilities would be built beyond those that NNSA has already decided to build, and no additional impacts on land use would occur at LANL beyond those of existing and future activities that are independent of this action. LANL has approximately 2,000 structures with approximately 8.6 million square feet under roof, spread over an area of approximately 25,600 acres. Table 5.1.1-2 presents the major LANL Technical Areas and associated facilities.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities

Technical Area [a]	Activities
TA-0 (Offsite Facilities)	This TA designation is assigned to structures leased by DOE that are located outside LANL's boundaries in the Los Alamos townsite and White Rock.
TA-2 (Omega Site or Omega West Reactor)	This TA in Los Alamos Canyon was home to the now demolished Omega West Reactor.
TA-3 (Core Area or South Mesa Site)	This TA is LANL's core scientific and administrative area, with approximately half of LANL's employees and total floor space. It is the location of a number of the LANL's Key Facilities, including the Chemistry and Metallurgy Research Building, the Sigma Complex, the Machine Shops, the Material Sciences Laboratory, and the Nicholas C. Metropolis Center for Modeling and Simulation. It is also the location proposed for operating the existing Biosafety Level 3 Facility.
TA-5 (Beta Site)	This TA is largely undeveloped. Located between East Jemez Road and the San Ildefonso Pueblo, it contains physical support facilities, an electrical substation, and test wells.
TA-6 (Two-Mile Mesa Site)	This TA, located in the northwestern part of LANL, is mostly undeveloped. It contains a meteorological tower, gas-cylinder-staging buildings, and aging vacant buildings that are awaiting demolition.
TA-8 (GT-Site [Anchor Site West])	This TA, located along West Jemez Road, is a testing site where nondestructive dynamic testing techniques are used for the purpose of ensuring the quality of materials in items ranging from test weapons components to high-pressure dies and molds. Techniques used include radiography, radioisotope techniques, ultrasonic and penetrant testing, and electromagnetic test methods.
TA-9 (Anchor Site East)	This TA is located on the western edge of LANL. Fabrication feasibility and the physical properties of explosives are explored at this TA, and new organic compounds are investigated for possible use as explosives.
TA-11 (K Site Environmental Test Facility)	This TA is used for testing explosives components and systems, including vibration analysis and drop-testing materials and components under a variety of extreme physical environments. Facilities are arranged so that testing may be controlled and observed remotely, allowing devices that contain explosives, radioactive materials, and nonhazardous materials to be safely tested and observed.
TA-14 (Q-Site)	This TA, located in the northwestern part of LANL, is one of 14 firing areas. Most operations are remotely controlled and involve detonations, certain types of high explosives machining, and permitted burning.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-15 (R-Site)	This TA, located in the central portion of LANL, is used for high explosives research, development, and testing, mainly through hydrodynamic testing and dynamic experimentation. TA-15 is the location of two firing sites, the Dual Axis Radiographic Hydrodynamic Test Facility, which has an intense high-resolution, dual-machine radiographic capability, and Building 306, a multipurpose facility where primary diagnostics are performed.
TA-16 (S-Site)	TA-16, in the western part of LANL, is the location of the Weapons Engineering Tritium Facility, a state-of-the-art tritium processing facility. The TA is also the location of high explosives research, development, and testing, and the High Explosives Wastewater Treatment Facility.
TA-18 (Pajarito Site)	This TA, located in Pajarito Canyon, is the location of the Los Alamos Critical Experiment Facility, a general-purpose nuclear experiments facility. It is the location of the Solution High-Energy Burst Assembly and is also used for teaching and training related to criticality safety and applications of radiation detection and instrumentation. In December 2002, NNSA decided to relocate all TA-18 Security Category I and II materials and activities to the Nevada Test Site; this transfer is in process.
TA-21 (DP-Site)	TA-21 is on the northern border of LANL, next to the Los Alamos townsite. In the western part of the TA is the former radioactive materials (including plutonium) processing facility that has been partially decontaminated and decommissioned. In the eastern part of the TA are the Tritium Systems Test Assembly and the Tritium Science and Fabrication Facility. Operations from both facilities have been transferred elsewhere as of the end of 2006.
TA-22 (TD-Site)	This TA, located in the northwestern portion of LANL, houses the Los Alamos Detonator Facility. Construction of a new Detonator Production Facility began in 2003. Research, development, and fabrication of high-energy detonators and related devices are conducted at this facility.
TA-28 (Magazine Area A)	TA-28, located near the southern edge of LANL, was an explosives storage area. The TA contains five empty storage magazines that are being decontaminated and decommissioned.
TA-33 (HP-Site)	TA-33 is a remotely-located TA at the southeastern boundary of LANL. The TA is used for experiments that require isolation, but do not require daily oversight. The National Radioastronomy Observatory's Very Long Baseline Array telescope is located at this TA.
TA-35 (Ten Site)	This TA, located in the north central portion of LANL, is used for nuclear safeguards research and development, primarily in the areas of lasers, physics, fusion, materials development, and biochemistry and physical chemistry research and development. The Target Fabrication Facility, located at this TA, conducts precision machining and target fabrication, polymer synthesis, and chemical and physical vapor deposition. Additional activities at TA-35 include research in reactor safety, optical science, and pulsed-power systems, as well as metallurgy, ceramic technology, and chemical plating. Additionally, there are some Biosafety Level 1 and 2 laboratories at TA-35.
TA-36 (Kappa-Site)	TA-36, a remotely-located area in the eastern portion of LANL, has four active firing sites that support explosives testing. The sites are used for a wide variety of non-nuclear ordnance tests.
TA-37 (Magazine Area C)	This TA is used as an explosives storage area. It is located at the eastern perimeter of TA-16.
TA-39 (Ancho Canyon Site)	TA-39 is located at the bottom of Ancho Canyon. This TA is used to study the behavior of non-nuclear weapons (primarily by photographic techniques) and various phenomenological aspects of explosives.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-40 (DF-Site)	TA-40, centrally located within LANL, is used for general testing of explosives or other materials and development of special detonators for initiating high explosives systems.
TA-41 (W-Site)	TA-41, located in Los Alamos Canyon, is no longer actively used. Many buildings have been decontaminated and decommissioned; the remaining structures include historic properties.
TA-43 (the Bioscience Facilities, formerly called the Health Research Laboratory)	TA-43 is adjacent to the Los Alamos Medical Center at the northern border of LANL. Two facilities are located within this TA: the Bioscience Facilities (formerly called the Health Research Laboratory) and NNSA's local Site Office. The Bioscience Facilities have Biosafety Level 1 and 2 laboratories and are the focal point of bioscience and biotechnology at LANL. Research performed at the Bioscience Facilities includes structural, molecular, and cellular radiobiology; biophysics; radiobiology; biochemistry; and genetics.
TA-46 (WA-Site)	TA-46, located between Pajarito Road and the San Ildefonso Pueblo, is one of LANL's basic research sites. Activities have focused on applied photochemistry operations and have included development of technologies for laser isotope separation and laser enhancement of chemical processes. The Sanitary Wastewater Systems Plant is also located within this TA.
TA-48 (Radiochemistry Site)	TA-48, located in the north central portion of LANL, supports research and development in nuclear and radiochemistry, geochemistry, production of medical radioisotopes, and chemical synthesis.
TA-49 (Frijoles Mesa Site)	TA-49, located near Bandelier National Monument, is used as a training area and for outdoor tests on materials and equipment components that involve generating and receiving short bursts of high-energy, broad-spectrum microwaves. A fire support building and helipad located near the entrance to the TA are operated by the U.S. Forest Service.
TA-50 (Waste Management Site)	TA-50, located near the center of LANL, is the location of waste management facilities including the Radioactive Liquid Waste Treatment Facility and the Waste Characterization, Reduction, and Repackaging Facility. The Actinide Research and Technology Instruction Center is also located in this TA.
TA-51 (Environmental Research Site)	TA–51, located on Pajarito Road in the eastern portion of LANL, is used for research and experimental studies on the long-term impacts of radioactive materials on the environment. Various types of waste storage and coverings are studied at this TA.
TA-52 (Reactor Development Site)	TA-52 is located in the north central portion of LANL. A wide variety of theoretical and computational research and development activities related to nuclear reactor performance and safety, as well as to several environmental, safety, and health activities, are carried out at this TA.
TA-53 (Los Alamos Neutron Science Center)	TA-53, located in the northern portion of LANL, includes the LANSCE. LANSCE houses one of the largest research linear accelerators in the world and supports both basic and applied research programs. Basic research includes studies of subatomic and particle physics, atomic physics, neutrinos, and the chemistry of subatomic interactions. Applied research includes materials science studies that use neutron spallation and contributes to defense programs. LANSCE has also produced medical isotopes for the past 20 years.
TA-54 (Waste Disposal Site)	TA-54, located on the eastern border of LANL, is one of the largest TAs at LANL. Its primary function is management of solid radioactive and hazardous chemical wastes, including storage, treatment, decontamination, and disposal operations.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-55 (Plutonium Facility Complex Site)	TA-55, located in the center of LANL, is the location of the Plutonium Facility Complex and is the chosen location for the Chemistry and Metallurgy Research Building Replacement. The Plutonium Facility provides chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. The Chemistry and Metallurgy Research Building Replacement, currently under construction, will provide chemistry and metallurgy research, actinide chemistry, and materials characterization capabilities.
TA-57 (Fenton Hill Site)	TA-57 is located about 20 miles (32 kilometers) west of LANL on land administered by the U.S. Forest Service. The primary purpose of the TA is observation of astronomical events. TA-57 houses the Milagro Gamma Ray Observatory and a suite of optical telescopes. Drilling technology research is also performed in this TA.
TA-58 (Twomile North Site)	TA-58, located near LANL's northwest border on Twomile Mesa North, is a forested area reserved for future use because of its proximity to TA-3. The TA houses a few LANL-owned storage trailers and a temporary storage area.
TA-59 (Occupational Health Site)	This TA is located on the south side of Pajarito Road adjacent to TA-3. This is the location of staff who provides support services in health physics, risk management, industrial hygiene and safety, policy and program analysis, air quality, water quality and hydrology, hazardous and solid waste analysis, and radiation protection. The Medical Facility at TA-59 includes a clinical laboratory and provides bioassay sample analytical support.
TA-60 (Sigma Mesa)	TA-60 is located southeast of TA-3. The TA is primarily used for physical support and infrastructure activities. The Nevada Test Site Test Fabrication Facility and a test tower are also located here. Due to the moratorium on testing, these buildings have been placed in indefinite safe shutdown mode.
TA-61 (East Jemez Site)	TA-61, located in the northern portion of LANL, contains physical support and infrastructure facilities, including a sanitary landfill operated by Los Alamos County and sewer pump stations.
TA-62 (Northwest Site)	TA-62, located next to TA-3 and West Jemez Road in the northwest corner of LANL, serves as a forested buffer zone. This TA is reserved for future use.
TA-63 (Pajarito Service Area)	TA-63, located in the north central portion of LANL, contains physical support and infrastructure facilities. The facilities at this TA serve as localized storage and office space.
TA-64 (Central Guard Site)	This TA is located in the north central portion of LANL and provides offices and storage space.
TA-66 (Central Technical Support Site)	TA-66 is located on the southeast side of Pajarito Road in the center of LANL. The Advanced Technology Assessment Center, the only facility at this TA, provides office and technical space for technology transfer and other industrial partnership activities.
TA-67 (Pajarito Mesa Site)	TA-67 is a forested buffer zone located in the north central portion of LANL. No operations or facilities are currently located at the TA.
TA-68 (Water Canyon Site)	TA-68, located in the southern portion of LANL, is a testing area for dynamic experiments that also contains environmental study areas.
TA-69 (Anchor North Site)	TA-69, located in the northwestern corner of LANL, serves as a forested buffer area. The new Emergency Operations Center, completed in 2003, is located here.
TA-70 (Rio Grande Site)	TA-70 is located on the southeastern boundary of LANL and borders the Santa Fe National Forest. It is a forested TA that serves as a buffer zone.

Table 5.1.1-2—Major LANL Technical Areas and Associated Facilities (continued)

Technical Area [a]	Activities
TA-71 (Southeast Site)	TA-71 is located on the southeastern boundary of LANL and is adjacent to White Rock to the northeast. It is an undeveloped TA that serves as a buffer zone for the High Explosives Test Area.
TA-72 (East Entry Site)	TA-72, located along East Jemez Road on the northeastern boundary of LANL, is used by protective force personnel for required firearms training and practice purposes.
TA-73 (Airport Site)	TA-73 is located along the northern boundary of LANL, adjacent to Highway 502. The County of Los Alamos manages, operates, and maintains the community airport under a leasing arrangement with DOE. Use of the airport by private individuals is permitted with special restrictions.
TA-74 (Otowi Tract)	TA-74 is a forested area in the northeastern corner of LANL. A large portion of this TA has been conveyed to Los Alamos County or transferred to the Department of the Interior in trust for the Pueblo of San Ildefonso and is no longer part of LANL.

TA = technical area, LANSCE = Los Alamos Neutron Science Center.
[a] Names in parentheses are common or historical names that are sometimes used to refer to the Technical Areas.

5.1.1.2 *DCE Alternative*

5.1.1.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. At LANL, which has an R&D facility (the Plutonium Facility [PF-4] at TA-55), there would be three separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; and Manufacturing. These buildings would be surrounded by a Perimeter Intrusion Detection and Assessment System (PIDAS) and a buffer area. The area outside the PIDAS would have a number of smaller support facilities, a Waste Staging/Transuranic (TRU) Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be used for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two heating, ventilation, and air conditioning (HVAC) exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be High Efficiency Particulate Air (HEPA)-filtered prior to discharge through the stacks. The reference location for the CPC is Technical Area (TA)-55, a 93-acre site 1.1 miles from the townsite of Los Alamos. Approximately one-half of TA-55 is developed. A CPC would change land use in this area. In addition, there might be a modification to the current land use designation, Nuclear Materials R&D, for this area.

An estimated 140 acres of land for buildings, walkways, access, parking, buffer space, and construction-related workspace would be required to construct a CPC. NNSA believes that, should Los Alamos be selected as the CPC site, the proposed facility design could be adapted to the available space. For example, approximately 40 acres of the CPC would require protection within a PIDAS. TA-55 has adequate land available to accommodate this protected area. Additionally, the Greenfield CPC includes acreage for support facilities, waste management facilities, and parking. These would not necessarily be located at TA-55 if Los Alamos were

selected for a Greenfield CPC. If the Los Alamos site were selected to host a CPC, a tiered EIS would serve to explore all reasonable siting options. The land required for the proposed CPC construction would represent approximately 0.55 percent of LANL's total land area of 25,600 acres. The developed area after construction would be approximately 110 acres.

Operations. An estimated 110 acres of land would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent approximately 0.4 percent of Los Alamos' total land area of 25,600 acres. Although there would be a change in land use (to nuclear materials production), the proposed CPC is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.2.2 Upgrade Alternative

Construction. As described in Section 3.4.1.6.1, in the Upgrade Alternative, NNSA would build the Chemistry and Metallurgy Research Replacement- Nuclear Facility (CMRR-NF), and construct a new facility (known as the "Manufacturing Annex") to augment pit-manufacturing capacity and related infrastructure capacity. The reference location for the CPC under this approach is in the area of TA-55. Land use at TA-55 has been categorized as R&D. TA-55 is a 93-acre site that is situated 1.1 miles from the townsite of Los Alamos. An estimated 13 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CMRR-NF and Manufacturing Annex at TA-55. The land required for this facility would represent approximately 14 percent of the total area at TA-55, and approximately 28 percent of the undeveloped area at TA-55.

Operations. As described in Section 3.4.1.6.1, the Upgrade Alternative would be expected to operate similar to the Greenfield CPC at LANL. An estimated 6.5 acres of additional land for buildings, walkways, building access, parking, and buffer space would be required to operate the Upgrade Alternative. Although there would be a change in land use (to nuclear materials production), the proposed CPC is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.2.3 50/80 Alternative

Construction. As described in Section 3.4.1.6.2, the 50/80 Alternative would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 to produce approximately 80 pits for the stockpile per year. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or consolidated within PF-4. Additionally, this alternative includes the CMRR-NF facility,[1] which would be expanded by approximately 9,000 square feet to approximately 209,000 square feet, to accommodate pit manufacturing operations. The construction activities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint, with 6.5 acres of total area disturbed during construction. The area required for the permanent

[1] The CMRR, which is approximately 400,000 square feet, consists of both a nuclear and non-nuclear facility. The nuclear facility is approximately one-half of the CMRR.

footprint would represent approximately 2.7 percent of the total land area at TA-55, and approximately 5.4 percent of the undeveloped land at TA-55.

Operations. The operation of the 50/80 Alternative would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint. Although there would be a change in land use (to nuclear materials production), the 50/80 Alternative is compatible with land use plans. No impacts to LANL land use plans or policies are expected.

5.1.1.3 *CCE Alternative*

5.1.1.3.1 CNC (CPC + CUC)

Land use impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.1.2 as well as the impacts discussed below.

***Construction:* CUC.** As described in Section 3.5.1.1, the CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, operations at the CUC would require approximately 35 acres. All buildings would be either one or two stories.

The land required for the proposed CUC construction would represent approximately 0.20 percent of LANL's total land area of 25,600 acres. Approximately 15 acres of the CUC would require protection within a PIDAS. TA-55 has adequate land available to accommodate this protected area. NNSA believes that, should Los Alamos be selected for the CUC (as part of a CNPC), the proposed facility design could be adapted to the space available. For example, some of the walkway, building access, parking and buffer space already allocated for TA-55 facilities could serve the CNC buildings as well so that less total acreage would be required. If the Los Alamos site were selected to host the CUC, a tiered EIS would serve to explore all reasonable siting options. Additionally, as explained in Section 5.1.1.3.2, the reference site for the full CNPC is TA-16, which affords a significant amount of undeveloped land at Los Alamos to host facilities such as the CUC.

Although there would be a change in land use, the proposed CUC is compatible with land use plans for this area. No impacts to Los Alamos land use plans or policies are expected.

***Operations:* CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNC. Of this, approximately 55 acres would be located within a PIDAS. This would be approximately 10 acres more than the undeveloped land available at TA-55. NNSA believes that, should Los Alamos be selected for the CUC (as part of a CNC), the facility design could be adapted to the space available. Administrative support buildings and non-nuclear component production would require approximately 90 acres area outside of the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. The total land required to support CNC operations would represent approximately 1 percent of LANL's total land area of 25,600 acres.

The CNC could be located in the existing TA-55 location, which would change land use in this area. Additionally, as explained in the next section, there is an alternative to locate the CNC at TA-16, as part of a full CNPC.

5.1.1.3.2 CNPC (CPC + CUC + A/D/HE Center)

Land use impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.1.2.1, the CUC construction impacts discussed in Section 5.1.1.3.1, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** As described in Section 3.5, the Assembly/Disassembly/High Explosives (A/D/HE) Center would consist of a nuclear facility within the PIDAS and high explosives facilities and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for the A/D/HE Center. Approximately 180 acres would be protected within a PIDAS.

The reference location for the A/D/HE Center (and CNPC) at LANL is TA-16, which consists of approximately 1,900 acres. TA-16, located in the western part of LANL, is the site of the Weapons Engineering Tritium Facility, which is a state-of-the-art tritium processing facility, and the High Explosives Wastewater Treatment Facility. The TA's high explosives research, development, and testing capabilities include high explosives processing; powder manufacturing; casting, machining, and pressing; inspection and radiography of high explosives components to guarantee integrity and ensure quality control; test device assembly; and chemical analysis. There are also some biological laboratories here. Approximately one-third of TA-16 is developed, and the other two-thirds of the TA are undeveloped. As such, there are a total of approximately 1,350 acres available at TA-16 for Complex Transformation facilities.

The land required for the proposed A/D/HE Center construction would represent approximately 1.2 percent of LANL's total land area of 25,600 acres, and approximately 22 percent of the available land at TA-16. Although there would be a change in land use, the proposed A/D/HE Center would be compatible with land use plans, although there might be a modification to the current land use designation, High Explosive R&D, for this area.

Operations: **CNPC.** As described in Section 3.5.1.2, an estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the full CNPC. Of this, approximately 235 acres would be located within a PIDAS. Administrative support buildings, non-nuclear component production, and high explosives fabrication activities would occur on approximately 210 acres outside the PIDAS. A 100-acre buffer zone would also be located outside the PIDAS. The land required for CNPC operations would represent approximately 2.3 percent of LANL's total land area of 25,600 square miles.

5.1.2 Visual Resources

5.1.2.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. The Cerro Grande Fire of 2000 altered views of LANL from various locations in Los Alamos County. While many LANL facilities are still generally screened from view, some developed areas that were previously screened by vegetation are now more visible to passing traffic (LANL 2008).

5.1.2.2 *DCE Alternative (CPC)*

5.1.2.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, the CPC would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for the Greenfield CPC Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Thus, impacts on visual resources during construction would be minimal.

Operations. The Greenfield CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of TA-55. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV Bureau of Land Management (BLM) Visual Resource Management rating of developed areas within TA-55.

5.1.2.2.2 Upgrade Alternative

Construction. Activities related to the construction of new buildings (CMRR-NF and Manufacturing Annex) required for the Upgrade Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, new buildings being constructed, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Moreover, this change would be consistent with the currently developed areas of TA-55. Thus, impacts on visual resources during construction would be minimal.

Operations. The Upgrade Alternative would include two new two-story buildings. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

5.1.2.2.3 50/80 Alternative

Construction. Activities related to the construction of the CMRR-NF required for the 50/80 Alternative would result in a change to the visual appearance at TA-55 due to the presence of construction equipment, a new building, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. Thus, impacts on visual resources during construction would be minimal.

Operations. The 50/80 Alternative would not change the appearance of TA-55. While not visible from lower elevations, the CMRR-NF would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

5.1.2.3 *CCE Alternative*

5.1.2.3.1 CNC (CPC + CUC)

Visual resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.2.2 as well as the impacts discussed below.

***Construction:* CUC.** Construction activities for the CUC are described in Section 3.5.1.1.1. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

***Operations:* CNC.** The CNC (consisting of the CPC and CUC) would include one- and two-story buildings that would change the appearance of the reference location. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be

consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 would not change the current Class IV BLM Visual Resource Management rating of developed areas.

5.1.2.3.2 CNPC (CPC + CUC + A/D/HE Center)

Visual Resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.2.2, the CUC construction and CNC operational impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** Construction activities for the A/D/HE Center are described in Section 3.5.1.2. In 2000, the Cerro Grande Fire swept across TA-16, burning V-Site (an inoperable historic Manhattan Project era site), but all other buildings were placed into a safe closed condition, and fire personnel bulldozed a fire line around the Weapons Engineering Tritium Facility. While not visible from lower elevations, the new facilities at TA-16 would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-16 area). However, this change would be consistent with the currently developed areas of TA-16. Thus, new construction within TA-16 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-16.

Bandelier National Monument is an important area from which LANL may be viewed. Separate units of the Monument border LANL to the south (Main Unit) and northeast (Tsankawi Unit). Views from the Main Unit along NM 4 are of a generally natural landscape, although there are instances where LANL structures are visible. These include miscellaneous buildings and infrastructure located in TA-33, several facilities and infrastructure associated with TA-49, and TA-16 facilities located east of NM 501 near where it meets NM 4.

***Operations:* CNPC.** The CNPC would be a large complex of industrial facilities, parking lots, and a buffer area encompassing approximately 545 acres. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures. However, this change would be consistent with the currently developed areas of TA-16. Thus, new construction within TA-16 boundaries would likely not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-16.

5.1.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.1.5). Other infrastructure demands, such as fuels or industrial gases, are commodities that not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS. In general, these commodities are readily available, could be purchased, and would not affect site selection decisions.

5.1.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to infrastructure beyond current/planned activities that are independent of this action. The current power pool peak load capacity is 150 megawatts-electric [MWe]) and current usage is approximately 70 MWe for LANL and approximately 18 MWe for other Los Alamos County users. (LANL 2008).[2] As such, the available capacity is 63 MWe. LANL and Los Alamos County uses approximately 550,870 megawatt-hours (MWh)/yr of electricity. Based on a system capacity 1,314,000 MWh/yr, approximately 763,130 MWh/yr is available (LANL 2008).

5.1.3.2 *DCE Alternative (CPC)*

Construction. The projected demand on electrical resources associated with construction activities of the three approaches for the DCE Alternative at LANL (Greenfield CPC, Upgrade Alternative, and 50/80 Alternative) are shown in Table 5.1.3–1. The existing electrical infrastructure at LANL would be adequate to support annual construction requirements for the CPC.

Table 5.1.3-1—Annual Electrical Requirements for Construction of CPC, CUC, and the A/D/HE Center at LANL

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
System capacity[a]	1,314,000	150
Available capacity[a]	763,130	63
No Action Alternative		
Total site requirement[b]	550,870	87
Percent of system capacity	42%	58%
Greenfield CPC		
CPC requirement	13,000	3.0
Percent of system capacity	1%	2%
Percent of available capacity	1.7%	4.8%
Upgrade Alternative		
CPC requirement	8,760	2.0
Percent of system capacity	<1%	1.5%
Percent of available capacity	<1%	3.2%
50/80 Alternative		
CPC requirement	4,380	1.0
Percent of system capacity	<1%	<1%
Percent of available capacity	<1%	1.6%
CUC		
CUC requirement	10,950	2.5
Percent of system capacity	<1%	1.7%
Percent of available capacity	1.4%	4.0%

[2] "Electrical energy and peak load capacity reflect the current import capacity of the electric transmission lines that deliver electric power to the Los Alamos Power Pool, as well as the completion of upgrades at the TA-3 Co-Generation Complex, which has added 40 MW of generating capacity. Values do not reflect completion of a new transmission line and other ongoing electrical power system upgrades."

Table 5.1.3-1—Annual Electrical Requirements for Construction of CPC, CUC, and the A/D/HE Center at LANL (continued)

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
A/D/HE Center		
A/D/HE Center requirement	55,000	12.7
Percent of system capacity	4.2%	8.5%
Percent of available capacity	7.2%	20%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.
[b] Electrical site capacity and requirements are for Los Alamos Power Pool, which include LANL and other Los Alamos County users.

5.1.3.2.2 Operations

The estimated annual electrical requirements for the three approaches for the DCE Alternative at LANL (Greenfield CPC, Upgrade Alternative, and 50/80 Alternative) are shown in Table 5.1.3-2. The existing electrical infrastructure would be adequate to support annual operations.

5.1.3.3 *CCE Alternative*

5.1.3.3.1 CNC (CPC + CUC)

Site electrical impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.3.2 as well as the impacts discussed below.

Construction: **CUC.** The estimated site electrical requirements for construction of the CUC are presented in Table 5.1.3-1. The existing electrical infrastructure would be adequate to support annual construction requirements for the CUC.

Table 5.1.3-2—Annual Site Infrastructure Requirements for Operation of the CPC, CUC, CNC, A/D/HE Center and the CNPC at LANL

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
System capacity[a]	1,314,000	150
Available capacity[a]	763,130	63
No Action Alternative		
Total site requirement[b]	550,870	87
Percent of system capacity	42%	58%
Greenfield CPC/Upgrade		
CPC requirement	48,000	11
Percent of system capacity	3.6%	7.3%
Percent of available capacity	6.3%	17.5%
50/80 Alternative		
CPC requirement	44,000	10
Percent of system capacity	3.3%	6.7%
Percent of available capacity	5.8%	15.9%

Table 5.1.3-2—Annual Site Infrastructure Requirements for Operation of the CPC, CUC, CNC, A/D/HE Center and the CNPC at LANL (continued)

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
CUC		
CUC requirement	168,000	18.4
Percent of system capacity	12.8%	12.3%
Percent of available capacity	22%	29.2%
CNC (Greenfield or Upgrade Alternative CPC + CUC)		
CNC requirement	216,000	29.4
Percent of system capacity	16.4%	19.6%
Percent of available capacity	28.3%	46.7%
CNC (50/80 Alternative + CUC)		
CNC requirement	212,000	28.4
Percent of system capacity	16.1%	18.9%
Percent of available capacity	27.8	45.1%
A/D/HE Center		
A/D/HE Center requirement	52,000	11.9
Percent of system capacity	3.9%	7.9%
Percent of available capacity	6.8%	18.9%
CNPC (Greenfield and Upgrade Alternative + CUC + A/D/HE Center)		
CNPC requirement	264,000	41.3
Percent of system capacity	20.1%	27.5%
Percent of available capacity	34.6%	65.6%
CNPC (50/80 Alternative + CUC + A/D/HE Center)		
CNPC requirement	260,000	40.3
Percent of system capacity	19.9%	26.9%
Percent of available capacity	34%	64%

Source : NNSA 2007.
[a] Not limited due to offsite procurement.
[a] Electrical system capacity and current requirements are for the entire Los Alamos Power Pool, which include LANL and other Los Alamos County users.

***Operations:* CNC.** The core operations of the CNC would be similar to the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site electrical requirements for operation of the CNC are presented in Table 5.1.3-2. Although the CNC operations would not exceed LANL electrical power capacity, the peak load could approach approximately 70 percent of the system capacity.

5.1.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site infrastructure impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** The estimated site infrastructure requirements for construction of the A/D/HE Center are presented in Table 5.1.3-1. The existing electrical infrastructure at LANL would be adequate to support annual construction requirements for the A/D/HE Center for the projected 6-year construction period.

Operations: **CNPC.** The core operations of the CNPC are discussed in Section 3.5.1. The estimated annual site infrastructure requirements for operation of the CNPC are presented in Table 5.1.3-2. The current power pool total electric energy capacity is 1,314,000 megawatt-hours (MWh) (based on a nominal peak load of approximately 150 MWe). The most recent data shows a peak load of approximately 69.5 MWe from LANL and 18.3 MWe from the county for a total peak load of 87 MWe (LANL 2008). Operation of a CNPC would have the potential to use approximately 65.6 percent of the peak power capacity that is available.

5.1.4 Air Quality and Noise

5.1.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The area encompassing LANL and Los Alamos County is classified as an attainment area for all six criteria pollutants. Simultaneous operation of LANL's air emission sources at maximum capacity, as described in the Title V permit application, would not exceed any state or Federal ambient air quality standards.

5.1.4.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of a CPC, or upgrades to existing facilities at LANL, 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 less than 10 microns in diameter (PM_{10}), total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the U.S. Environmental Protection Agency (EPA) document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicle) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.1.4-1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the LANL site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.1.4-1—Estimated Peak Nonradiological Air Emissions for CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)	Estimated Annual Emission Rate (metric tons/yr)	Estimated Annual Emission Rate (metric tons/yr)
	Greenfield CPC	Upgrade[a]	50/80
Carbon monoxide	409.6	NA	57
Carbon dioxide	7,084.2	NA	52
Nitrogen dioxide	177.7	NA	0.12
Sulfur dioxide	11.6	NA	0.04
Volatile organic compounds	28.7	NA	3.2
PM_{10}	686	NA	0.34
Total Suspended Particulates	915	NA	46.8

Source: NNSA 2007.
[a] Construction of the Upgrade Alternative would be similar in size and scope as the CMRR construction. See Table 5.1.4-2 for the maximum incremental concentrations associated with construction.

Table 5.1.4-2—Incremental Concentrations for CPC Upgrade Alternative–Construction

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (µg/m^3)	Maximum Incremental Concentration (µg/m^3)[b]	
			Baseline [b]	Upgrade
Carbon monoxide	8-hour	7,900	192.4	22.8
	1-hour	11,900	1,071	182
Nitrogen dioxide	Annual	75	7.0	0.86
	24-hour	150	40.2	23.1
Sulfur dioxide	Annual	42	10.2	0.079
	24-hour	209	83.5	2.26
	3-hour	1,050	397.3	18.1
PM_{10}	Annual	50	5.24	2.02
	24-hour	150	101.6	34.4
Total Suspended Particulates	Annual	60	5.7	3.96
	24-hour	150	135	66.7

NA = not available.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (µg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).
[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Radiological impacts. No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, U.S. Department of Energy (DOE) would survey potentially

affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Nonradiological impacts. Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, volatile organic compounds (VOCs), and total suspended particulates. The estimated emission rates for nonradiological pollutants emitted are presented in Table 5.1.4–3. For a Greenfield CPC, a portion of these emissions would be offset by the transfer of current pit manufacturing activities to the new facilities. However, in general, the emissions would be incremental to the LANL baseline. If LANL is selected as the site for a CPC, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

Table 5.1.4–3—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

As part of a previous evaluation of the impact of air emissions, NNSA consulted the Guidance on *Clean Air Act* (CAA) Conformity requirements (DOE 2000a). It determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

The maximum concentrations (micrograms per cubic meter) at the LANL site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.1.4-4. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For most pollutants, incremental concentration increases would generally be small (less than 5 percent). The greatest increase would occur for total suspended

particulates (TSP), which could increase by approximately 28 percent. Because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Radiological impacts. Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

Table 5.1.4-4—Criteria Pollutant Concentrations for CPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] ($\mu g/m^3$)	Maximum Incremental Concentration ($\mu g/m^3$)[b]			
			Baseline [b]	CPC	Upgrade	50/80
Carbon monoxide	8-hour	7,900	192.4	2.58	2.58	1.0
	1-hour	11,900	1,071	3.66	3.66	1.4
Nitrogen dioxide	Annual	75	7.0	1.28	1.28	0.51
	24-hour	150	40.2	NA	NA	NA
Sulfur dioxide	Annual	42	10.2	0.06296	0.06296	0.03
	24-hour	209	83.5	0.454	0.454	0.17
	3-hour	1,050	397.3	0.992	0.992	0.38
PM_{10}	Annual	50	5.24	0.0356	0.0356	0.01
	24-hour	150	101.6	0.18	0.18	0.07
Total Suspended Particulates	Annual	60	5.7	NA	NA	NA
	24-hour	150	135	38.2	38.2	15

Source: Janke 2007.
NA = not available.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (µg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

NNSA estimated routine radionuclide air emissions (see Table 5.1.4-5). To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations are expected to be smaller. NNSA estimated the radiation doses to the offsite maximally exposed individual (MEI) and the offsite population surrounding LANL.

Table 5.1.4-5—Annual Radiological Air Emissions for CPC at LANL–Operations

Isotope	Baseline[a, b]	Annual Emissions (Curies [Ci]/yr)[c]	Annual Emissions (Ci/yr)[c]
		CPC (200 ppy)[d]	50/80
Americium-241	2.6×10^{-7}	3.12×10^{-7}	1.72×10^{-8}
Plutonium-239		1.02×10^{-5}	5.38×10^{-7}
Plutonium-240		2.66×10^{-6}	1.40×10^{-7}
Plutonium-241		1.96×10^{-4}	1.03×10^{-5}
Total Plutonium	**9.3×10^{-6}**	**2.09×10^{-4}**	**1.1×10^{-5}**
Uranium-234		5.02×10^{-9}	2.52×10^{-10}
Uranium-235		1.58×10^{-10}	7.95×10^{-12}
Uranium-236		2.56×10^{-11}	1.28×10^{-12}
Uranium-238		1.42×10^{-12}	7.14×10^{-14}
Total Uranium	**7.3×10^{-6}**	**5.21×10^{-9}**	**2.62×10^{-10}**
Total	**1.7×10^{-5}**	**2.09×10^{-4}**	**1.1×10^{-5}**

[a] Based on calendar year 2001 data.
[b] The No Action Alternative is represented by the baseline.
[c] Source: NNSA 2007.
[d] Data for a CPC producing 200 ppy is applicable to both the Greenfield CPC and the Upgrade Alternative.

As shown in Table 5.1.4-6, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 millirem (mrem) per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the CPC resulting from radiological air emissions are presented in Section 5.1.11.

Table 5.1.4-6—Annual Doses Due to Radiological Air Emissions from CPC Operations at LANL

Receptor	CPC	50/80
Offsite MEI[a] (mrem/yr)	1.5×10^{-4}	7.7×10^{-6}
Population within 50 miles (person-rem per year)[a]	6.0×10^{-4}	3.2×10^{-5}

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.1.4-5 and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.1.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud intermittent sources such as blasting. Although noise levels in construction areas could be as high as 110 A-weighted decibels (dBA), these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.1.4-7 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 1 mile) there would

be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.1.4-7—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by Occupational Safety and Health Administration (OSHA) in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 1 mile) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented

appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.1.4.3 *CCE Alternative*

5.1.4.3.1 CNC (CPC + CUC)

Air Quality and Noise impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.4.2 as well as the impacts discussed below for the CUC.

5.1.4.3.1.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for the CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.1.4-1 would be representative of the CUC. Actual construction emissions of the CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts.

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* CUC and CNC nonradiological impacts.** CUC (and CNC) activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. This derivation did not include steam production at Y-12, which is responsible for approximately 90 percent of the nonradiological emissions at Y-12. The nonradiological pollutants were modeled to determine the incremental concentrations from the CUC to the LANL baseline. The results are presented in Table 5.1.4-8. Because estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. The CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded; however, as noted in Section 5.1.2.1, because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard for the CNC.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does

not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.1.4-8—Criteria Pollutant Concentrations for CNC Operations at Los Alamos

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (µg/m^3)	Maximum Incremental Concentration(µg/m^3)			
			Baseline	CPC	CUC	CNC
Carbon monoxide	8-hour	7,900	192.4	2.58	NA	2.58
	1-hour	11,900	1,071	3.66	NA	3.66
Nitrogen dioxide	Annual	75	7.0	1.28	0.9	2.18
	24-hour	150	40.2	NA	NA	NA
Sulfur dioxide	Annual	42	10.2	0.06296	2.1	2.16
	24-hour	209	83.5	0.454	2.1	2.5
	3-hour	1,050	397.3	0.992	52.4	53.4
PM_{10}	Annual	50	5.24	0.0356	17.5	17.5
	24-hour	150	101.6	0.18	17.5	17.7
Total Suspended Particulates	Annual	60	5.7	NA	NA	NA
	24-hour	150	135	38.2	NA	38.2

Source: Janke 2007.
NA = not available.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (µg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

CUC and CNC radiological impacts. The CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of the CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing Enriched Uranium (EU) facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from the CUC are conservatively estimated[3] from existing operations at Y-12. An estimated 0.010 curies (2.17 kilograms) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding LANL, and LANL workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding LANL. As shown in Table 5.1.4-9, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE

[3] This estimate is considered "conservative" because it is expected that a new uranium facility would produce smaller radiological airborne emissions than radiological airborne emissions from existing EU facilities at Y-12 due to the incorporation of newer technology into the facility design.

(DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the CUC resulting from radiological air emissions are presented in Section 5.1.11, Human Health and Safety.

Table 5.1.4-9—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations at LANL

Receptor	CUC	CNC
Offsite MEI[b] (mrem/yr)	0.077	0.077
Population within 50 miles (person-rem per year)	0.23	0.23

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. Bounding MEI dose is for a CUC at TA-55. Bounding population dose is for a CUC at TA-16.
[b] The offsite MEI is assumed to reside at the site boundary.

5.1.4.3.1.2 Noise

Construction: **CUC.** Anticipated noise impacts from the construction of the CUC are similar to those described for the CPC in Section 5.1.4.2.2.

Operations: **CUC and CNC.** Anticipated noise impacts from the operation of the CNC are similar to those described for the CPC in Section 5.1.4.2.2.

5.1.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air Quality and Noise impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.1.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.1.4.3.2.1 Air Quality

Construction: **A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for the CPC and CUC. However, due to the potential to disturb approximately 300 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent.

The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.1.4–10. Actual construction emissions are expected to be less, since

conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.1.4-10—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	267
24-hour	150	1,950

Source: Janke 2007.

The results presented above represent a bounding estimate of PM_{10} emissions at the site boundary. These estimates are very conservative in choice of the stability class and the source term. The source strength was assumed to come from a relatively concentrated area for application to the Gaussian Plume equation. Use of an area source would not reduce the emissions by an order of magnitude. Therefore, the results in the table potentially overestimate the impact by about a factor of 5. Based on this analysis, a more detailed site-specific analysis would need to be performed, using project-specific information, if Los Alamos is selected for a CNPC. If that analysis shows that regulatory limits would be exceeded, then mitigation measures would need to be developed.

A/D/HE Center radiological impacts. No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and what would be required to remediate any contamination in accordance with established site procedures.

***Operations:* A/D/HE Center and CNPC nonradiological impacts.** The CNPC would release nonradiological contaminants into the atmosphere during operations. The CPC and CUC nonradiological emissions are discussed in sections 5.1.4.2.1 and 5.1.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of the CNPC would be additive of the CPC, CUC, and the A/D/HE Center (which is discussed in this section). During normal operations, the A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.1.4-11. These emissions would add to the LANL baseline.

Table 5.1.4-11—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS Emissions	Emissions
Oxides of Nitrogen (tons/year)	91
Carbon Monoxide (tons/year)	31
Volatile Organic Compounds (tons/year)	31
Particulate Matter (tons/year)	18
Sulfur Dioxide (tons/year)	5
Hazardous Air Pollutants and Effluents (tons/yr)	22

Source: NNSA 2007.

The maximum concentrations (micrograms per cubic meter) at the LANL site boundary that would be associated with the release of criteria pollutants presented in Table 5.1.4-12. These concentrations were compared to the more stringent (Federal or state) ambient air quality

standards. As shown in that table, there would be a potential to exceed the 24-hour standard for nitrogen dioxide and the 24-hour standard for TSP. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are over estimated. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Table 5.1.4-12—Criteria Pollutant Concentrations for CNPC–Operations

Pollutant	Averaging Period	More Stringent Standard or Guideline [a] (µg/m^3)	Maximum Incremental Concentration (µg/m^3)			Total[b]
			Baseline	A/D/HE	CNPC	Maximum Concentration (µg/m^3)
Carbon monoxide	8-hour	7,900	192.4	90.6	93.2	285.6
	1-hour	11,900	1,071	274.7	278.4	1,349.4
Nitrogen dioxide	Annual	75	7.0	16.5	18.7	25.7
	24-hour	150	40.2	120.9	120.9	161.1
Sulfur dioxide	Annual	42	10.2	0.9	3.1	13.3
Sulfur dioxide	24-hour	209	83.5	6.6	9.1	92.6
	3-hour	1,050	397.3	29.2	82.6	479.9
PM_{10}	Annual	50	5.2	3.3	20.8	26
	24-hour	150	101.6	23.9	41.6	143.2
Total Suspended Particulates	Annual	60	5.7	4	4	9.7
	24-hour	150	135	29.2	67.4	202.4

Source: Janke 2007.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter (µg/m3) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).
[b]The Total concentration for each criteria pollutant is comprised of the baseline concentration and the CNPC concentration for each criteria pollutant.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

A/D/HE Center and CNPC radiological impacts. The CNPC would release radiological contaminants into the atmosphere during operations. The CPC and CUC radiological emissions are discussed in sections 5.1.4.2.1 and 5.1.4.3.1 respectively, and are not repeated here. The total radiological air impacts of the CNPC would be additive of the CPC, CUC, and the A/D/HE Center (which is discussed in this section).

During normal operations, the A/D/HE Center would release radionuclides to the air in the quantities indicated in Table 5.1.4-13.

Table 5.1.4-13—Annual Radiological Air Emissions for A/D/HE Center Operations

Radionuclide	Emissions (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Radiological Releases (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding LANL, and LANL workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding LANL. As shown in Table 5.1.4-14, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the A/D/HE Center resulting from radiological air emissions are presented in Section 5.1.11, Human Health and Safety.

Table 5.1.4-14—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations at LANL

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	5.8×10^{-5}	0.077
Population within 50 miles (person-rem per year)	1.3×10^{-4}	0.23

Source: Tetra Tech 2008.
Results calculated using CAP-88 computer code, version 3. CNPC data is presented for CPC at TA-55, CUC at TA-16 (MEI dose), CUC at TA-16 (population dose), and A/D/HE Center at TA-16.
[a] The offsite MEI is assumed to reside at the site boundary.

5.1.4.3.2.2 Noise

***Construction:* A/D/HE Center.** Anticipated noise impacts from the construction of the CNPC would be similar to those described for the CPC in Section 5.1.4.2.

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of the A/D/HE Center and CNPC would be similar to those described for the CPC in Section 5.1.4.2.

5.1.4.4 *Capability-Based Alternatives*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Increases in the level of activities at the Plutonium Facility Complex would cause a small increase in plutonium emissions. The higher level of activity would result in the annual emission of an additional 0.000019 curies per year of plutonium from the Plutonium Facility Complex. Under the No Net Production/Capability-Based Alternative, NNSA would decrease pit production above the current level of 20 pits annually to 10 pits annually. Decreases in the level of activities at the Plutonium Facility Complex would cause a small decrease in plutonium emissions. The impacts to human health are addressed in Section 5.11.

5.1.5 Water Resources

Environmental impacts associated with the programmatic alternatives at Los Alamos could affect groundwater resources. No impacts to surface water are expected. LANL uses approximately 380 million gallons of groundwater. Discharges were in compliance with permits.

5.1.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. Tables 5.1.5–1 and 5.1.5-2 summarize existing surface water and groundwater resources at Los Alamos, the total water resource requirements for each alternative, and the potential changes to water resources resulting from the programmatic alternatives.

Table 5.1.5-1—Potential Changes to Water Resources from the Construction of the CPC, CUC and A/D/HE Center at LANL

Proposed Alternatives	Water Availability and Use
Annual Water Rights (gal):	542,000,000
No Action Alternative	
Water Use (gal)	380,000,000
Greenfield CPC and Upgrade Alternative	
Water Requirement (gal)	20,900,000
Percent Change from No Action	5.5%
50/80 Alternative	
Water Requirement (gal)	550,000
Percent Change from No Action	<1%
CUC	
Water Requirement (gal)	5,200,000
Percent change from No Action Alternative	1.4%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent change from No Action Alternative	<1%

Source: LANL 2008.

Table 5.1.5-2—Water Requirements for Operation of the CPC, CUC and A/D/HE Center

Proposed Alternatives	Water Availability and Use
Annual Water Rights (gal)	542,000,000
Water Use (gal)	380,000,000
Greenfield CPC and Upgrade Alternative	
Water Requirement (gal)	80,000,000
Percent Change from No Action Alternative	21%
Total Water Use/ Water Rights Exceeded?	460,000,000/No

Table 5.1.5-2—Water Requirements for Operation of the CPC, CUC and A/D/HE Center (continued)

Proposed Alternatives	Water Availability and Use
50/80 Alternative	
Water Requirement (gal)	43,000,000
Percent Change from No Action Alternative	11.3%
Total Water Use/ Water Rights Exceeded?	423,000,000/No
CUC	
Water Requirement (gal)	105,000,000
Percent Change from No Action Alternative	27.6%
Total Water Use/ Water Rights Exceeded?	485,000,000/No
CNC (Greenfield CPC or Upgrade Alternative + CUC)	
Water Requirement (gal)	185,000,000
Percent Change from No Action Alternative	48.6%
Total Water Use/ Water Rights Exceeded?	565,000,000/Yes
A/D/HE Center	
Water Requirement (gal)	130,000,000
Percent Change from No Action Alternative	34.2%
Total Water Use/ Water Rights Exceeded?	510,000,000/No
CNPC (Greenfield CPC or Upgrade Alternative + CUC)	
Water Requirement (gal)	395,000,000
Percent Change from No Action Alternative	104%
Total Water Use/ Water Rights Exceeded?	775,000,000/Yes

Source: LANL 2008.

5.1.5.2 *DCE Alternative*

5.1.5.2.1 Greenfield CPC

***Surface Water:* construction.** Construction requirements for the CPC are described in Section 3.4.1. Surface water would not be used to support the construction of the CPC at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Although runoff from the vicinity of the site drains toward the Rio Grande, surface drainages in general are ephemeral, and infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal

and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The CPC reference location at TA-55 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

***Surface Water*: operations.** Operation requirements for the CPC are described in Section 3.4.1. No impacts on surface water resources are expected as a result of CPC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

***Groundwater:* construction.** Construction requirements for the CPC are described in Section 3.4.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. As a result, it is estimated that construction activities would require a total of approximately 20.9 million gallons of groundwater mainly to support CPC construction. Site water requirements are not expected to exceed LANL's maximum water allotment. The percent change from the No Action Alternative would be approximately 5.5 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* operations.** Operation requirements for the CPC are described in Section 3.4.1. Activities at LANL under the Greenfield CPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5–2. Site water requirements for the operation of the Greenfield CPC Alternative would increase LANL's annual use by approximately 21 percent.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.2.2 Upgrade Alternative

Construction. Construction requirements for the Upgrade Alternative are described in Section 3.4.1.2. Impacts to water during construction activities would be similar to those discussed above for the Greenfield CPC.

Operations: Operation requirements for the Upgrade Alternative are described in Section 3.4.1.2. Impacts to water during construction activities would be similar to those discussed above for the Greenfield CPC.

5.1.5.2.3 50/80 Alternative

***Surface Water:* construction.** Construction requirements for the 50/80 Alternative are described in Section 3.4.1.6.2. Impacts to surface water during construction activities would be similar to those discussed above for the Greenfield CPC.

***Surface Water:* operations.** Operation requirements for the 50/80 Alternative are described in Section 3.4.1.6.2. Impacts to surface water during operation activities would be similar to those discussed above for the Greenfield CPC.

***Groundwater:* construction.** Construction requirements for the 50/80 alternative are described in Section 3.4.1.6.2. It is estimated that construction activities would require a total of approximately 550,000 gallons of groundwater mainly to support CPC construction under the 50/80 Alternative. This would be increase LANL's annual water use by less than 1 percent.

***Groundwater:* operations.** Activities at LANL under the 50/80 Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5–2. Site water requirements for the operation of the 50/80 Alternative would increase LANL's annual use by approximately 11.3 percent (LANL 2008). Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.3 *CCE Alternative*

5.1.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.5.2 as well as the impacts discussed below.

***Surface Water:* CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. Surface water would not be used to support the construction of the CUC at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Although runoff from the vicinity of the site drains toward the Rio Grande, surface drainages are ephemeral, and infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The CUC reference locations (TA-55 and TA-16) are not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

***Surface Water*: CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. No impacts on surface water resources are expected as a result of CNC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in

contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNC liquid process waste facilities for the plutonium purification process.

Groundwater: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. The percent change in water consumption from the No Action Alternative would be approximately <1 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. A summary of water usage by category and total is listed in Table 5.1.5-2. Impacts from the operation of the CNC would vary depending upon the LANL CPC alternative that is selected (Greenfield CPC, Upgrade, or 50/80). The increase in water consumption for the CNC could be as much as 48.6 percent compared to the No Action Alternative (for Greenfield CPC and Upgrade Alternative). The total water use for this CNC would be 565 million gallons/year, which would exceed the LANL water allotment by 23 million gallons/year.

Los Alamos County continues to pursue the use of San Juan-Chama water as a means of preserving water rights. On September 19, 2006, New Mexico Governor Richardson signed new repayment contracts on behalf of five towns and cities and two counties, including Los Alamos County, that formally secured water rights with the Bureau of Reclamation for San Juan-Chama project water. Unlike the previous purchase form contracts, the repayment contract has no termination date, giving Los Alamos County and other municipalities perpetual rights and thus negating the need to renegotiate and renew contracts in the future. Los Alamos County will have permanent use of the water as long as it meets the terms of the contract. Use of the San Juan-Chama project along with conservation are integral to the County's Long-Range Water Supply Plan, which was commissioned to provide a sustainable water supply for the next 40 years and was completed in August 2006 (DOE 2006a).

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Surface Water:* A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. Surface water would not be used to support the construction of the A/D/HE Center at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at LANL is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The A/D/HE Center reference location at TA-16 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding.

***Surface Water:* CNPC Operations.** No impacts on surface water resources are expected as a result of CNPC operations at LANL. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

The CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected,

sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid process waste facilities for the plutonium purification process.

***Groundwater:* A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.1.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. The percent change in water consumption from the No Action Alternative would be less than 1 percent.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNPC operations.** LANL would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.1.5-2. A/D/HE Center operations would increase water usage by 34.2 percent compared to the No Action Alternative. Impacts from the operation of the CNPC would vary depending upon the LANL CPC alternative that is selected (Greenfield CPC, Upgrade, or 50/80). The percent change in water consumption from the No Action Alternative for the operation of the CNPC would be as much as 104 percent, and the potential increase in water demands from a CNPC would result in a total water use of approximately 775 million gallons/year, which would exceed LANL's existing water rights (542 million gallons/year) by 233 million gallons. LANL would need to obtain greater water rights.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.1.6 Geology and Soils

5.1.6.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on geology and soils would occur at LANL beyond those of existing and future activities that are independent of this action.

In May 2000, the Cerro Grande Fire burned approximately 43,000 acres, including about 7,700 acres on LANL (Balice, Bennett, and Wright 2004). The fire severely burned much of the mountainside that drains onto LANL (Gallaher and Koch 2004). The effects of the fire included increased soil erosion due to loss of vegetative cover, formation of hydrophobic soils, and soil disturbance during construction of fire breaks, access roads, and staging areas (DOE 2000f). The increased potential for flooding and erosion led to construction of mitigation structures to retain floodwaters and reinforce road crossings (DOE 2002i).

Los Alamos County continues to pursue the use of San Juan-Chama water as a means of preserving water rights. On September 19, 2006, New Mexico Governor Richardson signed new repayment contracts on behalf of five towns and cities and two counties, including Los Alamos County, that formally secured water rights with the Bureau of Reclamation for San Juan-Chama project water. Unlike the previous purchase form contracts, the repayment contract has no termination date, giving Los Alamos County and other municipalities perpetual rights and thus negating the need to renegotiate and renew contracts in the future. Los Alamos County will have permanent use of the water as long as it meets the terms of the contract. Use of the San Juan-Chama project along with conservation are integral to the County's Long-Range Water Supply Plan, which was commissioned to provide a sustainable water supply for the next 40 years and was completed in August 2006 (DOE 2006a).

The dominant contributor to seismic risk at LANL is the Pajarito Fault System. Five small earthquakes (magnitudes of 2 or less on the Richter scale) have been recorded in the Pajarito Fault since 1991. These small events, which produced effects felt at the surface, are thought to be associated with ongoing tectonic activity within the Pajarito Fault zone (LANL 2008).

5.1.6.2 *DCE Alternative*

5.1.6.2.1 Greenfield CPC

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The construction of the Greenfield CPC is expected to disturb land adjacent to existing facilities at TA-55.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's Environmental Restoration (ER) program and in accordance with

LANL's Hazardous Waste Facility Permit. Construction of the Greenfield CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the Design Basis Earthquake (DBE) ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations. An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CPC. The operation of the CPC would not be expected to result in impacts on geologic and soil resources. TA-55 is approximately 2.8 miles from the Pajarito Fault (LANL 2007). New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1B, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.2.2 Upgrade Alternative

Construction. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 13 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the Upgrade Alternative. The land required for the proposed CPC construction would represent approximately 0.05 percent of LANL's total land area of 25,600 acres.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of a Greenfield CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground

motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations. Impacts from the operation of the Upgrade Alternative would be similar to those discussed for a Greenfield CPC (Section 5.1.6.2.1).

5.1.6.2.3 50/80 Alternative

Construction. As described in Section 3.4.1.2, the LANL 50/80 Alternative would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 up to approximately 80 pits per year without expanding the size of the building. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or downsized and consolidated within PF-4. Additionally, the currently planned CMRR would be constructed.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in New Mexico. In addition to aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration. Thus, site geologic conditions would not likely affect the facilities.

Operations. The operation of the 50/80 Alternative is described in Section 3.4.1.2. New facilities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint. The operation of the 50/80 Alternative would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and

constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.3 *CCE Alternative*

5.1.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.6.2 as well as the impacts discussed below.

Construction. **CUC.** The CUC would primarily be made up of a new structure to contain a nuclear facility composed of the UPF and HEU storage (described in Sections 3.4.2 and 3.5.1.1) within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNC. Of this, approximately 55 acres would be located within a PIDAS. The administrative support buildings and non-nuclear component production would be located on a 90-acre area outside the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.1.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** As described in Section 3.5.1.2, the A/D/HE Center would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for the A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be non-nuclear facilities, HE fabrication, and administrative support. This area would be approximately 120 acres.

The reference location for the A/D/HE Center at LANL is in TA-16. TA-16 is an approximate 1,900 acre site. In the vicinity of TA-16, deformation associated with the Pajarito Fault extends at least 5,000 feet to the east of the Pajarito Fault escarpment (LANL 2004e). The west-central area of LANL, generally between TA-3 and TA-16, lies within a part of the Pajarito Fault made up of subsidiary or distributed ruptures. Deformation extends at least 5,000 feet to the east of the Pajarito Fault Escarpment. The general north-south trend of Pajarito Fault structure is disrupted in TA-62, TA-58, and TA-3 by some east-west trending faults. These faults may be related to the Pajarito Fault, the Rendija Canyon Fault, or be independent structures. These are areas of generally higher potential for seismic surface rupture, relative to locations farther removed from the Pajarito Fault zone. A comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the DBE ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-16, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Operations: **CNPC.** As described in Section 3.5.1.2, an estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. Of this, approximately 235 acres would be located within a PIDAS. The administrative

support buildings, HE fabrication, and non-nuclear component production would be located on a 210-acre area outside the PIDAS. A 100-acre buffer zone would also be located outside the PIDAS. The reference location for the A/D/HE Center at LANL is in TA-16. Probabilistic analyses of surface rupture potential at TA-16 indicate that, even in consideration of 1-in-10,000-year events, seismic surface rupture only becomes a significant hazard on the principal or main trace of the Pajarito Fault (LANL 2004e).

5.1.7 Biological Resources

5.1.7.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. No additional impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered (T&E) species would occur at LANL beyond those of existing and future activities that are independent of this action.

5.1.7.2 *DCE Alternative*

As discussed in Section 5.1, the DCE Alternative at LANL includes the evaluation of three approaches, the Greenfield CPC, the Upgrade Alternative, and the 50/80 Alternative. Biological impacts from the construction and operation will be very similar regardless of the CPC approach selected.

5.1.7.2.1 Terrestrial Resources

Construction. Construction would take place within the TA-55 built environment. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and primarily small mammals, lizards, and birds. Depending upon the CPC approach selected, approximately zero to 140 acres of low value vegetation and habitat would be affected during construction. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. The major difference between the LANL CPC approaches is the size of the modification or loss of low-value plant communities and wildlife habitat. The acreage modified or lost would range from zero to 110 acres depending upon the LANL CPC approach selected. It is important to note that the impacts would be within a previously and substantially developed location. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility

design and engineering controls for pit production, CPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

5.1.7.2.2 Wetlands

Construction. Construction requirements for the CPC are described in Section 3.4.1. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Operations. There are no adverse impacts predicted to any adjacent wetland area from implementation of any of the CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect wetlands downstream of the TA-55 watershed.

5.1.7.2.3 Aquatic Resources

Construction. There are no perennial or seasonal aquatic habitats within the TA-55 location proposed for the CPC. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-55 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution into the TA-55 watershed.

5.1.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of a CPC on any threatened and endangered species. It is expected that a CPC would have minimal affect on the

core and buffer area for the Mexican spotted owl as it is proposed for construction in an existing highly developed environment.

Construction. Construction requirements for the CPC are described in Section 3.4.1. A maximum of approximately 140 acres (Greenfield CPC) of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. Construction would take place within the TA-55 built environment. During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should LANL be selected for construction and operations of a CPC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Operation requirements for the CPC are described in Section 3.4.1. A maximum estimated 110 acres (Greenfield CPC) of land would be required to operate the CPC. Depending upon the CPC approach selected, acreage permanently modified or lost as foraging or prey base habitat for species of special interest would vary, but would be less than approximately 110 acres. It is important to note that the impacts would be to highly developed areas. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should have no adverse impacts to any special interest species population.

5.1.7.3 *CCE Alternative*

5.1.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.7.2 as well as the impacts discussed below.

***Terrestrial resources:* CUC construction.** As described in Section 3.5.1.1, approximately 50 acres of land would be disturbed during CUC construction. Construction would take place within the TA-55 built environment. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and consists of elk, deer, bob cat, mountain lion, bears, small mammals, lizards, and birds. Approximately 50 acres of vegetation and habitat would be affected during construction. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or

ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Terrestrial resources: **CNC operations.** As described in Section 3.5.2, approximately 195 acres of land would be required to support CNC operations. It is important to note that the impacts would be within a previously and substantially developed location. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

Wetlands: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Wetlands: **CNC operations.** There are no adverse impacts predicted to any adjacent wetland area from implementation of any of the CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect wetlands downstream of the TA-55 watershed.

Aquatic resources: **CUC construction.** Construction requirements for the CUC are described in Section 3.5.1.1. There are no perennial or seasonal aquatic habitats within the TA-55 location proposed for the CUC. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-55 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNC operations.** Operation requirements for the CNC are described in Section 3.5.2. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution into the TA-55 watershed.

Threatened and endangered species. Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix*

occidentalis lucida), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of a CUC on any threatened and endangered species. It is expected that a CUC would have minimal affect on the core and buffer area for the Mexican spotted owl as it is proposed for construction in an existing highly developed environment.

CUC construction. Construction requirements for a CUC are described in Section 3.5.1.1. Approximately 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. Construction requirements for the CPC are described in Section 3.4.1. Construction would take place within the TA-55 built environment. During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should Los Alamos be selected for construction and operations of the CNC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

CNC operations. Operation requirements for the CNC are described in Section 3.5.2. An estimated 195 acres of land would be required to operate the CNC. It is important to note that the impacts would be to highly developed areas. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations should not result in adverse impacts to any special interest species population.

5.1.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction. **A/D/HE Center.** As described in Section 3.5.1.2, approximately 300 acres would be required for the A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons A/D facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be a buffer zone, non-nuclear facilities, HE fabrication, and administrative support facilities. This area would be approximately 120 acres.

Construction would take place within TA-16. Wildlife and vegetation present are characteristic of species adapted to build environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and primarily small mammals, lizards, and birds. In addition to the impacts associated with the CPC and CUC, approximately 300 acres of low value vegetation and habitat would be affected during construction of the A/D/HE Center. During site clearing activities, highly mobile

wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

***Operations:* CNPC.** As described in Section 3.5.2, approximately 545 acres of land would be required to support CNPC operations. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CNPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-16.

***Wetlands:* A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the A/D/HE Center or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

***Wetlands:* CNPC operations.** There are no adverse impacts predicted to any adjacent wetland area from implementation of the CNPC alternative. There would be no direct untreated effluent discharges to the environment.

***Aquatic resources:* A/D/HE Center construction.** Construction requirements for the A/D/HE Center are described in Section 3.5.1.2. There are no perennial or seasonal aquatic habitats within the TA-16 location proposed for the A/D/HE Center. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-16 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

***Aquatic resources:* CNPC operations.** Operation requirements for the CNPC are described in Section 3.5.1. There would be no direct discharge of untreated operational effluent from CNPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments.

Threatened and endangered species. Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-16

does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of an A/D/HE Center on any threatened and endangered species. It is expected that an A/D/HE Center would have minimal affect on the core and buffer area for the Mexican spotted owl.

A/D/HE Center construction. As described in Section 3.5.1.2, approximately 300 acres would be required for the A/D/HE Center at TA-16. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. Located outside the PIDAS area would be a buffer zone and non-nuclear facilities for HE fabrication, administrative support, and disposal of explosive materials. This area would be approximately 120 acres.

During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should LANL be selected for construction and operations of the CNPC, then NNSA, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

CNPC operations. Operation requirements for the CNPC are described in Section 3.5.1. An estimated 545 acres of land would be required to operate the CNPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations should not adversely impact any special interest species population.

5.1.8 Cultural Resources

5.1.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in 3.2.1. No additional buildings or facilities would be built beyond those that NNSA has already decided to build, and no additional impacts to cultural and paleontological resources would occur at LANL beyond those of existing and future activities that are independent of this action.

As of 2005, cultural and paleontological surveys have been conducted on approximately 90 percent of the land within LANL boundaries with 86 percent having been intensively surveyed. The majority of these surveys emphasized American Indian cultural resources. Information on these resources was obtained from the LANL cultural resources database, which is organized primarily by site type. Although about 400 cultural and paleontological sites have been determined to be eligible for the National Register of Historic Places (NRHP), most of the

remaining sites have yet to be formally assessed and are therefore assumed to be eligible until assessed (LANL 2005h).

5.1.8.2 *DCE Alternative*

As discussed in Section 5.1, the DCE Alternative at LANL includes the evaluation of three approaches, the Greenfield CPC, the Upgrade Alternative, and the 50/80 Alternative. Cultural and paleontological impacts from the construction and operation will be very similar regardless of the CPC approach selected.

5.1.8.2.1 Cultural Resources

Construction. As described in Section 3.4.1, the CPC would disturb an estimated 140 acres (Greenfield CPC) and 13 acres (Upgrade Alternative) of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. For the 50/80 Alternative, the CMRR-NF would be constructed and expanded by approximately 9,000 square feet. The reference location for the CPC is at TA-55. Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during CPC construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the CPC. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico Site Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as buried artifacts, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

Operations. As described in Section 3.4.1, an estimated 110 acres (Greenfield CPC), 6.5 acres (Upgrade Alternative), and 2.5 acres (50/80 Alternative) of additional land would be required to operate the various CPC options at LANL. Operation of the CPC would have no impact on cultural resources.

5.1.8.2.2 Paleontological Resources

Construction. Only one paleontological resource has been discovered at LANL to date, and that was not found within TA-55. Such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the CPC.

Operations. Operation of the CPC would have no impact on paleontological resources.

5.1.8.3 *CCE Alternative*

5.1.8.3.1 CNC (CPC + CUC)

Cultural and paleontological resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.8.2 as well as the impacts discussed below.

***Cultural resources;* CUC construction.** As described in Section 3.4.1, the CUC would disturb an estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The reference location for the CUC is at TA-55. Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during CUC construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the CUC. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico State Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

***Cultural resources:* CNC operations.** As described in Section 3.5.2, an estimated 195 acres would be required to operate the CNC. Operation of the CNC would have no impact on cultural resources.

***Paleontological resources:* CUC construction.** Only one paleontological resource has been reported within the TA-55 boundaries, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the CUC. As discussed in Section 5.1.8.3.2, there is a higher probability that paleontological resources at TA-16 could be impacted if the CUC were sited at TA-16.

***Paleontological resources:* CNC operations.** As described in Section 3.5.2, operation of the CNC would require an estimated 195 acres. Operation of the CNC at would have no impact on paleontological resources.

5.1.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural resource impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.1.8.2, the CNPC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Cultural resources:* A/D/HE Center construction.** The A/D/HE Center construction would disturb an estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace at TA-16. Approximately one-third of TA-16 has been disturbed through development of other facilities and HE R&D. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during A/D/HE Center construction anywhere on the LANL site, including TA-16. The number of resources that would be disturbed is unknown, but would likely increase as the number of acres disturbed increases.

The Nake'muu site, an enclosed plaza pueblo, is located approximately 2 miles away from the proposed reference location for the A/D/HE Center. Unique architectural features of the Nake’muu are still visible, making it eligible for NRHP nomination. Previously, the New Mexico SHPO concurred in this determination in correspondence to the DOE dated February 21, 1989 (LANL 1995). This site is an irregular-shaped pueblo of possibly 50 rooms. The site has been described as the best-preserved ruin in this region. This site is unusual in that it is located at a high elevation, 7,175 feet, and is built on bedrock somewhat distant from agricultural resources as compared to other similar sites in the LANL area.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of the A/D/HE Center. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico SHPO and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995). If previously unknown cultural resources, such as buried artifacts, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

***Cultural resources:* CNPC operations.** As described in Section 3.5.1.2, the CNPC would require approximately 545 acres. Operation of the CNPC would be expected to have no impact on cultural resources.

***Paleontological resources:* A/D/HE Center construction.** Only one paleontological resource has been reported within the LANL boundaries, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of the A/D/HE Center.

***Paleontological resources:* CNPC operations.** As described in Section 3.5.2, the CNPC would require approximately 545 acres. Operation of the CNPC at would have no impact on paleontological resources.

5.1.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and the Capability-Based Alternative.

5.1.9.1 *No Action Alternative*

Under the No Action Alternative, there would be no major changes in the workforce currently at LANL. However, the LANL SWEIS estimates that employment at LANL could experience a minor rise with both increased pit production and increased remediation and D&D activities (LANL 2008). If LANL's employment rate were to continue increasing at the same level experienced from 1996 through 2005 (2.2 percent annually), approximately 15,400 individuals could be employed at LANL by the end of 2011.

5.1.9.2 *DCE Alternative*

5.1.9.2.1 Greenfield CPC

***Regional economic characteristics:* construction.** Construction of the CPC would require a total of 2,650 worker-years of labor. During peak construction, about 770 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 816 indirect jobs would be created, for a total of 1,586 jobs. This represents less than 2 percent of the total ROI labor force. It is estimated that one-half of the direct and indirect jobs would be filled by current workers in the ROI.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $23.8 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $49 million ($23.8 million direct and $25.2million indirect). Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.1.9-1—Socioeconomic Impacts from Peak Construction – CPC

Socioeconomic Factor	CPC
Worker Years	2,650
Peak Workers	770
Indirect Jobs Created	816
Total Jobs Created	1,586
ROI Average Earning (direct)	$30,900
Direct Income Increase	$23,793,000
Indirect Income Increase	$25,214,000
Total Impact to the ROI	$49,007,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operation of a CPC would require a total of 1,780 workers.[4] In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,887 indirect jobs would be created, for a total of approximately 3,667 jobs. This represents less than approximately 3 percent of the total ROI labor force. It is estimated that one-third of the direct and indirect jobs would be filled by workers migrating into the ROI.

Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.2 million ($84 million direct and $113.2 million indirect). Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC and the other facilities associated with the programmatic alternatives.

Table 5.1.9-2—Socioeconomic Impacts from Operations: All Facilities/Alternatives

Socioeconomic Factor	CPC	CUC	CNC	AD/HE	CNPC
Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,887	991	2,878	1,892	4,770
Total Jobs Created	3,667	1,926	5,593	3,677	9,270
ROI Average Earning (direct)	$47,200	$47,200	$47,200	$47,200	$47,200
Direct Income Increase	$84,016,000	$44,132,000	$128,148,000	$84,252,000	$212,400,000
Indirect Income Increase	$113,208,000	$59,466	$172,674,000	$113,526,000	$286,200,000
Total Impact to the ROI	$197,224,000	$103,598,000	$300,822,000	$197,778,000	$498,600,000

Source: NNSA 2007.

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (770 workers), a total of 1,155 new residents would be expected in the ROI. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

***Population and housing:* operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,170 new workers), approximately 1,170 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

[4] LANL currently conducts plutonium operations, including R&D and limited pit production, with a workforce of approximately 610. Consequently, the projected workforce increase at LANL should be approximately 1,170, compared to 1,780 for other sites. However, if a CPC were located at Los Alamos, the existing workers at LANL would become part of a CPC mission. Consequently, for steady-state operations, this analysis includes these workers as part of the CPC operational workforce, and assesses income changes for this total workforce.

***Community services:* construction.** The small increase in the population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

***Community services: operations*.** The small increase in the population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.1.9.2.2 Upgrade Alternative

***Regional economic characteristics:* construction.** Construction under the Upgrade Alternative would require a total of 1,100 worker-years of labor. During peak construction, 300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 318 indirect jobs would be created, for a total of 618 jobs. This represents less than 1 percent of the total ROI labor force.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $9.3 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $17.6 million ($9.3 million direct and $8.3 million indirect). Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

Table 5.1.9-3—Socioeconomic Impacts from Peak Construction–Upgrade Alternative

Socioeconomic Factor	CPC
Worker Years	1,100
Peak Workers	300
Indirect Jobs Created	318
Total Jobs Created	618
ROI Average Earning (direct)	$30,900
Direct Income Increase	$9,270,000
Indirect Income Increase	$8,281,000
Total Impact to the ROI	$17,551,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operations under the Upgrade Alternative would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,887 indirect jobs would be created, for a total of approximately 3,667 jobs.

Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.2 million ($84 million direct and $113.2 million indirect).

Population and Housing

Construction. The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 450 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

Operation. The influx of new workers would increase the ROI population and create new housing demand. A total of 1,170 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population.

***Community services:* construction.** The small increase in the ROI population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-3 presents the impacts to socioeconomic resources from construction of facilities associated with the Upgrade Alternative.

***Community services:* operations.** The small increase in the ROI population would not put increased demand on community services. Comparable services could be maintained with current staffing levels.

5.1.9.2.3 50/80 Alternative

***Regional economic characteristics:* construction.** Construction relating to the 50/80 Alternative would require a total of 430 worker-years of labor. During peak construction, 190 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 201 indirect jobs would be created, for a total of 391 jobs. This represents less than 0.3 percent of the total ROI labor force.

Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $5.9 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $11 million ($5.9 million direct and $5.2 million indirect). Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

Table 5.1.9-4—Socioeconomic Impacts from Peak Construction–50/80 Alternative

Socioeconomic Factor	CPC
Worker Years	430
Peak Workers	190
Indirect Jobs Created	201
Total Jobs Created	391
ROI Average Earning (direct)	$30,900
Direct Income Increase	$5,871,000
Indirect Income Increase	$5,245,000
Total Impact to the ROI	$11,116,000

Source: NNSA 2007.

***Regional economic characteristics:* operations.** Operation under the 50/80 Alternative would require 680 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 721 indirect jobs would be created, for a total of approximately 1,401 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $32.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $75.3 million ($32.1 million direct and $43.2 million indirect).

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 285 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

***Population and housing:* operations.** The influx of new workers would increase the ROI population and create new housing demand. A total of 680 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population.

***Community services:* construction.** The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels. Table 5.1.9-4 presents the impacts to socioeconomic resources from construction of facilities associated with the 50/80 Alternative.

***Community services:* operations.** The small increase in the ROI population would not put increased demand on community services. Comparable levels of service could be maintained with current staffing levels.

5.1.9.3 *CCE Alternative*

5.1.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of the CNC would include the impacts discussed in Section 5.1.9.2 as well as the impacts discussed below.

***Regional economic characteristics:* CUC construction.** Construction of the CUC would require approximately 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,378 indirect jobs would be created, for a total of 2,678 jobs. This represents approximately 2 percent of the total ROI labor force. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $40.2 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $76 million ($40.1 million direct and $35.9 million indirect). Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.1.9-5—Socioeconomic Impacts from Peak Construction–CUC

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	1,378
Total Jobs Created	2,678
ROI Average Earning (direct)	$30,900
Direct Income Increase	$40,170,000
Indirect Income Increase	$35,886,000
Total Impact to the ROI	$76,056,000

Source: NNSA 2007.

***Regional economic characteristics:* CUC and CNC operations.** Operation of the CUC would require 935 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 991 indirect jobs would be created, for a total of 1,926 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $44.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $103.6 million ($44.1 million direct and $59.5 million indirect). Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from the operation of the CPC and CUC individually.

***Population and housing:* CUC construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (1,300 workers), a total of 1,950 new residents would be expected in the ROI. This is an increase of approximately 2 percent over the current population. The current housing market would likely

be sufficient to absorb this increase in the ROI population. The influx of new workers would increase the ROI population and create new housing demand. Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Population and housing: **CUC and CNC operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (935 new workers), approximately 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from operation of the CPC and CUC individually.

Community services: **CUC construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-5 presents the impacts to socioeconomic resources from construction of the CUC.

Community services: **CNC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from operation of the CPC and CUC individually.

5.1.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.1.9.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Regional economic characteristics: **A/D/HE Center construction.** Construction of the A/D/HE Center would require approximately 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 4,049 indirect jobs would be created, for a total of 7,869 jobs. This represents approximately 5 percent of the total ROI labor force. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $118 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $223.5 million ($118 million direct and $105.5 million indirect). Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Table 5.1.9-6—Socioeconomic Impacts from Peak Construction–A/D/HE Center

Socioeconomic Factor	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	4,049
Total Jobs Created	7,869
ROI Average Earning (direct)	$30,900
Direct Income Increase	$118,038,000
Indirect Income Increase	$105,449,000
Total Impact to the ROI	$223,487,000

Source: NNSA 2007.

***Regional economic characteristics:* A/D/HE Center and CNPC operations.** Operation of the A/D/HE Center would require 1,785 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 1,892 indirect jobs would be created, for a total of 3,677 jobs. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84.3 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $197.8 million ($84.3 million direct and $113.5 million indirect). Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

***Population and housing:* construction.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (3,820 workers), a total of 5,730 new residents would be expected in the ROI. This is an increase of approximately 3.7 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

***Population and housing:* A/D/HE Center and CNPC operations.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,785 new workers), approximately 1,785 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

***Community services:* A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-6 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

***Community services:* A/D/HE Center and CNPC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.1.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the operation of the A/D/HE Center individually.

5.1.9.4 *Capability-Based Alternatives*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Employment at LANL is expected to continue to rise due to both increased pit production and increased remediation and D&D activities. In addition, work at LANL would likely increase beyond current operations in areas that cannot be easily identified at this time, but could be tied to expanding research efforts such as homeland security. Similar increases have been seen in recent years. LANL's employment rate were to continue increasing at the same level experienced from 1996 through 2005 (2.2 percent annually), approximately 15,400 individuals could be employed at LANL by the end of 2011, which would be an increase of about 1,890 above the 2005 level (LANL 2008). Under the No Net Production/Capability-Based Alternative, although NNSA would decrease pit production to 10 pits annually, employment was not estimated to change (NNSA 2008).

5.1.9.5 *LANL Plutonium Phaseout*

If LANL is not selected as the site for the CPC or CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations would result in a loss of approximately 610 jobs, which would represent a decrease of 4.5 percent of the workforce at LANL (13,504). The loss of 610 direct jobs would result in the loss of approximately 650 indirect jobs. Thus, the total loss of jobs in the ROI would be 1,260, which would represent less than a 1 percent decrease in the ROI workforce of 147, 792. A less than 1 percent loss in ROI jobs would have no major effect on unemployment, housing, or community services.

5.1.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.1.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations represented 57 percent of the total population within the census tracts containing LANL. In 2000, minorities were 30.9 percent of the population nationally and 55 percent of the population in New Mexico. The percentage of persons below the poverty level is 18.4 percent, which is comparable to the 2000 national average of 12.4 percent and the statewide figure of 18 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at LANL are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, cultural and archaeological resources. As shown in Section 5.1.11, Human Health and Safety, there are no large adverse impacts to any populations.

NNSA also analyzed the potential risk due to radiological exposure through subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. This special pathways receptors analysis is important to the environmental justice analysis because those consumption patterns reflect the traditional or cultural practices of minority populations in the area (LANL 2008).

5.1.11 Health and Safety

5.1.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. Based on the 2004 operational data, the total dose to the offsite MEI in 2004 was estimated at 1.68 mrem.

5.1.11.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities associated with the Greenfield CPC or the upgrade alternatives. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site, especially for the upgrade alternatives, where construction would occur in the immediate vicinity of PF-4. Workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from Bureau of Labor Statistics (BLS), U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the

Voluntary Protection Program (VPP). Additionally, the small number of fatal accidents reported in the Computerized Accident/Incident Reporting System (CAIRS) makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.1.11-1.

Table 5.1.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC Alternatives, CUC, and A/D/HE Center at LANL

Injury, Illness, and Fatality Categories	Projects Under Consideration				
	Greenfield CPC	Upgrade	50/80	CUC	A/D/HE Center
Peak Annual Employment	770	300	190	1,300	3,820
Total Recordable Cases	73	28	18	112	329
Total Lost Workday Cases	35	14	9	54	159
Total Fatalities	0.2	0.1	<0.1	0.3	0.8
Project Duration (6 years)					
Total Recordable Cases	251	98	62	384	1,128
Total Lost Workday Cases	121	47	30	184	541
Total Fatalities	0.6	0.2	0.1	0.9	2.6

Source: NNSA 2007, BLS 2007.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.1.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI) of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI

and collective population dose) and corresponding incremental latent cancer fatalities (LCFs). To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.1.11-2—Annual Radiological Impacts on the Public from CPC Alternatives, CNC, and CNPC Operations at LANL

Receptor	Projects Under Consideration				
	Greenfield CPC	Upgrade	50/80	CNC	CNPC
Population within 50 miles[a]					
Collective dose (person-rem)	6.0×10^{-4}	6.0×10^{-4}	3.2×10^{-5}	0.23	0.23
% of natural background radiation[a]	3×10^{-7}	3×10^{-7}	1.6×10^{-8}	1.1×10^{-4}	1.1×10^{-4}
LCFs[b]	4×10^{-7}	4×10^{-7}	2×10^{-8}	1×10^{-4}	1×10^{-4}
Offsite MEI[c]					
Dose (mrem)	1.5×10^{-4}	1.5×10^{-4}	7.7×10^{-6}	0.077	0.077
Percent of regulatory dose limit	1.5×10^{-3}	1.5×10^{-3}	7.7×10^{-5}	0.77	0.77
% of natural background radiation[a]	4.2×10^{-5}	4.2×10^{-5}	2.1×10^{-6}	0.02	0.02
Cancer fatality risk[b]	9×10^{-11}	9×10^{-11}	5×10^{-12}	5×10^{-5}	5×10^{-5}

[a]The average annual dose from background radiation at LANL is 360 mrem; the future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 would receive an annual dose of 198,760 person-rem from the background radiation. A "constant linear population growth" model was applied to estimate population increases.
[b]Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.
[c]The offsite MEI is assumed to reside at the site boundary. An actual residence may not currently be present at this location.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be less than or equal to 9×10^{-11} per year, or about 9 chances in 100 billion. The projected number of fatal cancers to the population within 50 miles would be less than or equal to 4×10^{-7} per year, or about 4 chances in 10 million.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material "as low as reasonably achievable" (ALARA). The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.

- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard "weapons grade" isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician would receive approximately 25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.1.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in the CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CNC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CNC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2, or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations.

Table 5.1.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at LANL from Operations

	Greenfield CPC	Upgrade	50/80	CNC	CNPC
Number of Radiological Workers	**1,150**	**1,150**	**458**	**1,640**	**2,040**
Individual Workers[a]					
Average individual dose, mrem/yr[b]	290	290	380	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	2×10^{-4}	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population					
Total dose (person-rem)	333	333	154	344	386
Cancer fatality risk[c]	0.20	0.20	0.09	0.21	0.23

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level. To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at the CPC would be approximately 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Table 5.1.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC at LANL

Injury, Illness, and Fatality Categories	Projects Under Consideration			
	Greenfield CPC and Upgrade	50/80	CNC	CNPC
Total Workers	1,780	680	2,715	4,500
Total Recordable Cases	77	29	117	195
Total Lost Workday Cases	40	15	61	101
Total Fatalities	0.07	0.02	0.11	0.18

Source: NNSA 2007, BLS 2007.

5.1.11.3 *CCE Alternative*

5.1.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.1.11.2 as well as the impacts discussed below.

CUC construction. No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.1.11-1.

CNC operations. NNSA expects minimal public health impacts from the radiological consequences of CNC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Approximately 1,640 radiological workers would be required to conduct CNC operations. Operations in the CNC would result in an average individual worker dose of approximately 210 mrem annually. The total annual dose to workers associated with the CNC operations would be approximately 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to the CNC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 2,715. The potential risk of occupational injuries and fatalities to workers operating the CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.1.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNC would include the CPC and CUC impacts discussed above, as well as the impacts discussed below.

A/D/HE Center construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.1.11-1.

CNPC operations. DOE expects minimal public health impacts from the radiological consequences of CNC operations. Table 5.1.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Approximately 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of approximately 189 mrem annually. The total annual dose to workers associated with the CNPC operations would be approximately 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.1.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.1.11.4 *Capability-Based Alternative*

LANL is currently authorized to produce up to 20 pits annually. Under the Capability-Based Alternative, NNSA would increase actual pit production above the current level of 20 pits annually to 50 pits annually. Worker dose from increased pit production at TA-55 would increase from 90 person-rem per year to 220 person-rem per year (LANL 2008). Statistically, a dose of 220 person-rem would result in a LCF risk of 0.13, which would equate to 1 LCF for every 7.6 years of operation. For the No Net Production/Capability-Based Alternative, worker

dose is estimated to be approximately 45 person-rem (a 50 percent reduction compared to the 20 ppy scenario, and a reduction of approximately 80 percent compared to the 80 ppy scenario). Statistically, a dose of 45 person-rem would result in a LCF risk of 0.03, which would equate to 1 LCF for every 37 years of operation.

5.1.11.4.1 *LANL Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in the potential health impacts to LANL employees and the population surrounding LANL. Assuming that LANL would be producing up to 20 pits annually prior to phase out, radiation doses to workers would be expected to decrease by approximately 90 person-rem.

If LANL were to produce 20 pits annually for the stockpile prior to phaseout, plutonium emissions would decrease. This would result in less radiation exposure to the 50-mile population surrounding LANL. Phasing out NNSA plutonium operations would reduce the dose to the 50-mile population by less than 1 person-rem (LANL 2008).

5.1.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at LANL. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- **Internal initiators.** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- **External initiators.** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.

- **Natural phenomena initiators.** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. Using approved computer models, NNSA predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for workers as the distance between the accident location and the worker decreases because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness, Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the LANL boundary; 2) the offsite population within 50 miles of LANL; and 3) a non-involved worker 3,281 feet from the accident location. DOE did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.1.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in detail in the LANL SWEIS (LANL 2008).

Under all alternatives analyzed in the LANL SWEIS, the facility accident with the highest radiological risk to the offsite population would be a lightning strike at the Radioassay and Nondestructive Testing Facility located in TA-54. If this accident were to occur, there could be six additional LCFs in the offsite population (LANL 2008).

Under all alternatives, the individual facility accident with the highest estimated consequences to the MEI and noninvolved workers would be a fire at a waste storage dome in TA-54. If this accident were to occur, an LCF in a noninvolved worker located about 110 yards from the site of

the accident would be likely, and there would also be a 0.50 likelihood (1 chance in 2) of an LCF to the MEI, assumed to be present at the nearest site boundary for the duration of the accident release (LANL 2008).

There is little difference among the alternatives for the maximum potential wildfire, seismic, or facility accident at LANL because actions under each alternative do not, for the most part, affect the location, frequency, scenario, or material at risk of the postulated accidents. Based on the analysis in the LANL SWEIS, if a seismic accident were to occur, there would be widespread damage at LANL and across the region resulting in a large number of fatalities and injuries unrelated to LANL operations. Facilities at LANL would be affected and the public and workers at the site would be exposed to increased risks from both radiological and chemical releases. In the event of such a seismic accident, the MEI would have an increased lifetime risk of an LCF of 0.55 (1 chance in 1.8) and an additional 22 LCFs could be expected in the population; a noninvolved worker 110 feet from certain failed buildings would likely develop an LCF. Taking into account the likelihood of occurrence, the annual risks from a seismic event are estimated to be 1 chance in 3,600 for an MEI, and zero (0.009) additional LCFs in the offsite population (LANL 2008).

5.1.12.2 *Consolidated Plutonium Center*

5.1.12.2.1 Radiological Accidents

Greenfield CPC and Upgrade Alternative. The accident scenarios, material at risk, and source term for the CPC are shown below.

Accident Scenario	Material at Risk	Source Term
Beyond Evaluation Basis Earthquake and Fire	16,929 kg Pu metal 35 kg Pu oxide 24 kg Pu solution	4.23 kg Pu metal 0.0021 kg Pu oxide 0.048 kg Pu solution
Fire in a single building	7,685 kg Pu metal	1.92 kg Pu
Explosion in a feed casting furnace	4.5 kg molten Pu metal	2.25 kg Pu
Nuclear Criticality	See Appendix C	5×10^{17} fissions
Fire-induced release in the CRT Storage Room	600 kg Pu metal	0.15 kg Pu
Radioactive material spill	4.5 kg molten Pu metal	0.0045 kg Pu

Source: Tetra Tech 2008.

Table 5.1.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MELCOR Accident Consequence Code System (MACCS) computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.1.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation SPEIS* (Tetra Tech 2008). The selection process, screening

criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

With respect to an earthquake, a comprehensive update to the LANL seismic hazards analysis was completed in 2007; the analysis presents estimated ground-shaking hazards and the ground motions that may result. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. One of the purposes of that seismic hazards analysis is to define the Design Basis Earthquake (DBE) ground motion parameters. That data would then be used to determine the design parameters that any facility at LANL would need to meet. The accident analyzed in this SPEIS is based on a beyond design basis earthquake, and assumes complete failure of structures, systems, and components, thereby resulting in the maximum possible radioisotope source term. This is a conservative approach. Higher seismic accelerations at the same annual frequency of exceedance would result in identical consequences for these facilities. Therefore, the larger seismic peak ground accelerations associated with the updated probabilistic seismic hazard analysis would not increase the consequence of this accident scenario.

Table 5.1.12-1—CPC Radiological Accident Frequency and Consequences at LANL[a]

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	87.5	0.105	44,200	26.5	1,420	1
Fire in a single building	1.0×10^{-4}	62.4	0.0749	27,600	16.6	2,200	1
Explosion in a feed casting furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1
Nuclear Criticality	1.0×10^{-2}	0.00014	8.40×10^{-8}	0.0372	2.23×10^{-5}	0.00278	1.67×10^{-6}
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	4.88	0.00293	2,160	1.3	172	0.206
Radioactive material spill	1×10^{-2}	0.146	8.76×10^{-5}	64.8	0.0389	5.16	0.0031

Source: Tetra Tech 2008.
[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

The results of the accident analysis indicate potential consequences that exceed NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for a CPC. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in a CPC design to ensure compliance with exposure guidelines if NNSA were to decide to build a CPC at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration

systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[5] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into a CPC design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.1.12-1) is the beyond evaluation basis earthquake and fire. Approximately 26.5 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of 87.5 rem. Statistically, this MEI would have a 0.052 chance of developing a LCF (i.e., about 1 chance in 19 of a LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.1.12-2), the accident with the highest risk is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be approximately 9×10^{-4}, or approximately 1 in 1,000. For the population, the LCF risk would be 0.19, meaning that an LCF would statistically occur once every 5 years in the population.

Table 5.1.12-2—Annual Cancer Risks for CPC at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	$1.05\text{x}10^{-6}$	$2.65\text{x}10^{-4}$	$1\text{x}10^{-5}$
Fire in a Single Building	$7.49\text{x}10^{-6}$	$1.66\text{x}10^{-3}$	$1\text{x}10^{-4}$
Explosion in a Feed Casting Furnace	$8.78\text{x}10^{-4}$	0.19	$1\text{x}10^{-2}$
Nuclear Criticality	$8.40\text{x}10^{-10}$	$2.23\text{x}10^{-7}$	$1.67\text{x}10^{8}$
Fire-induced Release in the CRT Storage Room	$2.93\text{x}10^{-5}$	$1.3\text{x}10^{-2}$	$2.06\text{x}10^{-3}$
Radioactive Material Spill	$8.76\text{x}10^{-7}$	$3.89\text{x}10^{-4}$	$3.1\text{x}10^{-5}$

Source: Tetra Tech 2008.
[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

50/80 Alternative. Under the 50/80 Alternatives at Los Alamos, the Plutonium Facility, Building 4 (PF-4) at TA-55 would be upgraded to provide a capability to produce as many as 80 pits/year. The potential hazards and accidents postulated for a Greenfield CPC would be applicable to the upgraded PF-4. However, for three of the accidents (Beyond Evaluation Basis Earthquake and Fire, Fire in a single building, and the Fire-induced release in the CRT Storage Room), the material-at-risk for the 50/80 Alternative would be approximately two-thirds as large as for the Greenfield CPC. The potential consequences and risks from accidents for the 50/80 Alternative are presented in Tables 5.1.12-1a and 5.1.12-2a.

[5] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

Table 5.1.12-1a—Radiological Accident Frequency and Consequences–50/80 Alternative

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	58.6	0.07	29,614	17.8	951	1
Fire in a single building	1.0×10^{-4}	41.8	0.05	18,492	11.1	1,474	1
Explosion in a feed casting furnace	1.0×10^{-2}	73.2	0.0878	32,400	19.4	2,580	1
Nuclear Criticality	1.0×10^{-2}	0.00014	8.40×10^{-8}	0.0372	2.23×10^{-5}	0.00278	1.67×10^{-6}
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	3.3	0.002	1,447	0.9	115	0.13
Radioactive material spill	1×10^{-2}	0.146	8.76×10^{-5}	64.8	0.0389	5.16	0.003

Source: Tetra Tech 2008.
[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-2a—Annual Cancer Risks for the 50/80 Alternative

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	7.0×10^{-7}	1.78×10^{-4}	1×10^{-5}
Fire in a Single Building	5.0×10^{-6}	1.1×10^{-3}	1×10^{-4}
Explosion in a Feed Casting Furnace	8.78×10^{-4}	0.19	1×10^{-2}
Nuclear Criticality	8.40×10^{-10}	2.23×10^{-7}	1.67×10^{8}
Fire-induced Release in the CRT Storage Room	2.0×10^{-5}	9.0×10^{-3}	1.3×10^{-3}
Radioactive Material Spill	8.76×10^{-7}	3.89×10^{-4}	3.1×10^{-5}

Source: Tetra Tech 2008.
[a] CPC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

5.1.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this analysis, Emergency Response Planning Guidelines (ERPG) values are used to develop hazard indices for chemical exposures.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERP 2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERP- 3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.1.12–3 provides information on each chemical and the frequency and consequences of an accidental release under the Greenfield CPC and Upgrade Alternative. The source term shown represents the amount of the chemical that is accidentally released.

Table 5.1.12-3—Greenfield CPC and Upgrade Alternative Chemical Accident Frequency and Consequences at LANL

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary[a] (ppm)	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	10.4	10^{-4}
Formic acid	1,500	10	0.215	0.54	1.06	10^{-4}

Source: Tetra Tech 2008.

[a] Site boundary is at a distance of 0.7 miles.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.1.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

NNSA also estimated the impacts of the potential release of the most hazardous chemicals that would be used under the 50/80 Alternative. Table 5.1.12-4 provides information on each chemical and the frequency and consequences of an accidental release. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 concentration increases, the potential number of people onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would also be expected to increase.

Table 5.1.12-4—50/80 Alternative Chemical Accident Consequences at LANL

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency (per year)
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary[a] (ppm)	
Nitric acid	3,420	6	0.5	1.46	2.85	10^{-4}
Hydrofluoric acid	340	20	0.4	3.1	6.42	10^{-4}
Hydrochloric acid	384	20	2.1	118	264	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 0.7 miles.

None of the chemicals released in an accident would exceed ERPG-2 limits offsite. Concentrations at the location of a non-involved worker at a distance of 3,281 feet from a hydrochloric acid release would exceed ERPG-2 limits.

5.1.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the individual exposure cannot be adequately established with respect to the presence of shielding and other protective features. Noninvolved workers may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury. For the TA-55 Upgrade Alternative, the number of workers required for operations is estimated to be 630 (including security guards). Each process facility within the upgraded facility would have attached safe haven structures designed in accordance with a number of life safety, fire protection, and safeguards and security requirements

5.1.12.3 *Consolidated Uranium Center*

5.1.12.3.1 Radiological Accidents

The accident scenarios, material at risk, and source term for the CUC are shown below:

Operation	Accident	Source Term	Notes/Assumptions
EU Metal Fabrication	Major fire	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hour
Assembly	Explosion	2 kg EU (sum of metal and chips) 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hour
EU Warehouse	Fire	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (the above all represent the sum of metals, oxides, and combustibles) Pu = 1.0×10^{-6} kg Np-237 = 1.6×10^{-5} kg	Release height = 4 m Release duration = 1 hour
HEUMF	Design-basis fires	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hour
EU Operations	Aircraft crash	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

Source: Tetra Tech 2008.

Table 5.1.12–5 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.1.12-6), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated were to occur, its impacts on workers and the public would be expected to be within the range of the impacts for accidents that were evaluated.

Table 5.1.12-5—CUC Radiological Accident Frequency and Consequences at LANL

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	$10^{-4} – 10^{-6}$	0.213	1.28×10^{-4}	94.5	5.67×10^{-2}	7.53	4.52×10^{-3}
Explosion	$10^{-4} – 10^{-6}$	0.0209	1.25×10^{-5}	9.3	5.58×10^{-3}	0.612	3.67×10^{-4}
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.249	1.49×10^{-4}	110	6.6×10^{-2}	8.33	5.0×10^{-3}
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0267	1.6×10^{-5}	12	7.2×10^{-3}	0.637	3.82×10^{-4}
Aircraft crash	$10^{-4} – 10^{-6}$	0.132	7.92×10^{-5}	75.5	4.53×10^{-2}	0.8	4.8×10^{-4}

Source: Tetra Tech 2008.
[a] CUC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-6—Annual Cancer Risks for CUC at Los Alamos, TA-55

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.28×10^{-8}	5.67×10^{-6}	4.52×10^{-7}
Explosion	1.25×10^{-9}	5.58×10^{-7}	3.67×10^{-8}
Fire in EU Warehouse	1.49×10^{-8}	6.6×10^{-6}	5.0×10^{-7}
Design-basis fires for HEU Storage	1.6×10^{-7}	7.2×10^{-5}	3.82×10^{-6}
Aircraft crash	7.92×10^{-9}	4.53×10^{-6}	4.8×10^{-8}

Source: Tetra Tech 2008.
[a] CUC operations at TA55; at site boundary, approximately 0.7 miles from release.
[b] Based on a projected future population (year 2030) of approximately 552,115 persons residing within 50 miles of LANL TA55 location.
[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Tables 5.1.12-5 and 5.1.12-7) is the fire in the EU warehouse. Depending upon whether the CUC were located at TA-55 or TA-16, approximately 0.04-0.06 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a maximum dose of 0.926 rem. Statistically, this MEI would have an LCF risk of approximately 6×10^{-4}, or approximately 1 chance in about 2,000 of an LCF. This accident has a probability of occurring approximately once every 10,000 years.

When probabilities are taken into account (see Tables 5.1.12-6 and 5.1.12-8), 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 approximately 6×10^{-7}, or less than one in a million. For the population, the LCF risk would be 7.2×10^{-5}, meaning that an LCF would statistically occur once every 13,888 years in the population.

Table 5.1.12-7—Potential Accident Consequences–CUC at Los Alamos, TA-16[a]

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
EU Metal Fabrication	0.798	4.79×10^{-4}	60.3	3.62×10^{-2}	7.53	4.52×10^{-7}
Assembly	0.0768	4.61×10^{-5}	5.95	3.57×10^{-3}	0.612	3.67×10^{-8}
EU Warehouse	0.926	5.56×10^{-4}	70.6	4.24×10^{-2}	8.33	5.0×10^{-7}
HEUMF	0.0961	5.77×10^{-5}	7.7	4.62×10^{-3}	0.637	3.82×10^{-6}
EU Operations	0.158	9.48×10^{-5}	68.2	4.09×10^{-2}	0.8	4.8×10^{-8}

Source: Tetra Tech 2008.
[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-8—Annual Cancer Risks for CUC at LANL, TA-16

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	4.79×10^{-8}	3.62×10^{-6}	0.00452
Explosion	4.61×10^{-9}	3.57×10^{-7}	0.000367
Fire in EU Warehouse	5.56×10^{-8}	4.24×10^{-6}	0.005
Design-basis fires for HEU Storage	5.77×10^{-7}	4.62×10^{-5}	0.000382
Aircraft crash	9.48×10^{-9}	4.09×10^{-6}	0.00048

Source: Tetra Tech 2008.
[a] LANL Option 2 Uranium Operations would be at TA16. At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

5.1.12.3.2 Hazardous Chemicals Impacts

A CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. NNSA estimated the impacts of the potential release of the most hazardous chemical used at a CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative

modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.1.12-9 shows the consequences of the dominant loss of containment accident scenario.

Table 5.1.12-9—Consequences and Frequency of CUC Chemical Accidents, Los Alamos

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.5	8.76	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 0.7 miles.

5.1.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident.

Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.1.12.4 *Assembly/Disassembly/High Explosives Center*

5.1.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.1.12–10 and 5.1.12-11 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts for accidents that were evaluated.

Table 5.1.12-10—A/D/HE Center Radiological Accident Consequences at LANL

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	73.8	0.0886	5,580	3.35	696	0.835
Scenario 2	0.0529	3.17×10^{-5}	4	2.4×10^{-3}	0.499	2.99×10^{-4}
Scenario 3	4.42×10^{-6}	2.65×10^{-9}	0.000334	2.00×10^{-7}	4.17×10^{-5}	2.50×10^{-8}
Scenario 4	1.31	7.86×10^{-4}	545	0.327	7.94	4.76×10^{-3}
Scenario 5	1.37	8.22×10^{-4}	570	0.342	8.3	4.98×10^{-3}
Scenario 6	0.0102	6.12×10^{-6}	4.23	2.5×10^{-3}	0.0615	3.69×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

Table 5.1.12-11—Annual Cancer Risks for A/D/HE Center Accidents at LANL

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Individual Noninvolved Worker[c]
Scenario 1	8.86×10^{-6}	3.35×10^{-4}	8.35×10^{-5}
Scenario 2	3.17×10^{-7}	2.4×10^{-4}	2.99×10^{-6}
Scenario 3	2.65×10^{-11}	2.00×10^{-9}	2.50×10^{-10}
Scenario 4	7.86×10^{-10}	3.27×10^{-7}	4.76×10^{-9}
Scenario 5	8.22×10^{-8}	3.42×10^{-5}	4.98×10^{-7}
Scenario 6	6.12×10^{-8}	2.54×10^{-5}	3.69×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 0.5 miles from release.
[b] Based on a projected future population (year 2030) of approximately 712,238 persons residing within 50 miles of TA-16 location.
[c] At a distance of 1,000 meters.

The results of the accident analysis indicate potential consequences that exceed NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for an A/D/HE Center. Additional NEPA analyses would be

conducted to identify specific mitigating features that would be incorporated in an A/D/HE Center design to ensure compliance with exposure guidelines if NNSA were to decide to build an A/D/HE Center at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[6] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into an A/D/HE Center design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.1.12-10) is Scenario 1, the explosive driven plutonium and tritium dispersal from an internal event. Approximately 3 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of 73.8 rem. Statistically, this MEI would have a 0.04 chance of developing a LCF (i.e., about 1 chance in 23 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.1.12-11), the explosive driven plutonium and tritium dispersal from an internal event also has the highest overall risk. For this accident, the LCF risk to the MEI would be approximately 9×10^{-6}, or approximately 1 in 100,000. For the population, the LCF risk would be 3.35×10^{-4}, meaning that an LCF would statistically occur once every 3,000 years in the population.

5.1.12.4.2 Hazardous Chemicals Impacts

NNSA has identified chlorine as the hazardous chemical dominating the risk from nonradiological releases for an A/D/HE Center (DOE 1996). Chlorine is the only chemical with the potential for significant adverse offsite consequences. Since chlorine is not carcinogenic, the consequences of exposure to chlorine (primarily acute effects) differ from the consequences of exposure to radionuclides (potential latent cancers). This difference precludes a direct comparison between the risk and consequences associated with hazardous chemical releases and radionuclide releases.

Scenario 7 involves a chlorine release. A release of chlorine to the environment due to an earthquake is an unlikely event. Should an earthquake occur with sufficient magnitude to damage a facility that uses chlorine, it could release the contents from as many as four chlorine cylinders. The magnitude of this release could be as high as 408 kilograms (900 pounds) (Pantex 1996a).

Workers in the vicinity of a chlorine release could be exposed to chlorine concentrations in excess of EPRG3 and threshold levels. No long-term adverse health effects are expected for workers who promptly evacuate the area. For any persons incapable of evacuating the area of the

[6] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

chlorine plume, no serious or irreversible health impacts are expected from EPRG1 or EPRG2 exposures since the exposure duration is less than 1 hour. Persons incapable of evacuating an area with EPRG3 concentrations may experience adverse health impacts depending upon the actual chlorine concentrations encountered and the exposure duration. Chronic lung disease, electrocardiographic changes, and death have occurred in humans exposed to high concentrations of chlorine as a consequence of industrial accidents (Calabrese 1991). Table 5.1.12-12 depicts the potential impacts of conservative modeling of a chlorine release over the period of 1-hour with culated down-wind concentrations.

Table 5.1.12-12—A/D/HE Center Chemical Accident Frequency and Consequences

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Scenario 7-Chlorine Release	408.23	3	2.8	17.4	32.5	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 0.5 miles from the A/D/HE Center.

5.1.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the individual decreases because the worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.1.12.5 *LANL Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in the potential accident impacts to LANL employees and the population surrounding LANL. For a site-wide seismic event, the dose from TA-55 to a non-involved worker at 110 yards could be reduced by approximately 2,700 rem. This would reduce the likelihood to less than 1 that this non-involved worker would contract a fatal cancer during their lifetime from this accident. For the population surrounding LANL, a site-wide seismic event affecting TA-55 could produce a population dose of 14,000 person-rem (approximately 9 LCFs) and a MEI dose of 150 rem (a LCF risk of 0.17). Phaseout of all plutonium operations from TA-55 would reduce these consequences to zero.

Risks from chemical accidents would also be reduced. For example, phasing out the plutonium operations would eliminate the risks from a chlorine gas release. Based on the current LANL operations, there is 1 chance in 15 that a worker within approximately 200 yards of the Plutonium Facility would receive exposure in excess of limits.

5.1.13 Transportation

5.1.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at LANL, and impacts would remain unchanged from the baseline presented in Section 4.1.12. Radiological transportation under the No Action Alternative for LANL would include transport of pits from Pantex to LANL, recycle of enriched uranium parts to and from Y-12, return of reassembled pits to Pantex, shipment of TRU waste to Waste Isolation Pilot Plant (WIPP) (near Carlsbad, New Mexico), and SNM transfers between LANL and other sites, including LLNL and SRS. Low-level waste (LLW) would be disposed of onsite at LANL. The number of pits processed per year would be limited to approximately 20. Section 5.10.1 presents the impacts of the No Action Alternative impacts associated with transportation.

Because there would be no change from the baseline in operations employment under the No Action Alternative, there would be no change in traffic in the vicinity of LANL.

5.1.13.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80 Alternative)*

5.1.13.2.1 Construction

Construction for a CPC, the Upgrade Alternative, or the 50/80 Alternative would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (a maximum of 2 percent based on employment increases) compared to the average daily traffic levels reported in Section 4.1.12 and would be temporary.

5.1.13.2.2 Operations

Radiological transportation impacts are presented in Section 5.10 for all the action alternatives. The addition of a maximum of 1,170 new direct employees (Greenfield CPC) would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.3 *CCE Alternative*

5.1.13.3.1 CNC (CPC + CUC)

Construction. **CUC.** Construction of a CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.1.12 and would be temporary.

Operations. **CNC.** Radiological transportation for a CNC is assessed in Section 5.10. The addition of approximately 2,105 new direct employees for a CUC (1,170 for CPC and 935 for

CUC) would represent an increase in ROI employment of less than 2 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.4 *CNPC (CPC + CUC + A/D/HE Center)*

***Construction:* A/D/HE Center.** Construction of an A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (approximately 5 percent based on employment increases) and temporary compared to average daily traffic levels reported in Section 4.1.12.

***Operations:* CNPC.** If the A/D/HE Center were located at LANL as part of a CNPC, the annual radiological transportation impacts associated with the pit production alternatives and the impacts associated with a CUC would not occur, with the exception of TRU waste transportation described for the pit production alternatives. There would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. The addition of approximately 3,890 new direct employees for a CNPC (1,170 for CPC, 935 for CPC, and 1,785 for A/D/HE Center) would represent an increase in ROI employment of approximately 2.5 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.1.12.

5.1.13.5 *Phase Out of NNSA Category I/II SNM Missions from LANL*

If NNSA's Category I/II SNM missions were eliminated at LANL, all of its Category I/II SNM inventories would be transferred to other DOE or NNSA sites. The environmental impacts of this transportation are addressed in Section 5.10.

5.1.14 Waste Management

5.1.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at LANL would continue as required to support the missions described in Section 3.2.1. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 5.1.14-1 shows annual waste generation volumes from LANL operations for the years 1999–2004 to facilitate comparisons of the additional alternatives presented.

Table 5.1.14-1—Annual Routine Waste Generation from LANL Operations

Waste Type	Units	1999	2000	2001	2002	2003	2004	2005
LLW	yd^3/year	2,190	5,530	3,400	9,560	7,640	19,400	7,080
Mixed LLW	yd^3/year	30	780	80	30	50	50	90
Transuranic Waste	yd^3/year	190	160	150	160	530	50	100
Mixed Transuranic Waste	yd^3/year	110	120	60	110	210	30	130
Chemical Waste	100lbs/year	34,000	61,000	60,800	3,820	1,520	2,460	4,340

Source: LANL 2008.

5.1.14.2 *DCE Alternative (Greenfield CPC, Upgrade, 50/80)*

5.1.14.2.1 Construction Impacts of Greenfield CPC, Upgrade, 50/80 Alternatives

Construction of a new CPC, or upgrading existing facilities, could generate TRU, LLW, hazardous waste and non-hazardous waste. Table 5.1.14–2 summarizes the expected construction wastes.

Table 5.1.14-2—Construction Waste Generation from CPC Alternatives

Construction Waste Type	Greenfield CPC	Upgrade	50/80
TRU Waste (yd^3)	0	200	0
LLW (yd^3)	0	200	0
Hazardous Waste (yd^3)	6.5	4 [a]	4
Non-hazardous Solid Waste (yd^3)	9,800	578 (tons)	9,750
Non-hazardous Liquid waste (yd^3)	50,700	7,800[a]	7,800

Source: NNSA 2007.
[a] Levels not expected to be significantly above levels for the 50/80 Alternative.

Construction associated with the 50/80 Alternative and the Greenfield CPC Alternative, at LANL, would not be expected to generate any TRU or LLW. Small quantities of hazardous waste would be generated from the construction associated with the Greenfield CPC, the Upgrade, and 50/80 Alternatives. Although these quantities approach the amount currently generated by LANL, they are a fraction of what LANL generated only a few years ago. Accordingly, the capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility, presently exists.

Construction of a Greenfield CPC at LANL would generate 9,810 cubic yards of non-hazardous solid waste. Construction of the 50/80 Alternative at LANL would be expected to generate 9,750 cubic yards of non-hazardous waste. Construction of the Upgrade Alternative, at LANL would be expected to generate 578 tons of non-hazardous solid waste. Previously, solid waste and construction waste generated at LANL was disposed at the Los Alamos County Landfill, located within LANL boundaries, and operated by Los Alamos County. This landfill is now closed. Solid waste includes paper, cardboard, plastic, glass, office supplies and furniture, food waste, brush, and debris. Through an aggressive waste minimization and recycling program, the amount of solid waste at LANL requiring disposal has been greatly reduced. In 2004, 6,380 tons of solid waste were generated at LANL, of which 4,240 tons were recycled (LANL 2004p). The County currently operates a new transfer station, which would transport that waste to other solid

waste landfills within the state. The Upgrade and the 50/80 Alternatives are not expected to generate substantial quantities of non-hazardous solid waste in relation to what the transfer station can accommodate.

Construction activities associated with the Greenfield CPC, Upgrade, and 50/80 Alternatives are expected to generate non-hazardous liquid wastes. The Greenfield Alternative would be expected to generate 58,000 cubic yards, and the 50/80 Alternative would be expected to generate 7,800 cubic yards. The Upgrade Alternative, at LANL would not be expected to generate liquid, non-hazardous waste significantly above the 50/80 Alternative levels. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation and has sufficient capacity to handle expected volumes. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

5.1.14.2.2 Operation of Greenfield CPC, Upgrade, 50/80 Alternatives

Normal operation under a Greenfield CPC, Upgrade, and 50/80 Alternatives would generate TRU waste, mixed TRU waste, LLW, mixed LLW (MLLW), hazardous waste, and non-hazardous waste. Table 5.1.14-3 summarizes the annual volumes of waste expected to be generated by normal operations.

Table 5.1.14-3—Operational Waste Generation from CPC Alternatives

Annual Operating Waste Type (yd^3)	Greenfield CPC	Upgrade	50/80
TRU Solid (including Mixed TRU) (yd^3)	850	850	575[1]
Mixed TRU Solid Waste (yd^3)(included in TRU solid)	310	310	2.6
TRU Liquid waste (yd^3)			6.5
Low Level Liquid Waste (yd^3)	0	0	19.5
LLW Solid (yd^3)	3,500	3,500	1,850
Mixed Low Level Solid Waste (yd^3)	3.6	3.6	65
Mixed Low Level Liquid Waste (yd^3)	0.4	0.4	0
Hazardous Solid (tons)	3.6	3.6	265
Hazardous Waste liquid (tons)	0.5	0.5	2.6
Nonhazardous Solid (yd^3)	7,400	7,400	700
Nonhazardous Liquid (gal)	69,500	69,500	16,000

Source: NNSA 2007.
[1]Includes 75 cubic yards/yr over a 10-year period to replace gloveboxes in PF-4

Operation of a Greenfield CPC would generate 850 cubic yards of TRU waste, and operation of the Upgrade Alternative would also generate 850 cubic yards of TRU waste. The 50/80 Alternative would generate a slightly smaller 575 cubic yards of TRU waste. Some portions of this TRU waste would be mixed TRU waste for the Greenfield Alternative (a little more than a third) and for the 50/80 Alternative (a little more than ten percent). This waste would be packaged in accordance with the WIPP Waste Acceptance Criteria (WAC), placed in TRUPACT-II shipping containers, and shipped to WIPP. This would be done within a new CPC or at the Solid Waste Management Facility in TA-54 for the Upgrade and 50/80 Alternatives. The liquid portions would be solidified.

Operation of the Greenfield CPC and the Upgrade Alternative would each generate 3,500 cubic yards of LLW. This amount of LLW that would be generated by the Greenfield CPC or the Upgrade Alternative would be from one-third to one-half the amount of LLW routinely generated at LANL. This waste would be processed at the newly constructed CPC, Greenfield or Upgrade Alternative facility, or at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G. Operation of the 50/80 Alternative would generate an estimated 1,850 cubic yards of LLW (reduced size and throughput), or a little more that half the amount of LLW generated by the Greenfield CPC and Upgrade Alternative. This LLW would be handled in a similar manner.

Small quantities of hazardous solid waste would be generated from the operation of a Greenfield CPC or the Upgrade Alternative. The 50/80 Alternative, relying on older, less efficient facilities, would generate substantially more (265 tons) hazardous waste. All of these amounts are small in comparison to the total amount of hazardous waste generated by LANL routine operations. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for shipment offsite and disposal at a commercial facility, presently exists, and would have little impact on routine hazardous waste operations at LANL.

Operation of a Greenfield CPC or the Upgrade Alternative would each generate 7,400 cubic yards of non-hazardous solid waste. The 50/80 Alternative is expected to generate 700 cubic yards of non-hazardous waste. The County currently operates a new transfer station, which

provides all of the services that are available to residents and businesses at the existing landfill. The transfer station has the capacity to handle these volumes of waste on a regular basis.

Operation of the Greenfield CPC or the Upgrade Alternative is expected to generate just under 70,000 cubic yards of non-hazardous liquid waste. The 50/80 Alternative is expected to generate approximately 16,000 cubic yards of non-hazardous waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.3 *CCE Alternative*

Waste management impacts from the construction and operation of the CNC would include the impacts of a Greenfield CPC discussed in Section 5.1.14.2, as well as the impacts of a CUC discussed below.

5.1.14.3.1 CNC (CPC + CUC)

Construction: **CUC.** Construction of a CNC would entail construction of a Greenfield CPC, already discussed in Section 5.1.14.2.1, above, and construction of a CUC, discussed in this section. Construction of a CUC would generate LLW, hazardous waste, and solid non-hazardous sanitary waste. Table 5.1.14-4 summarizes the total volume of waste which will be generated over the entire construction period for the CUC.

Table 5.1.14-4—Total Waste Generation from Construction of the CUC

Waste Category	Quantity
Low-level solid (yd^3)	70
Mixed Low-level solid (yd^3)	0
Hazardous (tons)	6
Nonhazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

Construction associated with a CUC would generate 70 cubic yards of LLW. This amount of LLW is a small percentage of the amount of LLW routinely generated at LANL. This waste would result from the installation of equipment and processes and would be processed at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G.

Small quantities of hazardous waste would be generated from the construction of a CUC. This 6 tons of hazardous waste generated over the entire construction period could easily be handled by the existing infrastructure at LANL. These wastes would be collected, accumulated at any of the four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility.

Construction of a CUC would generate 1,000 tons of non-hazardous solid waste. Solid waste includes paper, cardboard, plastic, glass, office supplies and furniture, food waste, brush, and debris. To the extent possible, metals would be removed from this waste and recycled. The County currently operates a new transfer station, which would transport that waste to other commercially available solid waste landfills within the state.

A concrete batch plant would operate at the CNC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CNC construction is completed. A retention pond would be constructed to manage stormwater runoff from the entire CNC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

***Operations:* CNC.** Operation of a CNC would entail operation of a Greenfield CPC, already discussed in Section 5.1.14.2.1, above, in addition to the operation of a CUC, discussed in this section. Operation of the CUC would generate LLW, and both solid and liquid sanitary waste. Table 5.1.14-5 summarizes the total volume of waste which will be generated by the operation of the CNC, at LANL.

Operation of a CNC would generate 850 cubic yards of TRU waste and 310 cubic yards of mixed TRU waste. This waste would be collected and then packaged in accordance with the WIPP WAC, placed in TRUPACT-II shipping containers, and shipped to WIPP.

Operation of a CNC would generate 3,515 gallons of liquid LLW and 3,616.4 gallons of mixed liquid LLW. These wastes would be solidified, processed, and packaged for disposal at the CUC or at the Solid Waste Management Facility in TA-54 and then disposed of on-site at TA-54 Area G. The mixed LLW could require additional treatment prior to solidification and disposal. In addition, operation of the CNC would generate 11,600 cubic yards of solid LLW and 72.3 cubic yards of mixed LLW. This waste would also be processed and packaged for disposal at the CPC and then disposed of on-site at TA-54 Area G. The mixed solid LLW could require additional treatment prior to disposal.

Table 5.1.14-5—Annual Waste Generation for CNC Operation

Waste Generated	CPC	CUC	CNC
TRU Solid Waste (yd^3)	850	0	850
TRU liquid waste (yd^3)	6.5		6.5
Low Level Liquid Waste (gal)	0	3,515	3,515
Low Level Solid Waste (yd^3)	3,500	8,100	11,600
Mixed Low Level Liquid Waste (gal)	0.4	3,616	3,616.4
Mixed Low Level Solid Waste (yd^3)	2.3	70	72.3
Mixed TRU Solid Waste (yd^3)	310	0	310
Hazardous waste solid (tons)	3.7	15	18.7
Hazardous waste liquid (tons)	0.52	0	0.52
Non-Hazardous Solid Waste (yd^3)	7,400	7,500	14,900
Non-Hazardous Liquid Waste (gal)	69,500	50,000	119,500

Source: NNSA 2007.

Small quantities of liquid hazardous waste and an estimated 18.7 cubic yards of solid hazardous waste would be generated by the operation of a CNC. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned) for offsite disposal at a commercial facility, presently exists and is sufficient to handle these volumes of hazardous waste.

Operation of a CNC would generate 14,900 cubic yards of non-hazardous solid waste. The County currently operates a new transfer station, which would transport that waste to other commercially available solid waste landfills within the state. Sufficient capacity exists to handle this amount of non-0hazardous solid waste on a regular basis.

Operation of a CNC is expected to generate 119,500 gallons of non-hazardous liquid waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.3.2 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.1.14.2, the CUC impacts, discussed above, and the impacts of an A/D/HE Center, the waste impacts of which are discussed below.

***Construction:* A/D/HE Center.** The additional construction of an A/D/HE Center would generate LLW, and non-hazardous waste. Table 5.1.14-6 summarizes the total volume of waste to be generated over the 6 years construction period for an A/D/HE Center.

Table 5.1.14-6—A/D/HE Center Construction Waste

Waste Generated	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (tons)	7,100
Non-Hazardous Liquid Waste (gallons)	40,000

Source: NNSA 2007.

Construction of an A/D/HE Center is expected to generate 9,900 cubic yards of solid LLW. This waste would be processed, and packaged for disposal at the new facility or at the Solid Waste Management Facility in TA-54 and then disposed of on-site at TA-54 Area G.

Construction of an A/D/HE Center would generate 7,100 cubic yards of non-hazardous solid waste. A concrete batch plant would operate at the CNPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would

be disassembled and the area would be restored once CNPC construction is completed. A retention pond would be constructed to manage stormwater runoff from the entire CNPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

5.1.14.4.2 CNPC Operations Impacts

Normal operation of a CNPC would generate TRU waste, LLW, MLLW, hazardous waste, and sanitary waste. Table 5.1.14-7 summarizes the estimated waste generation rates for the operation of the CNPC at LANL.

Table 5.1.14-7—Annual CNPC Operations Waste Generation

Waste Generated	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste (yd^3)	850	0	0	850
Low Level Liquid Waste (gal)		3,515	5,410	8,925
Low Level Solid Waste (yd^3)	3,500	8,100	40	11,640
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Mixed Low Level Solid Waste (yd^3)	2.3	70	0	72.3
Mixed TRU Solid Waste (yd^3)	310	0	0	310
Hazardous waste solid (yd^3)	3.7	15	1,350	1,368.7
Hazardous waste liquid (gal)	0.5	0	8,850	8,850.5
Non-Hazardous Solid Waste (yd^3)	7,400	7,500	15,000	29,900
Non-Hazardous Liquid Waste (gal)	69,500	50,000	46,000	165,500

Source: NNSA 2007.

Operation of a CNPC would generate 850 cubic yards of TRU waste and 310 cubic yards of mixed TRU waste. This waste would be collected and then packaged in accordance with the WIPP WAC, placed in TRUPACT-II shipping containers, and shipped to WIPP. Sufficient storage space to accumulate shipment quantities would exist in the CNPC.

Operation of a CNPC would generate 8,925 gallons of liquid LLW and 3,622.4 gallons of mixed liquid LLW. These wastes would be solidified, processed, and packaged for disposal at the waste processing portion of the new CNPC facility, or at the Solid Waste Management Facility in TA-54, and then disposed of on-site at TA-54 Area G. The mixed LLW could require additional treatment prior to solidification and disposal. The CNPC will have the necessary RCRA permit to allow for such treatment. In addition, operation of a CNPC would generate 11,640 cubic yards of solid LLW and 72.3 cubic yards of mixed LLW. This waste would also be processed and packaged for disposal, on-site, at TA-54 Area G. The mixed solid LLW could require additional treatment prior to disposal. This would be done at the new CNPC as it would have a RCRA permitted mixed waste treatment facility.

An estimated 1,368.7 cubic yards of solid hazardous waste and an estimated 8,850.5 gallons of liquid hazardous waste would be generated by the operation of a CNPC. The capacity to collect these wastes, accumulate them at four existing storage facilities (with two additional already planned), to solidify the liquid waste, and to ship these wastes offsite for treatment and disposal at a commercial facility, presently exists and is sufficient to handle these volumes of hazardous waste.

Operation of a CNPC at LANL would generate 29,900 cubic yards of non-hazardous solid waste. The County currently operates a new transfer station, which would transport that waste to other solid waste landfills within the state. Sufficient capacity exists to handle this volume of waste on a regular basis.

Operation of a CNPC is expected to generate 165,500 gallons of non-hazardous liquid waste. This waste would be processed at the TA-46 Sanitary Wastewater System Plant. Treated liquid effluent from the Sanitary Wastewater System Plant is pumped to storage tanks near the TA-3 Power Plant before being discharged to Sandia Canyon through a permitted outfall. The effluent reclamation facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation. Sanitary sludge from the Sanitary Wastewater System Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as New Mexico Special Waste at a permitted landfill (LANL 2008).

5.1.14.4 *Capability-Based Alternatives*

LANL is presently reestablishing an interim pit fabrication capacity that could provide up to 50 pits annually. Under the Capability-Based Alternative, this effort would continue and would not change. As a result of increased pit production, larger quantities of some radioactive wastes would be generated. Increased pit production is projected to annually result in about 240 cubic yards of additional contact-handled transuranic waste (LANL 2008). For the No Net Production/Capability-Based Alternative, LLW and TRU wastes would decrease. LLW from plutonium operations would be reduced to 68 cubic yards per year, and TRU wastes would be reduced to 42 cubic yards per year.

5.1.14.5 *Plutonium Phase Out*

If LANL is not selected as the site for a CPC or CNC/CNPC, NNSA would phaseout NNSA plutonium operations and remove Category I/II SNM from LANL by approximately 2022. Phasing out the plutonium operations from TA-55 would result in a decrease in waste generated at LANL. Assuming that LANL would be producing 20 certifiable pits annually prior to phase out, wastes would be expected to decrease by the following amounts after interim pit production ends:

- LLW would decrease by 990 cubic yards annually (from 13,000 cubic yards to 12,010 cubic yards, a decrease of approximately 8 percent);
- MLLW would decrease by 20 cubic yards annually (from 140 cubic yards to 120 cubic yards, a decrease of approximately 14 percent); and
- TRU would decrease by 690 cubic yards annually (from 860 cubic yards to 170 cubic yards, a decrease of approximately 80 percent).

5.1.14.6 *Decontamination and Decommissioning of the CMR*

The Chemistry and Metallurgy Research Building (CMR) is a 550,000 square foot facility located within TA-3, at LANL. Constructed between 1949 and 1952, as an actinide chemistry and metallurgy research facility, the facility was expanded in 1960, and again in 1986. As

presented in the Final EIS for the Chemistry and Metallurgy Research Building Replacement Project (CMRR), DOE-EIWS-0350, after a four year transition period which would transfer activities from the CMR to the newly constructed CMRR, the CMR would undergo some level of D&D. Operational experience at the CMR Building indicates some surface contamination has resulted from the conduct of various activities over the past 50 years.

Although D&D alternatives range from reuse of the entire building, to reuse of some of the building, to total demolition of the entire building, the greatest environmental impacts would be associated with the D&D and total demolition of the entire CMR Building and surrounding land. Impacts associated with the D&D and demolition of the entire CMR Building and surrounding land are expected to be limited to the creation of waste within LANL site waste management capabilities.

It is anticipated that the majority of the waste material produced by the D&D and demolition of the CMR Building would be solid waste and recyclable materials totaling an estimated 20,000 cubic yards. The amount of radioactive waste material is anticipated to be slightly less, about 16,000 cubic yards. The solid waste would be disposed of at the Los Alamos County Landfill, at LANL, or at a replacement facility. It is expected that the low-level radioactive waste could be transported offsite to a commercially licensed facility for disposal or disposed of onsite at LANL's TA-54, Area G. Asbestos contaminated radioactive material from the demolition of the CMR Building would be disposed of in a disposal cell in TA-54, Area G, which is dedicated to the disposal of radioactively contaminated asbestos waste. It is anticipated that the amount of this material would be within the current capacity of the disposal cell. Asbestos that is not radiologically contaminated would be packaged and sent to the LANL asbestos transfer station for shipment, offsite, to a permitted asbestos disposal facility, along with other asbestos waste generated at other locations on LANL. It is anticipated that the amount of asbestos material generated by the demolition of the CMR Building would not exceed the disposal capacity of existing facilities.

Removal of the existing CMR Building would result in emissions associated with equipment and vehicle exhaust as well as particulate emissions (fugitive dust) from demolition activities. The demolition effects would be expected to result in elevated concentrations of particulate matter in the immediate vicinity of TA-3. Concentrations of other criteria pollutants could also increase but would not be expected to exceed the ambient standards in areas to which the public has regular access. Demolition activities may also result in radiological releases.

Noise levels during disposition activities at the CMR Building would be consistent with those typical of construction activities. As appropriate, workers would be required to wear hearing protection to avoid adverse effects on hearing. Non-involved workers at nearby facilities within TA-3 would be able to hear some of the activities; however, the level of noise would not likely be distracting. Construction noise at LANL is common. Some wildlife species may avoid the immediate vicinity of the CMR Building as demolition proceeds due to noise; however, any effects on wildlife resulting from noise associated with demolition activities would be temporary.

Little or no effect on water resources would be anticipated. The demolition of the CMR Building would not disturb surface water or generate liquid effluents that would be released to the

surrounding environment. Silt fences, hay bales, or other appropriate Best Management Practices would be employed to ensure that fine particulates are not transported by stormwater into surface water features in the vicinity of the CMR Building. Potable water use at the site would be limited to that necessary for washing equipment, dust control, and sanitary facilities for workers.

All demolition activities would take place within TA-3, an area that has been dedicated to industrial use since the early 1940s. There are some small trees and shrubs around the CMR Building, but the immediate area consists mostly of roads, parking areas, and concrete pads. Wildlife in the vicinity could be temporarily disturbed by demolition activity and noise when the building is razed, building foundation and buried utilities removed, contaminated soils excavated, and waste trucked to disposal sites.

Under Section 106 of the *National Historic Preservation Act* (NHPA), any adverse effects to Register-eligible properties must be resolved prior to commencement of project activities. In conjunction with the State Historic Preservation Office, NNSA has developed documentation measures to reduce adverse effects to Register-eligible properties at LANL. These measures are incorporated into formal memoranda of agreement (MOAs) between the NNSA and the New Mexico Historic Preservation Division. Typical MOA terms include the preparation of a detailed report containing the history and description of the affected properties. Other terms include the identification of all drawings for each property, the production of medium-format archival photographs, and the preparation of LANL historic building survey forms. Documentation measures included in NNSA MOAs are carried out to the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Specific levels of HABS/HAER documentation are determined on a case-by-case basis.

The primary source of potential consequences to workers and members of the public would be associated with the release of radiological contaminants during the demolition process. The only radiological effect on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminate containment coupled with HEPA filters. Contaminate releases of radioactive particulate from disposition activities are expected to be lower than releases from past CMR operations. The demolition of the CMR Building would also involve the removal of some asbestos-contaminated material. Removal of asbestos-contaminated material would be conducted according to existing asbestos management programs at LANL in compliance with strict asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls, and no asbestos would likely be released that could be inhaled by members of the public.

Demolition wastes would need to be transported to storage or disposal sites at LANL or offsite location(s). Transport of contaminated waste material would present potential risks to workers and the public from radiation exposure as the waste packages are transported along roads and highways. There would also be increased risk from traffic accidents (without release of radioactive material) and radiological accidents (in which radioactive material is released).

Additional details of potential D&D activities related to the CMR Building may be found in "Preliminary Chemistry and Metallurgy Research Building Disposition Study," February 11, 2003, LA-UR-03-1122 (LANL 2003e).

5.2 LAWRENCE LIVERMORE NATIONAL LABORATORY

There are no Programmatic Alternatives for LLNL. Relevant project specific analyses for LLNL are discussed in Sections 5.12 through 5.17.

5.3 NEVADA TEST SITE

This section discusses the potential environmental impacts associated with the following programmatic alternatives at NTS:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. NTS would continue to perform its existing missions as described in Section 3.2.3 and no additional impacts would occur beyond those of existing and future activities that NNSA has already decided to perform.
- **DCE Alternative.** This alternative includes a CPC.
- **CCE Alternative.** This alternative includes two options: 1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, a Consolidated Uranium Center (CUC), and an A/D/HE Center; and 2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC, with the A/D/HE Center at Pantex. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE, 2020-2025).
- **Capability-Based Alternatives.** Under the Capability-Based Alternative and the No Net Production/Capability-Based Alternative, no additional changes would be required at NTS. As such, the No Action Alternative is the same as the Capability-Based Alternatives at NTS.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and archaeological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.3.1 Land Use

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.3.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.3.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
	140	110[a]	
		PIDAS	**Non-PIDAS**
Greenfield Alternative		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	

Table 5.3.1-1—Potential Effects on Land Use at the Proposed Sites (continued)

CUC		
Construction (acres)	50	
Operation (acres)	Total Area: 35[b]	
	PIDAS	**Non-PIDAS**
	15	20
A/D/HE CENTER [d]		
Construction (acres)	300	
Operation (acres)	Total Area: 300[e]	
	PIDAS	**Non-PIDAS**
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120
CNC		
	Total Area: 195[f]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50
CNPC		
	Total Area: 545[g]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.3.1.1 *No Action Alternative*

Most of NTS is currently unused or provides buffer zones for ongoing programs and projects, while about 7-10 percent (60,000–86,500 acres) of the site has been disturbed. Existing land use at NTS is discussed in Section 4.3.1.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at NTS beyond those of existing and future activities that are independent of this action.

Primary facilities that support the NTS national security missions include the U1a Complex (where high explosives are detonated in the presence of aging nuclear materials to test their dynamic properties), the Big Explosives Experimental Facility (BEEF) (used for hydrodynamic testing of high explosives), the Devise Assembly Facility (DAF) (originally built for high-explosive and nuclear explosive assembly operations, and now being used for other operations including criticality experiments), and Joint Actinide Shock Physics Experimental Research

(JASPER) Facility (which uses high explosives in research and development experiments using special nuclear material), and the Hazardous Materials (HAZMAT) Spill Center (used for hazardous materials testing and training). Facilities that support the Waste Management Program include the Area 5 Radioactive Waste Management Complex, and the Area 3 Radioactive Waste Management Site.

5.3.1.2 *DCE Alternative (Greenfield CPC)*

5.3.1.2.1 Construction

As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a Perimeter Intrusion Detection and Assessment System (PIDAS) and a buffer area. The area outside the PIDAS would have a number of smaller support facilities, a Waste Staging/Transuranic (TRU) Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be used for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks.

The reference location for a CPC at NTS is within Area 6. The northern quarter of the area is designated as the Nuclear Test Zone, the south central portion is categorized as the Defense Industrial Zone, and the remaining area is designated as the Reserved Zone. The reference location would be located on land designated as a Defense Industrial Zone within Area 6.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent less than 0.02 percent of NTS's total land area of 880,000 acres. The post-construction developed area would be approximately 110 acres. Table 5.3.1-1 summarizes land use requirements for each alternative.

Although there would be a change in land use, the proposed CPC is compatible and consistent with land use plans and the current use designation (Defense Industrial Zone) for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent 0.01 percent of NTS's total land area of 880,000 acres.

Although there would be a change in land use, the proposed CPC is compatible and consistent with land use plans and the current land use designation, Defense Industrial Zone, for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.3 *CCE Alternative*

5.3.1.3.1 CNC (CPC + CUC)

Land use impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.1.2 as well as the CUC impacts discussed below.

CUC. As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside of it. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state.

The CUC reference location at NTS is within Area 6. The northern quarter of the area is designated as the Nuclear Test Zone, the south central portion is categorized as the Defense Industrial Zone, and the remaining area is designated as the Reserved Zone. The reference location would be located on land designated as a Defense Industrial Zone within Area 6.

An estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. The land required for CUC construction would represent 0.01 percent of NTS's total land area of 880,000 acres. The reference location has adequate space to accommodate the total facilities footprint.

Once constructed, the area required to support a CUC would be approximately 35 acres. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current use designation (Defense Industrial Zone) for this area. No impacts to NTS land use plans or policies are expected.

Operations: **CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres would be located within a PIDAS. The administrative support buildings, and non-nuclear component production would consist of a 90-acre area outside the PIDAS. A 50-acre buffer zone would also be located outside the PIDAS. The land required for the proposed CNC operations would represent 0.02 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, a CNC is compatible and consistent with land use plans and the current use designation for this area. No impacts to NTS land use plans or policies are expected.

5.3.1.3.2 CNPC (CPC + CUC + A/D/HE)

Land use impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.1.2, the CUC impacts discussed in Section 5.3.1.3, and the A/D/HE impacts discussed below.

***Construction:* A/D/HE Center.** At NTS, an A/D/HE Center would make use of the existing capabilities at the Device Assembly Facility (DAF) and other NTS facilities such that construction requirements would be reduced compared to the generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 additional acres would be required for the construction of an A/D/HE Center. The existing DAF would form the cornerstone of this Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF. There is 1.2 acres of space available in the DAF. All plant facilities located within the limited area at the plant site would be new construction.

The DAF is located in an area designated as a Defense Industrial Zone. The land required for A/D/HE construction would represent 0.02 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, the proposed A/D/HE is compatible and consistent with land use plans and the current land use designation for this area. No impacts to NTS land use plans or policies are expected.

***Operations:* CNPC.** As described in Section 3.5.1.2, an estimated 445 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC at NTS. The land required for CNPC operations would represent 0.05 percent of NTS's total land area of 880,000 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area.

5.3.2 Visual Resources

5.3.2.1 *No Action Alternative*

Existing visual resources are discussed in Section 4.3.2. The region surrounding NTS ranges from unpopulated to sparsely populated desert and rural land. Lands within NTS have a BLM Visual Resource Management rating of Class II or III. Developed areas within the site are consistent with a Visual Resource Management Class IV rating in which management activities dominate the view and are the focus of viewer attention. Existing visual resources are discussed in Section 4.3.2.

Under the No Action Alternative, there would be no impact on visual resources at NTS since no new facilities would be built.

5.3.2.2 *DCE Alternative (CPC)*

5.3.2.2.1 Construction

As described in Section 3.4.3, a CPC would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and would not be noticeable beyond the NTS boundary, which would be more than 10 miles away. Site visitors and employees observing CPC construction would find these activities similar to the past construction activities of other developed areas on the NTS.

5.3.2.2.2 Operations

The CPC facilities, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location in Area 6. However, this change would be consistent with the currently developed areas of Area 6. Thus, CPC's placement in the Defense Industrial Zone within Area 6 boundaries would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas within Area 6. As noted above, a CPC and its supporting structures would not be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network.

5.3.2.3 *CCE Alternative*

5.3.2.3.1 CNC (CPC + CUC)

Visual Resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.2.2 as well as the impacts discussed below.

Construction: **CUC.** Construction activities for a CUC are described in Section 3.5.2. Activities related to the construction of new buildings required for a CUC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and, because of its interior location on the NTS site, would not be noticeable beyond the NTS boundary. Site visitors and employees observing CUC construction would find these activities similar to the past construction activities of other developed areas on the NTS.

Operations: **CNC.** As described in Section 3.5.2, a CNC would include one- and two-story buildings that would change the appearance of the reference location. The placement in the Defense Industrial Zone with Area 6 boundaries would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas within Area 6. A CNC would not

be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network. However, this change would be consistent with the currently developed areas of NTS.

5.3.2.3.2 CNPC (CPC + CUC + A/D/HE)

Visual Resources impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.2.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for construction. The existing DAF would form the cornerstone of an A/D/HE Center at NTS, along with the underground complex of tunnels at U1a, the Big Explosive Experimental Facility (BEEF), the Explosives Ordnance Disposal Unit, existing NTS site infrastructure, and the support areas of Mercury, the Control Point and Area 6 Construction.

Activities related to the construction of new buildings required for an A/D/HE Center would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Except for the buildings themselves, these changes would be temporary and, based on the interior location within the NTS site, would not be noticeable beyond the NTS boundary.

***Operations:* CNPC.** As described in Section 3.5.2, a CNPC would include one- and two-story buildings that would change the appearance of the reference location. The DAF is in the Defense Industrial Zone and would be consistent with the current Class IV BLM Visual Resources Management. The CNPC would not be visible beyond the NTS boundary. Views of the building, tanks, and exhaust stacks would be limited to visitors or employees using the NTS road network. However, this change would be consistent with the currently developed areas of NTS.

5.3.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.3.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS

5.3.3.1 *No Action Alternative*

An extensive network of existing infrastructure provides services to NTS activities and facilities as shown in Table 4.3.3-1. Electrical usage is below current site capacity. The annual maximum production capacity of site potable supply wells is approximately 2.1 billion gallons per year while the sustainable site capacity is estimated to be 1.36 billion gallons per year (DOE 2002l).

Baseline requirements are discussed in Section 4.3.3. Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3

5.3.3.2 *DCE Alternative (CPC)*

5.3.3.2.1 Construction

Construction requirements for a CPC are described in Section 3.4.1. The projected demand on electrical resources is shown in Table 5.3.3-1.

Table 5.3.3-1—Electrical Requirements–Construction of CPC, CUC, and A/D/HE Center

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity [a]	**176,844**	**45**
Available site capacity [a]	**75,476**	**18**
No Action Alternative		
Total site requirement	101,377	27
Percent of site capacity	57%	60%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	7%	7%
Percent of available capacity	17.3%	18%
CUC		
CUC requirement	11,000	2.5
Percent of site capacity	6.2%	5.5%
Percent of available capacity	14.6%	13.8%
A/D/HE		
A/D/HE requirement	55,000	12.7
Percent of site capacity	31%	28.2%
Percent of available capacity	73.3%	70.5%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.

The existing electrical infrastructure at NTS would be adequate to support annual construction requirements for the proposed plant sizes for the projected 6-year construction period.

5.3.3.2.2 Operations

Operation requirements for a CPC are described in Section 3.4.1. The estimated annual site electrical infrastructure requirements are presented in Table 5.3.3-2. Electrical energy requirements would be within the site's available capacity.

Table 5.3.3-2—Electrical Requirements–Operation of CPC, CUC, CNC, A/D/HE Center, and CNPC at NTS

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity [a]	**176,844**	**45**
Available site capacity [a]	**75,476**	**18**
No Action Alternative		
Total site requirement	101,377	27
Percent of site capacity	57%	60%
CPC		
CPC requirement	48,000	11
Percent of site capacity	27%	24%
Percent of available capacity	64%	61%
CUC		
CUC requirement	168,000	18.4
Percent of site capacity	95%	41%
Percent of available capacity	224%	102%
CNC (CPC + CUC)		
CNC requirement	216,000	29.4
Percent of site capacity	122%	65%
Percent of available capacity	288%	163%
A/D/HE		
A/D/HE requirement	52,000	11.9
Percent of site capacity	29.4%	26%
Percent of available capacity	69.3%	66%
CNPC (CPC + CUC + A/D/HE)		
CNPC requirement	268,000	41.3
Percent of site capacity	151%	91.7%
Percent of available capacity	357%	229%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.

5.3.3.3 *CCE Alternative*

5.3.3.3.1 CNC (CPC + CUC)

Site Infrastructure impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.3.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would primarily be made up of a new structure to contain a nuclear facility composed of the UPF and HEU storage (described in Sections 3.4.2 and 3.5.1.1). As shown in Table 5.3.3-1, the existing electrical infrastructure at NTS would be adequate to support annual construction requirements for a CUC.

Operations: **CNC.** The core operations of a CNC would be made up of the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site infrastructure requirements for operation of a CNC are presented in Table 5.3.3-2. Because electrical energy requirements would exceed available site electrical energy capacity, to support a CNC, NTS would have to procure additional power.

5.3.3.3.2 CNPC (CPC + CUC + A/D/HE)

Site electrical infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF and other existing NTS facilities such that construction requirements would be reduced compared to a generic A/D/HE Center described in Sections 3.5.1.2 and 3.5.1.2.1. The existing electrical infrastructure at NTS would be adequate to support annual construction requirements for an A/D/HE Center for the projected 6-year construction period. The estimated site infrastructure requirements for construction of an A/D/HE Center are shown in Table 5.3.3-1.

Operations: **CNPC.** The core operations of a full CNPC are discussed in Section 3.5.1. The estimated annual site electrical infrastructure requirements for operation of a CNPC are presented in Table 5.3.3-2. Because electrical energy requirements would exceed available site electrical energy capacity, to support a CNPC, NTS would have to procure additional power.

5.3.4 Air Quality and Noise

5.3.4.1 *No Action Alternative*

NTS is located in the Nevada Intrastate Air Quality Control region (AQCR) 147. The region is classified as an attainment area for all six criteria pollutants under the NAAQS. No emission limits for any criteria air pollutants or HAPS were exceeded (NTS 2007). Measured concentration of nonradiological criteria pollutants are below regulatory requirements (NTS 2007). For data reported for 2006, the estimated annual dose to the public from radiological emissions from current and past NTS activities is well below the 10 millirem per year dose limit (NTS 2007). Existing air quality at NTS is discussed in Section 4.3.4.1.

During periods of activity, local sound levels at NTS could vary from loud (70 dbA) to deafening (160 dbA) depending on the distance between the noise source and receptor (NTS 2006a). A description of the existing activities that produce noise at NTS is in Section 4.3.4.2. Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to air quality and noise beyond current and planned activities.

5.3.4.2 *DCE Alternative (Greenfield CPC)*

5.3.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of new structures 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, and carbon monoxide. The

calculation of emissions from construction equipment is based on factors provided in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicles), factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth moving operations depends on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 2.69 metric tons per hectare (1.20 tons per acre) per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process.

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.3.4–1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the NTS site boundary (DOE 2003d).

Table 5.3.4-1—Estimated Peak Nonradiological Air Emissions for CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

***Construction:* radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide

would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. As shown in Table 5.3.4-2, air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon dioxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). If NTS is selected for a CPC, a prevention of significant deterioration (PSD) increment analysis would be performed under a project-specific tiered EIS to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although the CPC would emit criteria pollutants, a conformity review is not necessary.

Table 5.3.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

The maximum concentrations (microgram per cubic meter) at the NTS site boundary that would be associated with the release of pollutants were modeled and are presented in Table 5.3.4-3. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For almost all the pollutants for which data were available, the incremental addition would be less than 1 percent of the most stringent standard or guideline. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.3.4-3—Criteria Pollutant Concentrations for CPC–Operations

Pollutant	Averaging Time	Most Stringent Standard[a] (µg/m^3)	Maximum Incremental Concentration (µg/m^3)	
			Baseline [d]	CPC- 200ppy
Carbon monoxide	8-hr (elevations < 5,000 ft amsl)	13,079[b]	2,995	2.68
	8-hour (elevations ≥ 5,000 ft above msl)	8,985[b]	No Data	No Data
	1-hr	52,318[c]	3,597	3.82
Nitrogen dioxide	Annual	130.8[c]	No Data	1.5
Lead	Quarterly	1.96[c]	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data
Sulfur dioxide	Annual	104.6[c]	No Data	0.09
	24-hr	477.4[c]	20.5	0.46
	3-hr	1,700[c]	85.5	1.06
PM_{10}	Annual	65.4[c]	No Data	0.037
	24-hr	196.2[c]	102.4	0.18

Source: NNSA 2007.
PM_{10}=particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.
[b] State standard.
[c] Federal standard (NAAQS).
[d] Highest measured concentration at NTS.

Radiological impacts. Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. Sample transfers would occur using a vacuum tube transfer system from the Feed Preparation and Manufacturing Facilities to the Analytical Support Facility. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-ft tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.3.4-4). Total radionuclide emissions at NTS would increase by less than 0.0001 percent. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.3.4-4—Annual Radiological Air Emissions for CPC at NTS–Operations

Isotope	Annual Emissions (Ci/yr)	
	Baseline[a,b]	200 ppy
Americium-241	4.7×10^{-2}	3.12×10^{-7}
Plutonium-239		1.02×10^{-5}
Plutonium-240		2.66×10^{-6}
Plutonium-241		1.96×10^{-4}
Total Plutonium	**2.9×10^{-1}**	**2.1×10^{-4}**
Uranium-234		5.02×10^{-9}
Uranium-235		1.58×10^{-10}
Uranium-236		2.56×10^{-11}
Uranium-238		1.42×10^{-12}
Total Uranium	NA	–
Tritium	170	–
Total	**170.3**	**2.09×10^{-4}**

Source: NNSA 2007.
[a] The No Action Alternative is represented by the baseline.
[b] Onsite emissions only.
NA=not available.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-5, the expected annual radiation dose to the offsite MEI would be much lower than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations at NTS

Receptor	CPC- 200 ppy
Offsite MEI[a] (mrem/yr)	1.1×10^{-5}
Population within 50 miles (person-rem per year)[a]	2.4×10^{-5}

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location. The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.2.2 Noise

Construction. Construction of new buildings at Area 6 would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Sources associated with construction at Area 6 would not include loud intermittent sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.3.4-6 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there

would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 10 miles), there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.3.4-6—Peak and Attenuated Noise Levels from Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations at Area 6. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (more than 10 miles), noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented

appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.3.4.3 *CCE Alternative*

5.3.4.3.1 CNC (CPC + CUC)

Air quality and noise impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.4.2 as well as the impacts discussed below for the CUC.

5.3.4.3.1.1 Air Quality

Construction: **CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.3.4–1 would bound CUC emissions. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the NTS site boundary, as the maximum baseline concentrations are more than 30 percent below the most stringent standard or guideline.

Construction: **CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **CUC and CNC nonradiological impacts.** CUC (and CNC) activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from the CUC to the NTS baseline. The results are presented in Table 5.3.4-7. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. The CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.3.4-7—Criteria Pollutant Concentrations at NTS Boundary for CUC and CNC Operations

Pollutant	Averaging Time	Most Stringent Standard[a] ($\mu g/m^3$)	Maximum Incremental Concentration ($\mu g/m^3$)		
			Baseline [d]	CUC	CNC
Carbon monoxide	8-hr (elevations < 5,000 ft amsl)	13,079[b]	2,995	0.2	2.78
	8-hour (elevations ≥ 5,000 ft amsl)	8,985[b]	NA	No Data	No Data
	1-hr	52,318[c]	3,597	No Data	3.66
Nitrogen dioxide	Annual	130.8[c]	No Data	0.9	2.18
Sulfur dioxide	Annual	104.6[c]	No Data	2.1	2.16
	24-hr	477.4[c]	20.5	52.4	52.8
	3-hr	1,700[c]	85.5	17.5	18.5
PM_{10}	Annual	65.4[c]	No Data	0.02	0.05
	24-hr	196.2[c]	102.4	0.2	0.4
Lead	Quarterly	1.96[c]	No Data	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data	No Data

Source: NNSA 2007.
NA–Not Applicable
PM_{10}=particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a]The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.
[b]State standard.
[c]Federal standard (NAAQS).
[d] Highest measured concentration at NTS.

CUC and CNC radiological impacts. A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of the CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 curies (2.17 kilograms) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding NTS, and NTS workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne

releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations–NTS

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	4.1×10^{-3}	4.1×10^{-3}
Population within 50 miles (person-rem per year)[a]	9.5×10^{-3}	9.5×10^{-3}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location. The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.3.1.2 Noise

Construction. **UC.** Anticipated noise impacts from the construction of a CUC would be similar to those described for the CPC in Section 5.3.4.2.

Operations. **CUC and CNC.** Anticipated noise impacts from the operation of a CNC would be similar to those described for the CPC in Section 5.3.4.2.

5.3.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air Quality and Noise impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.3.4.3.2.1 Air Quality

Construction: **A/D/HE Center nonradiological impacts.** Nonradiological impacts of an A/D/HE Center construction are expected to be similar to the impacts described above for a CPC and CUC. However, due to the potential to disturb approximately 200 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent.

The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.3.4-9. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The results represent a conservative estimate if PM_{10} emissions at the site boundary. As shown, these results show that concentrations would remain approximately 90 percent below any regulatory limits.

Table 5.3.4-9—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	5.67
24-hour	150	13.3

Source: Janke 2007.

Construction: **A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **A/D/HE Center and CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. The CPC and CUC nonradiological emissions are discussed in Sections 5.3.4.2.1 and 5.3.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.3.4-10. These emissions would be incremental to the NTS baseline.

Table 5.3.4-10—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS emissions (tons/year)	Emissions
Oxides of Nitrogen (tons/year)	91
Carbon Monoxide (tons/year)	31
Volatile Organic Compounds (tons/year)	31
Particulate Matter (tons/year)	18
Sulfur Dioxide (tons/year)	5
Hazardous Air Pollutants and Effluents (tons/yr)	22

Source: NNSA 2007.

The maximum concentrations (micrograms per cubic meter) at the NTS site boundary that would be associated with the release of criteria pollutants are presented in Table 5.3.4-11. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.3.4-11—Criteria Pollutant Concentrations at NTS for CNPC–Operations

Pollutant	Averaging Time	Most Stringent Standard[a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)		
			Baseline [d]	A/D/HE Center	CNPC
Carbon monoxide	8-hr (elevations < 5,000 ft above msl)	13,079[b]	2,995	0.12	3.0
	8-hour (elevations ≥ 5,000 ft above msl)	8,985[b]	NA	No Data	NA
	1-hr	52,318[c]	3,597	1.88	5.6
Nitrogen dioxide	Annual	130.8[c]	No Data	0.35	2.5
Sulfur dioxide	Annual	104.6[c]	No Data	0.02	2.2
	24-hr	477.4[c]	20.5	0.05	52.8
	3-hr	1,700[c]	85.5	0.2	18.7
PM_{10}	Annual	65.4[c]	No Data	0.07	0.1
	24-hr	196.2[c]	102.4	0.16	0.6
Lead	Quarterly	1.96[c]	No Data	No Data	No Data
Ozone	1-hr	307.4[c]	No Data	No Data	No Data

Source: NNSA 2007.
msl=mean sea level
PM_{10}=particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard.
[b] State standard.
[c] Federal standard (NAAQS).
[d] Highest measured concentration at NTS.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because NTS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

***Operations:* A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. The CPC and CUC radiological emissions are discussed in sections 5.3.4.2.1 and 5.34.3.1 respectively, and are not repeated here. The total radiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section).

During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.3.4-12.

Table 5.3.4-12—Annual Radiological Air Emissions for A/D/HE Center Operations

Radionuclide	Emission (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding NTS, and NTS workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding NTS. As shown in Table 5.3.4-12, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of an A/D/HE Center resulting from radiological air emissions are presented in Section 5.3.11.

Table 5.3.4-13—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations–NTS

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	3.1×10^{-6}	4.1×10^{-3}
Population within 50 miles (person-rem per year) [a]	7.3×10^{-6}	9.5×10^{-3}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.3.4-3and using the CAP88 computer code, version 3. Based on a projected future population (year 2030) of 60,138 persons residing within 50 miles of NTS location The offsite MEI is assumed to reside at the site boundary 13.7 miles from the release.

5.3.4.3.2.2 Noise

***Construction:* A/D/HE Center.** Anticipated noise impacts from the construction of a CNPC would be similar to those described for a CPC in Section 5.3.4.2.

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of a CNPC would be similar to those described for the CPC in Section 5.3.4.2.

5.3.5 Water Resources

Environmental impacts associated with the proposed alternatives at NTS could affect groundwater resources. No impacts to surface water are expected. At NTS, groundwater resources would be used to meet all construction and operations water requirements.

5.3.5.1 *No Action Alternative*

There are no perennial streams or other naturally occurring surface waterbodies at NTS. Three principal groundwater sub-basins have been identified within the NTS region. The history of nuclear testing at NTS has contaminated groundwater in some areas. Data for 2005 indicate that groundwater at offsite locations has not been significantly impacted by nuclear testing. Results from nine NTS water supply wells and one water monitoring well continue to indicate that nuclear testing has not impacted the NTS potable water supply network. Current and planned activities would continue as required with an expected demand for water of less than 400 million gallons per year (NNSA 2008b).

Table 5.3.5-1 and 5.3.5-2 summarizes existing surface water and groundwater resources at NTS, the total NTS water resource requirements for each alternative, and the potential changes to water resources at NTS resulting from the proposed alternatives.

Table 5.3.5-1—Potential Changes to Water Resources from the Construction of the CPC, CUC and A/D/HE Center–NTS

Proposed Alternatives	Water Availability and Use
Annual Maximum Production Capacity (gal/yr)	2,100,000,000
Sustainable site capacity (gal/yr)	1,360,000,000
No Action Alternative	
Water Requirement (gal/yr)	400,000,000
Percent of Sustainable Site Capacity	29.4%
CPC	
Water Requirement (gal)	20,900,000
Percent of Sustainable Site Capacity	1.5%
CUC	
Water Requirement (gal)	5,200,000
Percent of Sustainable Site Capacity	0.4%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent of Sustainable Site Capacity	0.2%

Source: NNSA 2007.

Table 5.3.5-2—Potential Changes to Water Resources from the Operation of the CPC, CUC and A/D/HE Center–NTS

Proposed Alternatives	Water Availability and Use
Annual Maximum Production Capacity (gal/yr)	**2,100,000,000**
Sustainable site capacity (gal/yr)	**1,360,000,000**
No Action Alternative	
Water Requirement (gal)	400,000,000
Percent of Sustainable Site Capacity	29.4%
CPC	
Water Requirement (gal)	88,500,000
Percent of Sustainable Site Capacity	6.5%
Total Water Requirement/Within Sustainable Capacity?	488,500,000/Yes
CUC	
Water Requirement (gal)	105,000,000
Percent of Sustainable Site Capacity	7.8%
Total Water Requirement/Within Sustainable Capacity?	505,000,000/Yes
CNC (CPC + CUC)	
Water Requirement (gal)	193,500,000
Percent of Sustainable Site Capacity	14.2%
Total Water Requirement/Within Sustainable Capacity?	593,500,000/Yes
A/D/HE Center	
Water Requirement (gal)	130,000,000
Percent of Sustainable Site Capacity	9.5%
Total Water Requirement/Within Sustainable Capacity?	530,000,000/Yes

Table 5.3.5-2—Potential Changes to Water Resources from the Operation of the CPC, CUC and A/D/HE Center–NTS (continued)

Proposed Alternatives	Water Availability and Use
CNPC (CPC + CUC + A/D/HE Center)	
Water Requirement (gal)	323,500,000
Percent of Sustainable Site Capacity	23.7%
Total Water Requirement/Within Sustainable Capacity?	723,500,00/Yes

Source: NNSA 2007.

5.3.5.1.1 Surface Water

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts to water resources would occur at NTS.

5.3.5.1.2 Groundwater

There would be no additional impacts on groundwater availability or quality beyond current and planned activities. Current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3.

5.3.5.2 *DCE Alternative (Greenfield CPC)*

5.3.5.2.1 Surface Water

Construction. Construction requirements for a CPC are described in Section 3.4.1. Surface water would not be used to support the construction of a CPC at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for the proposed CPC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

Operations. Operation requirements for a CPC are described in Section 3.4.1. No impacts on surface water resources are expected as a result of CPC operations at NTS. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. No industrial or other regulated discharges to surface waters are anticipated.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive-contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

5.3.5.2.2 Groundwater

Construction. Construction requirements for a CPC are described in Section 3.4.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of 20,900,000 gallons of groundwater mainly to support CPC construction. It is expected that construction should take approximately 6 years. The yearly peak in water use would be approximately 3.5 million gallons. The total site water requirements including these quantities would be well within the sustainable site capacity of 1.36 billion gallons. It is anticipated that this water would be derived from NTS's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Operation requirements for a CPC are described in Section 3.4.1. Activities at NTS under the CPC Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.3.5-2. The CPC operations would require 6.5 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.5.3 *CCE Alternative*

5.3.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.3.5.2 as well as the impacts discussed below.

***Surface water:* CUC construction.** Construction requirements for a CUC are described in Section 3.5.1. Surface water would not be used to support the construction of a CUC at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for CUC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

Surface water: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.1. No impacts on surface water resources are expected as a result of CNC operations at NTS. No surface water would be used to support facility activities and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds. No industrial or other regulated discharges to surface waters are anticipated.

A CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures.

Groundwater: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5–1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of 5.2 million gallons of groundwater mainly to support CUC construction. The maximum additional water requirement for a CPC is less than 1 percent of NTS's sustainable site capacity. It is anticipated that this water would be derived from NTS's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNC operations.** CUC operations would require 7.8 percent of the sustainable site water capacity. Operation requirements for a CNC are described in Section 3.5.1. Activities at NTS under the CNC Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. A summary of water usage by category and total is listed in Table 5.3.5-2. CNC operations would require 14.2 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Surface water:* A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would use the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The existing DAF would form the cornerstone of an A/D/HE Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF.

Surface water would not be used to support the construction of an A/D/HE Center at NTS as groundwater is the source of water at NTS. There are no natural surface waterbodies in the vicinity that are a viable source of water. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction liquid wastes would be generated. Liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Although runoff from the vicinity of the site drains toward Frenchman Lake, which has standing water during the winter months, surface drainages in the vicinity and onsite in general are ephemeral, and runoff infiltration is rapid on alluvium. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. NTS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at NTS is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

A rise in the surface elevation of any standing water on playas creates a potential flood hazard. Therefore, safeguards would be constructed as necessary for CUC buildings and would be sited in accordance with applicable regulatory requirements and DOE orders, including Executive Order 11988, Floodplain Management.

***Surface water:* CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. No impacts on surface water resources are expected as a result of CNPC operations at NTS. No surface water would be used to support facility activities and there would be no

discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. The sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds. No industrial or other regulated discharges to surface waters are anticipated.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. .

***Groundwater:* A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center described in Section 3.5.1.2 and 3.5.1.2.1.

Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. A summary of water usage by category and total is listed in Table 5.3.5-1. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 2 million gallons of groundwater mainly to support A/D/HE Center construction. The maximum additional water requirement for A/D/HE Center construction would be less than 1 percent of NTS's sustainable site capacity.

There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. A/D/HE Center operations would require approximately 130 million gallons of water annually, which would be 9.5 percent of the sustainable site water capacity. When coupled with a CPC and CUC, a CNPC would use 323.5 million gallons of groundwater annually to support operations. CNPC operations would require 23.7 percent of the sustainable site water capacity. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.3.6 Geology and Soils

5.3.6.1 *No Action Alternative*

Soils at NTS are considered acceptable for standard construction techniques. There is no prime farmland at NTS. Past testing at NTS (underground, atmospheric, safety, and nuclear rocket and related tests) has resulted in the displacement and contamination of soils at NTS. The areas of contamination have been delineated, air monitoring and radiological surveying continue for key indicator parameters and an extensive research and development project has evaluated alternative methods for remediating the soils for possible future land use. Existing geology and soils resources are discussed in Section 4.3.6.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on geology and soils would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.6.2 *DCE Alternative (Greenfield CPC)*

5.3.6.2.1 Construction

As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to CPC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion. As discussed in Section 4.3.5, faults located in the vicinity of NTS have the potential for earthquakes.

As discussed in Section 4.3.6, NTS is located in a region with relatively high seismicity. Ground shaking associated with postulated earthquakes is possible and supported by the historical record for the region. Further, minor to moderate earthquakes have occurred within the site within the last decade. Modified Mercalli Intensity VII ground shaking would be expected to affect primarily the integrity of inadequately designed or non-reinforced structures, but damage to properly or specially designed facilities would not be expected. Nevertheless, three potentially

active fault systems intersect the site and, thus, should be considered capable.[1] The closest capable fault (Cane Spring) is located about 3 miles southeast of DAF. The potential for other large scale geologic hazards to affect Area 6 facilities is generally low. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

5.3.6.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.6.3 *CCE Alternative*

5.3.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.6.2 as well as the impacts discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, a CUC would consist of multiple aboveground facilities. An estimated 50 acres of land, which includes a construction laydown area and temporary parking would be needed for construction. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, a CUC would require approximately 35 acres of land.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to CUC construction, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; therefore the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's Environmental Restoration Program and in accordance with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

[1] A *capable fault* is a fault which has exhibited movement at or near the ground surface at least once within the past 35,000 years or movement of a recurring nature within the past 500,000 years.

The CUC reference location is in a region that has been seismically active within the last few thousand to tens of thousands of years. Earthquakes on the faults in the area and larger earthquakes on the farther faults would result in ground motion at the CUC site. Ground shaking affects primarily the integrity of inadequately designed or non-reinforced structures, but does not damage or only slightly damages properly or specially designed facilities.

***Operations:* CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. The land required for CNC operations would represent less than 0.02 percent of NTS's total land area of 880,000 acres.

The operation of a CNC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.3.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** At NTS, an A/D/HE Center would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The DAF is located in an area designated as a Defense Industrial Zone. The land required for the proposed A/D/HE Center construction would represent 0.02 percent of NTS's total land area of 880,000 acres.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities, but these resources are abundant in southern Nevada. In addition to A/D/HE Center construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

The A/D/HE Center representative site is located in a region that has been seismically active within the last few thousand to tens of thousands of years. Earthquakes on the faults in the area and larger earthquakes on the farther faults would result in ground motion at the A/D/HE Center

site. Ground shaking affects primarily the integrity of inadequately designed or non-reinforced structures, but does not damage or only slightly damages properly or specially designed facilities.

***Operations:* CNPC.** As described in Section 3.5.1, an estimated 445 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. The land required for the proposed CNPC operations would represent 0.05 percent of NTS's total land area of 880,000 acres.

The operation of the CNPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.3.7 Biological Resources

5.3.7.1 *No Action Alternative*

The only federally-threatened species found at NTS is the Mojave Desert population of the desert tortoise (NTS 2007). Existing biological resources are discussed in Section 4.3.7.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered (T&E) species would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.7.2 *DCE Alternative (Greenfield CPC)*

5.3.7.2.1 Terrestrial Resources

Construction. Construction requirements are described in Section 3.4.1. The area identified for construction of a CPC consists primarily of white bursage (*Ambrosia dumosa*) and creosote bush (Larrea tridentata) or saltbush and white bursage shrubland vegetation (Skougard 2002) that supports a limited diversity of wildlife. An estimated 140 acres of land would be required to construct a CPC. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. As described in Section 3.4.1, an estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.3.7.2.2 Wetlands

Construction. Construction requirements for a CPC are described in Section 3.4.1. Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed CPC site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Operations. Operation requirements for a CPC are described in Section 3.4.1. There are no adverse impacts predicted to wetlands from operation of the CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect any wetlands.

5.3.7.2.3 Aquatic Resources

Construction. Construction requirements for a CPC are described in Section 3.4.1. There are no perennial or seasonal aquatic habitats within the proposed CPC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. Operation requirements for a CPC are described in Section 3.4.1. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

5.3.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at NTS, are known to be present within the proposed site location. As discussed in section 4.3.7.4, the only federally threatened species found at NTS is the Mojave Desert population of the desert tortoise (*Gopherus agassizii*) (NTS 2007). The desert tortoise inhabits the southern one-third of the NTS at fairly low estimated densities. The abundance of tortoises at NTS is low to very low compared to other areas within the range of this species. NTS contains less than 1 percent of the total desert tortoise habitat of the Mojave Desert population (DOE 2002l). A cumulative total of 265.70 acres of tortoise habitat on the NTS has been disturbed since the desert tortoise was listed as threatened in 1992 (NTS 2006a).

Construction. Construction requirements for a CPC are described in Section 3.4.1. Approximately 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. This represents much less than 1 percent of the undeveloped area at NTS. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Operation requirements for a CPC are described in Section 3.4.1. An estimated 110 acres of land would be required to operate a CPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should not impact any special-interest species population.

5.3.7.3 *CCE Alternative*

5.3.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.7.2 as well as the impacts discussed below.

***Terrestrial resources:* CUC construction.** As described in Section 3.5.1.1, approximately 50 acres of land would be modified during CUC construction. Once constructed, approximately 35 acres would be needed to support CUC operations. The area identified for construction of the CUC consists primarily of white bursage (*Ambrosia dumosa*) and creosote bush (*Larrea tridentata*) or saltbush and white bursage shrubland vegetation (Skougard 2002) that supports a

limited diversity of wildlife. An estimated 140 acres of land would be required to construct the CUC. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Terrestrial resources: **CNC operations.** As described in Section 3.5.2, an estimated 195 acres of land would be modified or lost. Of this, approximately 80 acres would be located within a PIDAS. The land required for CNC operations would represent less than 0.02 percent of NTS's total land area of 880,000 acres. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production and uranium operations, CNC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

Wetlands: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed CUC site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Wetlands: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. There are no adverse impacts predicted to wetlands from operation of a CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect any wetlands.

Aquatic resources: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. There are no perennial or seasonal aquatic habitats within the proposed CUC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic

resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Aquatic resources: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

Threatened and endangered species: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Approximately 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Threatened and endangered species: **CNC operations.** Operation requirements for a CNC are described in Section 3.5.2. An estimate 195 acres of land would be required to operate a CNC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations should not impact any special-interest species population.

5.3.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.3.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Terrestrial resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of the A/D/HE Center. The existing DAF would form the cornerstone of an A/D/HE Center at NTS. All plant facilities located within the material access area either occupy existing buildings inside the DAF or would be located in hardened new construction connected to the DAF.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and

engineering controls, CNPC operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) in the surrounding environment.

Terrestrial resources: **CNPC operations.** As described in Section 3.5.1, an estimated 445 acres of land would be required to support CNPC operations, which would represent 0.05 percent of NTS's total land area of 880,000 acres. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

Wetlands: **A/D/HE Center construction.** Construction of the A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center. Approximately 200 acres would be required for the construction of the A/D/HE Center.

Of the known 24 springs and seeps found at NTS, most of which support wetland vegetation, none are located on the proposed A/D/HE Center site. Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any degradation to wetlands in the area.

Wetlands: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. There are no adverse impacts predicted to wetlands from operation of the CNPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations are not expected to adversely affect any wetlands.

Aquatic resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center. Approximately 200 acres would be required for the construction of an A/D/HE Center.

There are no perennial or seasonal aquatic habitats within the proposed A/D/HE Center location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

***Aquatic resources:* CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff water would be similar to runoff from other NTS built environments and the quantity would represent a very minor contribution to the watershed.

***Threatened and endangered species:* A/D/HE Center construction.** Construction requirements for an A/D/HE Center are described in Section 3.5.1.2. Approximately 200 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct an A/D/HE Center. Prior to any habitat modifying activities, the DOE would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

***Threatened and endangered species:* CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. An estimate 445 acres of land would be required to operate a CNPC. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations should not impact to any special-interest species population.

5.3.8 Cultural Resources

5.3.8.1 *No Action Alternative*

Prehistoric sites found at NTS include habitation sites (DOE 2002l). Historic sites found at NTS include mines and prospects, trash dumps, settlements, campsites, ranches and homesteads, developed springs, roads, trails, and nuclear weapon development sites. Three ethnic groups were identified as having prehistoric and historic ties to NTS: Western Shoshone, Southern Paiute, and Owens Valley Shoshone Paiute. Existing cultural and archaeological resources are discussed in Section 4.3.8.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts to cultural and paleontological resources would occur at NTS beyond those of existing and future activities that are independent of this action.

5.3.8.2 *DCE Alternative (Greenfield CPC)*

5.3.8.2.1 Cultural Resources

Construction: **CPC.** As described in Section 3.4.1, a CPC would disturb an estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The CPC reference location at NTS has not been inventoried for cultural resources, thus the presence of resources that would be impacted during construction of a CPC is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other DOE sites under consideration. Thus, there is a low probability that resources would be impacted during CPC construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CPC at NTS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the Nevada SHPO and in accordance with the *Cultural Resources Management Plan for the Nevada Test Site* (DOE 1999d). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by DOE in consultation with the Nevada SHPO.

Operations: **CPC.** As described in Section 3.4.1, an estimated 110 acres of land would be required to operate a CPC. Operation of a CPC at would have no impact on cultural resources.

5.3.8.2.2 Paleontological Resources

Construction: **CPC.** As described in Section 3.4.1, a CPC would disturb an estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace.

No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the Quaternary deposits that make up Frenchman Flat and Area 6 could contain archaeological materials. Thus, there is a possibility that archaeological resources would be impacted due to construction of the CPC or the associated

infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to archaeological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by DOE.

Operations: **CPC.** As described in Section 3.4.1, an estimated 110 acres of land would be required to operate the CPC. Operation of the CPC at would have no impact on archaeological resources.

5.3.8.3 *CCE Alternative*

5.3.8.3.1 CNC (CPC + CUC)

Cultural and archaeological resources impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.8.2 as well as the impacts discussed below.

Cultural resources: **CUC construction.** As described in Section 3.5.1.1, a CUC would disturb an estimated 50 acres of land during construction. The CUC reference location at NTS has not been inventoried for cultural resources, thus the presence of resources that would be impacted during construction of the CUC is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other DOE sites under consideration. Thus, there is a low possibility that resources would be impacted during CUC construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CUC at NTS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Cultural resources: **CNC operations.** As described in Section 3.5.2, an estimated 195 acres would be required to operate a CNC. Operation of a CNC would have no impact on cultural resources.

Paleontological resources: **CUC construction.** As described in Section 3.5.1.1, a CUC would disturb an estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the

Quaternary deposits that make up Frenchman Flat and Area 6 could contain paleontological materials. Thus, there is a probability that paleontological resources would be impacted due to construction of the CPC or the associated infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Archaeological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by DOE.

Paleontological resources: **CNC operations.** As described in Section 3.5.2, a CNC would require an estimated 195 acres. Operation of a CNC at would have no impact on paleontological resources.

5.3.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural and paleontological resource impacts from the construction and operation of the full CNPC would include the CNC impacts discussed above, and the A/D/HE Center impacts discussed below.

Cultural resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center. Approximately 200 acres would be required for the construction of an A/D/HE Center.

The presence of resources that would be impacted during construction of the A/D/HE Center is currently unknown. This is true of many areas within NTS. However, an unrelated survey conducted in Area 6 indicated a low density of cultural resources in that area, relative to other areas at NTS and the other sites under consideration. Thus, there is a low probability that resources would be impacted during A/D/HE Center construction at the reference location. Probabilities for other areas on NTS would depend on the locations; some areas exhibit a high density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Cultural resources: **CNPC operations.** As described in Section 3.5.1.2, a CNPC would require an estimated 445 acres. Operation of a CNPC would have no impact on cultural resources.

Paleontological resources: **A/D/HE Center construction.** Construction of an A/D/HE Center at NTS would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to a generic A/D/HE Center as described in Section 3.5.1.2 and 3.5.1.2.1. Approximately 200 acres would be required for the construction of an A/D/HE Center.

No known fossil localities have been recorded on NTS and no fossils were located during the construction of the DAF (DOE 2002k). However, the Quaternary deposits that make up Frenchman Flat and Area 6 could contain archaeological materials. Thus, there is a possibility

that paleontological resources would be impacted due to construction of an A/D/HE Center or the associated infrastructure at the reference location. This is also true for any other area on NTS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Archaeological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop, and the discovery would be treated appropriately, as determined by NNSA.

Paleontological resources: **CNPC operations.** As described in Section 3.5.1.2, the CNPC would require an estimated 445 acres. Operation of the CNPC would have no impact on paleontological resources.

5.3.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, and the CCE Alternative.

5.3.9.1 *No Action Alternative*

The NTS ROI consists of Nye and Clark Counties. The current level of NTS employment is expected to continue. Existing socioeconomic characteristics for the ROI are described in Section 4.3.9.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action.

5.3.9.2 *DCE Alternative (Greenfield CPC)*

5.3.9.2.1 Regional Economic Characteristics

Construction. Construction of a CPC would require 2,900 worker-years of labor. During peak construction, about 850 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 826 indirect jobs would be created, for a total of 1,676 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by a maximum of $38.2 million annually at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $66.6 million ($38.2 million direct and $28.4 million indirect). Table 5.3.9-1 presents the impacts to socioeconomic resources from construction of the CPC. Impacts from the

construction of the CPC on population, housing, and community services characteristics within the ROI are presented in sections 5.3.9.2.2 and 5.3.9.2.3.

Table 5.3.9-1—Socioeconomic Impacts from CPC Construction

Socioeconomic Factor	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	826
Total Jobs Created	1,676
ROI Average Earning	$44,900
Direct Income Increase	$38,165,000
Indirect Income Increase	$28,456,000
Total Impact to the ROI	$66,621,000

Source: NNSA 2007.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,481 indirect jobs would be created, for a total of 3,261 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $135.1 million ($87.6 million direct and $47.5 million indirect). Table 5.3.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.3.9.2.2 Population and Housing

Construction. An influx of new workers would increase the ROI population and could create a new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 workers), a total of 1,275 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.3.9.2.3 Community Services

Construction. There would be no impact to ROI community services because the increase would be less than 1 percent over the current population.

Operations. There would be no impact to ROI community services because the increase would be less than 1 percent over the current population.

Table 5.3.9-2—Socioeconomic Impacts from Operations

Socioeconomic Factor	CPC	CUC	CNC	AD/HE	CNPC
Peak Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,481	1,713	1,704	3,270	2,824
Total Jobs Created	3,261	2,648	4,419	5,055	7,324
ROI Average Earning	$49,200	$49,200	$49,200	$49,200	$49,200
Direct Income Increase	$87,576,000	$46,002,000	$133,578,000	$87,822,000	$221,400,000
Indirect Income Increase	$47,519,000	$24,961,000	$72,479,000	$47,652,000	$120,132,000
Total Impact to the ROI	$135,095,000	$70,963,000	$206,057,000	$135,474,000	$341,532,000

Source: NNSA 2007.
Note: Construction of the UPF at Y-12 requires 900 peak workers. Construction of the CUC at NTS requires 1,300 peak workers.

5.3.9.3 *CCE Alternative*

5.3.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.9.2 as well as the impacts discussed below.

***Regional economic characteristics:* CUC construction.** Construction of the CUC would require 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,563 indirect jobs would be created, for a total of 3,863 jobs. It is estimated that many of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $58.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $101.9 million ($58.4 million direct and $43.5 million indirect). Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.3.9-3—Socioeconomic Impacts from CUC Construction

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	2,563
Total Jobs Created	3,863
ROI Average Earning	$44,900
Direct Income Increase	$58,370,000
Indirect Income Increase	$43,521,000
Total Impact to the ROI	$101,891,000

Source: NNSA 2007.

Regional economic characteristics: **CNC operations.** Operation of the CNC would require 2,715 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,704 indirect jobs would be created, for a total of 4,419 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $133.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $206.1 million ($133.6 million direct and $72.5 million indirect). Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Population and housing: **CNC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (935 new workers), 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

Community services: **CUC construction.** Table 5.3.9-3 presents the impacts to socioeconomic resources from construction of the CUC. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing.

Community services: **CNC operations.** There would be no impact to ROI community services because the increase would be less than 1 percent over the current population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNC as well as from individual operation of the CPC and CUC.

5.3.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.3.9.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Regional economic characteristics: **A/D/HE Center construction.** At NTS, the A/D/HE Center would make use of the existing capabilities at the DAF such that construction requirements would be reduced compared to the generic A/D/HE Center. Construction of the A/D/HE Center would require 915 worker-years of labor. During peak construction, 525 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,035 indirect jobs would be created, for a total of 1,560 jobs. It is estimated that many of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $23.6 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $41.2 million ($23.6 million direct and $17.6 million indirect). Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

Table 5.3.9-4—Socioeconomic Impacts from A/D/HE Center Construction

Socioeconomic Factor	AD/HE
Worker Years	915
Peak Workers	525
Indirect Jobs Created	1,035
Total Jobs Created	1,560
ROI Average Earning	$44,900
Direct Income Increase	$23,573,000
Indirect Income Increase	$17,576,000
Total Impact to the ROI	$41,149,000

Source: NNSA 2007.

Regional economic characteristics: **CNPC operations.** Operation of the CNPC would require 4,500 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,824 indirect jobs would be created, for a total of 7,324 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $221.4 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $341.5 million ($221.4 million direct and $120.1 million indirect). Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the A/D/HE Center.

Population and housing: **A/D/HE Center construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (525 new workers), 788 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (4,500 new workers), 4,500 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the AD/HE Center.

Community services: **A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.3.9-4 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

Community services: **CNPC operations.** The increase in population would not increase demand on local community services. Table 5.3.9-2 presents the impacts to socioeconomic resources from operation of the CNPC as well as from the individual operation of the A/D/HE Center.

5.3.10 Environmental Justice

Under Executive Order 12898, NNSA is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.3.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, approximately 1,408,250 people lived within the census tracts containing NTS. Minorities comprise 39.1 percent of this population. In 2000, minorities comprised 30.9 percent of the population nationally and 34.8 percent of the population in Nevada. The percentage of persons below the poverty level at the time of the 2000 Census was 13.7 percent, which is higher than the 2000 national average of 12.4 percent and the statewide figure of 10.5 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at NTS are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.3.11, there are no large adverse impacts to any populations.

5.3.11 Health and Safety

5.3.11.1 *No Action Alternative*

Based on 2006 operational data, NTS caused a MEI dose of 0.2 millirem per year. This dose is less than 1 percent of the DOE public dose limit for all pathways and is significantly below the EPA maximum permissible exposure limit to the public of 10 millirem per year. Existing health and safety at NTS is discussed in Section 4.3.11.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action.

5.3.11.2 *DCE Alternative (Greenfield CPC)*

5.3.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the Voluntary Protection Program

(VPP). Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for construction activities. These values are shown below in Table 5.3.11-1.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

Table 5.3.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, CUC, and A/D/HE Center–NTS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CUC	A/D/HE Center
Peak Annual Employment	850	1,300	525
Total Recordable Cases	81	112	50
Total Lost Workday Cases	38	54	25
Total Fatalities	0.2	0.3	0.1
Project Duration (6 years for CPC and CUC, 2 years for A/D/HE Center)			
Total Recordable Cases	276	384	100
Total Lost Workday Cases	143	184	50
Total Fatalities	0.7	0.9	0.2

Source: Tetra Tech 2008, BLS 2007.

5.3.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI) of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.3.3). Table 5.3.11–2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be less than or equal to 6×10^{-12} per year, or less than 6 in a trillion. The projected number of fatal cancers to the population within 50 miles would be less than or equal to 1×10^{-8} per year, or about 1 in 100 million.

Table 5.3.11-2—Annual Radiological Impacts on the Public from CPC, CNC, and CNPC Operations–NTS

Receptor	Projects Under Consideration		
	CPC	CNC	CNPC
Population within 50 miles			
Collective dose (person-rem)	2.4×10^{-5}	9.5×10^{-3}	9.5×10^{-3}
Percent of natural background radiation[a]	1.1×10^{-7}	4.4×10^{-5}	4.4×10^{-5}
LCFs[b]	1×10^{-8}	6×10^{-6}	6×10^{-6}
Offsite MEI			
Dose (mrem)	1.1×10^{-5}	4.1×10^{-3}	4.1×10^{-3}
Percent of regulatory dose limit	1.1×10^{-4}	4.1×10^{-2}	4.1×10^{-2}
Percent of natural background radiation[a]	3.5×10^{-5}	1.3×10^{-3}	1.3×10^{-3}
Cancer fatality risk[b]	6×10^{-12}	2×10^{-9}	2×10^{-9}

[a] The average annual dose from background radiation at NTS is 314 mrem ; the 69,501 people living within 50 mi of NTS in the year 2030 would receive an annual dose of 21,823 person-rem from the background radiation..
[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.
[c] The offsite MEI is assumed to reside at the site boundary, 103,680 feet south from the CPC. An actual residence may not currently be present at this location.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.

- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician approximately 25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in the CPC would result in an average individual worker dose of 290 mrem annually. The total dose to workers associated with the CPC operations would be 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.3.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at NTS from Operations

	CPC	CNC	CNPC
Number of Radiological Workers	**1,150**	**1,640**	**2,040**
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population			
Collective dose (person-rem)	333	344	386
Cancer fatality risk[c]	0.20	0.21	0.23

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level. To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.
[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.
[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at a CPC would be 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Table 5.3.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC at NTS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CNC	CNPC
Total Workers	1,780	2,715	4,500
Total Recordable Cases	77	117	195
Total Lost Workday Cases	40	61	101
Total Fatalities	0.07	0.11	0.18

Source: NNSA 2007, BLS 2002b.

5.3.11.3 *CCE Alternative*

5.3.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.3.11.2 as well as the impacts discussed below.

CUC construction. No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.3.11-1.

CNC operations. NNSA expects minimal public health impacts from the radiological consequences of CNC operations. Public radiation doses would likely occur from airborne releases only (Section 5.3.4). Table 5.3.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, 1,640 radiological workers would be required to conduct CNC operations. Operations in the CNC would result in an average individual worker dose of 210 mrem annually. The total annual dose to workers associated with the CNC operations would be 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to the CNC workforce.

During normal (accident-free) operations, total facility staffing would be 2,715. The potential risk of occupational injuries and fatalities to workers operating the CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.3.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNPC would include the CNC impacts discussed above, as well as the A/D/HE Center impacts discussed below.

A/D/HE Center construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for construction activities. These values are shown in Table 5.3.11-1.

A/D/HE Center operations. NNSA expects minimal public health impacts from the radiological consequences of CNPC operations. Table 5.3.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

The estimates of annual radiological doses to workers are provided in Table 5.3.11-3. As shown in the table, 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of 189 mrem annually. The total annual dose to workers associated with the CNPC operations would be 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.3.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.3.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at NTS. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- **Internal initiators.** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- **External initiators.** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- **Natural phenomena initiators.** Natural occurrences are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the NTS boundary; 2) the offsite population within 50 miles of NTS; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.3.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional accident risks beyond those associated with current and planned activities. Potential accident

scenarios for the No Action Alternative are addressed in detail in the NTS SWEIS (DOE 1996b) and Supplement Analysis (DOE 2002l).

The NTS SWEIS (DOE 1996b) and the Supplement Analysis for the NTS SWEIS (DOE 2002l) provide a baseline for accidents related to the No Action Alternative at NTS. Based on the analyses in those documents, the maximum reasonably foreseeable accident at the NTS would be a non-nuclear explosion involving high explosives in a storage bunker, which has a probability of occurrence of 1 in 10,000,000. The following consequences are estimated if such an accident occurs: MEI dose of 34 rem, which would result in a 0.02 probability of an LCF; population dose of 5,800 to 110,000 person-rem, which would result in 3-55 LCFs (DOE 1996b).

5.3.12.2 *Consolidated Plutonium Center*

5.3.12.2.1 Radiological Accidents

Table 5.3.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.3.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-1—CPC Radiological Accident Frequency and Consequences–NTS

Accident	Frequency	Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	1.99	0.00119	788	0.473	1,770	1
Fire in a single building	1.0×10^{-4}	0.918	0.000551	354	0.212	984	1
Explosion in a feed casting furnace	1.0×10^{-2}	1.08	0.000648	414	0.248	1,150	1
Nuclear Criticality	1.0×10^{-2}	1.89×10^{-6}	1.13×10^{-9}	0.000309	1.85×10^{-7}	0.00124	7.44×10^{-7}
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.0717	0.000043	27.6	0.0166	76.8	0.0922
Radioactive material spill	1×10^{-2}	0.00215	1.29×10^{-6}	0.829	0.000497	2.31	0.00139

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

Table 5.3.12-2—Annual Cancer Risks for CPC–NTS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	1.19×10^{-8}	4.73×10^{-6}	1×10^{-5}
Fire in a Single Building	5.51×10^{-8}	2.12×10^{-5}	1×10^{-4}
Explosion in a Feed Casting Furnace	6.48×10^{-6}	2.48×10^{-3}	1×10^{-2}
Nuclear Criticality	1.13×10^{-11}	1.85×10^{-9}	7.44×10^{-9}
Fire-induced Release in the CRT Storage Room	4.3×10^{-7}	1.66×10^{-4}	9.22×10^{-4}
Radioactive Material Spill	1.29×10^{-8}	4.97×10^{-6}	1.39×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.3.12-1) is the beyond evaluation basis earthquake and fire. Approximately 0.47 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a dose of approximately 2 rem. Statistically, the MEI would have a 0.001 chance of developing a LCF (i.e., about 1 chance in 1,000 of an LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.3.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be 6×10^{-6}, or approximately 1 in 150,000. For the population, the LCF risk would be approximately 2×10^{-3}, meaning that an LCF would statistically occur once every 400 years in the population.

5.3.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this analysis, Emergency Response Planning Guidelines (ERPG) values are used to develop hazard indices for chemical exposures.

DOE estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.3.12–3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.3.12-3 shows these consequences.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.3.12-3—CPC Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}
Hydrofluoric acid	550	20	0.5	5.05	<0.1	10^{-4}
Formic acid	1,500	10	0.215	0.54	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 13.7 miles west.

5.3.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.12.3 *Consolidated Uranium Center*

5.3.12.3.1 Radiological Accidents

Table 5.3.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.3.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Tranformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-4—CUC Radiological Accident Frequency, Consequences, and Risks–NTS

Accident	Frequency (per year)	Maximally Exposed Offsite Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.00314	1.88×10^{-6}	1.21	0.000726	3.36	0.00202
Explosion	$10^{-4} – 10^{-6}$	0.000309	1.85×10^{-7}	0.119	0.0000714	0.252	0.000151
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.00366	2.20×10^{-6}	1.41	0.000846	3.63	0.00218
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.000398	2.39×10^{-7}	0.155	0.000093	0.243	0.000146
Aircraft crash[d]	$10^{-4} – 10^{-6}$	0.0071	4.26×10^{-6}	2.28	0.00137	2.13	0.00128

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.
[d] NTS has controlled airspace over approximately 8000 square miles. Aircraft accidents are extremely unlikely and, therefore, are usually excluded from further analysis at the NTS. This accident is included as a comparison to other CUC sites.

Table 5.3.12-5—Annual Cancer Risks for CUC–NTS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	1.88×10^{-10}	7.26×10^{-8}	2.02×10^{-7}
Explosion	1.85×10^{-11}	7.14×10^{-9}	1.51×10^{-8}
Fire in EU Warehouse	2.20×10^{-10}	8.46×10^{-8}	2.18×10^{-7}
Design-basis fires for HEU Storage	2.39×10^{-9}	9.3×10^{-7}	1.46×10^{-6}
Aircraft crash	4.26×10^{-10}	1.37×10^{-7}	1.28×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.3.12-4) is the fire in the EU warehouse. Approximately 0.0008 LCFs in the offsite population could result from such an accident in the absence of mitigation measures. An offsite MEI would receive a maximum dose of 0.0037 rem. Statistically, the LCF risk to the MEI would be approximately 2×10^{-6}, or about 1 in half a million. This accident has a probability of occurring approximately once every 10,000 years.

When probabilities are taken into account (see Table 5.3.12-5), 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 approximately 2×10^{-9}, or about 1 in half a billion. For the population, the LCF risk would be approximately 9×10^{-7}, or about 1 in a million.

5.3.12.3.2 Hazardous Chemicals Impacts

The CUC facility would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion,

earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. .Table 5.3.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.3.12-6—CUC Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.86	4.55	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 13.7 miles.

5.3.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.12.4 *Assembly/Disassembly/High Explosives Center*

5.3.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^5
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^5
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^7
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^5

Source: Tetra Tech 2008.

Tables 5.3.12-7 and 5.3.12-8 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables is calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.3.12-7—A/D/HE Center Radiological Accident Consequences–NTS

	Maximally Exposed Offsite Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	0.29	0.000174	112	0.0672	311	0.373
Scenario 2	0.000208	1.25×10^{-7}	0.08	0.000048	0.223	0.000134
Scenario 3	1.74×10^{-8}	1.04×10^{-11}	6.70×10^{-6}	4.02×10^{-9}	1.86×10^{-5}	1.12×10^{-8}
Scenario 4	0.043	2.58E-05	17.7	0.0106	26.3	0.0316
Scenario 5	0.045	0.000027	18.5	0.0111	27.5	0.033
Scenario 6	0.000333	2.00×10^{-7}	0.137	8.22×10^{-5}	0.204	0.000122

Source: Tetra Tech 2008.
[a] At site boundary, 13.7 miles from release.
[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

Table 5.3.12-8—Annual Cancer Risks for A/D/HE Center Accidents–NTS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
	Latent Cancer Fatalities	Latent Cancer Fatalities	Latent Cancer Fatalities
Scenario 1	1.74×10^{-8}	6.72×10^{-6}	3.73×10^{-5}
Scenario 2	1.25×10^{-9}	4.8×10^{-7}	1.34×10^{-6}
Scenario 3	1.04×10^{-13}	4.02×10^{-11}	1.12×10^{-10}
Scenario 4	2.58×10^{-11}	1.06×10^{-8}	3.16×10^{-8}
Scenario 5	2.7×10^{-9}	1.11×10^{-6}	3.3×10^{-6}
Scenario 6	2.00×10^{-9}	8.22×10^{-7}	1.22×10^{-6}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 13.7 miles from release.
[b] Based on a projected future population (year 2030) approximately 60,138 persons residing within 50 miles of NTS location.
[c] At 1000 meters from release.

The results of the accident analysis indicate that potential consequences would not exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The accident with the highest consequences to the offsite population (see Table 5.3.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.06 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a dose of 0.29 rem. Statistically, this MEI would have a 2×10^{-4} chance of developing a LCF (i.e., about 1 chance in 57,000 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.3.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be approximately 2×10^{-8}, or less than 1 chance in a million. For the population, the LCF risk would be approximately 7×10^{-6}, or approximately one chance in 150,000.

5.3.12.4.2 Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.3.12-9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Table 5.3.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–NTS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	2.7	17	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 13.7 miles.

5.3.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.3.13 Transportation

5.3.13.1 *No Action Alternative*

Baseline transportation characteristics would remain unchanged. Under the No Action Alternative, there would be no change in the transportation activities at NTS, and impacts would remain unchanged from the baseline presented in Section 4.3.12.

5.3.13.2 *DCE Alternative (Greenfield CPC)*

5.3.13.2.1 Construction

Construction of the CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

5.3.13.2.2 Operations

Radiological transportation for the CPC is presented in Section 5.10. The addition of new employees for the CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.13.3 *CCE Alternative*

5.3.13.3.1 CNC (CPC + CUC)

***Construction:* CUC.** Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

***Operations*: CNC.** Radiological transportation for the CNC is presented in Section 5.10. The addition of new employees for the CUC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.13.3.2 CNPC (CPC + CUC + A/D/HE Center)

***Construction:* A/D/HE Center.** Construction of the A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.3.12 and would be temporary.

***Operations:* CNPC.** If the A/D/HE Center were located at NTS as part of a CNPC, there would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. There would also be new employees. The addition of new employees for the CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.3.12.

5.3.14 Waste Management

5.3.14.1 *No Action Alternative*

In 2001 NTS generated 4.86 cubic yards of hazardous waste and 4,550 cubic yards of sanitary waste. In 2005, the Area 5 RWMS received shipments containing 48,169 cubic yards of low level waste (LLW) for disposal. The Area 3 RWMS received shipments containing 12,576 cubic yards of LLW. A total of 1,055 cubic yards of LLW disposed of in 2005 was generated onsite. In 2005, a total of 38,228 pounds of hazardous wastes were received at the HWSU for temporary storage and 27,172 pounds were shipped offsite from the HWSU. A total of 27,140 pounds of hazardous wastes were shipped offsite. No hazardous wastes storage limits were exceeded. Approximately 2.1 tons per day of non-hazardous waste were disposed of at the Area 23 landfill, well below permit limits (NTS 2006a). Baseline waste amounts are discussed in Section 4.3.13.

Under the No Action Alternative, current and planned activities at NTS would continue as required to support the missions described in Section 3.2.3. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 5.3.14-1 gives a summary of the major waste categories currently being generated at NTS.

Table 5.3.14-1—Waste Volumes Generated–NTS

Waste Type	1996	1997	1998	1999	2000	2001	2005
Transuranic (yd^3)	0	0	0	0	0	0	0
Low Level Waste (yd^3)	0	0	0	7.1	0.46	0	1,055
Mixed LLW (yd^3)	0	0	0	0	0	0	0
Hazardous[a] (tons)	46	11	50.2	14	24.5	4.86	NA
Non-Hazardous Sanitary[b] (tons)	4,550	2,280	6,460	7,460	5,080	4,550	NA

Source: DOE 2002o.
[a] Includes state-regulated waste. Hazardous waste reported in metric tons.
[b] From DOE 2002o (1996 data) and DOE's Central Internet Database. Sanitary waste reported in metric tons.

5.3.14.2 *DCE Alternative (Greenfield CPC)*

5.3.14.2.1 Construction

Construction of a CPC would generate hazardous waste and both liquid and solid non-hazardous waste. Table 5.3.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the CPC at NTS. CPC construction activities would increase routine waste generation at NTS for hazardous waste and both liquid and solid non-hazardous waste over more recent waste generation volumes, but well below historic levels.

Table 5.3.14-2—CPC Construction Wastes–NTS

Waste Type	CPC
TRU Waste (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Non-hazardous Solid Waste (yd^3)	10,900
Non-hazardous Liquid Waste (gallons)	56,000

Source: NNSA 2007.

Hazardous wastes generated from the construction of a CPC would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes.

Non-hazardous wastes are currently disposed of in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. Existing and planned disposal sites at NTS have more than adequate capacity to handle all CPC construction waste. Sanitary wastewater generated during CPC construction would be disposed either by a septic system or by a lagoon system. Portable sanitary units would be used during the construction phase until the permanent wastewater system would be available.

A retention pond would be constructed to manage storm water runoff from a CPC, including the construction laydown area and concrete batch plant. The basin would be sized to limit storm

water discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land. A concrete batch plant would operate at a CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.3.14.2.2 Operations

Normal operation of a CPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.3.14–3 summarizes the estimated waste generation rates for the operation of a CPC.

Table 5.3.14-3—CPC Annual Operational Wastes–NTS

Waste Category	CPC
TRU Solid Waste (Including Mixed TRU)(yd^3)	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste solid (tons)	4.0
Hazardous waste liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to construction and operation of a CPC. TRU waste generated from a CPC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CPC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would be a RCRA-permitted facility with the ability to treat mixed TRU waste and would include a staging area with capacity for the storage of approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for other facilities within the DOE complex. LLW from CPC operations would include job control waste, failed equipment, and other general operations and maintenance waste. Liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. LLW generated at the CPC would be transferred from CPC to an existing facility in Area 5, the Radioactive Waste Management Site (RWMS). Here, the LLW would undergo characterization

and certification prior to disposal in either Area 3 and Area 5, at NTS. The capacity of these two LLW disposal facilities, at 3,923,888 cubic yards, could readily accommodate the projected LLW volume from CPC operations, as well as other planned volumes.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents. The projected hazardous waste volumes from CPC operations would substantially increase the annual volumes routinely managed by NTS. The waste would be sent to the Hazardous Waste Storage Unit at Area 5 and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The impacts of managing this waste at NTS would be minimal.

NTS does not routinely generate mixed LLW but manages substantial volumes in its role as one of two national disposal sites for the DOE complex. MLLW generated from CPC operations would be managed in accordance with the NTS Site Treatment Plan. The mixed LLW would be transferred to the Area 5 RWMS for characterization and identification of appropriate treatment. Once treated, the waste would be disposed onsite. The annual mixed LLW volume from CPC operations represents only a fraction of the disposal capacity 466,577 cubic yards and of the anticipated permit limit of 78,477 cubic yards for the Pit 3 disposal unit in Area 5. The impacts of managing this waste at NTS would be minimal.

Sanitary waste from CPC operations would be disposed of at the onsite landfill in Area 23. The CPC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23. Sanitary wastewater generated during CPC operations would be disposed of either by a septic system or by a lagoon system. The impacts of managing this non-hazardous sanitary waste at NTS would be minimal.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process. The waste would then be classified and handled according to the appropriate categories described above.

5.3.14.3 *CCE Alternative*

5.3.14.3.1 CNC (CPC + CUC)

***Construction:* CUC.** Construction of a CNC would entail construction of a CPC, already discussed in Section 5.3.13.2.1, above and construction of a CUC, discussed in this section. Construction of a CUC would generate LLW, hazardous waste and solid non-hazardous waste. Table 5.3.14-4 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the CUC at NTS.

Table 5.3.14-4—CUC Construction Wastes–NTS

Waste Category	Quantity
Low-level Solid (yd^3)	70
Mixed Low-level Solid (yd^3)	0
Hazardous (tons)	6
Non-hazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CUC construction would result from installation of process waste capturing mechanisms, and other such process line installation activities. There would not be any liquid LLW resulting from actual CUC facility construction activities. LLW generated from CUC construction activities would be transferred from the CUC construction site to the Area 5 RWMS for characterization and certification prior to disposal at the RWMSs in Area 3 and Area 5. The capacity of these RWMSs could readily accommodate the projected LLW volume from CUC construction.

Non-hazardous wastes are currently disposed in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. To the extent possible, metals would be removed from this waste and recycled. Existing and planned disposal sites at NTS have more than adequate capacity to handle all CUC construction waste.

Hazardous wastes generated from the construction of a CUC would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes.

Sanitary wastewater generated during CUC construction would be disposed either by a septic system or by a lagoon system. Portable sanitary units would be used during the construction phase until the permanent wastewater system became available. A retention pond would be constructed to manage storm water runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at a CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CUC construction is completed.

Operations: **CNC.** Normal operation of a CNC would generate TRU waste, LLW, MLLW, hazardous waste, and sanitary waste. Table 5.3.14-5 summarizes the estimated waste generation rates for the operation of the CPC.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored non-classified TRU waste at NTS prior to the timeframe of CNC construction and operations. TRU waste generated from the CNC includes

gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CNC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CNC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNC operations would be solidified prior to leaving the facility. The annual LLW generation for a CNC would be transferred from CNC to the Area 5 RWMS for characterization and certification prior to disposal at the RWMS in Area 3 and Area 5. The capacity of these RWMS could readily accommodate the projected LLW volume from CNC operations.

Table 5.3.14-5—Annual CNC Operational Waste–NTS

	CPC	CUC	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3) `	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic feet of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to construction and operation of a CNC. TRU waste generated from a CNC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. Since this process of the CNC is the same as for the CPC, about 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the CNC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would be a RCRA-permitted facility with the ability to treat mixed TRU waste and would include a staging area with capacity for the storage of approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

CNC operations would generate three times the amount of LLW of a CPC and small amounts of hazardous waste and MLLW. These wastes would include lead acid batteries, lubricating

oils/fluids, rags, and absorbents. NTS has more than enough capacity to handle the projected annual generation of 12,000 cubic yards of LLW. The projected hazardous waste volumes from CNC operations would substantially increase the annual volumes routinely managed by NTS. The hazardous waste would be sent to the Hazardous Waste Storage Unit, at Area 5, for accumulation of transport quantities, packaged, and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The infrastructure to collect, package, and transport these quantities of hazardous waste already exist at NTS and the impacts of managing this waste category, at NTS, would be minimal.

Solid sanitary waste from CNC operations would be disposed of at the onsite landfill in Area 23. The CNC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23. In the event this landfill proves insufficient, there would be no impediments to creating another at NTS. Sanitary wastewater generated during CNC operations would be disposed either by a septic system or by a lagoon system. The impacts of managing this waste at NTS would be minimal. CNC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.3.14.4 *CNPC (CPC + CUC + A/D/HE CENTER)*

Waste management impacts from the construction and operation of a full CNPC would include CPC impacts discussed in Section 5.3.13.2, CUC impacts discussed above, and an A/D/HE Center. The expected waste impacts are discussed below.

5.3.14.4.1 Construction

A/D/HE Center. Construction of a CNPC would entail the construction of the CPC and CUC, discussed above, and the construction of an A/D/HE Center, discussed in this section. At NTS, an A/D/HE Center would utilize the existing DAF for disassembly operations and therefore incur less waste generation, for some waste categories, than at some of the other sites for construction related activities. The additional construction of an A/D/HE Center, at NTS, would generate LLW, and non-hazardous waste. Table 5.3.14-6 summarizes the total volume of waste to be generated over the 6 years construction period for a proposed A/D/HE Center at NTS.

Table 5.3.14-6—A/D/HE Center Construction Waste–NTS

	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,000
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	6,400
Non-hazardous Liquid Waste (gal)	40,000

Source: NNSA 2007.

A/D/HE Center construction activities would substantially increase routine LLW and Non-hazardous waste generation at NTS, with the generation of 9,000 cubic yards of LLW and 6,400 cubic yards of non-hazardous solid waste. NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from A/D/HE Center construction would result from installation of process waste capturing mechanisms, and other such process line installation activities. There would not be any liquid LLW resulting from A/D/HE Center construction activities. LLW generated from construction activities would be transferred from the A/D/HE Center construction site to the Area 5 RWMS for characterization and certification prior to disposal at the RWMSs in Area 3 and Area 5. The capacity of these RWMS disposal areas could readily accommodate the projected LLW volume from construction.

Non-hazardous wastes are currently disposed in three onsite landfills. The disposal location would be determined by the specific characteristics of the construction waste. Existing and planned disposal sites at NTS have more than adequate capacity to handle all A/D/HE Center construction waste. A retention pond would be constructed to manage storm water runoff from the entire A/D/HE Center site including the construction laydown area and concrete batch plant. The basin would be sized to limit storm water discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the A/D/HE Center site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once A/D/HE Center construction is completed.

5.3.14.4.2 Operations

CNPC. Normal operation of a CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.3.14-7 summarizes the estimated waste generation rates for the operation of a CNPC at NTS.

Table 5.3.14-7—Annual CNPC Operational Wastes–NTS

	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU)(yd^3)	950	0	0	950
Mixed TRU Solid Waste(included in TRU, above (yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	40	12,640
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	70	0	782.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	15	.9	19.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	12,000	27,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

NTS does not routinely generate TRU waste but manages about 21,200 cubic yards of legacy waste that was transferred to NTS from offsite generators pending disposal at WIPP. DOE expects to complete disposition of all of this stored TRU waste at NTS prior to the timeframe of CNPC construction and operations. TRU waste generated from a CNPC would include gloves, filters, and other operations/maintenance waste from gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from a CNPC to the Waste Staging/TRU Packaging Building, which would be located outside the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transportation to WIPP.

NTS routinely generates little LLW but manages large volumes of LLW in its role as a national disposal site for the DOE complex. LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility. The annual LLW generation for a CNPC would be transferred from a CNPC to the Area 5 RWMS for characterization and certification prior to disposal at the RWMS in Area 3 and Area 5. The capacity of these RWMS could readily accommodate the projected LLW volume from CNPC operations.

CNPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents. The projected hazardous waste volumes from CNPC operations would substantially increase the annual volumes routinely managed by NTS. The waste would be sent to the Hazardous Waste Storage Unit at Area 5 and then shipped offsite to a commercial facility for treatment and disposal. Commercial treatment is readily available and currently used to treat most NTS hazardous wastes. The impacts of managing this waste at NTS would be minimal.

Sanitary waste from CNPC operations would be disposed at the onsite landfill in Area 23. The CNPC waste would substantially increase the annual routine waste volume from current NTS operations, but is a small fraction of the available capacity of 824,022 cubic yards in Area 23.

Sanitary wastewater generated during CNPC operations would be disposed either by a septic system or by a lagoon system. The impacts of managing this waste at NTS would be minimal.

CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.4 TONOPAH TEST RANGE

There are no Programmatic Alternatives for Tonopah Test Range (TTR). The project-specific analysis for TTR is discussed in Section 5.15.

5.5 PANTEX PLANT

This section discusses the potential environmental impacts associated with the following programmatic alternatives at Pantex:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. Pantex would continue to perform its existing missions as described in Section 3.2.5.
- **DCE Alternative.** This alternative includes a CPC.
- **CCE Alternative.** By definition, adding a CPC and Consolidated Uranium Center (CUC) at Pantex would create a full CNPC because there is an existing A/D/HE mission at Pantex. In general, construction impacts would be additive because construction activities would occur in series as follows: CUC, 2011-2016; and CPC, 2017-2022).
- **Capability-Based Alternatives.** Under these alternatives, production activities at Pantex would be reduced to support stockpile requirements below the Moscow Treaty requirements. The No Net Production/Capability-Based Alternative would maintain capability at Pantex to disassemble and re-assemble weapons, perform HE R&D, and conduct surveillance testing to ensure maintenance of capability for all active weapon types. Pantex would continue to support on-going surveillance, dismantlement, and HE R&D activities to fully support the Defense Programs missions. In addition, Pantex would perform approximately 44 weapon assemblies per year in order to maintain assembly capabilities across all programs.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.5.1 Land Use

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.5.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.5.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	

Table 5.5.1-1—Potential Effects on Land Use at the Proposed Sites (continued)

CUC		
Construction (acres)	50	
Operation (acres)	Total Area: 35[b]	
	PIDAS	**Non-PIDAS**
	15	20
A/D/HE CENTER [d]		
Construction (acres)	300	
Operation (acres)	Total Area: 300[e]	
	PIDAS	**Non-PIDAS**
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120
CNC		
	Total Area: 195[f]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50
CNPC		
	Total Area: 545[g]	
Operation (acres)	**PIDAS**	**Non-PIDAS**
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.5.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue on the 15,977 acre site, as required to support the missions described in Section 3.2.5. No additional buildings or facilities would be built beyond current and planned, but not built, and no additional impacts on land use would occur at Pantex beyond those of existing and future activities that are independent of this action. Existing land use at Pantex is discussed in Section 4.3.1.

Table 5.5.1-2 presents a summary of the facilities at Pantex associated with the No Action Alternative.

Table 5.5.1-2—Summary–Pantex No Action Alternative Facilities[a]

Mission	Approximate Number of Buildings	Example Facilities	Approximate Area (ft^2)	Year Built (average)	Remaining Life (average years)
A/D QA Testing, and Maintenance and Modification	94	A/D Bays, A/D Cells, Production Support Laboratories, Tool and Component Warehousing, Weapon Staging Magazines	908,000	1966	31
HE R&D	124	HE Machining Bays, HE Pressing Bays, HE Formulation, HE Synthesis, Firing Sites, Production Support Laboratories, HE Storage Magazines	498,000	1955	15
Facility Operations	141	Maintenance and Craft Shops, Security, Medical, Fire Department, ES&H, Support Laboratories, Offices	814,800	1977	22
Pit Storage	22[b]	Magazines, Vaults, Staging Facilities	74,200	1949	34

[a] Table excludes tanks, chemical storage, ramps (concrete floor enclosed walkways between buildings), guard towers, utility structures (e.g., pump houses), and miscellaneous structures (e.g., bust stop hut).
[b] Represents 18 Modified Richmond Magazines and Buildings 12-44 (Cell 8), 12-55, 12-58, and 12-116. Note 12-26 and 12-42 pit vaults and Steel Arch Construction (SAC) magazines are listed as Component Warehousing and Weapon Staging Magazines, respectively.
ES&H=Environment, Safety, and Health
HE=High Explosive(s)
A/D=Assembly and Disassembly
QA=Quality Assurance
R&D=Research and Development

5.5.1.2 *DCE Alternative (Greenfield CPC)*

5.5.1.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. A construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state. All new buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks. The CPC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. This tract of land is surrounded on all sides by a similar land use, open space. It is now considered a low maintenance area within the Protected Area boundaries.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for the proposed CPC construction would represent approximately 0.9 percent of Pantex's total land area of 15,977 acres. The post-construction developed area would be approximately 110 acres.

5.5.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for the proposed CPC operations would represent approximately 0.7 percent of Pantex's total land area of 15,977 acres. Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

5.5.1.3 *CCE Alternative*

5.5.1.3.1 CNPC (CPC + CUC + existing A/D/HE Center)

A CNPC located at Pantex would not require the construction of the A/D/HE Center, as Pantex currently performs these missions in existing facilities. As such, a CNPC at Pantex would entail the construction of a CPC and a CUC. Land use impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.1.2 as well as the impacts for the CUC discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. The land required for CUC construction would represent approximately 0.3 percent of Pantex's total land area of 15,977 acres. The reference location has adequate space to accommodate the total facilities footprint. The CUC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East.

Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. The post-construction developed area would be approximately 35 acres. All buildings would be either one or two stories. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

Operations: **CNPC.** As described in Section 3.5, an estimated 195 acres of additional land would be required for buildings, walkways, building access, parking, and buffer space to add both a CPC and CUC to Pantex to comprise a full CNPC. The total additional land required for the CNPC operations (195 acres) would represent approximately 1.2 percent of Pantex's total land area of 15,977 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to Pantex land use plans or policies are expected.

5.5.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Pantex. Reduced operations would not change land use at Pantex.

5.5.2 Visual Resources

5.5.2.1 *No Action Alternative*

The Pantex Plant is located on the Llano Estacado portion of the Great Plains at an elevation of approximately 3,500 feet. The topography at the Pantex Plant is relatively flat and characterized by rolling grassy plains and numerous natural playa basins. The developed areas at Pantex Plant are consistent with a Visual Resource Management Class IV designation. The remainder of Pantex is consistent with a Visual Resource Management rating of Class III or IV.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. Existing visual resources are discussed in Section 4.5.2.

5.5.2.2 *DCE Alternative (Greenfield CPC)*

5.5.2.2.1 Construction

As described in Section 3.4.1, activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. The reference location is obstructed from offsite view by existing buildings and infrastructure. However, dust and construction equipment mobilization may be visible to the general public. Members of the public, as well as onsite employees and visitors, observing CPC construction would find these activities temporary and similar to the past construction activities of other developed areas on the Pantex site. Thus, impacts on visual resources during construction would be minimal.

5.5.2.2.2 Operations

A CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. Located in the midst of the industrial complex, the facility would be visible to onsite employees and visitors, but not to the general public. The offsite view of CPC buildings would be obstructed by existing buildings and infrastructure. This change would be consistent with the currently developed areas of the Pantex site. Thus, new construction would not change the current Class IV BLM Visual Resource Management rating of developed areas within Pantex boundaries.

5.5.2.3 *CCE Alternative*

5.5.2.3.1 CNPC (CPC + CUC + existing A/D/HE Center)

A CNPC located at Pantex would not require the construction of the A/D/HE Center, as Pantex currently performs these missions in existing facilities. As such, the CNPC at Pantex would entail the construction of a CPC and the CUC. Visual impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.2.2 as well as the impacts of the CUC discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, activities related to the construction of new buildings required for the CUC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. The reference location is obstructed from offsite view by existing buildings and infrastructure. However, dust and construction equipment mobilization may be visible to the general public. Members of the public, as well as onsite employees and visitors, observing CUC construction would find these activities temporary and similar to the past construction activities of other developed areas on the Pantex site. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNPC.** As described in Section 3.5.1, a CNPC would include one- and two-story buildings that would change the appearance of the reference location. The offsite view of CNPC buildings would be obstructed by existing buildings and infrastructure. This change would be consistent with the currently developed areas of the Pantex site. Thus, new construction would not change the current Class IV BLM Visual Resource Management rating of developed areas within Pantex boundaries.

5.5.2.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Pantex. Reduced operations would not change visual resource impacts at Pantex.

5.5.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.5.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.5.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this

action. Baseline characteristics are described in Section 4.5.3. Pantex is expected to continue using about 81,850 MWh per year of electricity, well below the available site capacity.

5.5.3.2 *DCE Alternative (Greenfield CPC)*

5.5.3.2.1 Construction

Construction requirements for a CPC are described in Section 3.4.1. For a CPC, the projected demands on electrical infrastructure resources associated with construction activities are shown in Table 5.5.3-1. The existing electrical infrastructure at Pantex would be sufficient to support annual construction requirements for the projected 6 year construction period.

Table 5.5.3-1—Electrical Infrastructure Requirements for CPC and CUC Construction

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity [a]	**201,480**	**47.5**
Available site capacity [a]	**119,630**	**33.9**
No Action Alternative		
Total site requirement	81,850	13.6
Percent of site capacity	41%	29%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	6.5%	7%
Percent of available capacity	10.8%	10%
CUC		
CUC requirement	11,000	2.5
Percent of site capacity	5.5%	5.3%
Percent of available capacity	9.2%	7.4%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.

5.5.3.2.2 Operations

The estimated electrical infrastructure requirements for the operation of a CPC are shown in Table 5.5.3-2. Electrical energy requirements would be approximately 24 percent of the site capacity. The peak electrical load would be approximately 23 percent of the site capacity.

5.5.3.3 *CCE Alternative*

5.5.3.3.1 CNC (CPC + CUC)

Implementation of the CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex (see Section 5.5.3.3.2).

Table 5.5.3-2—Electrical Infrastructure Requirements for CPC and CUC Operation

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity [a]	201,480	47.5
Available site capacity [a]	119,630	33.9
No Action Alternative		
Total site requirement	81,850	13.6
Percent of site capacity	41%	29%
CPC		
CPC requirement	48,000	11
Percent of site capacity	24%	23%
Percent of available capacity	40%	32%
CUC		
CUC requirement	168,000	18.4
Percent of site capacity	83%	39%
Percent of available capacity	140%	54%
CNPC (CPC + CUC + existing A/D/HE)		
CNPC requirement	297,850	44
Percent of site capacity	148%	93%
Percent of available capacity	247%	130%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.

5.5.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site electrical infrastructure impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.3.2 as well as the impacts discussed below.

Construction: **CUC.** Construction requirements for a CUC are described in Section 3.5.1.1. The projected demand on electrical infrastructure resources associated with construction activities for the CUC is shown in Table 5.5.3-1. The existing electrical infrastructure at Pantex would be sufficient to support annual construction requirements for the projected 6-year construction period.

Operations: **CNPC.** The estimated annual electrical infrastructure requirements for the operation of a CUC would exceed the available capacity. To support a CUC (and, thus a CNPC), Pantex would need to procure additional power.

5.5.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use would be reduced from 81,850 MWhr per year to approximately 61,000 MWhr per year. Because there is currently adequate electrical capacity at the site, this reduction would not have

any major impact on operations. Under the No Net Production/Capability-Based Alternative, electrical use would be reduced to approximately 54,000 MWhr/year.

5.5.4 Air Quality and Noise

5.5.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Pantex is in compliance with all NAAQs. Existing air quality and noise resources are discussed in Section 4.5.4.

5.5.4.2 *DCE Alternative (Greenfield CPC)*

5.5.4.2.1 Air Quality

Construction. Construction of new structures 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, $PM_{10,}$ total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the EPA document AP-42, “Compilation of Air Pollutant Emission Factors” (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicles) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre/month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.5.4–1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air

Quality Standards (NAAQS) beyond the Pantex site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.5.4-1—Estimated Peak Nonradiological Air Emissions for the CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

Construction: **Radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **Nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.5.4-2. These emissions would be incremental to the Pantex baseline. If Pantex is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

Table 5.5.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on *Clean Air Act* (CAA) Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because Pantex is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

The maximum concentrations (µg/m^3) at the Pantex site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.5.4-3. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. The incremental concentration increases would be small and ambient concentrations would remain well below all ambient air quality standards. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.5.4-3—Criteria Pollutant Concentrations at Pantex for CPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (µg/m^3)	Maximum Incremental Concentration (µg/m^3)[b]	
			Baseline [b]	CPC 200 ppy
Carbon monoxide	8-hour	10,000	161	5.1
	1-hour	40,000	924	7.3
Nitrogen dioxide	Annual	100	0.90	2.2
Sulfur dioxide	Annual	80	<0.01	0.18
	24-hour	365	<0.01	0.90
	3-hour	1,300	<0.01	1.9
PM_{10}	Annual	50	8.73	0.07
	24-hour	150	88.5	0.35
Total Suspended Particulates	3-hour	200	NA	0.19
	1-hour	400	NA	0.97

Source: NNSA 2007.
NA = not available.
[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.
[b]No nonradiological air monitoring has been conducted at the Pantex Plant since November 2003, when the requirement by the Texas Commission on Environmental Quality (TCEQ) was eliminated (Pantex 2006). Data in this table is the best available data available related to NAAQS.

Operations: **Radiological impacts.** Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air. NNSA estimated routine radionuclide air emissions (see Table 5.5.4-4).

Table 5.5.4-4—Annual Radiological Air Emissions for the CPC at Pantex–Operations

Isotope	Baseline[a,b] (Ci/yr)	CPC—200 ppy Annual Emissions (Ci/yr)
Americium-241	ND	3.12×10^{-7}
Plutonium-239	ND	1.02×10^{-5}
Plutonium-240	ND	2.66×10^{-6}
Plutonium-241	ND	1.96×10^{-4}
Uranium-234	ND	5.02×10^{-9}
Uranium-235	ND	1.58×10^{-10}
Uranium-236	ND	2.56×10^{-11}
Uranium-238	ND	1.42×10^{-12}
Total Uranium	7.34×10^{-10}	
Tritium	5.53×10^{-5}	–
All Other	1.76×10^{-12}	–
Total	5.53×10^{-5}	**2.09×10^{-4}**

Source: NNSA 2007.
ND = No Data for individual radionuclides.
[a] Based on calendar year 2005 data.
[b] The No Action Alternative is represented by the baseline.

Total radionuclide emissions at Pantex would be much less than 1 curie of any radionuclide. To ensure that total emissions are not underestimated, DOE's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

DOE estimated the radiation doses to the offsite MEI and the offsite population surrounding Pantex. As shown in Table 5.5.4-5, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne radioactivity releases. The maximum estimated dose to the offsite population within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.5.11.

Table 5.5.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations at Pantex

Receptor	CPC-200 ppy Annual Dose
Offsite MEI[a] (mrem/yr)	4.1×10^{-5}
Population within 50 miles (person-rem per year) [a]	8.1×10^{-5}

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.5.4-4and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.5.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.5.4-6 presents the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 2 miles) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by the Occupational Safety & Health Administration (OSHA) in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Table 5.5.4-6—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68

Table 5.5.4-6—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment (continued)

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	50	50	50
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (more than 2 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.5.4.3 *CCE Alternative*

5.5.4.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.4.3.2).

5.5.4.3.2 CNPC (CPC + CUC + A/D/HE)

Air quality and noise impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.5.4.2 as well as the impacts discussed below.

5.5.4.3.2.1 Air Quality

Construction: **CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.5.4-1 would be representative of a CUC. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model the CPC construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Pantex site boundary (Janke 2007).

Construction: **CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **CUC and CNPC nonradiological impacts.** CUC activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates. The estimated emission rates for nonradiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from a CUC to the Pantex baseline. The results are presented in Table 5.5.4-7. The PM_{10} concentration has the potential to exceed the annual standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. CUC contribution to nonradiological emissions would not cause any standard or guideline to be exceeded. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because Pantex is located in an attainment area for all criteria pollutants. Thus, while each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.5.4-7—Criteria Pollutant Concentrations, CUC and CNPC–Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m^3)	Maximum Incremental Concentration (μg/m^3)[b]		
			Baseline [b]	CUC	CNPC
Carbon monoxide	8-hour	10,000	161	0.2	5.3
	1-hour	40,000	924	No Data	7.3
Nitrogen dioxide	Annual	100	0.90	0.9	3.1
Sulfur dioxide	Annual	80	<0.01	2.1	2.3
	24-hour	365	<0.01	52.4	53.3
	3-hour	1,300	<0.01	17.5	19.4
PM_{10}	Annual	50	8.73	52.4	53.1
	24-hour	150	88.5	17.5	17.8
Total Suspended Particulates	3-hour	200	NA	No Data	0.19
	1-hour	400	NA	No Data	0.97

Source: NNSA 2007.
NA = not available.
[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.
[b]No nonradiological air monitoring has been conducted at the Pantex Plant since November 2003, when the requirement by the Texas Commission on Environmental Quality (TCEQ) was eliminated (Pantex 2006). Data in this table is the best available data available related to NAAQS.

Operations: **CUC and CNPC radiological impacts.** A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of a CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 Curies (2.17 kg) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding Pantex, and Pantex workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding Pantex. As presented in Table 5.5.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.5.11.

Table 5.5.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNPC Operations–Pantex

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	0.016	0.016
Population within 50 miles (person-rem per year)	0.033	0.033

Source: Tetra Tech 2008.

[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.5.4.3.2.2 Noise

Construction: **CUC.** Anticipated noise impacts from the construction of a CUC would be similar to those described for the CPC in Section 5.5.4.2.

Operations: **CUC and CNPC.** Anticipated noise impacts from the operation of a CNC would be similar to those described for the CPC in Section 5.5.4.2.

5.5.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to air quality, Pantex is located within the Amarillo-Lubbock Intrastate Air Quality Control Region (AQCR), which is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Reduced operations would reduce the emissions from the steam plant boilers, the explosives-burning operation, and emissions from onsite vehicles. With respect to radiological emissions, because the maximum radiation levels are extremely small (less than three percent of the allowable standard), further reductions would be inconsequential.

5.5.5 Water Resources

5.5.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Pantex is expected to continue using about 130 million gallons of water per year, which is drawn from the Ogallala Aquifer. Existing water resources are discussed in Section 4.5.5.

5.5.5.2 *DCE Alternative (Greenfield CPC)*

5.5.5.2.1 Surface Water

Construction. Construction requirements for a CPC are described in Section 3.4.1. Surface water would not be used to support the construction of the construction of a CPC as groundwater is the source of water at Pantex. Therefore, there would be no impact to surface water availability from

construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction, it is estimated that one-third of the liquid wastes generated would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to Pantex's Texas Pollutant Discharge Elimination System (TPDES) permit for stormwater involving construction activities.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although runoff would likely be collected in retention ponds. In addition, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Pantex would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the CPC reference location is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

Floodplains at the Pantex site have been delineated. The CPC reference location at Pantex is not within the 100- or 500-year floodplains, or the Standard Project Flood boundaries. Therefore, no impacts to floodplains would be anticipated, nor would project facilities be expected to be impacted by flooding.

Operations. Operation requirements for a CPC are described in Section 3.4.1. No impacts on surface water resources would be expected as a result of CPC operations at Pantex. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. Pantex's current NPDES permit may require modification and approval concerning the increase in wastewater discharges. The sanitary wastewater would be treated in the Waste Water Treatment Facility (WWTF) and disposed of via land application for the irrigation of crops in cooperation with the Texas Tech University Research Farm. No industrial or other TPDES-regulated discharges to surface waters are anticipated.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid-process waste facilities for the plutonium purification process.

5.5.5.2.2 Groundwater

Construction. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water over that normally required by construction activities. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 20.9 million gallons to support CPC construction (see Table 5.5.5.-1). It is expected that construction should take approximately 6 years. Assuming an equal usage over that timeframe, it is estimated that 3.5 million gallons would be needed for CPC construction annually. This would increase current water use by approximately 2.6 percent compared to the No Action Alternative and would be within Pantex's water capacity of approximately 422.7 million gallons. It is anticipated that this water would be derived from Pantex's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

Table 5.5.5-1—Potential Changes to Water Resources from the Construction of the CPC and CUC–Pantex

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground (Ogallala Aquifer)
Water Requirement (gal)	130,000,000
CPC	
Water Requirement (gal)	20,900,000
Percent Change from No Action Alternative	16%
CUC	
Water Requirement (gal)	5,200,000
Percent Change from No Action Alternative	4%

Source: NNSA 2007.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Activities at Pantex for a CPC would use groundwater primarily to meet the potable and sanitary needs of facility personnel and for cooling tower water makeup. A summary of water needed is presented in Table 5.5.5-2. The percent change in water consumption from the No Action Alternative is approximately 68 percent. The Pantex wellfield has a water capacity of approximately 422.7 million gallons per year. For comparison, in 2001, the City of Amarillo withdrew 6.93 billion gallons of water from the Amarillo City wellfield. Pantex, governed by the Panhandle Groundwater Conservation District No. 3, does not limit the quantity of water pumped from the aquifer. However, depletion of the Ogallala Aquifer is a regional concern. The Texas portion of the Ogallala Aquifer contained approximately 146.7 trillion gallons of water in 1990. The Texas Water Development Board estimated that the net depletion rate of the Ogallala Aquifer is predicted to average about 1.2 trillion gallons per year from 1990 to 2000.

Approximately 70 percent of water use on the Texas High Plains is attributed to agriculture (Guru and Horne 2000). Pantex's total contribution to the depletion of the Ogallala Aquifer from operation of a CPC would be much less than 1 percent of the estimated annual total depletion.

Table 5.5.5-2—Potential Changes to Water Resources from Operation of the CPC and CUC–Pantex

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground (Ogallala Aquifer)
Water Requirement (gal)	130,000,000
CPC	
Water Requirement (gal)	88,500,000
Percent Change from No Action Alternative	68%
CUC	
Water Requirement (gal)	105,000,000
Percent Change from No Action Alternative	80.8%
CNPC (CPC + CUC at Pantex)	
Water Requirement (gal)	193,500,000
Percent Change from No Action Alternative	149%

Source: NNSA 2007.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these chemicals is standard and no adverse impacts would be expected.

5.5.5.3 *CCE Alternative*

5.5.5.3.1 CNC (CPC + CUC)

Implementation of a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex (see Section 5.5.5.3.2)

5.5.5.3.2 CNPC (CPC + CUC + A/D/HE)

Site infrastructure impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.5.2 as well as the impacts discussed below.

Surface water: **CUC construction.** Construction requirements for a CUC are described in Section 3.5.1.1. Surface water would not be used to support construction of a CUC as groundwater is the source of water at Pantex. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. Because plans include use of portable toilets, onsite discharge of sanitary wastewater would be minimized.

During construction, it is estimated that one-third of the liquid wastes generated would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to Pantex's TPDES permit for stormwater involving construction activities.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although runoff would likely be collected in retention ponds. In addition, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Pantex would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the CUC reference location is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

Floodplains at the Pantex site have been delineated. The CUC reference location at Pantex is not within the 100- or 500-year floodplains, or the Standard Project Flood boundaries. Therefore, no impacts to floodplains would be anticipated, nor would project facilities be expected to be impacted by flooding.

Surface water: **CNPC operations.** Operation requirements for a CNPC are described in Section 3.5.1. No impacts on surface water resources would be expected as a result of CNPC operations at Pantex. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of operations stemming from use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. Pantex's current NPDES permit may require modification and approval concerning the increase in wastewater discharges. The sanitary wastewater would be treated in the WTTF and disposed of via land application for the irrigation of crops in cooperation with the Texas Tech University Research Farm. No industrial or other TPDES-regulated discharges to surface waters are anticipated.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid-process waste facilities for the plutonium purification process.

Groundwater: **CUC construction.** Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water over that normally required by construction activities. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 5,200,000 gallons to

support CUC construction. It is expected that construction should take approximately 6 years. Assuming an equal usage over that timeframe, it is estimated that approximately 866,667 gallons would be needed annually for CUC construction. This would increase current water use by less than 1 percent compared to the No Action Alternative and would be within Pantex's water capacity of approximately 422.7 million gallons. It is anticipated that this water would be derived from Pantex's groundwater distribution system via a temporary service connection or trucked to the point-of-use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNPC operations.** A CUC would require approximately 105 million gallons per year for operation. The percent change in water consumption from the No Action Alternative would be approximately 80.8 percent for a CUC. For a CNPC, groundwater would be used primarily to meet the potable and sanitary needs of facility personnel and for cooling tower water makeup. A summary of water need by category and total is presented in Table 5.5.5-2. Including the 130 million gallons per year for the existing A/D/HE operations, a CNPC would require approximately 323.5 million gallons per year of water. The Pantex wellfield has a water capacity of approximately 422.7 million gallons year. For comparison, in 2001, the City of Amarillo withdrew 6.93 billion gallons of water from the Amarillo City wellfield. Pantex, governed by the Panhandle Groundwater Conservation District No. 3, does not limit the quantity of water pumped from the aquifer. However, depletion of the Ogallala Aquifer is a regional concern. The Texas portion of the Ogallala Aquifer contained approximately 146.7 trillion gallons of water in 1990. The Texas Water Development Board estimated that the net depletion rate of the Ogallala Aquifer is predicted to average about 1.2 trillion gallons per year from 1990 to 2000. Approximately 70 percent of water use on the Texas High Plains is attributed to agriculture (Guru and Horne 2000). Pantex's total contribution to the depletion of the Ogallala Aquifer from operation of the CNPC would be less than 1 percent of the estimated annual total depletion. No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these chemicals is standard and no adverse impacts would be expected.

5.5.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in use from 130 million gallons per year to 97.5 million gallons per year would continue to be well within Pantex's water capacity of approximately 422.7 million gallons per year. While this would reduce the burden on the Ogallala Aquifer, Pantex operations account for

much less than 1 percent of the total depletion of this aquifer. Under the No Net Production/Capability-Based Alternative, water use would be reduced from 130 million gallons per year to 85.8 million gallons per year.

5.5.6 Geology and Soils

5.5.6.1 No *Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to the Pullman and Randall soil series, or other geological and soil resources, beyond current and planned activities that are independent of this action. Existing geology and soils are discussed in Section 4.5.6.

5.5.6.2 *DCE Alternative (Greenfield CPC)*

5.5.6.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for CPC construction would represent approximately 0.9 percent of Pantex's total land area of 15,977 acres. The post-construction developed area would be approximately 110 acres.

The CPC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. This tract of land is surrounded on all sides by a similar land use, open space.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at Pantex, but these resources are abundant in the Amarillo area. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER Program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Faults located in the vicinity of Pantex have little potential for earthquakes. Ground shaking affecting primarily the integrity of inadequately designed or non-reinforced structures might occur, but shaking capable of damaging property or specially designed or upgraded facilities is not expected. All new facilities and building expansions would be designed to withstand the

maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities

5.5.6.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the Concrete Batch Plant upon construction completion. The land required for CPC operations would represent approximately 0.7 percent of Pantex's total land area of 15,977 acres. The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.5.6.3 *CCE Alternative*

5.5.6.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.6.3.2).

5.5.6.3.2 CNPC (CPC + CUC + existing A/D/HE Center)

Geologic and soil impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.6.2 as well as the impacts discussed below.

Construction: **CUC.** As described in Section 3.5.1.1, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. The CUC reference location at Pantex is located north of Zone 11 and south of Zone 4 West and Zone 4 East. The land was cultivated until 1993 and replanted with native grasses in 1996. An estimated 50 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CUC.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at Pantex, but these resources are abundant in the Amarillo area. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's Environmental Restoration Program and in accordance

with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

Faults located in the vicinity of Pantex have little potential for earthquakes. Ground shaking affecting primarily the integrity of inadequately designed or non-reinforced structures might occur, but shaking capable of damaging property or specially designed or upgraded facilities is not expected.

***Operations:* CNPC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to add both a CPC and CUC to Pantex to comprise a full CNPC. The operation of a CNPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.5.6.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact.

5.5.7 Biological Resources

5.5.7.1 *No Action Alternative*

At least 13 species of mammals were recorded at the Pantex Plant in 2005 during routine activities such as bird surveys, nuisance animal actions, and incidental observations. There are six playas on DOE-owned or leased land at Pantex: Playas 1, 2, and 3 are on the main Pantex Site; Playas 4 and 5 are on land leased from Texas Tech University; and Pantex Lake is on a separate parcel of DOE-owned property, approximately 2.5 miles northeast of the main portion of the Pantex Plant. There are no federally designated Wild and Scenic Rivers onsite. The Pantex Plant provides habitat for several species protected by Federal and state endangered species. The current status of threatened and endangered (T&E) species known to appear on, or in the vicinity of the Pantex Plant is shown in Table 4.5.7-1. Five special status species have been observed at the Pantex Plant.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.5.7.

5.5.7.2 *DCE Alternative (Greenfield CPC)*

5.5.7.2.1 Terrestrial Resources

Construction. Construction activities for a CPC are described in Section 3.4.1. The area identified for construction of a CPC is classified as a previously cultivated area that has been replanted with native grasses. This tract of land is surrounded by similar land use on all sides, which is wide-open space. The land was last cultivated in 1993 and was planted to native short grasses in 1996 (DOE 2003b). The current state of the altered shortgrass prairie is reflective of conditions of the Southern High Plains of Texas that contain relatively little native undisturbed grassland. Land in the Texas Panhandle is generally used for agricultural purposes and does not support extensive populations of endemic shortgrass prairie wildlife. The remaining undisturbed playas are "islands" of wildlife habitat, allowing the continued existence of many species. The 2002 revision of the *Integrated Plan for Playa Management at Pantex Plant* (BWXT 2002a) calls for adaptive management for species diversity that is consistent with the shortgrass prairie ecosystem of the Southern High Plains. Cultivation, intensive grazing, and invasion of honey mesquite (*Prosopis glandulosa*) have changed species diversity and supporting habitat. Consequently, the importance of managed shortgrass prairie has increased for wildlife and plant species. Thus, preservation and management of remaining grassland is an important goal for biotic community protection. This management issue takes on special significance because few federally managed public lands occur on the Southern High Plains, an important part of the Central Flyway for migratory birds.

Approximately 140 acres of primarily shortgrass prairie and habitat would be cleared or modified during CPC construction. During site-clearing activities, highly mobile wildlife species, such as some mammals and birds, would be able to relocate to adjacent, less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur on a very small scale during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations: Operation requirements for a CPC are described in Section 3.4.1. Approximately 110 acres of primarily shortgrass prairie and habitat would be cleared or modified for CPC operation. In addition to the areas to be disturbed, there could be impacts to wildlife in habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. Further loss of shortgrass prairie habitat on the site is of regional and local concern due to fragmentation of habitat. However, adverse impacts to wildlife due to the loss of grassland in Zone 11 would be negligible.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.5.7.2.2 Wetlands

Construction. The two nearest wetlands to the CPC reference location are Playa 1 and Playa 2. Measuring from the center of the CPC site, the center of Playa 1 is approximately 3,860 feet northeast and the center of Playa 2 is approximately 5,200 feet west (DOE 2003b). There would be no direct impacts to wetlands as there are no wetlands within the area proposed for construction of a CPC or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of Playas 1 and 2.

Operations. There would be no adverse impacts predicted to wetlands from operation of a CPC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect Playa 1, Playa 2, or other wetlands.

5.5.7.2.3 Aquatic Resources

Construction. There are no perennial or seasonal aquatic habitats within the CPC reference location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the Pantex watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other Pantex built environments and the quantity would represent a very minor contribution to the watershed.

5.5.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at Pantex, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of a CPC on any threatened and endangered species.

Construction. Table 4.5.7-1 identifies those Federal- and state-threatened and endangered listed species and other special interest species that occur or may occur within Carson County and Pantex. The CPC would disturb approximately 140 acres of restored shortgrass vegetation and habitat would be cleared or modified during CPC construction. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special

interest avian, mammalian, and reptile species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Approximately 110 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations should not impact any special-interest species population. The USFWS has told Pantex that construction within Zones 11 and 12 would not have adverse impacts on threatened and endangered species. The contractor would be advised to move any Texas horned lizards encountered and to notify the Pantex Regulatory Compliance Department should any bird nests be discovered.

5.5.7.3 *CCE Alternative*

5.5.7.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.7.3.2).

5.5.7.3.2 CNPC (CPC + CUC + existing A/D/HE)

Biological resource impacts from the construction and operation of a CNPC would include the CPC impacts discussed in Section 5.5.7.2 as well as the impacts discussed below.

Construction: **CUC.** Approximately 50 acres of primarily shortgrass prairie and habitat would be cleared or modified during CUC construction. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of a CPC in Section 5.5.7.2.

Operations: **CNPC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to add both a CPC and CUC to Pantex to comprise a full CNPC. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for operations of a CPC in Section 5.5.7.2.

5.5.7.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact.

5.5.8 Cultural Resources

5.5.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no expected impacts to the 69 identified cultural and paleontological resources beyond current and planned activities that are independent of this action. Current cultural resources are discussed in Section 4.5.8.

5.5.8.2 *DCE Alternative (Greenfield CPC)*

5.5.8.2.1 Construction

Under this alternative, approximately 140 acres of land would be disturbed during construction of a CPC. As discussed in section 4.5, systematic archaeological inventories at Pantex have included approximately half of the facility acreage with the other half of the site consisting mainly of industrial areas, playa wetlands, or uplands between playas with very low probability of site occurrence. The probability of impacting cultural and paleontological resources would depend on the location, because some areas (near playas or in developed areas) can exhibit a higher density of cultural resources. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by the construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the Texas SHPO and in accordance with the Cultural Resource Management Plan. If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop, and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the Texas SHPO.

5.5.8.2.2 Operations

Operation of a CPC would have no impact on cultural and paleontological resources.

5.5.8.3 *CCE Alternative*

5.5.8.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.8.3.2).

5.5.8.3.2 CNPC (CPC + CUC + existing A/D/HE)

Cultural and paleontological impacts from the construction and operation of the CNPC would include the CPC impacts discussed in Section 5.5.8.2 as well as the impacts discussed below.

Construction: **CUC.** Construction activities for a CUC are discussed in Section 3.5.1.1. Approximately 50 acres of land would be disturbed during construction. Impacts cultural and paleontological resources would be similar to those described for construction of a CPC in Section 5.5.8.2.

Operations: **CNPC.** Operation of a CNPC would have no impact on cultural and paleontological resources.

5.5.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to cultural resources, reduced operations would have no impact.

5.5.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and Capability-Based Alternative.

5.5.9.1 *No Action Alternative*

Under the No Action Alternative, Pantex would be expected to continue employing approximately 3,800 employees in order to maintain current and planned activities as required to support the missions described in Section 3.2.5. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Existing socioeconomic characteristics are discussed in Section 4.5.9.

5.5.9.2 *DCE Alternative (Greenfield CPC)*

5.5.9.2.1 Regional Economic Characteristics

Construction. Construction of the CPC would require 2,900 worker-years of labor. During peak construction, 850 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 677 indirect jobs would be created, for a total of 1,527 jobs. This represents approximately 1.5 percent of the total ROI labor force.

Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $38.2 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $63.7 million ($38.2 million direct and $25.6 million indirect). Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.5.9-1—Socioeconomic Impacts from CPC Construction

Socioeconomic Factor	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	677
Total Jobs Created	1,527
ROI Average Earning	$44,900
Direct Income Increase	$38,165,000
Indirect Income Increase	$25,563,000
Total Impact to the ROI	$63,728,000

Source: NNSA 2007, BEA 2007.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,707 indirect jobs would be created, for a total of approximately 3,487 jobs. The ROI income would increase by approximately 1 percent as a result of the new jobs created.

Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $136 million ($87.6 million direct and $48.4 million indirect). Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of CPC and other programmatic facilities.

5.5.9.2.2 Population and Housing

Construction. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 new workers), 1,275 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Table 5.5.9-2—Socioeconomic Impacts for All Alternatives–Operations

Socioeconomic Resource	CPC	CUC	CNC	A/D/HE	CNPC
Peak Workers	1,780	935	NA	NA	2,715
Indirect Jobs Created	1,707	897	NA	NA	2,604
Total Jobs Created	3,487	1,832	NA	NA	5,319
ROI Average Earning (direct)	49,200	49,200	NA	NA	49,200
Direct Income Increase	$87,576,000	$46,002,000	NA	NA	$133,578,000
Indirect Income Increase	$48,403,000	$25,425,000	NA	NA	$73,828,000
Total Impact to the ROI	$135,979,000	$71,427,000	NA	NA	$207,406,000

Source: NNSA 2007, BEA 2007.
Note: There are no numbers under the CNC alternative because if the CNC is constructed then the CNPC would be located at Pantex. There are no numbers under the A/D/HE alternative because this mission already exists at Pantex and no new impacts are anticipated. The numbers under the CNPC alternative reflect the changes to socioeconomic resources from addition of the CPC and CUC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.5.9.2.3 Community Services

Construction. The increase in population would put an increased demand on local community services. Because the population would increase by less than 1 percent, comparable levels of service could be maintained without increased staffing. Table 5.5.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operations. The increase in population would not increase demand on local community services. Because the population would increase by less than 1 percent, comparable levels of service could be maintained without increased staffing. Table 5.5.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.5.9.3 *CCE Alternative*

5.5.9.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.9.3.2).

5.5.9.3.2 CNPC (CPC + CUC + A/D/HE)

Socioeconomic impacts from the construction and operation of a full CNPC at Pantex (which operates the existing A/D/HE mission) would include the CPC impacts discussed above and the CUC impacts discussed below.

Regional economic characteristics: **CUC construction.** Construction of a CUC would require 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,036 indirect jobs would be created, for a total of 2,336 jobs. This represents less than 2 percent of the total ROI labor force.

Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $58.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $97.5 million ($58.4 million direct and $39.1 million indirect).

Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Table 5.5.9-3—Socioeconomic Impacts from CUC Construction

Socioeconomic Factor	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	1,036
Total Jobs Created	2,336
ROI Average Earning (direct)	$44,900
Direct Income Increase	$58,370,000
Indirect Income Increase	$39,096,000
Total Impact to the ROI	$97,466,000

Source: NNSA 2007, BEA 2007.

Regional economic characteristics: **CNPC operations.** Operation of a CNPC at Pantex would require 2,715 new workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,604 indirect jobs would be created, for a total of 5,319 jobs. It is estimated that most of the direct jobs would likely be filled by current workers in the ROI. In addition, this ROI labor force would be sufficient to fill any indirect jobs generated.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $133 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $207 million ($133 million direct and $74 million indirect). Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Population and housing: **CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (2,715 new workers), 2,175 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

Community services: **CUC construction.** The minor increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.5.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Community services: **CNPC operations.** The minor increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.5.9-2 presents the impacts to socioeconomic resources from operation of a CNPC.

5.5.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced operations would reduce the workforce from 1,644 to 1,230. This workforce, which currently represents approximately 1.3 percent of area employment, would fall to 1.2 percent. This change would not have a major impact on the socioeconomics of the region. Under the No Net Production/Capability-Based Alternative, reduced operations would reduce the workforce from 1,644 to 1,085.

5.5.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.5.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 30.1 percent of the ROI population surrounding Pantex. In 2000, minorities comprised 30.9 percent of the population nationally and 47.6 percent of the population in Texas. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 14 percent, which is higher than the 2000 national average of 12.4 percent but lower than the statewide figure of 15.4 percent.
Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at Pantex are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural resources. As shown in Section 5.5.11, there are no large adverse impacts to any populations.

5.5.11 Health and Safety

5.5.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that Pantex would emit a dose to the MEI of 4.28 x 10^{-9} mrem per year. This is significantly below the EPA maximum permissible exposure limit to the public. Existing health and safety at Pantex is discussed in Section 4.5.11.

5.5.11.2 *DCE Alternative (Greenfield CPC)*

5.5.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from Bureau of Labor Statistics (BLS), U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the Voluntary Protection Program (VPP). Additionally, the small number of fatal accidents reported in the Computerized Accident/Incident Reporting System makes associated calculated fatality rates statistically invalid. The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are presented in Table 5.5.11-1.

Table 5.5.11-1—Injury, Illness, and Fatality Estimates for Construction of a CPC and CUC–Pantex

Injury, Illness, and Fatality Categories	CPC	CUC
Peak Annual Employment	850	1,300
Total Recordable Cases	81	112
Total Lost Workday Cases	38	54
Total Fatalities	0.2	0.3
Project Duration (6 years)		
Total Recordable Cases	276	384
Total Lost Workday Cases	143	184
Total Fatalities	0.7	0.9

Source: NNSA 2007.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with a CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.5.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC operations. Table 5.5.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.5.11-2—Annual Radiological Impacts on the Public from the CPC and CNPC Operations–Pantex

Receptor	CPC	CNC/CNPC[1]
Population within 50 mi		
Collective dose (person-rem)	8.1×10^{-5}	0.033
Percent of natural background radiation[a]	6.2×10^{-8}	2.6×10^{-5}
LCFs[b]	5×10^{-8}	2×10^{-5}
Offsite MEI		
Dose (mrem)	4.1×10^{-5}	0.016
Percent of regulatory dose limit	4.1×10^{-4}	0.16
Percent of natural background radiation[a]	1.2×10^{-5}	4.8×10^{-3}
Cancer fatality risk[b]	2×10^{-11}	1×10^{-8}

Source: Tetra Tech 2008.
[a]The average annual dose from background radiation at Pantex is 335 mrem; the 386,000 people living within 50 miles of Pantex in the year 2030 would receive an annual dose of 129,310 person-rem.
[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.
[c]The offsite MEI is assumed to reside at the site boundary at distance of approximately 2.2 miles. An actual residence may not currently be present at this location.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-11} per year (i.e., about 2 chances in 100 billion).

[1] By definition, a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex.

The projected number of fatal cancers to the population within 50 miles would be less than or equal to 5×10^{-8} per year (i.e., about 5 chances in 100 million).

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE/NNSA has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of a CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct “hands-in-gloves” labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.5.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in a CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to a CPC workforce. The projected number of fatal cancers in

the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.5.11-3—Annual Radiological Impacts on CPC and CNPC Workers at Pantex from Operations

	CPC	CNC/CNPC[2]
Number of Radiological Workers	1,150	2,040
Average individual dose, mrem/yr[b]	290	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.3×10^{-4}
Collective dose (person-rem)	333	386
Cancer fatality risk[c]	0.20	0.23

Source: Tetra Tech 2008.
[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.
[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.
[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at a CPC would be approximately 1,780. The potential risk of occupational injuries and fatalities to workers operating a CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are presented in Table 5.5.11-4.

Table 5.5.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC–Pantex

Injury, Illness, and Fatality Categories	CPC	CNC/CNPC[3]
Total Workers	1,780	4,500
Total Recordable Cases	77	195
Total Lost Workday Cases	40	101
Total Fatalities	0.07	0.18

Source: Tetra Tech 2008, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of a CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.5.11.3 *CCE Alternative*

5.5.11.3.1 CNC (CPC + CUC)

By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex (see Section 5.5.11.3.2).

[2] By definition, a CNC Alternative at Pantex would create a CNPC because of the existing A/D/HE mission at Pantex.
[3] By definition, a CNC Alternative at Pantex would amount to a CNPC, because of the existing A/D/HE mission at Pantex.

5.5.11.3.2 CNPC (CPC + CUC + A/D/HE)

Because Pantex operates the existing A/D/HE mission, a CNPC would include the CPC impacts discussed in Section 5.5.11.3.1 as well as the CUC impacts discussed below.

Construction: **CUC.** No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents at Pantex makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.5.11-1.

Operations: **CNPC.** DOE expects minimal public health impacts from the radiological consequences of CNPC operations. Table 5.5.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. The estimates of annual radiological doses to workers are provided in Table 5.5.11-3. As shown in the table, approximately 2,040 radiological workers would be required to conduct CNPC operations. Operations in the CNPC would result in an average individual worker dose of approximately 189 mrem annually. The total annual dose to workers associated with CNPC operations would be approximately 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to a CNPC workforce.

During normal (accident-free) operations, total facility staffing would be approximately 4,500. The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.5.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth

controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.5.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced operations would reduce the number of workers involved in radiological operations from approximately 334 to 250. This would reduce the total worker dose from 44.1 person-rem to 33 person-rem. Statistically, the number of LCFs would be reduced from 2.6×10^{-2} to 2.0×10^{-2}, which would be an inconsequential change. Impacts to the surrounding population would also be inconsequential. Under the No Net Production/Capability-Based Alternative, reduced operations would reduce the number of workers involved in radiological operations to approximately 220. The total worker dose would be reduced to approximately 29 person-rem.

5.5.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, CUC, and A/D/HE Center at Pantex. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases because the individual worker exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the Pantex boundary; 2) the offsite population within 50 miles of Pantex; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.5.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in Section 5.5.12.4.

5.5.12.2 *Consolidated Plutonium Center*

5.5.12.2.1 Radiological Accidents

Table 5.5.12–1 and 5.5.12-2 present the frequencies, consequences, and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MELCOR Accident Consequence Code System (MACCS) computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012.

Table 5.5.12-1—CPC Radiological Accident Frequency and Consequences–Pantex

Accident		Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
	Frequency	Dose (rem)	Latent Cancer Fatalities[d]	Dose (Person-rem)	Latent Cancer Fatalities[e]	Dose (rem)	Latent Cancer Fatalities[d]
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	23.1	0.0277	9,840	5.9	1,550	1
Fire in a single building	1.0×10^{-4}	11.4	0.00684	4,610	2.77	988	1
Explosion in a feed casting furnace	1.0×10^{-2}	13.3	0.00798	5,400	3.24	1,160	1
Nuclear Criticality	1.0×10^{-2}	$3.17\text{x}10^{-5}$	$1.90\text{x}10^{-8}$	0.00446	$2.68\text{x}10^{-6}$	0.00126	$7.56\text{x}10^{-7}$
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.888	0.000533	360	0.216	77.2	0.0926
Radioactive material spill	1×10^{-2}	0.0266	0.000016	10.8	0.00648	2.32	0.00139

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table 5.5.12-2—Annual Cancer Risks for CPC–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Beyond Evaluation Basis Earthquake with Fire	$2.77\text{x}10^{-7}$	$5.9\text{x}10^{-5}$	$1\text{x}10^{-5}$
Fire in a Single Building	$6.84\text{x}10^{-7}$	$2.77\text{x}10^{-4}$	$1\text{x}10^{-4}$
Explosion in a Feed Casting Furnace	$7.98\text{x}10^{-5}$	$3.24\text{x}10^{-2}$	$1\text{x}10^{-2}$
Nuclear Criticality	$1.90\text{x}10^{-10}$	$2.68\text{x}10^{-8}$	$7.56\text{x}10^{-9}$
Fire-induced Release in the CRT Storage Room	$5.33\text{x}10^{-6}$	$2.16\text{x}10^{-3}$	$9.26\text{x}10^{-4}$
Radioactive Material Spill	$1.6\text{x}10^{-7}$	$6.48\text{x}10^{-5}$	$1.39\text{x}10^{-5}$

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report, Supporting Documentation for the Accident Impacts and Normal Operations Presented in the Complex 2030 Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. In the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-1) is the beyond evaluation basis earthquake and fire in the absence of mitigation measures. Approximately 5.9 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a dose of 23.1 rem. Statistically, the MEI would have a

0.01 chance of developing a LCF (i.e., about 1 chance in 100 of an LCF). This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.5.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be approximately $8x10^{-5}$, or approximately one in 10,000. For the population, the LCF risk would be $3x10^{-2}$, meaning that an LCF would statistically occur once every 31 years in the population.

5.5.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.5.12–3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.5.12-3 shows the consequences of the dominant accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be

exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.5.12-3—CPC Chemical Accident Frequency and Consequences–Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}
Hydrofluoric acid	550	20	0.5	5.1	0.55	10^{-4}
Formic acid	1,500	10	0.22	0.56	<0.1	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 2.2 miles east.

5.5.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.5.12.3 *Consolidated Uranium Center*

5.5.12.3.1 Radiological Accidents

Table 5.5.12–4 presents the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.5.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.5.12-4—CUC Radiological Accident Frequency and Consequences–Pantex

		Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities[c]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[c]**	**Dose (rem)**	**Latent Cancer Fatalities[d]**
Major fire	$10^{-4} – 10^{-6}$	0.0388	0.0000233	15.8	0.00948	3.38	0.00203
Explosion	$10^{-4} – 10^{-6}$	0.00383	2.30×10^{-6}	1.56	0.000936	0.283	0.00017
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.0454	0.0000272	18.4	0.011	3.77	0.00226
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.00494	2.96×10^{-6}	2.01	0.00121	0.303	0.000182
Aircraft crash	$10^{-4} – 10^{-6}$	0.0719	0.0000431	26.4	0.0158	2.68	0.00161

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table 5.5.12-5—Annual Cancer Risks for CUC–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Major fire	2.33×10^{-9}	9.48×10^{-7}	2.03×10^{-7}
Explosion	2.30×10^{-10}	9.36×10^{-8}	1.7×10^{-8}
Fire in EU Warehouse	2.72×10^{-9}	1.1×10^{-6}	2.26×10^{-7}
Design-basis fires for HEU Storage	2.96×10^{-8}	1.21×10^{-5}	1.82×10^{-6}
Aircraft crash	4.31×10^{-9}	1.58×10^{-6}	1.61×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-4) is the aircraft crash into the EU facilities. Approximately 0.0158 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a maximum dose of 0.07 rem. Statistically, this MEI would have a 0.00004 chance of developing a LCF, or about 1 in 25,000. This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.5.12-5), 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 approximately 3×10^{-8}, or approximately 1 in 33 million. For the population, the LCF risk would be 1×10^{-5}, or approximately 1 in 100,000.

5.5.12.3.2 Hazardous Chemicals Impacts

A CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE

estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.5.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.5.12-6—CUC Chemical Accident Frequency and Consequences–Pantex

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.85	4.49	0.48	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 2.2 miles.

5.5.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.5.12.4 *Assembly/Disassembly/High Explosives*

Accidents associated with the A/D/HE Center, which are included under the No Action Alternative, are presented in Tables 5.5.12-7 through 5.5.12-9 below.

Table 5.5.12-7—Potential Consequences of A/D/HE Accidents–Pantex

	Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	Dose (rem)	Latent Cancer Fatalities[c]	Dose (Person-rem)	Latent Cancer Fatalities[d]	Dose (rem)	Latent Cancer Fatalities[c]
Scenario 1	3.59	0.00215	1,460	0.876	312	0.374
Scenario 2	0.00257	1.54×10^{-6}	1.04	0.000624	0.224	0.000134
Scenario 3	2.15×10^{-7}	1.29×10^{-10}	8.73×10^{-5}	5.24×10^{-8}	1.87×10^{-5}	1.12×10^{-8}

Table 5.5.12-7—Potential Consequences of A/D/HE Accidents–Pantex (continued)

	Maximally Exposed Offsite Individual[a]		Offsite Population[a,b]		Noninvolved Worker[a,c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities[c]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[d]**	**Dose (rem)**	**Latent Cancer Fatalities[c]**
Scenario 4	0.453	0.000272	208	0.125	25.2	0.0302
Scenario 5	0.474	0.000284	218	0.131	26.3	0.0316
Scenario 6	0.00352	2.11×10^{-6}	1.61	0.000966	0.195	0.000117

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

Table 5.5.12-8—Annual Cancer Risks for A/D/HE Accidents–Pantex

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[a,b]	Noninvolved Worker[a,c]
Scenario 1	2.15×10^{-7}	8.76×10^{-5}	3.74×10^{-5}
Scenario 2	1.54×10^{-8}	6.24×10^{-6}	1.34×10^{-6}
Scenario 3	1.29×10^{-12}	5.24×10^{-10}	1.12×10^{-10}
Scenario 4	2.72×10^{-10}	1.25×10^{-7}	3.02×10^{-8}
Scenario 5	2.84×10^{-8}	1.31×10^{-5}	3.16×10^{-6}
Scenario 6	2.11×10^{-8}	9.66×10^{-6}	1.17×10^{-6}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 2.2 miles from release.
[b] Based on a projected future population (year 2030) approximately 386,706 persons residing within 50 miles of Pantex location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.876 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 3.6 rem. Statistically, this MEI would have a 0.002 chance of developing a LCF (i.e., about 1 chance in 460 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.5.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be 2×10^{-7}, or approximately 1 in 5 million. For the population, the LCF risk would be approximately 9×10^{-5}, or approximately 1 in 10,000.

For chemical accidents, NNSA estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.5.12–9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site

boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Table 5.5.12-9—Chlorine Accident Frequency and Consequences–Pantex

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	2.8	17.5	1.8	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 2.2 miles east.

5.5.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accidents are largely a function of the operation being conducted, rather than the number of times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.5.13 Transportation

5.5.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at Pantex, and impacts would remain unchanged from the baseline presented in Section 4.5.12.

5.5.13.2 *DCE Alternative (Greenfield CPC)*

Construction. Construction of a CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels and would be temporary.

Operations. If a CPC were sited at Pantex there would be no significant transportation of plutonium within the nuclear weapons complex. Radiological transportation for the CPC would include the recycle of enriched uranium parts to Y-12, return of enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. LLW would be disposed of at NTS. The addition of CPC employees would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.5.12.

5.5.13.3 *CCE Alternative*

5.5.13.3.1 CNPC (CPC + CUC)

Construction: **CUC.** Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels and would be temporary.

Operations: **CNPC.** If a CUC were located at Pantex as part of a CNPC, only the impacts of transporting TRU waste and LLW for the CPC would occur. There would be a one-time transport of SNM from Y-12 to the CNPC, as described in Section 5.10. The addition of new employees for a CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic levels.

5.5.13.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in employees from 1,644 to 1,230 (or 1,085 for the No Net Production/Capability-Based Alternative) would not be noticed on area roads. Reduced operations would have a minimal impact on: 1) the transportation of pits between Pantex and LANL, and 2) the transportation of secondaries and cases between Pantex and Y-12. As discussed in Section 5.10, the annual transportation impacts for pits and secondaries and cases, for both incident-free transportation and potential accidents, would be small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts).

5.5.14 Waste Management

5.5.14.1 *No Action Alternative*

The types of wastes generated at Pantex Plant include hazardous wastes, regulated under RCRA, universal waste, non-hazardous wastes, wastes regulated under TSCA, LLW, MLLW, and sanitary waste.

Under the No Action Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to waste management resources beyond current and planned activities. Table 5.5.14-1 presents annual waste generation volumes from Pantex Operations.

Table 5.5.14–1—Annual Waste Volumes Generated–Pantex

Waste Type	1993	2003	2004	2005
TRU (yd^3)	0	0	0	0
Low-Level Waste (yd^3)	375.4	75.8	95.6	96.8
Mixed LLW (yd^3)	49	0.8	3.3	1.8
Hazardous Waste (yd^3)	483.8	8,798.9	337.6	711
Universal Waste[a] (yd^3)	-	31.9	24	30.7
TSCA Waste (yd^3)	147.7	542.9	1,481.8	2,036.1
Non-hazardous Waste (yd^3)	14,237	14,208.3	6,050	6,374.5
Sanitary Waste (yd^3)	800.5	988.8	1,061	944.9

Source: Pantex 2006.
[a] In 2001, Pantex began managing some hazardous Waste under the Universal Waste Rules.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Pantex does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective, exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities. DOE/NNSA also routinely ship LLW to off-site commercial LLW disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to

dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted where necessary to address changes in the options available to DOE/NNSA for disposition of these wastes.

5.5.14.2 *DCE Alternative (Greenfield CPC)*

5.5.14.2.1 Construction

Construction of CPC would generate hazardous waste, and both solid and liquid sanitary waste. Table 5.5.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for a CPC.

Table 5.5.14-2—Waste Generation from CPC Construction–Pantex

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Nonhazardous Solid (yd^3)	10,900
Nonhazardous Liquid (gallons)	56,000

Source: NNSA 2007.

CPC construction would increase Pantex's 2005 routine hazardous waste generation by less than one percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and is the normal method currently used to treat Pantex's hazardous waste. The onsite Hazardous Waste Treatment and Processing Facility (HWTPF) may also be used to treat hazardous waste generated from CPC construction activities.

Solid non-hazardous waste generated from CPC construction activities would result in a 70 percent increase over the 2005 level for Pantex. Although a large increase, this volume of non-hazardous waste would present no issues at Pantex, as substantial capacity is available for the disposal of this material. The waste would be disposed of onsite, in the Construction Debris Landfill or at offsite facilities, such as the City of Amarillo Landfill. These disposal facilities, or their replacements, are expected to have adequate capacity to handle the projected amount of waste. To the extent practicable, metal and other recyclable materials would be removed from this waste stream prior to its disposal.

Sanitary wastewater generated during CPC construction would be treated in the onsite Waste Water Treatment Facility (WWTF). DOE recently completed upgrades to this facility sufficient to satisfy the increased treatment requirements of the CPC as well as other planned program requirements at Pantex.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acres per 40 acres of developed land.

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.5.14.2.2 Operations

Normal operation of a CPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.5.14-3 summarizes the estimated waste generation rates for a CPC.

Table 5.5.14-3—CPC Annual Operational Waste Generation–Pantex

Waste Type	CPC
TRU Solid Waste (including Mixed TRU)(yd^3)	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste solid (tons)	4.0
Hazardous waste liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

Normal operations at Pantex do not generate TRU waste. While there are procedures to manage TRU, there is presently no TRU waste management infrastructure at Pantex. CPC operations would generate about 1,290 cubic yards of TRU waste annually (950 TYRU plus 340 Mixed TRU). TRU waste generated from plutonium pit manufacturing would include gloves, filters, and other operations/maintenance waste from gloveboxes. About 26 percent of the TRU waste would be mixed waste. The TRU and mixed TRU waste would be transferred from the CPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). This capacity is more than sufficient to allow for the packaging of this waste according to the WIPP Waste Acceptance Criteria and one to two months of accumulation prior to shipment to WIPP. A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CPC operations represent about 2-4 percent of the annual routine hazardous waste volumes presently managed by Pantex. Commercial treatment is readily available and currently used to treat most Pantex hazardous wastes.

LLW generation from the operation of a CPC would be a small percentage of the 2005 Pantex LLW generation volume. The LLW would be packaged according to DOE, NRC, and DOT requirements, and transferred to NTS for disposal. LLW from CPC operations would include job

control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. This waste could also be disposed of at a commercial LLW disposal facility.

Pantex's current mixed LLW generation level is small. The majority of the mixed LLW is presently transferred offsite to commercial facilities for treatment and disposal. CPC operations would increase the annual generation of mixed LLW generation by 20-48 percent over current amounts. The waste would be managed in accordance with the Pantex Site Treatment Plan. The mixed LLW would be managed onsite at the HWTPF or shipped offsite to commercial facilities. The impact to the capacity of these onsite or commercial facilities would be small.

Non-hazardous waste from CPC operations includes sanitary solid waste and wastewater. Volumes of this waste generated by the operation of a CPC would be about 27 percent greater than the amount generated by Pantex in 2005. This sanitary solid waste would be disposed of at offsite facilities, such as the City of Amarillo Landfill. Some waste may be suitable for disposal onsite in the Construction Debris Landfill. Sanitary wastewater from a CPC would be treated in the onsite WWTF. DOE recently completed upgrades to this facility to provide flexibility to increase the treatment volume. There would be adequate capacity to manage the sanitary wastewater from CPC operations.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.5.14.3 *CCE Alternative*

Since the A/D/HE Center already exists at Pantex, the addition of a CNC at Pantex would create a CNPC. The impacts of this alternative are discussed above in Section 5.5.13.4, and there is no need to present them here.

5.5.14.3.1 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction of a CPC and CUC would be the same as for a CNPC, since Pantex already is operating an A/D/HE Center.

Construction: **CUC.** For Pantex, construction of a CNPC would entail only the construction of a CPC, already discussed in Section 5.5.14.2.1 and a CUC, discussed in this Section, since an A/D/HE Center already exists. Table 5.5.14-4 describes the wastes expected to be generated by the construction of a CPC and CUC at Pantex.

Table 5.5.14-4—Waste Generation from CUC Construction–Pantex

Waste Category	CPC	CUC	CNPC
TRU Solid Waste (yd^3)	0	0	0
Low Level Solid Waste (yd^3)	0	70	70
Mixed TRU Solid Waste (yd^3)	0	0	0
Hazardous waste (tons)	7.0	6	13
Non-Hazardous Solid Waste (tons)	10,900	1,000	11,900

Source: NNSA 2007.

Construction of a CUC would generate LLW, hazardous waste, and both solid and liquid sanitary waste. CUC construction would increase Pantex's annual routine hazardous waste generation by less than 3 percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat Pantex's hazardous waste. The onsite HWTPF may also be used to treat hazardous waste generated from CUC construction activities.

Hazardous waste generated through the construction of a CUC at Pantex would be a small percentage of the amount of hazardous waste generated by Pantex in 2005. This waste would be managed according to RCRA requirements and shipped off-site for treatment and disposal at a commercial facility. LLW volume from the construction of a CUC would be about 72 percent of the LLW generated by Pantex in 2005. The LLW would be packaged and transferred to NTS for disposal.

Solid nonhazardous waste from CUC construction activities would result in a 70 percent increase over the 2005 volume. The waste would be disposed of onsite in the Construction Debris Landfill or at offsite facilities, such as the City of Amarillo Landfill. These disposal facilities, or their replacements, are expected to have more than adequate capacity to handle the projected amount of waste. Sanitary wastewater generated during CUC construction would be treated in the onsite WWTF. DOE recently completed upgrades to this facility sufficient to satisfy the increased treatment requirements of a CUC. A retention pond would be constructed to manage stormwater runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acres per 40 acres of developed land. A concrete batch plant would operate at the CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities.

Operations: **CNPC.** Normal operation of a CNPC at Pantex would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.5.14-5 summarizes the estimated waste generation rates for the CNPC**.** It should be noted that the A/D/HE Center operational waste generation rates do not appear on this table since these wastes are presently being generated at Pantex and are therefore attributable to the no action alternative. Pantex current waste generation rates are described in Table 4.5.13.

Table 5.5.14-5—Annual Wastes Generated by the Operation of Facilities–Pantex

Waste Type	Projects Under Consideration		
	CPC	CUC	CNPC (CPC + CUC + existing A/D/HE)
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3)	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Normal operations at Pantex do not generate TRU waste. While there are procedures to manage TRU, there is presently no TRU waste management infrastructure at Pantex. CNPC operations would result in the generation of about 950 cubic yards of TRU waste, annually. TRU waste generated from plutonium pit manufacturing would include gloves, filters, and other operations/maintenance waste from gloveboxes. About 36 percent of the TRU waste would be mixed waste. The TRU and mixed TRU waste would be transferred from the CNPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 977 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

CNPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CNPC operations represent about 2-4 percent of the annual hazardous waste volumes presently managed by Pantex. Commercial treatment is readily available and currently used to treat most Pantex hazardous wastes.

LLW generation for a CNPC would substantially increase the current Pantex LLW generation volumes. The LLW would be packaged at a waste management portion of a new CNPC, in accordance with DOE, NRC, and DOT requirements, and transferred to NTS for disposal. Due to the large increase in routine LLW generation, additional storage capacity would be needed to manage the waste until it can be accumulated into shipment quantities and shipped offsite for disposal. LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility.

Pantex's current mixed LLW generation level is small. The majority of this mixed LLW is presently transferred offsite to commercial facilities for treatment and disposal. CNPC operations would drastically increase the annual routine mixed LLW generation at Pantex. The waste would

be managed in accordance with the Pantex Site Treatment Plan, and similar to the small quantities presently being generated, shipped offsite to commercial facilities. Since the CNPC would contain a RCRA-permitted mixed waste treatment facility, this would pose no issues to the normal Pantex operations. The impact from managing this increased mixed LLW waste stream would be small.

Non-hazardous waste from CNPC operations would include sanitary solid waste and paper, debris, and general office waste. Sanitary solid wastes would be disposed of at offsite facilities, such as the City of Amarillo Landfill. Some waste may be suitable for disposal onsite in the Construction Debris Landfill. Annual non-hazardous waste volumes would increase by a factor of 4–5 relative to current Pantex operations. This increase could accelerate the rate at which DOE consumed the available onsite capacity and require more off-site, commercial treatment and disposal.

Sanitary wastewater from the CNPC would be treated in the onsite WWTF. DOE recently completed upgrades to this facility to provide flexibility to increase the treatment volume. There would be adequate capacity to manage the sanitary wastewater from CNPC operations. CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process.

5.5.14.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Pantex would continue as required to support smaller stockpile requirements. With respect to waste management, reduced operations would reduce wastes generated as shown in Table 5.5.14-6.

Table 5.5.14-6—Annual Wastes Generated for the No Action Alternative and the Capability-Based Alternative–Pantex

Waste Category	No Action	Capability-Based Alternative	No Net Production/Capability-Based Alternative
Low-level Waste (yd^3)	96.8	73	64
Mixed Low-level Waste (yd^3)	1.8	1.4	1.2
Hazardous Waste (yd^3)	711	530	470
Nonhazardous Waste (yd^3)	6,375	4,800	4,200

Source: NNSA 2007, NNSA 2008.

Because Pantex has adequate facilities to manage the wastes under the No Action Alternative (what Pantex is doing today), neither alternative would present major impacts to waste management, as the Capability-Based Alternatives generates less waste than the No Action Alternative. Reductions in LLW generation would reduce the transportation of LLW to NTS. As discussed in Section 5.10, these impacts are small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts) under the No Action Alternative.

5.5.15 Impacts Associated with Closing and D&D of Pantex Facilities

If a CNPC were to be constructed at a site other than Pantex, Pantex would close. As a part of estimating the overall environmental impacts associated with such an action, this section discusses, in general terms, what would be necessary for the closure and remediation of the Pantex Plant, and what these activities might entail.

In May 1994, the Pantex Plant was listed on the National Priorities List (NPL) as a Superfund Site. This action required complete site characterization and the development of a remediation plan. The remediation plan was completed in July 2003. This plan, prepared by BWXT Pantex, with oversight by the EPA and the Texas Commission on Environmental Quality, entails a reduction of building usage to only what is actually being used (thereby reducing the usable footprint) and a comprehensive clean-up of the rest of the site. The plan has four major strategies: 1) accelerate soil clean-up, 2) accelerate clean-up of the perched aquifer, 3) continued monitoring of the Ogallala Aquifer, and 4) reduction of operating footprint and clean-up of entire site areas.

It is estimated that these actions would require a total expenditure of $131 million through 2114. The plan calls for the operations footprint reduction to occur by 2008. Pantex is presently finalizing remediation plans for the accelerated soil clean-up from previously identified Solid Waste Management Units. A pump and treat system will be utilized to remove contaminants from the perched aquifer, directed by a predictive groundwater modeling program to direct and prioritize activities. In addition to the above mentioned remediation, clean-up of the Ogallala Aquifer will be required, once final characterization has been completed. It has been estimated by the Innovative Treatment Remediation Demonstration (ITRD) Program that restoration of the Ogallala Aquifer would be a 30 year project costing an estimated $30 million. This would entail the drilling of up to 50 monitoring/injection/extraction/treatment wells.

All of the remediation actions detailed above have been committed to by DOE/NNSA and BWXT Pantex (the current operating contractor at the site), and would be done regardless of alternatives being considered by the Complex Transformation SPEIS. Accordingly, these remediation actions, for purposes of this analysis, are considered part of the No Action Alternative and not a part of the proposed actions. Although the Pantex Plant covers approximately 16,000 acres (about 25 square miles), the majority of Plant operations are conducted on about 2,500 acres. Pantex has about 640 buildings covering almost 3 million square feet of floor space, 55 miles of paved roads, 60 miles of fences, and 17,000 pieces of Plant equipment. There are nine miles of steam/condensate lines, 17 miles of natural gas lines, 30 miles of main line water piping, 33 miles of electrical distribution lines and five water production wells (see Section 4.5).

Once these remediation activities which NNSA/DOE has already committed to have been completed, the Pantex Plant will be left with approximately 400 buildings, comprising approximately 1,875,000 square feet, with which to conduct ongoing operations. It is this footprint which if decisions were to be made to close the Pantex Plant that would be attributable to that decision. Although many of these buildings, especially the administrative and office complexes could be of use to DOE and/or others, for purposes of this analysis, it is assumed that the entire site would be razed and the waste from this activity managed in accordance with all

applicable requirements. It is further assumed that the roads, electric supply system, water supply system, and natural gas supply system would remain intact as a potential asset for future use of the property. The closing and decontamination and decommissioning (D&D) of these facilities would be expected to entail the impacts detailed in Table 5.5.15-1. It should be noted that this analysis is not a rigorous engineering assessment intended to serve as the basis of decisionmaking or serve as a cost analysis. It was constructed only to give the reader some idea of the magnitude of the effort associated with the closure and D&D of this facility.

Table 5.5.15-1—Impacts from Closure and D&D–Pantex

Activity	Quantity		
Total floorspace ft^2			
Admin	10% x 1,875,000	187,500	
Industrial	90% x 1,875,000	1,687,500	
TOTAL			1,875,000
No of buildings			
Admin	10 % x 400	40	
Industrial	90 % x 400	360	
TOTAL			400
Non-Hazardous Solid Waste (yds^3)			
Admin buildings	4 yds^3 x 40	160	
Industrial buildings	2 yds^3 x 360	720	
TOTAL			880
Concrete/bock/brick (yds^3)			
Admin buildings	187,500 ft^2 x .064 yds^3/ ft^2	12,000	
Industrial buildings	1,687,500 ft^2 x .09 yds^3/ ft^2	151,875	
TOTAL			163,865
Steel and scrap iron (tons)			
Steam pipe	17.8lb/ft x 47,520 / 2,000	423	
Rebar		20	
Misc		20	
Scrap equip		120	
TOTAL			583
Soil excavation (yds^3)	360 bldg x 20% x 200 yds^3 / bldg		14,400
LLW generated (yds^3)			
Concrete	2% x 151,875	3,036	
Soil	1% x 14,400	144	
Equip		50	
TOTAL			3,230
TRU generated (yds^3)			0
Mixed LLW (yds^3)			20
Hazardous waste (yds^3)			
from rubble	2% x 151,875	3,036	
from soils	2% x 14,440	288	
unused storage		100	
TOTAL			3,424
Asbestos waste (yds^3)	400 bldg x 4 yds^3/bldg		1,600
Employment			
Admin buildings	5 persons/bldg x 40	200	
Industrial buildings	8 persons/bldg x 360	2,880	
TOTAL			3,080
Peak employment			4,000

Table 5.5.15-1—Impacts from Closure and D&D–Pantex (continued)

Activity	Quantity	
Total worker hours	2,000 x 4yrs x 3,080	24,640,000
Time required (yrs)		4
Asbestos waste (yds^3)	400 bldg x 4 yds^3/bldg	1,600
Water requirements (gal/yr)		
Workers	2gal x 200 days x 3,080 workers 1,232,000	
construction	1000 gal/hr x 11 hrs x 100 days 1,100,000	
TOTAL		2,332,000

Source: NNSA 2007.

Once the buildings were vacated, all reusable fixtures, doors copper pipe, copper wire, equipment, office furniture etc. would be removed inspected for radioactivity or the presence of hazardous wastes and sold. The buildings would then be cleaned of all remaining loose items. It is expected that this would result in the generation of 880 cubic yards of non hazardous solid waste. This waste would be disposed of, on-site, as Class 2 non-hazardous waste, as defined by Title 30 of the Texas Administrative Code. Once this has been completed, all buildings and structures would be demolished. This would involve hand cutting, detonations, and large earthmoving equipment.

As detailed in Table 5.5.15-1, above, an estimated 12,000 cubic yards of concrete/block/brick rubble would be generated from the administration buildings (not expected to be contaminated) and 151, 875 cubic yards generated from the razing of the industrial buildings and structures. All of this material would undergo analysis for the presence of radioactive material and hazardous waste contamination. Contaminated quantities would be removed and handled according to their classification. It is assumed that 2 percent of this waste originating from the industrial facilities would be contaminated with radioactive materials and be considered LLW. Another 2 percent of this waste originating from the industrial buildings would be assumed to be contaminated with hazardous waste and be handled accordingly. This would leave approximately 157,800 cubic yards of concrete, brick, block, rebar and rubble, which would likely be disposed of on-site as Class 2 non-hazardous waste, as defined by Title 30 of the Texas Administrative Code.

An estimated 14,400 cubic yards of soil would be removed from around and under the industrial buildings and structures. This soil would be tested for the presence of radioactive materials and for hazardous wastes. Soil found not to be contaminated with these materials would be mounded and stored, to be used as grade material and fill once the buildings were removed and the surrounding areas cleaned up. These mounds would be covered with vegetation or tarps to minimize erosion. The D&D of this soil would be expected to generate about 288 cubic yards of LLW. An additional 3,036 cubic yards of LLW would be expected to be generated from the concrete, brick, and block, along with 50 cubic yards of LLW from contaminated equipment. The 3,230 cubic feet of LLW, which amounts to about thirty-five times the annual LLW generation rate for Pantex would be packaged for transport, taken to NTS and disposed of at NTS. In addition it is expected that 20 cubic yards of mixed LLW would be generated. This waste would be packaged for transport and transported to NTS for treatment and disposal.

Approximately 3,424 cubic yards of hazardous waste would be expected to be generated from the demolition process. About 100 cubic yards of hazardous waste would come from unused

chemicals and "empty drums," bottles, etc. left in buildings. The hazardous waste would be packaged and transported to a commercial facility for treatment and disposal. From 2003–2005, Pantex generated an average of 3,282 cubic yards of hazardous waste. It is estimated that 1,600 cubic yards of asbestos waste would be generated. This waste would be removed from buildings (prior to demolition) packaged and shipped off-site, in accordance with TSCA requirements and then disposed of at a TSCA certified disposal facility.

5.6 SANDIA NATIONAL LABORATORIES/NEW MEXICO

There are no Programmatic Alternatives for SNL/NM. Relevant project-specific analyses for SNL/NM are discussed in Sections 5.12 through 5.17.

5.7 WHITE SANDS MISSILE RANGE

There are no Programmatic Alternatives for WSMR. Project-specific analysis for WSMR is discussed in Section 5.15.

5.8 SAVANNAH RIVER SITE

This section discusses the potential environmental impacts associated with the following programmatic alternatives at SRS:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. SRS would continue to perform its existing missions as described in Section 3.2.8. In addition, construction of the Mixed Oxide Fuel (MOX) Facility was started in August, 2007, and is expected to begin operation in 2016. Construction of the Pit Disassembly and Conversion Facility (PDCF) is scheduled to start in 2010, and begin operation in 2019.
- **DCE Alternative.** This alternative includes a CPC, which could be either a "Greenfield" facility or a facility that uses the mixed-oxide (MOX) fuel fabrication facility and the pit disassembly and conversion facility (PDCF) infrastructure. Operations would be the same for either the Greenfield facility or MOX/PDCF option.
- **CCE Alternative.** This alternative includes two options: (1) a Consolidated Nuclear Production Center (CNPC), which would consist of a CPC, a Consolidated Uranium Center (CUC), and an A/D/HE Center; and (2) Consolidated Nuclear Centers (CNC), which would be a CPC and a CUC, with the A/D/HE Center at Pantex. In general, the CCE facilities would produce additive construction impacts because construction activities would occur sequentially as follows: CUC, 2011-2016; CPC, 2017-2022; A/D/HE Center, 2020-2025.
- **Capability-Based Alternatives.** Under the Capability-Based Alternative and the No Net Production Capability-Based Alternative, tritium activities at SRS would be reduced to support stockpile requirements below the Moscow Treaty requirements.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.8.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.8.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.8.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
	Construction (acres)	**Operation (acres)**	
Greenfield Alternative	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	
CUC			
Construction (acres)	50		
Operation (acres)	Total Area: 35[b]		
	PIDAS	**Non-PIDAS**	
	15	20	
A/D/HE CENTER [d]			
Construction (acres)	300		
Operation (acres)	Total Area: 300[e]		
	PIDAS	**Non-PIDAS**	
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120	
CNC			
	Total Area: 195[f]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50	
CNPC			
	Total Area: 545[g]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100	

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.8.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at SRS beyond those of existing and future activities that are independent of this action. Planned construction includes the MOX/ PDCF facilities. Construction of the MOX facility began in August 2007, and construction of the PDCF is scheduled to begin in 2010. Together these two facilities will disturb 77 acres in the F-Area. Existing land resources is discussed in Section 4.8.1.

Table 5.8.1-2 identifies the major facilities at SRS for the No Action Alternative.

Table 5.8.1-2—Savannah River Site No Action Alternative Facilities

Administrative facilities **Area A** **Area B**	 Provides office space, training areas, and records storage. Houses Savannah River National Lab Provides office space, training areas, and records storage. Over the last ten years most admin. functions have been transferred to B Area, with A Area and M Area undergoing some closure activities
Heavy water reprocessing **D Area**	Now closed, had facilities for supporting heavy water coolant/moderator for the reactors, heavy water purification facilities, an analytical laboratory, and a power plant
Non-nuclear facilities **N Area** **T Area**	 Central Shops, containing construction and craft facilities and the primary facilities for storage of construction material Also known as TNX-Area, used to contain facilities that tested equipment and developed new designs
Nuclear/radiological facilities **M Area**	Fuel/Target Fabrication facilities housed the metallurgical/foundry operations for fabricating fuel and target elements for the SRS reactors. This area is undergoing closure activities
Reactors **C, K, L, P, and R Areas**	Housed the C, K, L, P, and R reactors. These reactors were used for nuclear production, are permanently shut down and are being evaluated for D & D. Fuel storage basins at the L reactor contain spent nuclear fuel. Portions of the K reactor have been converted to the K Area Material Storage Facility. Decontamination capability has been installed in the C Area.
Processing facilities **H Area** **F Area**	 Process, stabilize, separate, and recover nuclear materials. Includes the Tritium Extraction Facility, Tritium Loading, Unloading, and Surveillance Facility, Effluent Treatment Facility, High Level Tanks. Chemical Separation Facility (now closed). Houses high level tanks, Mixed Oxide Fuel Fabrication Facility (under construction), Pit Disassembly and Conversion Facility (proposed), Waste Solidification Facility (proposed)
Waste Management facilities **G Area** **E Area** **S Area** **Z Area**	 Storage and disposal of radioactive waste Storage and disposal of radioactive waste; LLW Disposal Facilities (2) TRU Waste Storage Facilities Defense Waste Processing Facility, Salt Waste Processing Facility(under construction) Saltstone Production Facility, Saltstone Disposal Facility, Salt Waste Processing Facility (under construction)

5.8.1.2 *DCE Alternative (CPC)*

5.8.1.2.1 Construction

As described in Section 3.4.1, a CPC would have multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a PIDAS with a 300-foot wide buffer area outside the PIDAS. The area outside the PIDAS and buffer area would consist of a number of smaller support facilities, a Waste Staging/TRU Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks.

The CPC reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent 0.07 percent of SRS's total land area of 198,400 acres. Use of the MOX/PDCF facilities would reduce the land disturbance by approximately 10 percent. The reference location has adequate space to accommodate the total CPC footprint. The post-construction developed area would be approximately 110 acres.

Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation (Site Industrial) for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.2.2 Operations

An estimated 110 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC. The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for CPC operations would represent 0.06 percent of SRS's total land area of 310 square miles.

Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current land use designation (Site Industrial) for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.3 *CCE Alternative*

5.8.1.3.1 CNC (CPC + CUC)

Land Use impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.1.2 as well as the impacts for the CUC discussed below.

***Construction:* CUC.** As described in Section 3.5.2, a CUC would consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, operations at a CUC would require approximately 35 acres. All buildings would be either one or two stories.

The CUC reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial. The land required for CUC construction would represent 0.02 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, a CUC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

***Operations:* CNC.** As described in Section 3.5.2, an estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres would be located within a PIDAS. The land required for CNC operations would represent approximately 0.1 percent of SRS's total land area of 310 square miles. Although there would be a change in land use, a CNC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.3.2 CNPC (CPC + CUC + A/D/HE Center)

Land use impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.1.2, the CUC impacts discussed in Section 5.8.1.3, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** As described in Section 3.5, an Assembly/Disassembly/High Explosives (A/D/HE) Center would consist of a nuclear facility within the PIDAS and high explosives facilities and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for an A/D/HE Center. Approximately 180 acres would be protected within a PIDAS.

The A/D/HE Center reference location at SRS is immediately south of Road C near Burma Road. The site is flat and located on a topographic divide so surface drainage is both west toward

Upper Three Runs and east toward Fourmile Branch streams. The reference location would be located on land categorized as Site Industrial. The land required for A/D/HE Center construction would represent approximately 0.1 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, an A/D/HE Center is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

Operations: **CNPC.** An estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 235 acres would be located within a PIDAS. The land required for CNPC operations would represent approximately 0.2 percent of SRS's total land area of 310 square miles. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current land use designation for this area. No impacts to SRS land use plans or policies are expected.

5.8.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at SRS. Reduced operations would not change land use at SRS.

5.8.2 Visual Resources

5.8.2.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. No additional impacts to visual resources would occur beyond current and planned activities that are independent of this action. Construction of the MOX/PDCF facilities will temporarily change the visual appearance of the F-Area. Since this is an already developed site and the two buildings will be of a similar type to those there now, there will not be a change in the visual classification. Existing visual resources is discussed in Section 4.8.2.

5.8.2.2 *DCE Alternative (CPC)*

5.8.2.2.1 Construction

Activities related to the construction of new buildings required for a CPC would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary (approximately 6.7 miles away). Site visitors and employees observing CPC construction would find these activities similar to the past

construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Cranes used during construction of a CPC could create short-term visual impacts, but would not be out of character for an industrial site such as SRS. The construction lay-down areas, temporary parking, and temporary construction office trailers would also be typical for an industrial site. After construction of the facilities are complete, cranes and temporary construction office trailers would be removed, and construction lay-down areas would be regraded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel.

5.8.2.2.2 Operations

A CPC, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. Views of the buildings, tanks, and exhaust stacks by visitors or employees using the SRS road network (Road C and Burma Road) would be limited by the forest vegetation and rolling terrain surrounding the location. Only the exhaust stacks would exceed the height of the forest vegetation. However, this change would be consistent with the currently developed areas of SRS.

5.8.2.3 *CCE Alternative*

5.8.2.3.1 CNC (CPC + CUC)

Visual resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.2.2 as well as the impacts discussed below.

Construction: **CUC.** Activities related to the construction of new buildings required for a CUC would be similar to a CPC described in Section 5.8.2.2.1. There would be a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary. Site visitors and employees observing CUC construction would find these activities similar to the past construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNC.** A CNC would encompass approximately 195 acres of buildings, walkways, parking, and buffer space. Structures would include one- and two-story industrial facilities, cooling towers, and water tanks that would change the appearance of the reference location. Views of the buildings, tanks, and exhaust stacks by visitors or employees using the SRS road network would be limited by the forest vegetation and rolling terrain surrounding the location. Any changes would be consistent with the currently developed areas of SRS.

5.8.2.3.2 CNPC (CPC + CUC + A/D/HE Center)

Visual resources impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.2.2, the CUC impacts discussed in Section 5.8.2.3.1, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** Activities related to the construction of new buildings required for an A/D/HE Center would be similar in nature to a CPC and CUC. Any changes would be temporary and, because of its interior location on the SRS site, would not be noticeable beyond the SRS boundary. Site visitors and employees observing A/D/HE Center construction would find these activities similar to the past construction activities of other developed areas on the SRS. Thus, impacts on visual resources during construction would be minimal.

Operations: **CNPC.** A CNPC would be a large complex of industrial facilities, parking lots, and a buffer zone encompassing approximately 545 acres. Because of the reference site's interior location on the SRS site, a CNPC would not be noticeable beyond the SRS boundary. Views of the complex by visitors or employees using the SRS road network would be limited by the forest vegetation and rolling terrain surrounding the location. Any changes would be consistent with the currently developed areas of SRS.

5.8.2.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at SRS.

5.8.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.8.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.8.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to the site electrical infrastructure beyond current and planned activities (MOX/PDCF facilities) that are independent of this action. SRS currently uses about 370,000 MWh per year of electricity. Additional site infrastructure information is discussed in Section 4.8.3.

5.8.3.2 *DCE Alternative (Greenfield CPC)*

5.8.3.2.1 Construction

The projected demand on the site electrical infrastructure resources associated with construction activities for a CPC are shown in Table 5.8.3-1.

Table 5.8.3-1—Electrical Infrastructure Requirements for Construction of CPC, CUC, and the A/D/HE Center–SRS

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity	4,400,000	330
Available site capacity	4,030,000	260
No Action Alternative		
Total site requirement	370,000	70
Percent of site capacity	8%	21%
CPC		
Total site requirement	13,000	3.0
Percent of site capacity	<1%	1%
Percent of available capacity	<1%	1.2%
CUC		
Total site requirement	11,000	2.5
Percent of site capacity	<1%	<1%
Percent of available capacity	<1%	1%
A/D/HE Center		
Total site requirement	55,000	12.7
Percent of site capacity	1.2%	3.8%
Percent of available capacity	1.4%	4.9%

Source: NNSA 2007.
[a] Not limited due to offsite procurement.
NA = not applicable.

The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for a CPC (Greenfield or use of MOX/PDCF) for the projected 6-year construction period.

5.8.3.2.2 Operations

The estimated annual site electrical infrastructure requirements for a CPC are presented in Table 5.8.3-2. There would be negligible impacts to site infrastructure.

Table 5.8.3-2—Electrical Infrastructure Requirements for Operations Of the CPC,CUC, A/D/HE Center, CNC, and the CNPC–SRS

Proposed Alternatives	Electrical	
	Energy	Peak Load
	(MWh/yr)	(MWe)
Site capacity	4,400,000	330
Available site capacity	4,030,000	260
No Action Alternative		
Total site requirement	370,000	70
Percent of site capacity	8%	21%
CPC		
Total site requirement	48,000	11
Percent of site capacity	1.1%	3.3%
Percent of available capacity	1%	4.2%
CUC		
Total site requirement	168,000	18.4
Percent of site capacity	3.8%	5.6%
Percent of available capacity	4.1%	7.1%
A/D/HE Center		
Total site requirement	52,000	11.9
Percent of site capacity	1.2%	3.6%
Percent of available capacity	1.3%	4.6%
CNPC (CPC + CUC + A/D/HE Center)		
Total site requirement	268,000	41.3
Percent of site capacity	6.1%	12.4%
Percent of available capacity	6.6%	15.9%

Source: NNSA 2007.

5.8.3.3 *CCE Alternative*

5.8.3.3.1 CNC (CPC + CUC)

Site electrical infrastructure impacts from the construction of a CUC and operation of a CNC would include the CPC impacts discussed in Section 5.8.3.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would require additional infrastructure demands during the construction phase. During construction, these facilities would require a peak electrical demand of approximately 2.5 MWe, which is approximately 1 percent of the current electrical usage at SRS and less than 1 percent of available capacity. The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for a CUC for the projected 6-year construction period. Infrastructure requirements for construction would have a negligible

impact on current site infrastructure resources. The estimated electrical infrastructure requirements for construction of a CUC are presented in Table 5.8.3-1.

Operations: **CNC.** During operations, a CNC would require approximately 15 percent of the current available electrical capacity at SRS. The core operations of a CNC would be similar to the CPC and CUC operations described in Sections 3.4.2 and 3.5.1.1. The estimated annual site electrical infrastructure requirements for operation of a CNC are presented in Table 5.8.3-2. There would be negligible impacts to site infrastructure.

5.8.3.3.2 CNPC (CPC + CUC + A/D/HE Center)

Site electrical infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.3.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** The existing electrical infrastructure at SRS would be adequate to support annual construction requirements for an A/D/HE Center for the projected 5-year construction period. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources. The estimated site electrical infrastructure requirements for construction of an A/D/HE Center are presented in Table 5.8.3-1.

Operations: **CNPC.** During operations, a CNPC would require less than 20 percent of the current available electrical capacity at SRS. The estimated annual site electrical infrastructure requirements for operation of a CNPC are presented in Table 5.8.3-2. There would be negligible impacts to the site electrical infrastructure.

5.8.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use at the tritium facilities would be reduced from 27,500 MWhr per year to 22,500 MWhr per year. Because there is currently adequate electrical capacity at the site, this reduction would not have any major impact on operations.

5.8.4 Air Quality and Noise

5.8.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. The SRS is located in the Augusta-Aiken Interstate AQCR. All areas within this region are classified as achieving attainment with the NAAQS (40 CFR 50).There would be no additional impacts to air quality and noise beyond temporary fugitive dust emissions, and traffic and construction noise resulting from construction of the MOX/PDCF facilities. Operation of these facilities is not expected to diminish the existing level of air quality, impact existing permits, or exceed any established air release limits. SRS is presently in compliance with all NAAQs. Existing air quality and noise resources is discussed in Section 4.8.4.

5.8.4.2 *DCE Alternative (CPC)*

5.8.4.2.1 Air Quality

Construction: **Nonradiological impacts.** Construction of new structures 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, $PM_{10,}$ total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on factors provided in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicle) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons/acres per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.8.4-1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the SRS site boundary (DOE 2003d). A site-specific EIS, if required, would address this issue, and any potential need for mitigation, in greater detail.

Table 5.8.4-1—Estimated Peak Nonradiological Air Emissions for the CPC–Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

Construction: **Radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **Nonradiological impacts.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual non-radioactive air emissions. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.8.4–2. These emissions would be incremental to the SRS baseline. If SRS is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary. The maximum concentrations ($\mu g/m^3$) at the SRS site boundary that would be associated with the release of criteria pollutants were modeled and are presented in Table 5.8.4-3.

Table 5.8.4-2—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

Table 5.8.4-3—Criteria Pollutant Concentrations at SRS Boundary for CPC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline [a] (µg/m^3)	Background Ambient Air Concentration	CPC—200 ppy Maximum Incremental Concentration (µg/m^3)
Carbon Monoxide	8-hour(1)	10	No Data	2.58
	1-hour(1)	40	No Data	3.66
Lead	Quarterly Average	1.5	0.001	No Data
Nitrogen Dioxide	Annual	100	7.9	1.28
Particulate Matter (PM_{10})	Annual(2)	50	17.6	0.0356
	24-hour(1)	150	36	0.18
Particulate Matter ($PM_{2.5}$)	Annual(3)	15	13.5	No Data
	24-hour(4)	65	32.1	No Data
Ozone	8-hour(5)	0.08 ppm	0.069 ppm	No Data
	1-hour(6)	0.12 ppm	0.082 ppm	No Data
Sulfur Oxides	Annual	80	4.5	0.06296
	24-hour(1)	365	18.3	0.454
	3-hour(1)	1300	34.0	0.992
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.05

Source: SCDHEC 2005; Janke 2007.
[1] Not to be exceeded more than once per year.
[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations must not exceed 0.08 ppm.
[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1; (b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Operations: **Radiological impacts.** Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.8.4-4). Releases would be small. Total radionuclide emissions at SRS would increase by less than 1 percent. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.8.4-4—Annual Radiological Air Emissions for the CPC at SRS–Operations

Isotope	Baseline [a] (Ci/yr)	Annual Emissions (Ci/yr)
Americium-241	2.67×10^{-4}	3.12×10^{-7}
Plutonium-239	2.20×10^{-3}	1.02×10^{-5}
Plutonium-240	8.51×10^{-7}	2.66×10^{-6}
Plutonium-241	6.70×10^{-6}	1.96×10^{-4}
Uranium-234	3.26×10^{-4}	5.02×10^{-9}
Uranium-235	1.10×10^{-5}	1.58×10^{-10}
Uranium-236	7.17×10^{-10}	2.56×10^{-11}
Uranium-238	4.12×10^{-4}	1.42×10^{-12}
Tritium	4.74×10^{4}	–
Krypton-85	6.47×10^{4}	–
All other	$\mathbf{3.06 \times 10^{-1}}$	–
Total	$\mathbf{1.12 \times 10^{5}}$	$\mathbf{2.09 \times 10^{-4}}$

Source: NNSA 2007.
[a] Based on calendar year 2001 data. The No Action Alternative is represented by the baseline.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-5, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-5—Annual Doses Due to Radiological Air Emissions from CPC Operations–SRS

Receptor	CPC-200 ppy
Offsite MEI[a] (mrem/yr)	2.1×10^{-6}
Population within 50 miles (person-rem per year) [a]	1.5×10^{-4}

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.8.4-4and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

5.8.4.2.2 Noise

Construction. Construction of new buildings would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 dBA, these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.8.4-6 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately

55–85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (approximately 6.7 miles) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments.

Table 5.8.4-6—Peak Noise Levels Expected from Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations. The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 6.7 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely produce increases in traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.8.4.3 *CCE Alternative*

5.8.4.3.1 CNC (CPC + CUC)

Air Quality and Noise impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.4.2 as well as the impacts discussed below for the CUC.

5.8.4.3.1.1 Air Quality

***Construction:* CUC nonradiological impacts.** Construction impacts would be similar to the construction impacts for a CPC (discussed above), as both facilities are similarly sized (approximately 650,000 square feet of floorspace) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.8.4-1 would be representative of a CUC. Actual construction emissions of a CUC are expected to be less, since conservative emission factors and other assumptions were used to model CPC construction activities and tend to overestimate impacts.

***Construction:* CUC radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Table 5.8.4-7—Criteria Pollutant Concentrations at SRS for CUC and CNC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline ($\mu g/m^3$)	Background Ambient Air Concentration ($\mu g/m^3$)	CUC Maximum Incremental Concentration ($\mu g/m^3$)	CNC Maximum Incremental Concentration ($\mu g/m^3$)
Carbon Monoxide	8-hour(1)	10	No Data	0.2	2.78
	1-hour(1)	40	No Data	No Data	3.66
Lead	Quarterly Average	1.5	0.001	No Data	No Data
Nitrogen Dioxide	Annual	100	7.9	0.9	2.18
Particulate Matter (PM_{10})	Annual(2)	50	17.6	52.4	52.4
	24-hour(1)	150	36	17.5	17.7

Table 5.8.4-7—Criteria Pollutant Concentrations at SRS for CUC and CNC–Operations (continued)

Pollutant	Averaging Times	Most Stringent Standard or Guideline (µg/m^3)	Background Ambient Air Concentration (µg/m^3)	CUC Maximum Incremental Concentration (µg/m^3)	CNC Maximum Incremental Concentration (µg/m^3)
Particulate Matter ($PM_{2.5}$)	Annual[3]	15	13.5	0.02	0.02
	24-hour[4]	65	32.1	0.2	0.2
Ozone	8-hour[5]	0.08 ppm	0.069 ppm	No Data	No Data
	1-hour[6]	0.12 ppm	0.082 ppm	No Data	No Data
Sulfur Oxides	Annual	80	4.5	2.1	2.16
	24-hour[1]	365	18.3	52.4	52.8
	3-hour[1]	1300	34.0	17.5	18.5
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.05[7]	0.1

Source: SCDHEC 2005; Janke 2007.
[1] Not to be exceeded more than once per year.
[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1, as determined by appendix H.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.
[7] No data exists for TSP for the CUC. TSP concentrations estimated based on CPC data.

Operations: **CUC and CNC nonradiological impacts.** CUC activities would result in the release of criteria and toxic pollutants into the surrounding air. Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, and sulfur dioxide. The estimated emission rates for non-radiological pollutants were derived from existing Y-12 operations. The nonradiological pollutants were modeled to determine the incremental concentrations from a CUC to the SRS baseline. The results are presented in Table 5.8.4-7. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. CUC contribution to non-radiological emissions should not cause any standard or guideline to be exceeded. As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Operations: **CUC and CNC radiological impacts.** A CUC would release radiological contaminants, primarily uranium, into the atmosphere during operations. The current design of a CUC nuclear facility calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from existing EU facilities at Y-12, and are likely to be less due to the incorporation of

newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS, the radiological airborne emissions from a CUC are conservatively estimated from existing operations at Y-12. An estimated 0.10 Curies (2.17 kg) of uranium was released into the atmosphere in 2004 as a result of Y-12 activities (DOE 2005a). After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding SRS, and SRS workers. The CAP88 code is a Gaussian plume dispersion model used to demonstrate compliance with the radionuclide NESHAP (40 CFR Part 61). Specific parameters, including meteorological data, source characteristics, and population data, were used to estimate the radiological doses.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-8, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of a CUC resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-8—Annual Doses[a] Due to Radiological Air Emissions from CUC and CNC Operations–SRS

Receptor	CUC	CNC
Offsite MEI[a] (mrem/yr)	8.2×10^{-4}	8.2×10^{-4}
Population within 50 miles (person-rem per year)	0.06	0.06

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CUC and CNC operations were calculated using the uranium emission rates from the Y-12 ASER and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary

5.8.4.3.1.2 Noise

***Construction:* CUC.** Anticipated noise impacts from the construction of a CUC are similar to those described for a CPC in Section 5.8.4.2.

***Operations:* CUC and CNC.** Anticipated noise impacts from the operation of a CNC are similar to those described for a CPC in Section 5.8.4.2.

5.8.4.3.2 CNPC (CPC + CUC + A/D/HE Center)

Air quality and noise impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.4.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

5.8.4.3.2.1 Air Quality

***Construction:* A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for a CPC and CUC. However, due to the potential to disturb approximately 300 acres of land during

construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons/acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.8.4-8a. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.8.4-8a—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	0.15
24-hour	150	41.2

Source: Janke 2007.

The results presented above represent a conservative estimate if PM_{10} emissions at the site boundary. As shown, concentrations would remain well below any regulatory limits.

***Construction:* A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

***Operations:* A/D/HE Center and CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. CPC and CUC non-radiological emissions are discussed in sections 5.8.4.2.1 and 5.8.4.3.1 respectively, and are not repeated here. The total nonradiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities indicated in Table 5.8.4-9. These emissions would be incremental to the SRS baseline.

Table 5.8.4-9—Annual Nonradiological Air Emissions, A/D/HE Center–Operations

NAAQS emissions (tons/year)	
Oxides of Nitrogen	91
Carbon Monoxide	31
Volatile Organic Compounds	31
Particulate Matter	18
Sulfur Dioxide	5
Hazardous Air Pollutants and Effluents	22

Source: NNSA 2007.

The maximum concentrations (µg/m^3) at the SRS site boundary that would be associated with the release of criteria pollutants presented in Table 5.8.4-10. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. There would be a potential to exceed the annual standards for PM-10 and PM-2.5. However, because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative. A site-specific EIS, if required, would address this issue, and the potential need for mitigation, in greater detail.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on CAA Conformity requirements (DOE 2000a). DOE determined that the General Conformity rule does not apply because SRS is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.8.4-10—Criteria Pollutant Concentrations at the SRS Site Boundary for the CNPC–Operations

Pollutant	Averaging Times	Most Stringent Standard or Guideline (µg/m^3)	Background Ambient Air Concentration (µg/m^3)	A/D/HE Center Maximum Incremental Concentration (µg/m^3)	CNPC Maximum Incremental Concentration (µg/m^3)
Carbon Monoxide	8-hour(1)	10	No Data	1.91	4.69
	1-hour(1)	40	No Data	5.8	9.46
Lead	Quarterly Average	1.5	0.001		
Nitrogen Dioxide	Annual	100	7.9	0.01	2.19
Particulate Matter (PM_{10})	Annual(2)	50	17.6	0.0019	52.4
	24-hour(1)	150	36	0.5	18.2
Particulate Matter ($PM_{2.5}$)	Annual(3)	15	13.5	0.0019	52.4
	24-hour(4)	65	32.1	0.5	18.2
Ozone	8-hour(5)	0.08 ppm	0.069 ppm	No Data	No Data
	1-hour(6)	0.12 ppm	0.082 ppm	No Data	No Data

Table 5.8.4-10—Criteria Pollutant Concentrations at the SRS Site Boundary for the CNPC–Operations (continued)

Pollutant	Averaging Times	Most Stringent Standard or Guideline (μg/m^3)	Background Ambient Air Concentration (μg/m^3)	A/D/HE Center Maximum Incremental Concentration (μg/m^3)	CNPC Maximum Incremental Concentration (μg/m^3)
Sulfur Oxides	Annual	80	4.5	0.005	2.16
	24-hour(1)	365	18.3	0.14	52.94
	3-hour(1)	1300	34.0	0.62	19.1
Total Suspended Particulates	Annual Geometric Mean	75	38.2	0.0024	0.1

Source: SCDHEC 2005; Janke 2007.
[1] Not to be exceeded more than once per year.
[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
[6] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1, as determined by appendix H.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone non-attainment Early Action Compact (EAC) Areas.

***Operations:* A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. CPC and CUC radiological emissions are discussed in sections 5.8.4.2.1 and 5.8.4.3.1 respectively, and are not repeated here. The total radiological air impacts of a CNPC would be additive of a CPC, CUC, and an A/D/HE Center (which is discussed in this section).

During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.8.4-11.

Table 5.8.4-11—Annual Radiological Air Emissions for A/D/HE Center–Operations

Radionuclide	Emissions (Ci)
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the MEI, the populations surrounding SRS, and SRS workers. NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding SRS. As shown in Table 5.8.4-12, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the

public and on a hypothetical non-involved worker in the vicinity of an A/D/HE Center resulting from radiological air emissions are presented in Section 5.8.11.

Table 5.8.4-12—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations–SRS

Receptor	A/D/HE	CNPC
Offsite MEI[a] (mrem/yr)	6.2×10^{-7}	8.2×10^{-4}
Population within 50 miles (person-rem per year)	4.5×10^{-5}	0.06

Source: Tetra Tech 2008.
[a] The offsite MEI is assumed to reside at the site boundary.

5.8.4.3.2.2 Noise

***Construction:* A/D/HE Center.** Anticipated noise impacts from the construction of an A/D/HE Center would be similar to those described for a CPC in Section 5.8.4.2.

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of an A/D/HE Center and CNPC would be similar to those described for a CPC in Section 5.8.4.2.

5.8.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to air quality, SRS is located within the Augusta-Aiken Interstate AQCR. All areas within this region are classified as achieving attainment with the NAAQS (40 CFR 50). Reduced tritium operations would have no significant impact on nonradiological air quality at SRS. With respect to radiological emissions, normal operations tritium air emissions could decrease to approximately 2,500 Curies. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. Tritium oxide releases accounted for 66 percent of the dose to the MEI. Reducing tritium emissions would not significantly change this already small dose.

5.8.5 Water Resources

Environmental impacts associated with the proposed alternatives at SRS could affect groundwater resources. No impacts to surface water are expected. At SRS, groundwater resources would likely be used to meet all construction and operations water requirements. Table 5.8.5–1 summarizes existing surface water and groundwater resources at SRS, the total SRS site-wide water resource requirements for each alternative, and the potential changes to water resources at SRS resulting from the proposed alternatives are summarized in Table 5.8.5-2.

Table 5.8.5-1—Potential Changes to Water Resources from the CPC, CNC, and CNPC – SRS, Construction

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground
Water Use (gallons per year)	3,500,000,000
CPC	
Water Requirement (total gallons)	20,900,000
Percent change from No Action Alternative	<1%
CUC	
Water Requirement (total gallons)	5,200,000
Percent change from No Action Alternative	<1%
A/D/HE Center	
Water Requirement (total gallons)	2,022,000
Percent change from No Action Alternative	<1%

Source: NNSA 2007.

5.8.5.1 *No Action Alternative*

The regional drainage is dominated by the north to south running Savannah River. The Savannah River is classified as a freshwater source that is suitable for primary and secondary contact recreation, drinking after appropriate treatment, balanced native aquatic species development, and industrial and agricultural purposes. Data from the river's monitoring locations generally indicate that South Carolina's freshwater standards are being met (NRC 2005). SRS is expected to continue using approximately 3.5 billion gallons of water per year.

The SRS is underlain by southeast-dipping wedges of unconsolidated sediments of the Atlantic Coastal Plain that extends from its contact with the Piedmont Province at the Fall Line to the edge of the continental shelf. Contaminant fate and transport models predict that the aquifer is expected to return to an uncontaminated state within 2 to 115 years, depending on the specific contaminant (NRC 2005).

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Existing water resources are discussed in Section 4.8.5.

5.8.5.2 *DCE Alternative (CPC)*

5.8.5.2.1 Surface Water

Construction. Surface water would not be used to support the construction of a CPC at SRS as groundwater is the source of water at SRS. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, no onsite discharge of sanitary wastewater would be minimized.

During construction, an estimated 10.5 million gallons of liquid wastes would be generated. It is expected that construction should take approximately 6 years. Assuming an equal generation of liquid waste over that timeframe, it is estimated that 1.75 million gallons per year of liquid waste would be generated. It is estimated that one-third of the liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to SRS's NPDES permit for stormwater involving construction activities.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. SRS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The CPC reference location at SRS is not within the 100-year floodplain. Therefore, no impact on the floodplain is anticipated. Information concerning the 500-year floodplain in the area of the reference location is not available.

Operations. No impacts on surface water resources are expected as a result of operations at SRS. No surface water would be used to support facility activities. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. SRS's current NPDES permit would require modification and approval concerning any increase in wastewater discharges. Sanitary wastewater would be treated, monitored, and discharged into site streams and the Savannah River, as required under SRS's NPDES permit. No industrial or other NPDES-regulated discharges to surface waters are anticipated.

The CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, analyzed, and only discharged if uncontaminated. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CPC liquid process waste facilities for the plutonium purification process.

Table 5.8.5-2—Changes to Water Resources from CPC, CNC, and CNPC–Operations

Proposed Alternatives	Water Availability and Use
No Action Alternative	
Water source	Ground
Water Use (gal/yr)	3,500,000,000
CPC	
Water Requirement (gal/yr)	80,500,000
Percent change from No Action Alternative	2.3%
CUC	
Water Requirement (gal/yr)	105,000,000
Percent change from No Action Alternative	3%
CNC (CPC + CUC)	
Water Requirement (gal/yr)	185,500,000
Percent change from No Action Alternative	5.3%
A/D/HE Center	
Water Requirement (gal/yr)	130,000,000
Percent change from No Action Alternative	3.7%
CNPC (CPC + CUC + A/D/HE Center)	
Water Requirement (gal/yr)	315,500,000
Percent change from No Action Alternative	9%

Source: NNSA 2007.

5.8.5.2.2 Groundwater

Construction. Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require 20,900,000 gallons, of groundwater. The percent change from the No Action Alternative would be less than 1 percent. The total site water requirement including these quantities would be feasible since SRS has absolute ownership of the groundwater resource underlying SRS land and has no limit on the amount of water withdrawn annually.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations. Activities at SRS for a CPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup.

Approximately 80.5 million gallons per year is needed for the operation of a CPC. This would represent a 2.3 percent increase in water use at SRS. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually. However, SRS withdrawal routinely exceeds 100,120 gallons per day of water, and therefore the withdrawal rate is reported to the South Carolina Water Resource Commission.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.8.5.3 *CCE Alternative*

5.8.5.3.1 CNC (CPC + CUC)

Water resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.5.2 as well as the impacts discussed below.

Surface water: **CUC construction.** Surface water would not be used to support the construction of a CUC at SRS as groundwater is the source of water at SRS. Therefore, there would be no impact to surface water availability from construction. The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. SRS would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The CUC reference location at SRS is not within the 100-year floodplain. Therefore, no impact on the floodplain is anticipated. Information concerning the 500-year floodplain in the area of the reference location is not available.

Surface water: **CNC operations.** No impacts on surface water resources are expected as a result of operations at SRS. No surface water would be used to support facility activities. Sanitary wastewater would be generated as a result of operations stemming from staff use of lavatory, shower, and breakroom facilities, and from miscellaneous potable and sanitary uses. SRS's current NPDES permit would require modification and approval concerning any increase in wastewater discharges. Sanitary wastewater would be treated, monitored, and discharged into site streams and the Savannah River, as required under SRS's NPDES permit. No industrial or other NPDES-regulated discharges to surface waters are anticipated. Minimal impacts to groundwater quality are expected from the operation of a CNC because groundwater extracted would be collected and treated in on-site treatment facilities to meet the discharge limits of the NPDES permit prior to release to surface water. Utility and sanitary wastewater would be treated prior to discharge in accordance with the applicable permits.

A CNC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNC liquid process waste facilities for the plutonium purification process.

***Groundwater:* CUC construction.** Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by construction personnel would greatly reduce water use over that normally required during construction. In addition, the water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require 5.2 million gallons of groundwater. The percent change from the No Action Alternative is less than 1 percent. The total site water requirement including these quantities would be feasible since SRS has absolute ownership of the groundwater resource underlying SRS land and has no limit on the amount of water withdrawn annually.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls, and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

***Groundwater:* CNC operations.** Activities at SRS for a CNC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. The percent change from the No Action Alternative would be 5.3 percent. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control.

5.8.5.3.2 CNPC (CPC + CUC + A/D/HE Center)

Water resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.5.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Surface water:* A/D/HE Center construction.** Surface water impacts from the construction of an A/D/HE Center would be similar to those discussed for the construction of a CPC and CUC.

Surface water: **CNPC operations.** Surface water impacts from the operation of an A/D/HE Center would be similar to those discussed for a CPC and CUC.

Groundwater: **A/D/HE Center construction.** It is estimated that construction activities would require approximately 2 million gallons of groundwater. Additional impacts from the construction of an A/D/HE Center would be similar to those discussed for the construction of a CPC and CUC.

Groundwater: **CNPC operations.** Activities at SRS for a CNPC would use groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. The percent change in water consumption from the No Action Alternative would be approximately 9 percent. SRS has absolute ownership of the groundwater resource underlying SRS land and has no restrictions on the amount of groundwater withdrawn annually.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control.

5.8.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in water use would be inconsequential, as SRS has plentiful water supplies. Reduced operations could reduce tritium effluents. Tritium accounts for more than 99 percent of the total amount of radioactivity released from the site to the Savannah River. In 2005, a total of 4,480 Ci of tritium were released to the river. This total—based on the measured tritium concentration at River Mile 118.8—includes releases from Georgia Power Company's Vogtle Electric Generating Plant (1,860 Ci). The 12-month average tritium concentration measured in Savannah River water near River Mile 118.8 (5.46×10^{-4} pCi per liter) was 17 percent less than the 2004 concentration of 6.61×10^{-4} pCi per liter. These concentrations are well below the EPA maximum tritium contaminant level of 20,000 pCi per liter for drinking water.

5.8.6 Geology and Soils

5.8.6.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to geology and soil resources beyond current and planned construction of the MOX/PDCF facilities which are expected to have minor impacts on Coastal Plain Sediments, which would be mitigated by soil erosion and surface water runoff protective measures. Existing geology and soils resources are discussed in Section 4.8.6.

5.8.6.2 *DCE Alternative (CPC)*

5.8.6.2.1 Construction

The construction of a CPC is expected to disturb land adjacent to existing facilities at SRS. An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the CPC. The land required for the proposed CPC construction would represent 0.07 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total CPC footprint, whether a Greenfield facility or use of the MOX/PDCF infrastructure. The post-construction developed area would be approximately 110 acres.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes as it is not presently farmed. The FPPA (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) since the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to CPC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of a CPC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

5.8.6.2.2 Operations

The operation of a CPC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1B, which requires that nuclear and non-nuclear facilities be

designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.8.6.3 *CCE Alternative*

5.8.6.3.1 CNC (CPC + CUC)

Geologic and soil resource impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.6.2 as well as the impacts discussed below.

Construction: **CUC.** A CUC would primarily be made up of a new structure to contain a nuclear facility composed of the Uranium Processing Facility (UPF) and HEU storage (described in Sections 3.4.2 and 3.5.1.1) within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. The land required for CUC construction would represent 0.03 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes as it is not presently farmed. The Farmland Protection Policy Act (FPPA) (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) since the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to CUC construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of a CUC would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities.

Operations: **CNC.** An estimated 195 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNC. Of this, approximately 55 acres

would be located within a PIDAS. The land required for CNC operations would represent 0.09 percent of SRS's total land area of 310 square miles, an extremely small proportion.

The operation of a CNC would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.8.6.3.2 CNPC (CPC + CUC + A/D/HE Center)

Geologic and soil resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.6.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** Construction of an A/D/HE Center would require an estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace. The land required for A/D/HE Center construction would represent 0.03 percent of SRS's total land area of 310 square miles. The reference location has adequate space to accommodate the total facilities footprint.

While the soils that would be disturbed are classified as prime farmland, the disturbed area would not be converted from farming to other purposes because it is not presently farmed. The FPPA (7 USC 4201 et seq.) and associated regulations require agencies to make evaluations of the conversion of farmland to non-agricultural uses by Federal projects and programs. SRS is exempt from FPPA under section 1540(c)(4) because the acquisition of SRS property occurred prior to FPPA's effective date of June 22, 1982 (7 USC 4201 et seq.).

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at SRS, but these resources are abundant in the South Carolina area. In addition to A/D/HE Center construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. Because the land area to be disturbed is relatively small, the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with appropriate requirements and agreements. Construction of the A/D/HE Center would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Chapter 4, there are no faults located within SRS. While the risk for an earthquake exists in association with faults offsite, ground shaking could occur that would affect primarily the integrity of inadequately designed or non-reinforced structures, but not damaging property or specially designed facilities. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in

accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines. Thus, site geologic conditions would not likely affect the facilities.

***Operations:* CNPC.** An estimated 545 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 235 acres would be located within a PIDAS. The operation of a CNPC would not be expected to result in impacts on geologic and soil resources.

5.8.7.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact**.**

5.8.7 Biological Resources

5.8.7.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Small animals, reptiles and birds may be temporarily dislocated during the construction process, but no permanent changes to biological resources are expected as a result of construction and operation of the MOX/PDCF facilities. Existing biological resources are discussed in Section 4.8.7.

5.8.7.2 *DCE Alternative (CPC)*

5.8.7.2.1 Terrestrial Resources

Construction. The area identified for construction of a CPC is located on a heavily wooded tract that is topographically flat and in an area that supports a wide diversity of birds, mammals, reptiles, amphibians, and aquatic species.

Approximately 140 acres of forest and associated wildlife habitat would be cleared or modified during CPC construction. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include stress and over-wintering mortality. For less mobile species (reptiles, amphibians, and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations. Approximately 110 acres of land would be modified or lost from operation of a CPC. In addition to the areas to be disturbed, there would be a decrease in quality of the habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential for any adverse affects to plant and animal communities (terrestrial resources) in the surrounding environment.

5.8.7.2.2 Wetlands

Construction. Of the known 370 isolated upland Carolina bays and wetland depressions at SRS, none are located on the CPC site (SRS 2007). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

Operations. There are no adverse impacts predicted to wetlands from implementation of any of a CPC production capacities. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CPC operations are not expected to adversely affect any wetlands.

5.8.7.2.3 Aquatic Resources

This site is located on a topographic divide, so surface drainage is both west toward Upper Three Runs and east toward Fourmile Branch. Upper Three Runs is considered to be a valuable aquatic resource, not only to SRS, but also to regional ecosystem biodiversity (Wike, et al. 2006).

Construction. There are no perennial or seasonal aquatic habitats within the CPC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations. There would be no direct discharge of untreated operational effluent from CPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

5.8.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at SRS, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of any new facilities on any threatened and endangered species. There are no known threatened or endangered species or species proposed for listing present at the proposed CPC, CUC, and A/D/HE Center site (Wike, et al. 2006).

Construction. Approximately 140 acres of forest and associated wildlife habitat would be cleared or modified during CPC construction. Should SRS be selected for the construction and operation of a CPC, then DOE, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special interest species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations. Approximately 110 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, CPC operations would minimize the potential impacts to any special-interest species population.

5.8.7.3 *CCE Alternative*

5.8.7.3.1 CNC (CPC + CUC)

Biological resource impacts from the construction and operation of the CNC would include the CPC impacts discussed in Section 5.8.7.2 as well as the impacts discussed below.

***Terrestrial resources:* CUC construction.** The area identified for construction of a CUC is located on a heavily wooded tract that is topographically flat (Wike, et al. 2006) and in an area that supports a wide diversity of birds, mammals, reptiles, amphibians, and aquatic species. Approximately 50 acres of land would be modified during CUC construction. Impacts would be similar to those described for the construction of a CPC in Section 5.8.7.2.1.

***Terrestrial resources:* CNC operations.** An estimated 195 acres of land would be modified or lost. Of this, approximately 55 acres would be located within a PIDAS. Impacts would be similar to those described for a CPC in Section 5.8.7.2.1.

***Wetlands:* CUC construction.** Of the known 300 isolated upland Carolina bays and wetland depressions at SRS, none are located on the CUC site (Wike, et al. 2006). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

***Wetlands:* CNC operations.** There are no adverse impacts predicted to wetlands from operation of a CNC. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations are not expected to adversely affect any wetlands.

***Aquatic resources:* CUC construction.** There are no perennial or seasonal aquatic habitats within the proposed CUC location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

***Aquatic resources:* CNC operations.** There would be no direct discharge of untreated operational effluent from CNC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

***Threatened and endangered species:* CUC construction.** Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. There are no known threatened or endangered species or species proposed for listing present at the proposed CUC site (Wike, et al. 2006).

***Threatened and endangered species:* CNC operations.** Acreage permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest would be approximately 195 acres. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNC operations would minimize the potential impacts to any special-interest species population.

5.8.7.3.2 CNPC (CPC + CUC + A/D/HE Center)

Biological resources impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.8.7.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Terrestrial resources:* A/D/HE Center construction.** An estimated 300 acres of land would be required to construct the A/D/HE Center. Additional impacts would be similar to those described for a CPC in Section 5.8.7.2.1.

***Terrestrial resources:* CNPC operations.** An estimated 545 acres of land would be required to support CNPC operations. Potential impacts would be similar to those described in Section 5.8.7.2.1.

***Wetlands:* A/D/HE Center construction.** Of the known 300 isolated upland Carolina bays and wetland depressions at SRS, none are located on the A/D/HE Center site (Wike, et al. 2006). Therefore, there would be no direct impacts to wetlands. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid any indirect degradation to wetlands in the area. Should SRS be selected, the potential for indirect wetland impacts exists, and the site-specific tiered EIS would analyze those potential impacts.

***Wetlands:* CNPC operations.** There are no adverse impacts predicted to wetlands from implementation of any of the CNPC production capacities. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations are not expected to adversely affect any wetlands.

***Aquatic resources:* A/D/HE Center construction.** There are no perennial or seasonal aquatic habitats within the proposed A/D/HE Center location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downslope and within the SRS watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

***Aquatic resources:* CNPC operations.** There would be no direct discharge of untreated operational effluent from CNPC operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas are not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other SRS built environments and the quantity would represent a very minor contribution to the watershed.

***Threatened and endangered species:* A/D/HE Center construction.** An estimated 300 acres of land would be modified or lost during construction activities for an A/D/HE Center. Additional impacts would be similar to those described for the construction of a CPC in Section 5.8.7.2.1.

***Threatened and endangered species:* CNPC operations.** Acreage permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest would be approximately 545 acres. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, CNPC operations would minimize the potential impacts to any special-interest species population.

5.8.6.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact**.**

5.8.8 Cultural Resources

5.8.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to cultural and archeological resources beyond current and planned activities that are independent of this action. Construction of the MOX/PDCF facilities is not expected to impact any of the 800 recorded archeological sites at SRS. Prior to any soil disturbance, a thorough screening of all recorded sites and an on-site investigation for the presence of archeological sites or artifacts would be conducted. Existing cultural and paleontological resources are discussed in Section 4.8.8.

5.8.8.2 *DCE Alternative (CPC)*

5.8.8.2.1 Cultural Resources

Construction: **CPC.** Under this alternative, a block of land would be disturbed during construction. The size of the disturbed area would vary by the output of the facility, and would include SRS buildings and structures (inside the PIDAS fence), security fencing and perimeter roads, support buildings and parking, a retention basin, a concrete batch plant, a construction laydown area, and buffer zone surrounding the facility. For purposes of analyzing impacts to cultural resources, approximately 140 acres of land could be disturbed/affected.

The presence of cultural resources that would be impacted during construction of a CPC at the reference location or any other location at SRS is unknown. However, the reference location at SRS is located in Archaeological Zone 2 (moderate archaeological potential) and very close to Zone 1 (high archaeological potential). This location has not been previously disturbed by construction. Thus, there is a moderate probability that cultural resources are located within the reference location and would be impacted by the construction of a CPC. The probability that resources would be disturbed by construction of a CPC at another location within SRS is dependent on what archaeological zone the facility would be located in and whether that location has been previously disturbed. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CPC at SRS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here, but will be in the site-specific tiered EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by construction of a CPC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the South Carolina SHPO and in accordance with the *Archaeological Resources Management Plan of the Savannah River Archaeological Research Program* (SRARP 1989). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the South Carolina SHPO.

***Operations:* CPC.** Operation of the CPC would have no impact on cultural resources.

5.8.8.2.2 Paleontological Resources

***Construction:* CPC.** Paleontological resources at SRS are comprised exclusively of marine invertebrate fossils. These types of fossils are relatively widespread and common, and have a relatively low research potential or scientific value, except for deposits containing giant oysters. Thus, it is probable that paleontological resources would be impacted due to construction of a CPC or the associated infrastructure at the reference location. This is also true for any other area at SRS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be treated appropriately, as determined by DOE.

***Operations:* CPC.** Operation of a CPC would have no impact on paleontological resources.

5.8.8.3 *CCE Alternative*

5.8.8.3.1 CNC (CPC + CUC)

Cultural and archaeological resources impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.8.2 as well as the impacts discussed below.

***Cultural resources:* CUC construction.** As described in Section 3.5.2, a CUC would be comprised of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Construction of these facilities would require approximately 50 acres of land, which includes a construction laydown area and temporary parking. Upon construction completion, the

construction laydown area and temporary parking area would be removed and the area could be returned to its original state. Once constructed, a CUC would be approximately 35 acres. All buildings would be either one or two stories.

The presence of cultural resources that would be impacted during construction of a CUC at the reference location or any other location at SRS is unknown. However, the reference location at SRS is located in Archaeological Zone 2 (moderate archaeological potential) and very close to Zone 1 (high archaeological potential). This location has not been previously disturbed by construction. Thus, there is a moderate probability that cultural resources are located within the reference location and would be impacted by the construction of a CUC. The probability that resources would be disturbed by construction of a CUC at another location within SRS is dependent on what archaeological zone the facility would be located in and whether that location has been previously disturbed. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of a CUC at SRS is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here, but will be in the site-specific tiered EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, NNSA would identify and evaluate any cultural resources that could potentially be impacted by construction of a CUC. Methods for identification could include field survey, shovel tests, archival research, and consultation with interested Native American tribes. NNSA would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the South Carolina SHPO and in accordance with the *Archaeological Resources Management Plan of the Savannah River Archaeological Research Program* (SRARP 1989). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the South Carolina SHPO.

Cultural resources: **CNC operations.** Operation of a CNC would have no impact on cultural resources.

Paleontological resources: **CUC construction.** It is probable that paleontological resources would be impacted due to construction of a CUC or the associated infrastructure at the reference location. This is also true for any other area at SRS. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be treated appropriately, as determined by DOE.

Paleontological resources: **CNC operations.** Operation of a CNC would have no impact on paleontological resources.

5.8.8.3.2 CNPC (CPC + CUC + A/D/HE Center)

Cultural and archaeological resource impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.8.8.2, the CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

Cultural resources: **A/D/HE Center construction.** Approximately 300 acres of land would be disturbed during construction activities of an A/D/HE Center. Additional impacts to cultural resources would be similar to those described for the construction of a CPC in Section 5.8.8.2.1

Cultural resources: **CNPC operations.** Operation of a CNPC would have no impact on cultural resources.

Paleontological resources: **A/D/HE Center construction.** Approximately 300 acres of land would be disturbed during construction activities of an A/D/HE Center. Additional impacts to paleontological resources would be similar to those described for the construction of the CPC in Section 5.8.8.2.2

Paleontological resources: **CNPC operations.** Operation of a CNPC would have no impact on paleontological resources.

5.8.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to cultural resources, reduced operations would have no impact**.**

5.8.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, CCE Alternative, and Capability-Based Alternatives.

5.8.9.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. The current employment level at SRS is about 15,000 employees. The construction of the MOX/PDCF facilities would ad about 1,968 construction jobs to this level and the operation of these two facilities would require 1,120 additional employees. Existing socioeconomic characteristics at SRS are discussed in Section 4.8.9.

5.8.9.2 *DCE Alternative (CPC)*

5.8.9.2.1 Regional Economic Characteristics

Construction. Construction of a CPC would require approximately 2,900 worker-years of labor. During peak construction, about 850 workers would be employed at the site for a Greenfield CPC, and 770 workers for the MOX/PDCF option. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. For a Greenfield CPC, it is estimated that 611 indirect jobs would be created, for a total of 1,461 jobs. This represents less than 1 percent of the total ROI labor force.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $27.5 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $44.5 million ($27.5 million direct and $17 million indirect). Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of the CPC.

Table 5.8.9-1—Socioeconomic Impacts from Construction of Greenfield CPC

Socioeconomic Resource	CPC
Worker Years	2,900
Peak Workers	850
Indirect Jobs Created	611
Total Jobs Created	1,461
ROI Average Earning	$32,300
Direct Income Increase	$27,455,000
Indirect Income Increase	$17,025,000
Total Impact to the ROI	$44,480,000

Source: NNSA 2007, BEA 2007a.

Operations. Operation of a CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 1,573 indirect jobs would be created, for a total of 3,353 jobs. The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $40,600 for the government services industry, direct income would increase by $72.3 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $108.2 million ($72.3 million direct and $35.9 million indirect). Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

5.8.9.2.2 Population and Housing

Construction. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 new workers), 1,275 new

residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operations. The influx of new workers would increase the ROI population and could create new housing demand. This analysis assumes that one-third of the operational jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 new workers), 1,780 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of the CPC.

5.8.9.2.3 Community Services

Construction. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-1 presents the impacts to socioeconomic resources from construction of a CPC.

Operation. The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing Table 5.8.9-2 illustrates the impacts to socioeconomic resources from operation of a CPC.

Table 5.8.9-2—Socioeconomic Impacts from Operations, All Facilities/Alternatives

Socioeconomic Resource	CPC	CUC	CNC	AD/HE	CNPC
Peak Workers	1,780	935	2,715	1,785	4,500
Indirect Jobs Created	1,573	826	2,091	1,577	3,466
Total Jobs Created	3,353	1,761	4,806	3,362	7,966
ROI Average Earning	$40,600	$40,600	$40,600	$40,600	$40,600
Direct Income Increase	$72,268,000	$37,961,000	$110,229,000	$72,471,000	$182,700,000
Indirect Income Increase	$35,910,000	$18,863,000	$54,773,000	$36,011,000	$90,784,000
Total Impact to the ROI	$108,178,000	$56,824,000	$165,002,000	$108,482,000	$273,484,000

Source: NNSA 2007, BEA 2007a.

5.8.9.3 *CCE Alternative*

5.8.9.3.1 CNC (CPC + CUC)

Socioeconomic impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.9.2 as well as the impacts discussed below.

***Regional economic characteristics:* CUC construction.** As shown in Table 5.8.9-3, construction of a CUC would require approximately 4,000 worker-years of labor. During peak construction, 1,300 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 934 indirect jobs would be created, for a total of 2,234 jobs. This

represents less than 1 percent of the total ROI labor force. Income within the ROI would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $42 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $68 million ($42 million direct and $26 million indirect). Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of the CUC.

Table 5.8.9-3—Socioeconomic Impacts from Construction of the CUC

Socioeconomic Resource	CUC
Worker Years	4,000
Peak Workers	1,300
Indirect Jobs Created	934
Total Jobs Created	2,234
ROI Average Earning	$32,300
Direct Income Increase	$41,990,000
Indirect Income Increase	$26,038,000
Total Impact to the ROI	$68,028,000

Source: NNSA 2007, BEA 2007a.

Regional economic characteristics: **CNC operations.** Operation of a CUC would require 935 workers. In addition to the direct jobs created by operations, additional jobs would be created in other supporting industries. It is estimated that 826 indirect jobs would be created, for a total of 1,761 jobs.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $40,600 for the government services industry, direct income would increase by approximately $38 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $56.8 million ($38 million direct and $18.8 million indirect). Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

Population and housing: **CUC construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (1,300 new workers), 1,950 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

Population and housing: **CNC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (935 new workers), 935 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be

sufficient to absorb this increase in the population. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

***Community services:* CUC construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-3 presents the impacts to socioeconomic resources from construction of a CUC.

***Community services:* CNC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNC as well as from individual operation of a CPC and CUC.

5.8.9.3.2 CNPC (CPC + CUC + A/D/HE Center)

Socioeconomic impacts from the construction and operation of a full CNPC would include the CPC and CUC impacts discussed above, and the A/D/HE Center impacts discussed below.

***Regional economic characteristics:* A/D/HE Center construction.** Construction of an A/D/HE Center would require 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that 2,745 indirect jobs would be created, for a total of 6,565 jobs. This represents less than 4 percent of the total ROI labor force. Based on the ROI average earnings of $32,300 for the construction industry, direct income would increase by $123.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $199.9 million ($123.4 million direct and $76.5 million indirect). Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of an A/D/HE Center.

Table 5.8.9-4—Socioeconomic Impacts from Construction of the A/D/HE Center

Socioeconomic Resource	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	2,745
Total Jobs Created	6,565
ROI Average Earning	$32,300
Direct Income Increase	$123,386,000
Indirect Income Increase	$76,512,000
Total Impact to the ROI	$199,898,000

Source: NNSA 2007, BEA 2007a.

***Regional economic characteristics:* CNPC operations.** Operation of a CNPC would require 4,500 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 3,466 indirect jobs would be created, for a total of 7,966 jobs. Based on the ROI average earnings of $40,600 for the

government services industry, direct income would increase by $182.7 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be $273.5 million ($182.7 million direct and $90.8 million indirect). Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

***Population and housing:* A/D/HE Center construction.** The influx of new workers would increase the ROI population and could create new housing demand. For the peak year of construction (3,820 new workers), 5,730 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1.5 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of an A/D/HE Center.

***Population and housing:* CNPC operations.** The influx of new workers would increase the ROI population and could create new housing demand. For operations (4,500 new workers), 4,500 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the population. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

***Community services:* A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-4 presents the impacts to socioeconomic resources from construction of the AD/HE Center.

***Community services:* CNPC operations.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.8.9-2 presents the impacts to socioeconomic resources from operation of a CNPC as well as from the individual operation of an A/D/HE Center.

5.8.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced tritium operations would reduce the workforce by 25 workers. This reduction would be inconsequential relative to the total site workforce of approximately 15,000.

5.8.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian

and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.8.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly; as such, the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 39.3percent of the ROI populations surrounding SRS. In 2000, minorities comprised 30.9 percent of the population nationally, 37.4 percent of the population in Georgia, and 33.9 percent of the population in South Carolina. The percentage of persons below the poverty level in the ROI at the time of the 2000 Census was 16.4 percent, which is higher than the 2000 national average of 12.4 percent and the statewide figures of 13 percent and 14.1 percent for South Carolina and Georgia, respectively.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at SRS are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.8.11, there are no large adverse impacts to any populations.

5.8.11 Health and Safety

5.8.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. In 2005, the estimated dose from atmospheric releases to MEI, at SRS, was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem/year. Operation of the MOX/PDCF facilities are expected to add less than 1.8 person-rem to the 50-mile population surrounding SRS. Existing health and safety at SRS is discussed in Section 4.8.11.

5.8.11.2 *DCE Alternative (CPC)*

5.8.11.2.1 Construction

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.8.11-1.

Table 5.8.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, CUC, and A/D/HE Center–SRS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	Greenfield CPC/MOX	CUC	A/D/HE Center
Peak Annual Employment	850/770	1,300	3,820
Total Recordable Cases	81/73	112	329
Total Lost Workday Cases	38/35	54	159
Total Fatalities	0.2/0.2	0.3	0.8
Project Duration (6 years)			
Total Recordable Cases	276/251	384	1,128
Total Lost Workday Cases	143/121	184	541
Total Fatalities	0.7/0.6	0.9	2.6

Source: NNSA 2007, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with a CPC. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of ISMS programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

5.8.11.2.2 Operations

The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem/yr.

DOE expects minimal public health impacts from the radiological consequences of CPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4).

Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-15} per year (i.e., a risk of 1 in more than a billion). The projected number of fatal cancers to the population within 50 miles would be less than or equal to 4×10^{-10} per year (i.e., a risk of 1 in more than a billion).

Table 5.8.11-2—Annual Radiological Impacts on the Public from CPC, CNC, and CNPC Operations–SRS

Receptor	Projects Under Consideration		
	CPC	CNC	CNPC
Population within 50 miles			
Collective dose (person-rem)	1.5×10^{-4}	0.06	0.06
Percent of natural background radiation[a]	5×10^{-8}	2×10^{-5}	2×10^{-5}
LCFs[b]	9×10^{-7}	4×10^{-5}	4×10^{-5}
Offsite MEI			
Dose (mrem)	2.0×10^{-6}	8.2×10^{-4}	8.2×10^{-4}
Percent of regulatory dose limit	2.0×10^{-5}	8.2×10^{-3}	8.2×10^{-3}
Percent of natural background radiation[a]	6.7×10^{-7}	2.7×10^{-4}	2.7×10^{-4}
Cancer fatality risk[b]	1×10^{-12}	5×10^{-10}	5×10^{-10}

Source: Tetra Tech 2008.
[a] The average annual dose from background radiation at SRS is approximately 300 mrem; the 985,980 people living within 50 miles of SRS in the year 2030 would receive an annual dose of 295,800 person-rem .
[b] Based on a cancer risk estimate of 0.0006 LCFs per rem or person-rem.
[c] The offsite MEI is assumed to reside at the site boundary, approximately 6.7 miles away. An actual residence may not currently be present at this location.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.

- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard "weapons grade" isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct "hands-in-gloves" labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem/yr) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835) and the DOE-recommended control level of 1,000 mrem (10 CFR 835). Operations in a CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to a CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.8.11-3—Annual Radiological Impacts on CPC, CNC, and CNPC Workers at SRS–Operations

	CPC	CNC	CNPC
Number of Radiological Workers	1,150	1,640	2,040
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	210	189
Average worker cancer fatality risk[c]	2×10^{-4}	1.4×10^{-4}	1.3×10^{-4}
Worker Population			
Collective dose (person-rem)	333	344	386
Cancer fatality risk[c]	0.20	0.21	0.23

Source: Tetra Tech 2008.

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835. Further, DOE recommends that facilities adopt a more limiting 800-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.

[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.

[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.

During normal (accident-free) operations, total facility staffing at the CPC would be 1,780. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown below in Table 5.8.11-4.

Table 5.8.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, CNC, and CNPC–SRS

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	CNC	CNPC
Total Workers	1,780	2,715	4,500
Total Recordable Cases	77	117	195
Total Lost Workday Cases	40	61	101
Total Fatalities	0.07	0.11	0.18

Source: NNSA 2007, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of a CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.8.11.3 *CCE Alternative*

5.8.11.3.1 CNC (CPC + CUC)

Health and safety impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.11.2 as well as the impacts discussed below.

Construction: **CUC.** No radiological risks would be incurred by members of the public from CUC construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CUC reference site is a “Greenfield” site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CUC would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.8.11-1.

Operations: **CNC.** DOE expects minimal public health impacts from the radiological consequences of CNC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4). Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-9} per year (i.e., a risk of 1 in approximately 500 million). The projected number of fatal cancers to the population within 50 miles would be approximately 3×10^{-4} (i.e., a risk of 1 in 3,333).

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, 1,640 radiological workers would be required to conduct CNC operations. Operations in a CNC would result in an average individual worker dose of 210 mrem annually. The total annual dose to workers associated with CNC operations would be 344 person-rem. Statistically, an annual dose of 344 person-rem would result in 0.21 LCFs to a CNC workforce.

During normal (accident-free) operations, total facility staffing would be 2,715. The potential risk of occupational injuries and fatalities to workers operating a CNC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.8.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.8.11.3.2 CNPC (CPC + CUC + A/D/HE Center)

Health and safety impacts from the construction and operation of a CNPC would include the CNC impacts discussed above, as well as the A/D/HE Center impacts discussed below.

Construction: **A/D/HE Center.** No radiological risks would be incurred by members of the public from A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from

exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.8.11-1.

Operations: **CNPC.** DOE expects minimal public health impacts from the radiological consequences of CNPC operations. Public radiation doses would likely occur from airborne releases only (Section 5.8.4). Table 5.8.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both the EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be approximately 2×10^{-9} per year (i.e., a risk of 1 LCF approximately every 500 million years). The projected number of fatal cancers to the population within 50 miles would be approximately 3×10^{-4} (i.e., a risk of 1 LCF every 3,333 years).

The estimates of annual radiological doses to workers are provided in Table 5.8.11-3. As shown in the table, 2,040 radiological workers would be required to conduct CNPC operations. Operations in a CNPC would result in an average individual worker dose of 189 mrem annually. The total annual dose to workers associated with CNPC operations would be 386 person-rem. Statistically, an annual dose of 386 person-rem would result in 0.23 LCFs to the CNPC workforce.

During normal (accident-free) operations, total facility staffing would be 4,500. The potential risk of occupational injuries and fatalities to workers operating a CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.8.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of a CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design

features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.8.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced tritium operations would reduce the total tritium worker dose from 4.1 person-rem to 3.1 person-rem. Statistically, the number of LCFs would be reduced from 2.5×10^{-3} to 1.9×10^{-3}, which would be an inconsequential change. Impacts to the surrounding population would also be inconsequential.

5.8.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of a CPC, CUC, and A/D/HE Center at SRS. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their

location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each DOE site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. DOE estimated radiological impacts to three receptors: (1) the MEI at the SRS boundary; (2) the offsite population within 50 miles of SRS; and (3) a non-involved worker 3,281 feet from the accident location. DOE did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.8.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in existing NEPA documents.

In order to provide a baseline for accidents related to the No Action Alternative at SRS, including operations involving waste management, tritium operations, and plutonium disposition, NNSA reviewed relevant NEPA documents, including the SRS Tank Closure EIS (DOE 2002a), the Tritium Extraction Facility EIS (DOE 1999i), and the Surplus Plutonium Disposition EIS (DOE 1996b). For the SRS Tank Closure EIS, the bounding accident analyzed would cause an MEI dose of less than 1 rem. The maximum population dose was 11,000 rem, which would equate to approximately 6.6 LCFs. For the Tritium Extraction Facility EIS, the bounding accident analyzed would cause less than 1 LCF to the surrounding population. For the Surplus Plutonium Disposition EIS, the bounding accident analyzed would cause an MEI dose of approximately 8.8 rem. The maximum population dose was 21,000 rem, which would equate to approximately 12.6 LCFs.

5.8.12.2 *Consolidated Plutonium Center*

5.8.12.2.1 Radiological Accidents

Table 5.8.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. Table 5.8.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-1—CPC Radiological Accident Frequency and Consequences–SRS

Accident	Frequency	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	3.39	0.00203	17,500	10.5	1,580	1
Fire in a single building	1.0×10^{-4}	1.57	0.000942	7,890	4.73	1,070	1
Explosion in a feed casting furnace	1.0×10^{-2}	1.83	0.0011	9,250	5.55	1,260	1
Nuclear Criticality	1.0×10^{-2}	3.42×10^{-6}	2.05×10^{-9}	0.00728	4.37×10^{-6}	0.00146	8.76×10^{-7}
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	0.122	7.32×10^{-5}	617	0.37	83.7	0.1
Radioactive material spill	1×10^{-2}	0.00367	2.20×10^{-6}	18.5	0.0111	2.51	0.00151

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

Table 5.8.12-2—Annual Cancer Risks for CPC–SRS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Non-involved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	2.03×10^{-8}	1.05×10^{-4}	1×10^{-5}
Fire in a Single Building	9.42×10^{-8}	4.73×10^{-4}	1×10^{-4}
Explosion in a Feed Casting Furnace	1.1×10^{-5}	5.55×10^{-2}	1×10^{-2}
Nuclear Criticality	2.05×10^{-11}	4.37×10^{-8}	8.76×10^{-9}
Fire-induced Release in the CRT Storage Room	7.32×10^{-7}	0.37×10^{-7}	1×10^{-3}
Radioactive Material Spill	2.20×10^{-8}	1.11×10^{-4}	1.51×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Table 5.8.12-1) is the beyond evaluation basis earthquake and fire. Approximately 10.5 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of approximately 3 rem. Statistically, the MEI would have a 0.002 chance of developing a LCF, or about 1 in 500. This accident has a probability of occurring once every 100,000 years.

When probabilities are taken into account (see Table 5.8.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be 1×0^{-5}, or approximately 1 in 100,000. For the population, the LCF risk would be approximately 6×10^{-2}, meaning that an LCF would statistically occur once every 18 years in the population.

5.8.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.8.12–3 provides information on each chemical and

the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 3,281 feet from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting in calculated down-wind concentrations. Both Gaussian Plume and ALOHA methodologies were used to evaluate the potential consequences associated with a release of each chemical in an accident situation. Table 5.8.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.8.12-3—CPC Alternative Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary [a] (ppm)	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}
Hydrofluoric acid	550	20	0.12	0.21	<0.01	10^{-4}
Formic acid	1,500	10	0.1	0.02	0	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

5.8.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.3 *Consolidated Uranium Center*

5.8.12.3.1 Radiological Accidents

The accident scenarios, material at risk, and source term for a CUC are shown below:

Operation	Accident	Source Term	Notes/Assumptions
EU Metal Fabrication	Major fire	EU = 17.9 kg (sum of metal and chips) DU = 452 kg (sum of metal and chips)	Release height = ground level Release duration = 1 hour
Assembly	Explosion	2 kg EU 0.04 kg DU (sum of metal and chips)	Release height = 7.6 m Release duration =1 hour
EU Warehouse	Fire	EU = 22.6 kg DU = 20.1 kg U-233 = 0.0066 kg Th = 0.13 kg (the above all represent the sum of metals, oxides, and combustibles) Pu = 1.0×10^{-6} kg Np-237 = 1.6×10^{-5} kg	Release height = 4 m Release duration = 1 hour
HEUMF	Design-basis fires	EU = 2.58 kg DU = 0.55 kg	Release height = 11.3 m Release duration = 1 hour
EU Operations	Aircraft crash	37.8 kg EU (includes metals, chips, oxides, and aqueous and organic solutions)	Release height = "roof level" Release duration = 15 min

Source: Tetra Tech 2008.

Table 5.8.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the CUC) and a hypothetical non-involved worker, as well as the accident risks (Table 5.8.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table were selected from a wide spectrum of accidents described in the *Topical Report — Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CUC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-4 —CUC Radiological Accident Frequency and Consequences at SRS

Accident	Frequency (per year)	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
		Dose (rem)	Latent Cancer Fatalities	Dose (Person-rem)	Latent Cancer Fatalities	Dose (rem)	Latent Cancer Fatalities
Major fire	$10^{-4} – 10^{-6}$	0.00535	3.21×10^{-6}	27	0.0162	3.66	0.0022
Explosion	$10^{-4} – 10^{-6}$	0.000528	3.17×10^{-7}	2.67	0.0016	0.313	0.000188
Fire in EU Warehouse	$10^{-4} – 10^{-6}$	0.00625	3.75×10^{-6}	31.5	0.0189	4.11	0.00247
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.000682	4.09×10^{-7}	3.45	0.00207	0.344	0.000206
Aircraft crash	$10^{-4} – 10^{-6}$	0.011	6.60×10^{-6}	47.3	0.0284	1.28	0.000768

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

Table 5.8.12-5—Annual Cancer Risks for CUC–SRS

Accident	Maximally Exposed Offsite Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	3.21×10^{-10}	1.62×10^{-6}	2.2×10^{-7}
Explosion	3.17×10^{-11}	1.6×10^{-7}	1.88×10^{-8}
Fire in EU Warehouse	3.75×10^{-10}	1.89×10^{-6}	2.47×10^{-6}
Design-basis fires for HEU Storage	4.09×10^{-9}	2.07×10^{-5}	2.06×10^{-6}
Aircraft crash	6.60×10^{-10}	2.84×10^{-6}	7.68×10^{-8}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

The accident with the highest potential consequences to the offsite population (see Table 5.8.12-4) is the aircraft crash into the EU facilities. Approximately 0.03 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a maximum dose of 0.01 rem. Statistically, this MEI would have a 7×10^{-6} chance of developing a LCF, or about 1 in 150,000. This accident has a probability of occurring approximately once every 100,000 years.

When probabilities are taken into account (see Table 5.8.12-5), 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 4×10^{-9}, or approximately 1 in 250 million. For the population, the LCF risk would be 2×10^{-5}, or approximately 1 in 50,000.

5.8.12.3.2 Hazardous Chemicals Impacts

The CUC would store and use a variety of hazardous chemicals. The quantities of chemicals would vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents

within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. DOE estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.8.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.8.12-6—CUC Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.17	0.189	<0.01	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

5.8.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.4 *Assembly/Disassembly/High Explosives Center*

5.8.12.4.1 Radiological Accidents

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^{5}
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^{5}
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^{7}
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^{5}

Source: Tetra Tech 2008.

Tables 5.8.12-7 and 5.8.12-8 show the consequences and risks of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of an A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table was selected from a wide spectrum of accidents described in the *Topical Report—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.8.12-7—A/D/HE Center Radiological Accident Consequences–SRS

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities[b]**	**Dose (Person-rem)**	**Latent Cancer Fatalities[c]**	**Dose (rem)**	**Latent Cancer Fatalities[c]**
Scenario 1	0.495	0.000297	2,490	1.49	339	0.407
Scenario 2	0.000354	2.12×10^{-7}	1.79	0.00107	0.243	0.000146
Scenario 3	2.96×10^{-8}	1.78×10^{-11}	0.000149	8.94×10^{-8}	2.03×10^{-5}	1.22×10^{-8}
Scenario 4	0.065	0.000039	368	0.221	12.1	0.00726
Scenario 5	0.068	4.08×10^{-5}	385	0.231	12.6	0.00756
Scenario 6	0.000504	3.02×10^{-7}	2.85	0.00171	0.0936	5.62×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

Table 5.8.12-8—Annual Cancer Risks for A/D/HE Center Accidents–SRS

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	2.97×10^{-8}	1.49×10^{-4}	4.07×10^{-5}
Scenario 2	2.12×10^{-9}	1.07×10^{-5}	1.46×10^{-6}
Scenario 3	1.78×10^{-13}	8.94×10^{-10}	1.22×10^{-10}
Scenario 4	3.9×10^{-11}	2.21×10^{-7}	7.26×10^{-9}
Scenario 5	4.08×10^{-9}	2.31×10^{-5}	7.56×10^{-7}
Scenario 6	3.02×10^{-9}	1.71×10^{-5}	5.62×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 6.7 miles from release.
[b] Based on a projected future population (year 2030) of 985,980 persons residing within 50 miles of SRS location.
[c] At a distance of 1,000 meters.

The results of the accident analysis indicate that potential consequences would not exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The accident with the highest potential consequences to the offsite population (see Table 5.8.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 1.49 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 0.5 rem. Statistically, this MEI would have a 0.0003 chance of developing a LCF, or about 1 in 3,300. The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.8.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be 3×10^{-8}, or approximately 1 in 33 million. For the population, the LCF risk would be 1×10^{-4}, or approximately 1 in 6,500.

5.8.12.4.2 Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemicals used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.8.12–9 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.8.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–SRS

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	1.8	15	<0.2	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of 6.7 miles.

5.8.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the worker decreases because the exposure cannot be adequately established with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.8.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accident probabilities are largely a function of the operation being conducted, rather than the number of

times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.8.13 Transportation

5.8.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at SRS, and impacts would remain unchanged from the baseline presented in Section 4.8.12.

5.8.13.2 *DCE Alternative (CPC)*

5.8.13.2.1 Construction

Construction of a CPC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

5.8.13.2.2 Operations

Radiological transportation for a CPC would include transport of pits from Pantex to SRS, recycle of enriched uranium parts to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. Section 5.10 presents the impacts of transportation for the CPC at SRS. The addition of new employees for a CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.3 *CCE Alternative*

5.8.13.3.1 CUC Construction

Construction of the CUC would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

5.8.13.3.2 CNC Operations

Radiological transportation for a CNC would include the impacts associated with a CPC plus the impacts described in Section 5.10 for a CUC. The addition of new employees for a CUC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.3.3 CNPC (CPC + CUC + A/D/HE Center)

Construction: **A/D/HE Center.** Construction of an A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.8.12 and would be temporary.

Operations: **CNPC.** If an A/D/HE Center was located at SRS as part of a CNPC, the annual radiological transportation impacts associated with the CPC (Section 5.8.13.2) and the impacts associated with the CUC (Section 5.8.13.3.1) would not occur, with the exception of TRU waste transportation described for the CPC. There would be a one-time transport of SNM from Y-12 and Pantex to the CNPC, as described in Section 5.10. The addition of new employees for a CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.8.12.

5.8.13.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in total ROI workers by 25 would have an inconsequential impact on local transportation. A reduction in tritium operations would reduce both the transportation of tritium producing burnable absorber rods from the Watts Bar nuclear reactor in Tennessee to SRS, as well as the transportation of filled tritium reservoirs from SRS to Pantex. As explained in Section 5.10, the annual transportation impacts for tritium components, for both incident-free transportation and potential accidents, would be small (less than 1 death related to non-radiological impacts and less than 1 LCF for radiological impacts).

5.8.14 Waste Management

5.8.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at SRS would continue as required to support the missions described in Section 3.2.8. There would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. SRS currently manages high-level waste, LLW, mixed LLW, TRU waste, hazardous waste and sanitary waste. SRS has a RCRA licensed hazardous and mixed waste storage facility.

Table 5.8.14-1 presents annual waste generation volumes from SRS operations. For convenience, this table is shown again below, to facilitate comparisons of the additional alternatives presented.

Table 5.8.14-1—Annual Routine Waste Generation from SRS Operations (m^3)

Waste type	1996	1997	1998	1999	2000	2001
Transuranic (yd^3)	165	119	61.9	42.4	54	64.1
Low-level (yd^3)	5,780	6,620	6,520	4,970	5,220	4,610
Mixed (yd^3)	452	286	463	402	290	380
Hazardous[a] (yd^3)	57.0	55.0	177	26.5	30.8	45.3
Sanitary[b] (yd^3)	2,780	2,770	2,640	1,760	1,550	1,560

Source: DOE 2002o.
[a] Hazardous waste reported in metric tons.
[b] From DOE 2002o (1996 data) and DOE's Central Internet Database. Sanitary waste reported in metric tons.

5.8.14.2 *DCE Alternative (CPC)*

5.8.14.2.1 CPC Construction Impacts

Construction of a CPC would generate liquid hazardous waste and both liquid and solid non-hazardous waste. Table 5.8.14-2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for a CPC.

Table 5.8.14-2—Total Waste Generation from CPC Construction–SRS

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Nonhazardous Solid (yd^3)	10,900
Nonhazardous Liquid (gal)	56,000

Source: NNSA 2007.

Although CPC construction activities would increase annual non-hazardous waste generation levels substantially, the infrastructure and available disposal capacity exists at SRS to adequately manage this waste stream on an ongoing basis. The waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE could also pursue a permit for an additional onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

CPC construction activities would increase the annual routine hazardous waste generation by approximately 50 percent of 2004 generation rates for SRS operations. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat most SRS hazardous wastes.

Sanitary wastewater generated during CPC construction would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction is completed.

5.8.14.2.2 CPC Operation Impacts

Normal operation of the CPC would generate LLW, hazardous waste, and sanitary waste. Table 5.8.14-3 summarizes the estimated waste generation rates for the operation of a CPC.

Table 5.8.14–3—Annual Waste Generation from Operations of the CPC–SRS

Waste Category	CPC
TRU Solid Waste (yd^3)	950
Mixed TRU Solid Waste (yd^3)	340
Low Level Solid Waste (yd^3)	3,900
Mixed Low Level Solid Waste (yd^3)	2.5
Mixed Low Level Liquid Waste (yd^3)	0.4
Hazardous waste, solid (tons)	4
Hazardous waste, liquid (tons)	0.6
Non-Hazardous Solid Waste (yd^3)	8,100
Non-Hazardous Liquid Waste (gal)	75,000

Source: NNSA 2007.

In 2002, SRS had a TRU waste inventory of 43,167 cubic yards of legacy TRU waste (WSRC 2002a). Since 2002 the TRU waste inventory at SRS has been dramatically reduced by shipments to WIPP. Currently, the inventory is about 5,200 cubic yards (Grainger 2008). The projected TRU waste volumes for a CPC represents an increase by a factor of about 2 percent in the annual routine TRU waste generation at SRS. TRU waste generated from plutonium pit manufacturing includes gloves, filters, and other operations/maintenance waste from the CPC gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The TRU waste would be transferred from the CPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 978 yd^3 of TRU waste). A drum loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

LLW from CPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CPC operations would be solidified prior to leaving the facility. LLW generation for the CPC would almost double the annual LLW generation volumes presently being generated at SRS. The LLW would be transferred to E-Area for disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 yd^3 and the projected volumes for disposal are about 456,566 yd^3

(DOE 2000g). The remaining capacity would be adequate to dispose of all the projected LLW from CPC operations and still allow for the disposal of LLW generated by other operations at SRS.

CPC operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volumes from CPC operations represent less than twenty-five percent of the annual routine volumes currently managed at SRS. Commercial treatment and disposal is readily available and currently used to treat most SRS hazardous wastes.

Operation of a CPC would increase annual routine mixed LLW generation at SRS by about seventeen percent relative to current site operations. Depending on the characteristics of the mixed LLW, it would be transferred to onsite treatment facilities or shipped to commercial or DOE treatment and disposal facilities.

Nonhazardous waste from CPC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CPC operations would increase annual sanitary waste generation, the combination of disposal facilities is expected to provide adequate disposal capacity.

Sanitary wastewater generated during CPC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process (NNSA 2007).

5.8.14.3 *CCE Alternative*

5.8.14.3.1 CNC (CPC + CUC)

Waste Management impacts from the construction and operation of a CNC would include the CPC impacts discussed in Section 5.8.14.2 as well as the impacts of a CUC, as discussed below.

Construction: **CUC.** Construction of a CUC would entail construction of a CPC, already discussed in Section 5.8.14.2.1, above, and construction of a CUC, discussed in this section.

Construction of a CUC would entail the generation of LLW, hazardous waste, and both solid and liquid sanitary waste. Table 5.8.14-4 summarizes the total volume of waste generated over the 6 years of construction activity for a CUC.

Table 5.8.14-4—CUC Construction Wastes at SRS

Waste Category	Quantity
Low-level Solid (yd^3)	70
Mixed Low-level Solid (yd^3)	0
Hazardous (tons)	6
Nonhazardous (Sanitary) (tons)	1,000

Source: NNSA 2007.

CUC construction activities would increase annual sanitary waste generation by less than five percent, relative to current SRS operations. The waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

CUC construction activities would more increase the annual routine hazardous waste currently generated by SRS operations by an additional 40 percent. The hazardous waste would be sent offsite for treatment and disposal at a commercial facility along with the hazardous waste normally generated by SRS. Commercial treatment is readily available and currently used to treat most SRS hazardous wastes.

Sanitary wastewater generated during CUC construction would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

A retention pond would be constructed to manage stormwater runoff from the entire CUC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the CUC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CUC construction is completed.

Operations: **CNC.** Normal operation of a CNC would generate TRU waste, LLW, mixed LLW, mixed TRU waste, hazardous waste, and sanitary waste. Table 5.8.14-5 summarizes the estimated waste generation rates for a CNC**.**

Table 5.8.14-5—Annual CNC Operational Waste–SRS

	CPC	CUC	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	12,000
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (yd^3) `	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (tons)	0.6	0	0.6
Non-Hazardous Solid Waste (tons)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Since 2002 the TRU waste inventory at SRS has been dramatically reduced by shipments to WIPP. Currently, the inventory is about 5,200 cubic yards (Grainger 2008). The projected TRU waste volumes which would be generated by the operation of a CNC at SRS would represent an increase of about two percent of the annual routine TRU waste SRS already processes. About a third of the TRU waste generated by a CNC would be mixed waste. The TRU waste would be transferred from the CNC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 978 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

LLW generation for the CNC would increase the annual LLW generation at SRS by more than three fold. The LLW would be transferred to E-Area for disposal. The estimated capacity of the E-Area facilities is 963,711 cubic yards and the projected volumes for disposal are about 456,566 cubic yards (DOE 2000g). The remaining capacity would be adequate to dispose of all the projected LLW from CNC operations and still allow for disposal of LLW generated by other activities at SRS. LLW from CNC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNC operations would be solidified prior to leaving the facility. Offsite disposal at another DOE site, such at NTS, or commercial facility could be used for LLW that is not technically or economically suitable for disposal at SRS."

The projected hazardous waste volumes from CNC operations would be large in comparison to the annual routine volumes of hazardous waste currently managed at SRS. Commercial treatment is readily available and currently used to treat and dispose of most SRS hazardous wastes. Sufficient hazardous waste transfer points exist, at SRS, for the collection of sufficient quantities to facilitate shipment.

Operation of a CNC would increase annual routine mixed LLW generation at SRS by less than five percent relative to current site operations. Depending on the characteristics of the mixed LLW, it would be treated at the RCRA-permitted mixed waste treatment facility, transferred to

onsite treatment facilities at other facilities at SRS, or shipped to commercial or DOE treatment and disposal facilities. These wastes include lead acid batteries, lubricating oils/fluids, rags, and absorbents.

Non-hazardous waste from CNC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CNC operations would substantially increase the annual sanitary waste generation at SRS, the combination of disposal facilities is expected to provide more than adequate disposal capacity.

Sanitary wastewater generated during CNC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CNC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid-process waste facilities for the plutonium purification process (NNSA 2007).

5.8.14.3.2 CNPC (CPC + CUC + A/D/HE Center)

Waste management impacts from the construction and operation of the full CNPC would include the CPC impacts discussed in Section 5.8.14.5, the CUC impacts discussed above, and the A/D/HE Center. The expected waste impacts are discussed below.

***Construction:* A/D/HE Center.** The construction of an A/D/HE Center would generate low level waste, and solid and liquid sanitary waste. Table 5.8.14-6 summarizes the total volume of waste generated over the 6 years of construction of an A/D/HE Center.

Table 5.8.14-6—Total Waste Generation from Construction of the A/D/HE Center

Waste Category	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	7,100
Non-Hazardous Liquid Waste (gal)	45,000

Source: NNSA 2007.

A/D/HE Center construction activities would increase annual sanitary waste generation by less than ten percent relative to current SRS operations. The waste would be disposed in an onsite

structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. This combination of disposal facilities would provide adequate capacity to handle the projected amount of waste.

The 45,000 gallons of liquid non-hazardous waste (sanitary wastewater) generated during the 6 year A/D/HE Center construction period would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary waste is well within the existing capacity and would not be expected to have any detrimental effects on the existing operations of the SRS sanitary sewer system.

LLW generation from the construction of an A/D/HE Center at SRS would generate substantial volumes of additional LLW to be managed by SRS. This waste, however would be generated over a multi-year timeframe (more like half of the 6 year construction period) making its volume less of a jolt to the system. The LLW would be transferred from the A/D/HE Center to E-Area for processing and disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 cubic yards and the projected volumes for disposal of waste normally generated at SRS are about 456,566 cubic yards (DOE 2000g). The remaining capacity would be more than adequate to dispose of all the projected LLW from A/D/HE Center operations and still allow for disposal of LLW generated by other activities not yet planned for at SRS. Any liquid LLW resulting from A/D/HE Center operations would be solidified prior to leaving the center.

A retention pond would be constructed to manage stormwater runoff from the entire A/D/HE Center site, including the construction laydown area and concrete batch plant. The basin of this retention pond would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at an A/D/HE Center site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once A/D/HE Center construction is completed.

Operations: **CNPC.** Normal operation of a CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.8.14-7 summarizes the estimated waste generation rates for the operation of a CNPC at SRS.

SRS currently manages an inventory of 5,200 cubic yards of legacy TRU waste. The projected TRU waste volumes represent an increase by a factor of less than two percent of the annual routine TRU waste generation at SRS. About one third of the TRU waste would be mixed waste. The TRU waste would be transferred from the CNPC process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 326 cubic yards of TRU waste). A drum-loading area equipped with overhead bridge cranes would load the waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP.

Table 5.8.14-7—Annual Waste Generation from Operations at SRS–CNPC

Waste Type	CPC	CUC	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU) (yd^3)	950	0	0	950
Mixed TRU Solid Waste (included in TRU, above)(yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	8,100	40	12,040
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	70	0	782.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	15	.9	19.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,500	12,000	27,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

LLW from CNPC operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from CNPC operations would be solidified prior to leaving the facility. LLW generation for the CNPC would substantially increase the annual LLW generation at SRS by a factor of about 4. The LLW would be transferred to E-Area for disposal. Offsite disposal could also be used for LLW that is not technically or economically suitable for disposal at SRS. The estimated capacity of the E-Area facilities is 963,711 yd^3 and the projected volumes for disposal are about 456,566 yd^3 (DOE 2000g). The remaining capacity would be more than adequate to dispose of all the projected LLW from CNPC operations and still allow for disposal of low level waste generated from other operations at SRS.

The projected hazardous waste volumes from CNPC operations would substantially increase the annual routine volumes currently managed at SRS. This waste would be collected at a hazardous waste transfer point until sufficient quantities are obtained for a shipment to an off-site, RCRA-permitted commercial treatment and disposal facility. Commercial treatment is readily available and currently used to treat and dispose of most of SRS hazardous wastes.

Non-hazardous waste from CNPC operations includes sanitary solid waste and wastewater. The solid waste would be disposed in an onsite structural fill or the Three Rivers Regional Landfill, located within SRS boundaries. If there were sufficient demand, DOE may pursue a permit for an onsite construction and debris landfill, replacing the Burma Road Landfill that was filled to capacity in 2001. Although CNPC operations would substantially increase the current annual sanitary waste generation at SRS, the combination of existing disposal facilities is expected to provide adequate disposal capacity.

Sanitary wastewater generated as a result of CNPC operations would be treated in the Centralized Sanitary Wastewater Treatment Facility. The anticipated volume of sanitary wastes would not be expected to have any effect on the existing capacity of the SRS sanitary sewer system.

CNPC operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in

contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge.

5.8.14.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at SRS would continue as required to support smaller stockpile requirements. With respect to waste management, reduced tritium operations would reduce LLW by approximately 50 percent, from 138 cubic yards to 69 cubic yards. No other waste streams would be significantly affected. Because SRS has adequate facilities to manage LLW under either alternative, no major impacts to waste management are expected with a fifty percent reduction in volume.

5.9 Y-12 NATIONAL SECURITY COMPLEX (Y-12)

This section discusses the potential environmental impacts associated with the following programmatic alternatives at the Y-12 Complex:

- **No Action Alternative.** Under the No Action Alternative, NNSA would continue operations to support national security requirements using the nuclear weapons complex as it exists today. Y-12 would continue to perform its existing missions as described in Section 3.2.9.
- **DCE Alternative.** This alternative includes an analysis of adding a CPC to the existing enriched uranium mission at Y-12. It is noted that the combination of a CPC with the existing enriched uranium mission would constitute a Consolidated Nuclear Center (CNC). For the enriched uranium mission, this SPEIS also assesses the impacts of a UPF and an upgrade of existing Y-12 facilities, because NNSA is considering these options in the Y-12 SWEIS as potential replacements for facilities that currently perform enriched uranium operations.
- **CCE Alternative.** This alternative would be a full CNPC (which would consist of a CPC, the UPF, and an A/D/HE Center). By definition, there is no "CNC Alternative" at Y-12, because locating a CPC at Y-12 (in combination with the existing enriched uranium mission) would amount to a CNC. In general, CNPC alternatives would produce additive construction impacts because construction activities would occur in series as follows: UPF, 2010-2018; CPC, 2017-2022; A/D/HE Center, 2020-2025.
- **Capability-Based Alternatives.** Under these alternatives, HEU operations at Y-12 would be reduced to support stockpile requirements below levels established by the Moscow Treaty.

The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.9.1 Land Use

This section presents a discussion of the potential impacts to land associated with the No Action Alternative, the DCE Alternative, and the CCE Alternative. Table 5.9.1-1 describes the potential effects on land use from construction and operation of facilities under the DCE and CCE Alternatives.

Table 5.9.1-1—Potential Effects on Land Use at the Proposed Sites

CPC Alternatives			
Greenfield Alternative	**Construction (acres)**	**Operation (acres)**	
	140	110[a]	
		PIDAS	**Non-PIDAS**
		40	70
Upgrade Alternative	13	6.5 (All within PIDAS)	
50/80 Alternative	6.5	2.5 (All within PIDAS)	
CUC			
Construction (acres)	50		
Operation (acres)	Total Area: 35[b]		
	PIDAS	**Non-PIDAS**	
	15	20	
A/D/HE CENTER [d]			
Construction (acres)	300		
Operation (acres)	Total Area: 300[e]		
	PIDAS	**Non-PIDAS**	
	Weapons A/D/Pu Storage: 180	Administrative and High Explosives Area: 120	
CNC			
	Total Area: 195[f]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 55 • CPC: 40 • CUC: 15	**Total: 140** • Non-SNM component production: 20 • Administrative Support: 70 • Buffer Area: 50	
CNPC			
	Total Area: 545[g]		
Operation (acres)	**PIDAS**	**Non-PIDAS**	
	Total: 235 • CPC: 40 • CUC: 15 • A/D/Pu Storage: 180	**Total: 310** • Non-SNM component production: 20 • Administrative Support: 70 • Explosives Area: 120 • Buffer Area: 100	

[a] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[b] At Y-12, a UPF would be constructed (see Section 3.4.2).
[c] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[d] At NTS, an A/D/HE Center would require 200 acres, due to use of existing infrastructure.
[e] Includes a buffer area that would provide unobstructed view of the area surrounding the PIDAS.
[f] Total land area for CNC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.
[g] Total land area for CNPC at Y-12 would be reduced by approximately 27 acres due to existing uranium production facilities.

5.9.1.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. Table 5.9.1-2 provides an overview of major facilities at Y-12. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Y-12 beyond those of existing and future activities that are independent of this action. Additional information on land use resources for Y-12 may be found in Section 4.9.1.

Table 5.9.1-2—Y-12 Major Facility Overview

Facility	• Function	• Mission	Current Status
EU Complex	• Uranium Recovery Operations • Metallurgical Operations • In-Process Storage • X-ray density	• Recovery of EU to a form suitable for storage • Casting EU metal (for weapons, storage, reactors, or other uses) • EU down-blending • Accountability of EU from Y-12 activities • Nondestructive evaluation of parts • Packaging for Off-site Transportation	Operating
Intermediate Assay Building	• Chemical recovery of intermediate enrichments of EU (20% to 85% 235U) • In-Process Storage	• Recovery of EU to a form suitable for storage	Not Operating-EU materials will be transferred to other areas for processing or to a storage location. Operations in this building will not resume
EU By-Products Storage Building	• Storage of combustibles, residues and other solid by-product material contaminated by EU	• Storage of combustibles, residues, and other solid materials awaiting chemical recovery of EU	In use as a storage facility
Metalworking Building	• Storage • Fabrication (rolling, heat treating, forming, shearing, machining, inspection, etc.) of parts	• Storage and handling of EU and DU • Fabrication and inspection of metal parts	Operating
EU Storage Building	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-plant material transfers in SNM vehicle	Operating
Assembly and Special Materials Process Buildings	• Assembly • Product Certification • Disassembly • Storage • Quality Evaluation	• Assembly of new or replacement weapons components/assemblies • Quality operations for certification • Disassembly of retired weapons components/assemblies and part recovery • Storage of retired weapons assemblies, subassemblies, and components • LiH/LiD production • Shelf Life Program – Medium and Long Term Evaluations	Operating

Table 5.9.1-2—Y-12 Major Facility Overview (continued)

Facility	• Function	• Mission	Current Status
Quality Evaluation Building	• Quality Evaluation/Disassembly • DU Metalworking • Testing	• Quality Evaluation/Disassembly is conducted	Operating
Plant Laboratory Building	• Analytical Chemistry Organization	• Provides analytical support services for Y-12 and regulatory compliance	Operating
Special Materials Machining	• Metal machining	• Machining of metal parts	Not operating
DU Metalworking Building	• Machining • Dimensional Inspection • Electroplating • X-ray density	• Depleted uranium and stainless-steel machining • Dimensional inspection of parts • Electroplating of parts • Nondestructive evaluation of parts	Operating
Development Buildings	• Process Development • Beryllium Operations	• Development and refinement of manufacturing processes employed at Y-12 • Technology transfer support	Operating
Tooling Storage Building	• Storage	• Tooling and material storage	Operating
General Manufacturing Building	• Metal and graphite machining	• General machine shop • Machining and tooling • Work for others • Technology transfer	Operating
DU Processing Building	• Machining processes • Dimensional Inspection • Nondestructive Evaluation (X-ray density)	• DU operations • Dimensional inspection of parts • Nondestructive evaluation of parts	Operating
HEUMF	• Storage of EU • Receiving • Shipping • SNM vehicle material transfers	• Warehouse for shipping and receiving EU from other sites • Transient, interim, and long-term storage of EU • In-plant material transfers in SNM vehicle	Under Construction
Purification Facility	• Chemical Processing	• Special Material production	Operating

Source: ORNL 2002.
Note: SNM - special nuclear material, EU – enriched uranium, DU – depleted uranium, LiH – lithium hydride, LiD – lithium deuteride.

5.9.1.2 *DCE Alternative*

5.9.1.2.1 Construction

CPC. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. There would be four separate nuclear buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; Manufacturing; and R&D. These buildings would be surrounded by a PIDAS. The area outside the PIDAS and buffer area would consist of a number of smaller support facilities, a

Waste Staging/TRU Packaging Building, roads and parking areas, and a runoff retention area. In addition to these structures, a construction laydown area and a concrete batch plant would be built for the construction phase only. Upon construction completion, they would be removed and the area could be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 100 feet, would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The UPF and HEUMF is located to the east of the CPC reference location. This site is outside of, but adjacent to the existing PIDAS.

An estimated 140 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct a CPC. The land required for CPC construction would represent approximately 17.5 percent of Y-12's total land area of approximately 800 acres. The post-construction developed area would be approximately 110 acres. Although there would be a change in land use, a CPC is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

UPF. A UPF would be compatible and consistent with the current land use at Y-12 and would not change the current industrial use classification that exists at the proposed location. Construction of and future operations at a UPF would be consistent with the Y-12 Ten Year Comprehensive Site Plan (TYCSP) and would be a significant contribution to achieving an optimum configuration of Y-12. A UPF would enable the EU operations to be consolidated into an area that would be approximately 10 percent of the current size of the Y-12 PIDAS high security area.

The UPF site is in the Pine Ridge and Bear Creek Parking Lots, located to the west of the Highly Enriched Uranium Materials Facility (HEUMF). This site is outside of, but adjacent to, the existing PIDAS. This site is close to the existing HEU processing complex and represents a large level site with minimal site preparation requirements.

Construction of a UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. The construction laydown area for the UPF would be developed on the west side of the proposed UPF site. This area would be finished with an 8-inch-thick 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.

Upgraded Y-12 facilities. Under this alternative, NNSA would upgrade the existing enriched uranium (EU) and non-nuclear 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. The Upgrade Alternative would be both compatible and consistent with the current land use at Y-12 and would not change the current industrial use classification that exists. Construction activities would consist of internal modifications to existing facilities.

5.9.1.2.2 Operations

CPC and UPF. An estimated 118 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CPC (110 acres) and UPF (8 acres). The reduction in required acreage from construction to operations represents the removal of the construction laydown area and the concrete batch plant upon construction completion. The land required for CPC and UPF operations would represent approximately 15 percent of Y-12's total land area of approximately 800 acres. The UPF would allow the EU operations at Y-12 to be reduced from approximately 150 acres to 15 acres. Although there would be a change in land use, a CPC and UPF would be compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

Upgraded Y-12 facilities. Operation of the Upgraded EU and other processing facilities would have no impact on the current land use at Y-12 and would not change the current industrial use classification that exists at Y-12. Upgrading the existing facilities would not allow the EU operations to be reduced from approximately 150 acres to 15 acres.

5.9.1.3 *CCE Alternative*

5.9.1.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.1.3.2 CNPC (CPC + UPF + A/D/HE Center)

***Construction:* A/D/HE Center.** As described in Section 3.5.1.2, an A/D/HE Center would be consist of a nuclear facility within the PIDAS and non-nuclear support facilities outside the PIDAS. Approximately 300 acres would be required for an A/D/HE Center. An area of 180 acres would be provided in the PIDAS for the weapons assembly and disassembly facilities, and the associated weapons and plutonium component storage. These functions would be located on the west end of Y-12. Located outside the PIDAS area would be a buffer area, administrative support buildings, and other non-nuclear support facilities, on approximately 63 acres. The high explosives (HE) fabrication would be located on approximately 120 acres of ORR, approximately 4.5 miles from the Y-12 industrialized area (see Figure 3.5.1-7).

The land required for an A/D/HE Center construction would represent approximately 37.5 percent of Y-12's total land area of approximately 800 acres. The reference location has adequate space to accommodate the total facilities footprint. Although there would be a change in land use, an A/D/HE Center is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

***Operations:* CNPC.** An estimated 518 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate a CNPC. Of this, approximately 398 acres would be located on Y-12, and 120 acres (HE fabrication) would be located on ORR, approximately 4.5 miles from the Y-12 industrialized area. The land required for CNPC

operations at Y-12 (would represent approximately 50 percent of Y-12's total land area of approximately 800 acres. Although there would be a change in land use, a CNPC is compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected. The HE fabrication would be located on approximately 120 acres of ORR, which would be less than 1 percent of the ORR (35,000 acres).

5.9.1.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on land use would occur at Y-12. Reduced operations would not change land use at Y-12.

5.9.2 Visual Resources

5.9.2.1 *No Action Alternative*

The landscape at ORR is characterized by a series of ridges and valleys that trend in a northeast-to-southwest direction. Currently, there is no BLM classification for Y-12; however, the level of development at Y-12 is consistent with VRM Class IV which is used to describe a highly developed area. Most of the land surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes). Existing visual resources are discussed in Section 4.9.2.

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Y-12 that are independent of this action.

5.9.2.2 *DCE Alternative*

5.9.2.2.1 Construction

CPC and UPF. A CPC and UPF would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for a CPC and UPF would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust.

Cranes used during construction of a CPC and UPF could create short-term visual impacts, but would not be out of character for an industrial site such as Y-12. The construction laydown areas, temporary parking, and temporary construction office trailers would also be typical for an industrial site. After construction of the facilities are complete, cranes and temporary construction office trailers would be removed, and construction laydown areas would be regraded and seeded after removal of any soil that may have become contaminated with construction-related materials such as diesel fuel. Alternatively, the laydown areas could be used to provide for additional parking.

Upgraded Y-12 facilities. The Upgrade Alternative would consist mainly of internal upgrades to existing facilities, and would not change the current visual impact of Y-12. Y-12 would still remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

5.9.2.2.2 Operations

CPC and UPF. As described in Section 3.4.2, a CPC would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The UPF and HEUMF are located to the east of the CPC reference location.

Upon completion of UPF and CPC construction (approximately 2022), the PIDAS would be extended to surround the new facilities. When the new PIDAS is completed, the existing EU operations would be relocated to the UPF, the current EU facilities could be declared surplus, and evaluated for D&D. Although the ultimate disposition of these facilities would be determined by a separate NEPA review in the future, when such actions are ripe for decisionmaking, this SPEIS acknowledges that approximately 633,000 square feet of facilities could become excess if the UPF is constructed. Ultimately, this could improve the visual character of the site by reducing the density of industrial facilities. Nonetheless, Y-12 would remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected. The CPC placement would be consistent with the current Class IV BLM Visual Resources Management rating of developed areas.

Upgraded Y-12 facilities. Operation of the Upgraded EU and other processing facilities would have no impact on the current visual impact of Y-12.

5.9.2.3 *CCE Alternative*

5.9.2.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.2.3.2 CNPC (CPC + UPF + A/D/HE Center)

***Construction:* A/D/HE Center.** Activities related to the construction of new buildings required for an A/D/HE Center would be similar in nature to the CPC. An A/D/HE Center would consist of multiple aboveground facilities. Activities related to the construction of new buildings required for an A/D/HE Center would result in a change to the visual appearance of the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Impacts on visual resources during construction would be minimal.

***Operations:* CNPC.** A CNPC would be a large complex of industrial facilities, parking lots, and a buffer zone encompassing approximately 518 acres. The CNPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek parking Lots. The CNPC placement would be

consistent with the current Class IV BLM Visual Resources Management rating of developed areas. Y-12 would remain a highly developed area with an industrial appearance and no change to the VRM classification would be expected.

5.9.2.3.3 Capability-Based Alternative

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. No additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on visual resources would occur at Y-12. Reduced operations would not change visual resource impacts at Y-12**.**

5.9.3 Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.9.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

5.9.3.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this action. The baseline characteristics of these systems are presented in Table 4.9.3-1. Y-12 would be expected to continue using from 360 to 480 MWh of electricity per year.

5.9.3.2 *DCE Alternative*

5.9.3.2.1 Construction

CPC and UPF. The projected demands on electricity associated with construction activities for a CPC, UPF, and A/D/HE Center are shown in Table 5.9.3-1.

Table 5.9.3-1—Electrical Requirements for Construction of a CPC, UPF, and A/D/HE Center–Y-12

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity	**3,766,800**	**390**
No Action Alternative		
Total site requirement	349,251	40
Percent of site capacity	9.3%	9.3%
CPC		
CPC requirement	13,000	3.3
Percent of site capacity	<1%	1%
UPF		
UPF requirement	11,000	2.5

Table 5.9.3-1—Electrical Requirements for Construction of a CPC, UPF, and A/D/HE Center–Y-12 (continued)

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Percent of site capacity	<1%	<1%
A/D/HE Center		
A/D/HE Center requirement	55,000	12.7
Percent of site capacity	1.5%	3.3%

Source: NNSA 2007.

The existing electrical infrastructure at Y-12 would be adequate to support annual construction requirements. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources.

Upgraded Y-12 facilities. The Upgrade Alternative would involve internal upgrades to existing facilities and would have negligible energy and infrastructure requirements.

5.9.3.2.2 Operations

CPC and UPF. The estimated annual site electrical requirements for the programmatic alternatives are presented in Table 5.9.3-2. There would be negligible impacts to site infrastructure. Existing site infrastructure would be adequate to support operation of a CPC and UPF.

Table 5.9.3-2—Electrical Requirements for Operation of the CPC, UPF, and CNPC–Y-12

Proposed Alternatives	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site capacity	**3,766,800**	**390**
No Action Alternative		
Total site requirement	349,251	40
Percent of site capacity	9.3%	9.3%
CPC		
CPC requirement	48,000	11
Percent of site capacity	1.3%	2.8%
CPC + UPF		
CPC + UPF requirement	168,000	29.4
Percent of site capacity	3.4%	7.5%
CNPC (CPC + UPF + A/D/HE Center)		
CNPC requirement	268,000	41.3
Percent of site capacity	7.1%	10.5%

Source: NNSA 2007.

Upgraded Y-12 facilities. The Upgrade Alternative would not change energy and infrastructure requirements compared to the No Action Alternative.

5.9.3.3 *CCE Alternative*

5.9.3.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. A CPC and UPF, discussed in Section 5.9.4.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.3.3.2 CNPC (CPC + UPF + A/D/HE Center)

Site infrastructure impacts from the construction and operation of a full CNPC would include the CPC impacts discussed in Section 5.9.3.2 and the A/D/HE Center impacts discussed below.

***Construction:* A/D/HE Center.** The existing electrical infrastructure at Y-12 would be adequate to support annual construction requirements for an A/D/HE Center for the projected 6-year construction period. Infrastructure requirements for construction would have a negligible impact on current site infrastructure resources. The estimated site electrical requirements for construction of an A/D/HE Center are presented in Table 5.9.3-1.

***Operations:* CNPC.** During operations, a CNPC would utilize approximately 10 percent of Y-12's available peak electrical site capacity. The estimated annual site electrical requirements for operation of a CNPC are presented in Table 5.9.3-2. There would be negligible impacts to the site electrical infrastructure.

5.9.3.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to infrastructure, electrical use would be reduced by approximately 25 percent. Because there is currently adequate electrical capacity at the site, this reduction would not have any major impact on operations. Steam use, which is largely used for building heating, would be expected to decrease from approximately 1.5 billions of pounds per year to approximately 900 million pounds per year. The No Net Production/Capability-Based Alternative would reduce these quantities by approximately an additional 10 percent.

5.9.4 Air Quality and Noise

5.9.4.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. The ORR is located in Anderson and Roane Counties in the Eastern Tennessee-Southwestern Virginia AQCR 207, and Y-12 is completely within Anderson County. The EPA has designated Anderson County as a basic non-attainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone

non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (DOE 2007). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS. There would be no additional impacts to air quality beyond current and planned activities that are independent of this action.

Major noise emission sources within Y-12 include various industrial facilities, and 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 that noise levels at the boundary from these sources are not distinguishable from background noise levels. Within the Y-12 site boundary, noise levels from Y-12 mission operations are typical of industrial facilities, ranging from 50 to 70 dBA (DOE 2001a). Traffic is the primary source of noise at the Y-12 site boundary and at residences located near roads. During peak hours, the Y-12 worker traffic is a major contributor to traffic noise levels in the area (DOE 2001a). There would be no additional impacts to noise levels beyond current and planned activities that are independent of this action.

5.9.4.2 *DCE Alternative*

5.9.4.2.1 Air Quality

Construction: **Nonradiological air impacts from CPC and UPF.** Construction of new facilities 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, $PM_{10,}$ total suspended particulates, and carbon monoxide. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a concrete batch plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the concrete batch plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from CPC construction activities are presented in Table 5.9.4-1. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Y-12 site boundary, with the exception of PM-2.5 and PM-10 concentrations (which could be mitigated using dust suppression), and the 8-hour ozone concentration (see Table 5.9.4-2). The 8-hour ozone concentration exceedance is not a result of Y-12-specific activities. Instead, the EPA has designated Anderson County as a basic non-attainment area for the 8-hour ozone standard, as part of the Knoxville basic 8-hour ozone non-attainment area that encompasses several counties.

Table 5.9.4-1—Estimated Peak Nonradiological Air Emissions–CPC Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)
	CPC
Carbon monoxide	409.6
Carbon dioxide	7,084.2
Nitrogen dioxide	177.7
Sulfur dioxide	11.6
Volatile organic compounds	28.7
PM_{10}	686
Total Suspended Particulates	915

Source: NNSA 2007.

Construction of the UPF would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Fugitive dust generated during the clearing, grading, and other earth moving operations would also cause short-term impacts to air quality, predominantly to particulate matter in the air. Construction impacts of the UPF would be similar to the construction impacts for the CPC (discussed above), as both facilities are similarly sized (approximately 400,000 square feet of floorspace for the UPF versus approximately 650,000 square feet of floorspace for the CPC) and have the same construction durations (6 years). As such, the nonradiological emissions presented in Table 5.9.4-2 would be representative of the UPF construction nonradiological air impacts.

Table 5.9.4-2—Estimated NAAQs Concentrations at Y-12–CPC Construction

Pollutant	Averaging Time	Maximum standard ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Additional Contribution to Background from Releases During Construction ($\mu g/m^3$)
Sulfur dioxide	3-hr 24-hr Annual	1,300 365 80	398 47.1 10.5	22.15 5.03 0.02
PM10	Annual 24-hr	50 150	25.4 77	1.25 301.33
PM2.5	Annual 24-hr	15 35	No Data 48.2	0.125* 30.1*
Carbon monoxide	1-hr 8-hr	40,000 10,000	12,712 4,466	1184.9 391.03
Ozone	1-hr 8-hr	235 157	225 188.4	No Data No Data
Nitrogen dioxide	Annual	100	15.1	0.32
Lead	Calendar quarterly mean	1.5	0.009	No Data No Data

Source: Janke 2007.

* Assumes $PM_{2.5}$ is approximately 10 percent of the PM_{10} value due to the smaller quantity of particulates at the 2.5 micron size range. These estimates are based on Gaussian Plume modeling assuming emissions sources are approximated by a small area source relative to the down-wind distances. The modeling used conservative assumptions for wind speed and stability class to develop the estimates.

Upgraded Y-12 facilities. Negligible fugitive dust would be generated because no new land would be disturbed. Temporary decreases in air quality from construction equipment, trucks, and employee vehicles would be much less than the CPC and UPF, discussed above, due to the significantly smaller workforce required for the upgrades.

Construction: **Radiological air impacts from construction of CPC, UPF, and Upgraded Y-12 facilities.** No radiological releases to the environment are expected in association with construction activities of a CPC or UPF. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures. No radiological releases to the environment are expected in association with construction activities related to the upgrade of Y-12 facilities.

Operations: **Nonradiological air impacts from operation of CPC, UPF, and Upgraded Y-12 facilities.** Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). Air emissions from periodic functional testing support systems (primarily standby diesel generators) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, VOCs, and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted are presented in Table 5.9.4-3. These emissions would be incremental to the Y-12 baseline.

Table 5.9.4-3—Annual Nonradiological Air Emissions for the CPC–Operations

Chemical Released	Quantity Released (kg/yr)
	200 ppy
Carbon dioxide	1,843,600
Carbon monoxide	8,580
Nitrogen dioxide	42,803.2
PM_{10}	1,042.8
Sulfur dioxide	2,626.8
Total suspended particulates	2,820.4
Volatile organic compounds	2,626.8

Source: NNSA 2007.

For a UPF, operations would not be expected to increase air emissions at Y-12 because a UPF would replace existing EU operations. No significant new quantities of criteria or toxic pollutants would be generated from the new facility itself. Any additional steam-generated heat required for a UPF would be off-set by the reduction in steam from the phase-out of operations in excess Enriched Uranium facilities. A UPF would not change the level of emissions estimated for the No Action Alternative. Any releases of nitrogen and argon, which are used to maintain inert atmospheres for glovebox operations, would be less than current releases from existing EU

operations. No new hazardous air emissions would result from the facility operation. Additionally, 90 percent of emissions at Y-12 are from operation of the steam plant, which would be relatively unaffected by UPF operations.

As part of its evaluation of the impact of air emissions, NNSA consulted the Guidance on CAA Conformity requirements (DOE 2000a). NNSA determined that the General Conformity rule applies because Y-12 is located in a non-attainment area for one or more criteria pollutants (i.e., 8-hour ozone). However, because construction plans for the CPC and UPF are insufficiently developed to quantify emissions, they do not satisfy the Tennessee Code definition of reasonably foreseeable. For this reason, a complete General Conformity Review cannot be included in the SPEIS. When the construction plans are sufficiently developed to estimate NAAQS emissions, a General Conformity Review must be performed before future construction activities can proceed.

Operation of the Upgraded EU and other processing facilities would not change air quality impacts beyond those presented for the No Action Alternative because there would be no significant change in the operating requirements of the facilities.

Table 5.9.4-4 presents the results of conservative modeling for operations at Y-12, including the CPC and UPF. If Y-12 is selected as the preferred site, a prevention of significant deterioration (PSD) increment analysis would be performed under a project-specific tiered EIS.

Table 5.9.4-4—Criteria Pollutant Concentrations at Y-12 Boundary–CPC and UPF

Pollutant	Averaging Time	Maximum standard (µg/m^3)	Background Concentration (µg/m^3)	Maximum Modeled Concentration[3] (µg/m^3)	Background Concentration + Maximum Modeled Concentration (Percent of Standard)
SO2	3-hr 24-hr Annual	1,300 365 80	398[1] 47.1[2] 10.5[2]	523.8 174.6 20.7	71 61 39
PM10	Annual[1] 24-hr[2]	50 150	25.4[2] 77[1]	0.2 1.5	51 52
PM2.5	Annual[1] 24-hr[2]	15 35	No Data 48.2[1]	No Data No Data	No Data 74.1
CO	1-hr 8-hr	40,000 10,000	12,712 4,466[2]	4.30 2.52	32 44
Ozone	1-hr 8-hr	235 157	225[1] 188.4[1]	No Data No Data	96 120
NO2	Annual	100	15.1[1]	9.1	24
Lead	Calendar quarterly mean	1.5	0.009[1]	No Data	0.6

N/A= Not Applicable.
[1]TDEC 2005c.
[2]DOE 2007.
[3]Janke 2007.

***Operations:* Radiological air impacts from operation of CPC, UPF, and Upgraded Y-12 facilities.** Radioactive air emissions from pit manufacturing activities would involve plutonium,

americium, and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment; and include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each laboratory module would be separated from occupied areas of the laboratory facility by airlocks. Sample transfers would occur using a vacuum tube transfer system from the Feed Preparation and Manufacturing Facilities to the Analytical Support Facility. The ventilation exhaust from process and laboratory facilities would be filtered through at least two stages of HEPA filters before being released to the air via a 100-foot tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

NNSA estimated routine radionuclide air emissions (see Table 5.9.4-5). Releases would be small. Total radionuclide emissions at Y-12 would be much less than 1 Curie of any radionuclide. To ensure that total emissions are not underestimated, NNSA's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller. Operation of the UPF would result in some radiological airborne emissions. The current design calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from the existing EU facilities, and are likely to be less due to the incorporation of newer technology into the facility design. However, because detailed design information does not yet exist, these reductions cannot be quantified. As a result, for purposes of this SPEIS analysis, the radiological airborne emissions and resulting impacts from the UPF would remain unchanged from the No Action Alternative, which are estimated to be 0.10 Curies of uranium, based on releases into the atmosphere in 2004 (DOE 2005a).

Table 5.9.4-5—Annual Radiological Air Emissions–CPC Operations

Isotope	Baseline[a,b] (Ci/yr)	CPC Annual Emissions (Ci/yr)
Americium-241	ND	3.12×10^{-7}
Plutonium-239	None	1.02×10^{-5}
Plutonium-240	None	2.66×10^{-6}
Plutonium-241	None	1.96×10^{-4}
Uranium-234	ND	5.02×10^{-9}
Uranium-235	ND	1.58×10^{-10}
Uranium-236	ND	2.56×10^{-11}
Uranium-238	ND	1.42×10^{-12}
Total Uranium	0.10	2.06×10^{-4}
Tritium	None	–
All Other	None	–
Total	**0.10**	**2.09×10^{-4}**

Source: NNSA 2007.
ND=No data for these radionuclides.
[a] Based on calendar year 2004 data.
[b] The No Action Alternative is represented by the baseline.

NNSA estimated the radiation doses to the offsite MEI and the offsite population surrounding Y-12. As shown in Table 5.9.4-6, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.9.11.

Table 5.9.4-6—Annual Doses Due to Radiological Air Emissions from CPC and UPF Operations–Y-12

Receptor	CPC	UPF
Offsite MEI[a] (mrem/yr)	4.5×10^{-4}	0.2
Population within 50 miles (person-rem per year)[a]	3.2×10^{-3}	1.2

Source: Tetra Tech 2008.
[a] MEI and population dose estimates for the CPC operations were calculated using the radiological emissions in Table 5.9.4-5and using the CAP88 computer code, version 3. The offsite MEI is assumed to reside at the site boundary.

Operation of the upgraded EU facilities would not change the radiological airborne emissions, and impacts would be the same as described for the No Action Alternative.

5.9.4.2.2 Noise

***Construction:* CPC, UPF, and Upgraded Y-12 facilities.** Construction of new buildings or upgrade of existing facilities would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Although noise levels in construction areas could be as high as 110 dBA, these noise levels would not extend far beyond the boundaries of the construction site. Table 5.9.4-7 shows the attenuation of construction noise over relatively short distances. At 400 feet from the construction site, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Given the distance to the site boundary (approximately 1.3 miles) there would be no major change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels.

Table 5.9.4-7—Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source (feet)			
		50	100	200	400
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

***Operations:* CPC, UPF, and Upgraded Y-12 facilities.** The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (approximately 1.3 miles) noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely increase traffic noise levels along roads used to access the site.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.9.4.3 *CCE Alternative*

5.9.4.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.4.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.4.3.2 CNPC (CPC + UPF + A/D/HE Center)

Air quality and noise impacts from the construction and operation of the CNPC would include the CPC and UPF impacts discussed in Section 5.9.11.2 as well as the impacts discussed below for the A/D/HE Center.

5.9.4.3.2.1 Air Quality

***Construction:* A/D/HE Center nonradiological impacts.** Nonradiological impacts of A/D/HE Center construction are expected to be similar to the impacts described above for the CPC and UPF. However, due to the potential to disturb approximately 300 acres of land during construction, modeling was performed to determine if PM_{10} emissions (which were considered to be the most likely criteria pollutant to exceed regulatory limits) at the site boundary would exceed regulatory limits. Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. Fugitive emissions were estimated based on the EPA emission factor of 1.20 tons per acre per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. The estimated maximum annual PM_{10} emissions resulting from construction activities are presented in Table 5.9.4–7a. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts.

Table 5.9.4-7a—A/D/HE Center Construction–PM_{10} Impacts

Parameter	Guideline or limit ($\mu g/m^3$)	Concentration at Site Boundary ($\mu g/m^3$)
Particulate Matter emitted: 1,620 tons/year		
Annual	50	2.62
24-hour	150	638

Source: Janke 2007.

The results presented above represent a conservative estimate of PM_{10} emissions at the site boundary. The source strength was assumed to come from a relatively concentrated area for application to the Gaussian Plume equation. Use of an area source would not reduce the emissions by an order of magnitude. Therefore, the results in the table potentially overestimate the impact by about a factor of 5. Based on this analysis, a more detailed site-specific analysis would need to be performed, using project-specific information, if Y-12 is selected for a CNPC. If that analysis shows that regulatory limits would be exceeded, then mitigation measures would need to be developed.

Construction: **A/D/HE Center radiological impacts.** No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations: **CNPC nonradiological impacts.** A CNPC would release nonradiological contaminants into the atmosphere during operations. CPC and UPF nonradiological emissions are discussed in Sections 5.9.4.2 and are not repeated here. The total nonradiological air impacts of the CNPC would be additive of a CPC, UPF, and an A/D/HE Center (which is discussed in this section). During normal operations, an A/D/HE Center would release the non-radionuclides to the air in the quantities presented in Table 5.9.4-8. These emissions would be incremental to the Y-12 baseline.

Table 5.9.4-8—Annual Nonradiological Air Emissions–A/D/HE Center Operations

NAAQS emissions	(tons/year)
Oxides of Nitrogen	91
Carbon Monoxide	31
Volatile Organic Compounds	31
Particulate Matter	18
Sulfur Dioxide	5
Hazardous Air Pollutants and Effluents	22

Source: NNSA 2007.

The maximum concentrations ($\mu g/m^3$) at the Y-12 site boundary that would be associated with the release of criteria pollutants presented in Table 5.9.4-9. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Because the estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.9.4-9—Criteria Pollutant Concentrations at Y-12 Boundary–CNPC Operations

Pollutant	Averaging Time	Maximum standard (μg/m^3)	Background Concentration (μg/m^3)	Maximum Modeled Concentration for CPC and UPF (μg/m^3)	A/D/HE Center Maximum Incremental Concentration (μg/m^3)	CNPC Concentration (μg/m^3)
Sulfur dioxide	3-hr 24-hr Annual	1,300 365 80	398 47.1 10.5	523.8 174.6 20.7	9.6 2.2 0.01	533.4 176.8 20.7
PM10	Annual[1] 24-hr[2]	50 150	25.4 77	0.2 1.5	0.03 7.8	25.6 9.3
PM2.5	Annual[1] 24-hr[2]	15 35	No Data 48.2	No Data No Data	0.03 7.8	No Data 56.0
Carbon monoxide	1-hr 8-hr	40,000 10,000	12,712 4,466	4.30 2.52	89.7 29.6	91.9 4498.1
Ozone	1-hr 8-hr	235 157	225 188.4	No Data No Data	No Data No Data	No Data No Data
Nitrogen dioxide	Annual	100	15.1	9.1	0.2	24.4
Lead	Calendar quarterly mean	1.5	0.009	N/A	N/A	N/A

Source: Janke 2007.

As part of its evaluation of the impact of air emissions, NNSA consulted the Guidance on CAA Conformity requirements (DOE 2000a). NNSA determined that the General Conformity rule applies because Y-12 is located in a non-attainment area for one or more criteria pollutants (i.e., 8-hour ozone). However, because construction plans for the A/D/HE Center are insufficiently developed to quantify emissions, they do not satisfy the Tennessee Code definition of reasonably foreseeable. For this reason, a complete General Conformity Review cannot be included in the SPEIS. When the construction plans are sufficiently developed to estimate NAAQS emissions, a General Conformity Review must be performed before future planned construction activities can proceed.

Operations: **A/D/HE Center and CNPC radiological impacts.** A CNPC would release radiological contaminants into the atmosphere during operations. The total radiological air impacts of a CNPC would be additive of a CPC, UPF, and an A/D/HE Center. During normal operations, an A/D/HE Center would release the radionuclides to the air in the quantities indicated in Table 5.9.4-10.

Table 5.9.4-10—Annual Radiological Air Emissions for A/D/HE Center Operations

Radiological Air Emissions	Emissions
Tritium (Ci)	1.41×10^{-2}
Total Uranium (Ci)	7.50×10^{-5}
Total Other Actinides (Ci)	2.17×10^{-15}

Source: NNSA 2007.

After determining the emissions rates, the CAP88 computer code was used to estimate radiological doses to the maximally exposed individual (MEI) and the population surrounding Y-12 from an A/D/HE Center. As shown in Table 5.9.4-10, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA

(40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the A/D/HE Center resulting from radiological air emissions are presented in Section 5.9.11. Table 5.9.4-11 also shows the total annual doses from a CNPC. As can be seen, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity.

Table 5.9.4-11—Annual Doses Due to Radiological Air Emissions from A/D/HE Center Operations and a CNPC–Y-12

Receptor	A/D/HE Center	CNPC
Offsite MEI[a] (mrem/yr)	1.3×10^{-4}	0.2
Population within 50 miles (person-rem per year)	9.2×10^{-4}	1.2

Source: Tetra Tech 2008.
[a] The offsite MEI is assumed to reside at the site boundary.

5.9.4.3.2.2 Noise

***Construction:* A/D/HE Center.** *Anticipated noise impacts from the construction of the A/D/HE Center would be similar to those described for the CPC and UPF.*

***Operations:* A/D/HE Center and CNPC.** Anticipated noise impacts from the operation of a CNPC would be similar to those described for a CPC and UPF.

5.9.4.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to air quality, Y-12 is located in the Eastern Tennessee-Southwestern Virginia AQCR 207. The EPA has designated this area as a basic non-attainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (EPA 2005a). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS. Reduced operations could reduce the emissions from the steam plant boilers and emissions from onsite vehicles. Because 90 percent of emissions at Y-12 are from operation of the steam plant, this represents the most significant factor in any air quality changes. Reduced operations would reduce the basic needs for steam by approximately 40-50 percent, which would improve nonradiological impacts to air quality associated with Y-12 operations. With respect to radiological emissions, the total 2004 dose to the MEI from the Y-12 activities was 0.4 mrem, which is 4 percent of the regulatory limit. If radiological emissions decreased from 0.01 Curies to 0.006 Curies (per Table 3.6.1-2) (or 0.005 Curies per Table 3.6.3.7-1 for the No Net Production/Capability-Based Alternative), the MEI dose would decrease to approximately 0.24 mrem (0.20 mrem for the No Net Production/Capability-Based Alternative), which would be an inconsequential change.

5.9.5 Water Resources

Environmental impacts associated with the proposed alternatives at Y-12 could affect water resources. No impacts to groundwater are expected. At Y-12, surface water resources would likely be used to meet all construction and operations water requirements. Table 5.9.5-1 summarizes potential changes to water resources at Y-12 resulting from the construction of a CPC, UPF, and an A/D/HE Center. Table 5.9.5-2 summarizes potential changes to water resources at Y-12 resulting from the operation of a CPC, UPF, and CNPC.

5.9.5.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. Y-12 uses approximately 2,000 million gallons per year of water while the ORR uses approximately twice as much. The ORR water supply system, which includes the city of Oak Ridge treatment facility and the ETTP treatment facility, has a capacity of 11,715 million gallons per year (DOE 2005b).

Under this alternative no additional buildings or facilities would be built beyond current and planned activities, and no additional impacts on surface water or groundwater resources would be expected to occur at Y-12 that are independent of this action. Baseline water resources are discussed in Section 4.9.5.

5.9.5.2 *DCE Alternative*

5.9.5.2.1 Surface Water

***Construction:* CPC.** Construction requirements for the CPC are described in Section 3.4.1. Y-12 surface water withdrawals and discharges would not increase during construction of the CPC. Construction water requirements for a CPC would not raise the average annual water use for Y-12. Approximately 20,900,000 gallons of water would be needed for construction of the CPC; this is less than 1 percent of the average annual water use at Y-12. No impact from flooding would be expected. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits and minimized.

Table 5.9.5-1—Potential Changes to Water Resources from Construction of a CPC, UPF, and A/D/HE Center–Y-12

Proposed Alternatives	Water Use
Water Use (gal/yr)	**2,000,000,000**
CPC	
Water Requirement (gal)	20,900,000
Percent of Average Annual Water Use	1%
UPF	
Water Requirement (gal)	4,000,000
Percent of Average Annual Water Use	<1%
A/D/HE Center	
Water Requirement (gal)	2,022,000
Percent of Average Annual Water Use	<1%

Source: NNSA 2007.

Table 5.9.5-2—Potential Changes to Water Resources from Operation of the CPC, UPF, and CNPC–Y-12

Proposed Alternatives	Water Use
Average Annual Water Use	**2,000,000,000**
CPC	
Water Requirement (gal/yr)	88,500,000
Percent of Average Annual Water Use	4.4%
UPF	
Water Requirement (gal/yr)	105,000,000
Percent of Available Site Capacity	5.2%
CPC + UPF	
Water Requirement (gal/yr)	193,500,000
Percent of Average Annual Water Use	9.7%
A/D/HE Center	
Water Requirement (gal/yr)	130,000,000
Percent of Available Site Capacity	6.5%
CNPC (CPC + UPF + A/D/HE Center)	
Water Requirement (gal/yr)	403,500,000
Percent of Average Annual Water Use	20.1%

Source: NNSA 2007.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Y-12 would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. The CPC reference location at Y-12 is not within the 100-year or 500- year floodplains. Therefore, no impact on the floodplain is anticipated.

Construction: **UPF**. Y-12 surface water withdrawals and discharges would not increase substantially during construction of the UPF. Construction water requirements for a UPF (approximately 4 million gallons per year) would not raise the average annual water use for Y-12 (approximately 2,000 million gallons per year). The proposed UPF site is not located within either the 100-year or 500-year floodplains.

Construction: **Upgrade Y-12 facilities.** Construction activities associated with upgrading existing Y-12 facilities would require approximately 4 million gallons/year of water. This would represent an increase of less than 1 percent compared to existing water uses at Y-12.

Operations: **CPC.** Operation of a CPC would require an estimated 88,500,000 gallons, less than 4.4 percent of the average annual water usage at Y-12. Operation of a CPC would not increase water demands at Y-12. It is not anticipated that operation of a CPC would impact surface water quality.

A CPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures.

Operations: **UPF**. UPF operation would require an estimated 105,000,000 gallons per year, approximately 5.2 percent of the water usage under the No Action Alternative (approximately 2,000 million gallons per year). A UPF would not increase water demands at the site because EU operations would be phased out in existing facilities once the UPF becomes operational. It is not anticipated that operation of a UPF would impact surface water quality beyond impacts described for the No Action Alternative. EU operations would be phased out in existing facilities once a UPF becomes operational. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits.

Operations: **Upgraded Y-12 facilities**. No significant change in water requirements would result from upgrading Y-12 facilities.

5.9.5.2.2 Groundwater

Construction: **CPC, UPF, and Upgraded Y-12 facilities.** Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations: **CPC, UPF, and Upgraded Y-12 facilities.** Minimal amounts of groundwater would be used. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.9.5.3 *CCE Alternative*

5.9.5.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. A CPC and UPF, discussed in Section 5.9.5.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.5.3.2 CNPC (CPC + UPF + A/D/HE Center)

A CNPC would be made up of CPC, UPF and A/D/HE Center. A CPC and UPF are discussed in Section 5.9.5.2, and an A/D/HE Center is discussed below.

***Surface water:* A/D/HE Center construction.** Y-12 surface water withdrawals and discharges would not increase during construction of an A/D/HE Center. Approximately 2,022,000 gallons of water would be needed for construction of an A/D/HE Center; this is less than 1 percent of the average annual water use at Y-12. No impact from flooding would be expected. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with permit limits and minimized.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. Appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. Y-12 would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities.

The A/D/HE Center reference location at Y-12 is not within the 100-year or 500-year floodplains. Therefore, no impact on the floodplain is anticipated.

***Surface water:* CNPC operations.** Operation of a CNPC would require an estimated 403.5 million gallons, approximately 20.1 percent of the average annual water usage at Y-12. Operation of a CNPC would not increase water demands at Y-12. It is not anticipated that operation of a CNPC would impact surface water quality.

A CNPC would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the CNPC liquid process waste facilities for the plutonium purification process.

***Groundwater:* A/D/HE Center construction.** Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate

spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Groundwater: **CNPC operations.** Minimal amounts of groundwater would be used. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

5.9.5.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to water resources, the reduction in water use would be inconsequential, as Y-12 has plentiful water supplies. Reduced operations could continue to improve the water quality in surface waters. Of all the parameters measured in the surface water as a best management practice, mercury is the only demonstrated contaminant of concern.

5.9.6 Geology and Soils

5.9.6.1 *No Action Alternative*

ORR lies in the Valley and Ridge Physiographic Province of eastern Tennessee. The topography consists of alternating valleys and ridges that have a northeast-southwest trend, with most ORR facilities occupying the valleys. In general, the ridges consist of resistant siltstone, sandstone, and dolomite units, and the valleys, which resulted from stream erosion along fault traces, consist of less-resistant shales and shale-rich carbonates (DOE 2001a). Soil erosion from past land uses has ranged from slight to severe. Erosion potential is very high in those areas that have been eroded in the past with slopes greater than 25 percent. Erosion potential is lowest in the nearly flat-lying permeable soils that have a loamy texture. Additionally, shrink-swell potential is low to moderate and the soils are generally acceptable for standard construction techniques (DOE 2001a). Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no expected impacts to geology and soil resources beyond current and planned activities that are independent of this action.

5.9.6.2 *DCE Alternative*

5.9.6.2.1 Construction

CPC and UPF. As described in Section 3.4.1, a CPC would consist of multiple aboveground facilities. The CPC reference location at Y-12 is adjacent to the Pine Ridge and Bear Creek

parking Lots. The UPF and HEUMF are located to the east of the CPC reference location. This site is outside of, but adjacent to the existing PIDAS.

Construction of a CPC and UPF would have no impact on geological resources, and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other non-tectonic events are unlikely to affect the CPC and UPF site. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for a CPC and UPF.

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

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

The potential for additional soil contamination from project activities at the CPC and UPF sites would be minimized by current waste management procedures. These procedures are based on current Federal, state, and local regulations that regulate the hazardous material releases that could impact soil resources.

Upgraded Y-12 facilities. The current authorization basis for many of the EU buildings has been designated as Performance Category (PC)[1] 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 (BWXT 2004a).

[1] 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.

5.9.6.2.2 Operations

During operation, minor soil erosion impacts could occur, but retention basins, runoff control ditches, and cell design components would minimize impacts. The CPC, UPF, or Upgraded Y-12 Facilities would have no added impact on geology or soils during operation because of site design and engineered control measures.

5.9.6.3 *CCE Alternative*

5.9.6.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. A CPC and UPF, discussed in Section 5.9.6.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.6.3.2 CNPC (CPC + UPF + A/D/HE Center)

A CNPC would be made up of a CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.6.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** As described in Section 3.5.1.2, an A/D/HE Center would consist of multiple aboveground facilities. The A/D reference location at Y-12 is along Bear Creek Road on the western side of the Y-12 Complex, with the HE fabrication facilities located approximately 4.5 miles west. An estimated 300 acres of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the A/D/HE Center. Construction of the A/D/HE Center would have no impact on geological resources and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12 and ORR. Landslides or other non-tectonic events are unlikely to affect the construction sites. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the construction of the A/D/HE Center project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for the project.

Based on the seismic history of the area, a moderate seismic risk exists at Y-12. Past earthquake events in this area have not resulted in the liquefaction of foundation soils. All new facilities and building expansions would be designed to withstand the maximum expected earthquake-generated ground acceleration in accordance with DOE Order 420.1B, *Facility Safety*, and accompanying safety guidelines.

***Operations:* CNPC.** An estimated 518 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the CNPC. During operation, minor soil erosion impacts are expected, but retention basins, runoff control ditches, and cell design components would minimize impacts. The CNPC and other new facilities would have no added impact on geology or soils during operation because of site design and engineered control measures.

5.9.6.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to geology and soils, reduced operations would have no impact.

5.9.7 Biological Resources

5.9.7.1 *No Action Alternative*

Within the fenced, developed portion of Y-12, grassy and unvegetated areas surround the entire facility. Building and parking lots dominate the landscape at Y-12, with limited vegetation present. A wetlands survey of the Y-12 area found palustrine, scrub/shrub, and emergent wetlands. Sixty-four fish species have been collected on or adjacent to the ORR. Forty-five Federal- or state-listed threatened, endangered, and other special status species have been identified on the ORR; however none have been observed at Y-12.

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.9.7.

5.9.7.2 *DCE Alternative*

5.9.7.2.1 Terrestrial Resources

Construction. Short-term impacts to terrestrial resources could occur during construction activities. The CPC (140 acres) and UPF (35 acres) would be constructed on approximately 175 acres of land, which includes laydown areas and a temporary parking lot. There would be some disturbance to terrestrial biotic resources due to construction, construction vehicle traffic, and associated utility and parking relocation. Some dislocation of small urban type species (i.e., rodents) could be expected. Because the areas on which these facilities would be constructed are largely developed and paved, terrestrial biotic impacts would be few. The upgrade of Y-12 facilities would not involve any new land disturbance and would not impact terrestrial resources.

Because appropriate stormwater management techniques would be used to prevent pollutants from entering local waterways, aquatic resources should not be negatively impacted. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

Operations. Operational impacts to terrestrial resources from the operation of the CPC, UPF, or upgrades would not be expected. The facilities would be located in a developed area. Additionally, the Biological Monitoring and Abatement Program (BMAP) would continue and would be used to ascertain any impacts from the CPC, UPF, or upgraded facilities on local biota. However, if required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

5.9.7.2.2 Wetlands

Construction. There are wetlands along the East Fork Poplar Creek (EFPC), located to the southeast of the sites for the CPC, UPF, and existing facilities, but the stormwater management measures would help protect them from any impacts. The BMAP would continue to monitor effects in both wetlands and waterways from the construction of UPF and other Y-12 activities. Although wetlands have been identified on the Oak Ridge Reservation (ORR), no wetlands have been observed in close proximity to the project area.

Operations. There are no adverse impacts anticipated from the operation of the CPC, UPF, or upgraded facilities. Although wetlands have been identified on the ORR, no wetlands have been observed in close proximity to the project area.

5.9.7.2.3 Aquatic Resources

Construction. There are wetlands along EFPC, located to the southeast of the sites for the new and existing facilities, but the stormwater management measures would help protect them from any impacts. The BMAP would continue to monitor effects in both wetlands and waterways from the construction of the CPC and UPF. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

Operations. There are no adverse impacts anticipated from the operation of the CPC, UPF, or facilities that would be upgraded. There would be no direct untreated effluent discharges to the environment. Although wetlands have been identified on the ORR, no wetlands have been observed in close proximity to the project area. If required, mitigation measures would be used to minimize the impacts to biological resources that might occur during operation activities associated with this alternative.

5.9.7.2.4 Threatened and Endangered Species

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No Federal- and state-threatened and endangered species, or other species of special interest that may occur at Y-12, are known to be present within the proposed site location. Prior to any construction activities, NNSA would consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to discuss the potential impacts of any new facilities on any threatened and endangered species.

Construction. Approximately 175 acres would be cleared or modified during CPC and UPF construction. Because any acreage modified from construction would be in previous developed areas, impacts to threatened and endangered species would not be expected. The upgrade of Y-12 facilities would not involve any new land disturbance.

Operations. Approximately 118 acres of land would be permanently modified. The land to be used for the CPC and UPF is already developed and is accessible via existing roads. Monitoring to assure that threatened and endangered species and other special status species, such as the gray bat *(Myotis grisescens)*, which is present in other parts of the ORR but not Y-12, would continue. On January 19, 2007, the NNSA conducted consultations with the USFWS to discuss the potential impacts of the UPF on the Indiana bat and gray bat. As a result of that consultation, NNSA agreed to prepare a biological assessment (BA) to specifically address the potential impacts to the habitats of these bats. That BA is currently being prepared. The upgrade of Y-12 facilities would not involve any new land disturbance.

There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special-interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls, operations of the CPC, UPF, or upgraded facilities would minimize the potential impacts to any special-interest species population.

5.9.7.3 *CCE Alternative*

5.9.7.3.1 CNC (CPC + UPF)

By definition, there is no “CNC Alternative” at Y-12. The CPC and UPF, discussed in Section 5.9.7.2, would constitute a “CNC” if both projects were implemented at Y-12.

5.9.7.3.2 CNPC (CPC + UPF + A/D/HE Center)

The CNPC would be made up of CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.7.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** Approximately 300 acres of land would be permanently modified or lost as habitat, foraging area, or as a prey base during construction activities for the A/D/HE Center. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of the A/D/HE Center.

***Operations:* CNPC.** Approximately 518 acres of land would be permanently modified or lost as habitat, foraging areas, or as a prey base for species of special interest during operation of the CNPC. Impacts for terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be similar to those described for construction of the CPC and UPF.

5.9.7.4 *Capability-Based Alternative*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to biological resources, reduced operations would have no impact.

5.9.8 Cultural and Paleontological Resources

5.9.8.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9, and no additional impacts to cultural and paleontological resources are expected.

5.9.8.2 *DCE Alternative*

5.9.8.2.1 Cultural and Paleontological Resources

Construction. Construction of the CPC, UPF, or upgrades would take place in areas outside of the proposed historic district and there would be no appreciable impacts or changes.

Operations. Operation of the CPC, UPF, or upgraded facilities would have no impact on the cultural or paleontological resources at Y-12.

5.9.8.3 *CCE Alternative*

5.9.8.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.8.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.8.3.2 CNPC (CPC + UPF + A/D/HE Center)

The CNPC would be made up of CPC, UPF and A/D/HE Center. The CPC and UPF are discussed in Section 5.9.8.2, and the A/D/HE Center is discussed below.

***Construction:* A/D/HE Center.** Construction of the A/D/HE Center, as described in Section 3.5.1.2, would take place in areas outside of the proposed historic district and there would be no appreciable impacts or changes.

***Operations:* CNPC.** Operation of the CNPC and other new facilities would have no impact on the current cultural and paleontological resources at Y-12.

5.9.8.4 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to cultural and paleontological resources, reduced operations would have no impact.

5.9.9 Socioeconomic Resources

This section analyzes the impacts to socioeconomic resources from the No Action Alternative, DCE Alternative, and the CNPC Alternative.

5.9.9.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Y-12 has a total site employment of about 6,500 contract and federal employees. Labor force statistics for the ROI are summarized in Table 4.9.9-1. Existing socioeconomic characteristics for the ROI are described in Section 4.9.9.

5.9.9.2 *DCE Alternative*

5.9.9.2.1 Regional Economic Characteristics

Construction: **CPC.** Construction of the CPC would require 2,900 worker-years of labor. During peak construction, 850 workers would be employed at the site. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 3,570 indirect jobs would be created, for a total of 4,420 jobs.

The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $26,100 for the construction industry, direct income would increase by $22.2 million annually. This would also generate additional indirect income in supporting industries (the analysis uses the average ROI earnings of $29,986 for other indirect jobs). The total impact to the ROI income would be approximately $129 million ($22 million direct and $107 million indirect). Table 5.9.9-1 illustrates the impacts to socioeconomic resources from construction of the CPC.

Table 5.9.9-1—Socioeconomic Impacts: Construction of the CPC, UPF, or Y-12 Upgrade

Socioeconomic Factor	CPC	UPF	Upgrade
Worker Years	2,900	2,900	1,000
Peak Workers	850	900	300
Indirect Jobs Created	3,570	3,780	1,260
Total Jobs Created	4,420	4,680	1,560
ROI Average Earning (direct)	$26,100	$26,100	$26,100
ROI Average Earning (indirect)	$29,986	$29,986	$29,986
Direct Income Increase	$22,185,000	$23,490,000	$7,830,000
Indirect Income Increase	$107,050,020	$113,347,080	$37,782,360
Total Impact to the ROI	$129,235,020	$136,837,080	$45,612,36

Source: NNSA 2007, BEA 2007.

***Construction:* UPF.** The construction of the UPF would require 900 workers during the peak year of construction. A total of 4,680 additional jobs (900 direct and 3,780 indirect) would be created in the ROI during the peak year of construction. The total new jobs would represent an increase of less than 2 percent in ROI employment. Income increases would be comparable to those expected for construction of the CPC at Y-12. Overall, these changes would be temporary, lasting only the duration of the 6-year construction period, and would be similar in magnitude to the socioeconomic impacts that are currently being experienced at Y-12 with construction of the HEUMF.

***Construction:* Upgraded Y-12 facilities.** The upgrade would require approximately 300 workers, generating a total of 1,560 jobs (300 direct and 1,260 indirect) in the ROI during the peak year of construction. The total jobs would represent an increase of approximately 0.5 percent in ROI employment, while the direct jobs would increase the employment at Y-12 by approximately 4 Percent. These changes would be temporary, lasting only the duration of the 10-year construction period, and would be much less in magnitude than the socioeconomic impacts that are currently being experienced at Y-12 with construction of the HEUMF. The existing ROI labor force could likely fill all of the jobs generated by the increased employment and expenditures. Therefore, there would be no impacts to the ROI's population or housing sector. Because there would be no change in the ROI population, there would be no change to the level of community services provided in the ROI.

***Operations:* CPC.** Operation of the CPC would require 1,780 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 7,476 indirect jobs would be created, for a total of 9,256 jobs. The ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $87.6 million annually. This would also generate additional indirect income in supporting industries (based on average ROI income of $29,986). The total impact to the ROI income would be approximately $311 million ($87 million direct and $224 million indirect). Table 5.9.9-2 describes the impacts to socioeconomic resources from operation of the facilities considered in this SPEIS.

Table 5.9.9-2—Socioeconomic Impacts from Operation of Facilities

Socioeconomic Resource	CPC	UPF [a]	A/D/HE Center	CNPC
Workers	1,780	600	1,785	4,165
Indirect Jobs Created	7,476	2,520	7,497	17,493
Total Jobs Created	9,256	3,120	9,282	21,658
ROI Average Earning (direct)	$49,200	$49,200	$49,200	$49,200
ROI Average Earning (indirect)	$29,986	$29,986	$29,986	$29,986
Direct Income Increase	$87,576,000	$29,520,000	$87,822,000	$204,918,000
Indirect Income Increase	$224,175,000	$75,565,000	$224,805,000	$524,545,000
Total Impact to the ROI	$311,351,000	$105,085,000	$312,627,000	$729,463,000

Source: NNSA 2007, BEA 2007.
[a] For UPF, the numbers in the table reflect the absolute impacts of that facility. In terms of incremental impacts, once operational, the UPF would actually result in a decrease in employment of 550 direct workers, due to more efficient operations than the current EU operations at Y-12.

***Operations:* UPF.** Upon completion of construction, the operational workforce for the UPF is expected to be smaller than the existing EU workforce due to efficiencies associated with the new facility. NNSA estimates that the total number of EU workers should decrease by approximately 35 percent, to 600, which is a reduction of 350 workers. The consolidation of the Protected Area from 150 acres to 15 acres is also expected to reduce the security forces at Y-12 by 200 workers. Coupled together, the total workforce reduction should be 550 workers. Coupled together with efficiency gains in remaining plant operations, the total workforce reduction would be approximately 20-30 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.

***Operations:* Upgraded Y-12 facilities.** Upon completion of the upgrades (approximately 2015), operation of the EU facilities would not result in any significant change in Y-12 workforce requirements and the facilities would be staffed by the existing Y-12 workforce. Therefore, there would be no change from the baseline Y-12 employment and no impacts to ROI employment, income, population, housing, or community services. Upgrading the existing facilities would not allow the EU operations at Y-12 to be reduced from approximately 150 acres to 15 acres, and would not reduce security force requirements

5.9.9.2.2 Population and Housing

***Construction:* CPC.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-half of the construction jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for the peak year of construction (850 workers), a total of 1,275 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

***Construction:* UPF.** The influx of new workers would increase the ROI population and could create new housing demand. For construction (900 new workers), 1,350 new residents would be expected in the ROI, including workers and their families. This is an increase of less than

1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Construction: **Upgrade Y-12 facilities**. The influx of new workers would increase the ROI population and create new housing demand. For construction (300 new workers), 450 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Operations: **CPC.** The influx of new workers would increase the ROI population and create new housing demand. This analysis assumes that one-third of the operations jobs would be filled by incoming workers and that each worker would bring an average of two family members to the ROI. Consequently, for operations (1,780 workers), a total of 1,780 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-2 presents the impacts to socioeconomic resources from operation of the CPC.

Operations: **UPF.** The total workforce reduction should be 550 workers, which is approximately 8 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. As such, UPF should have a minimal impact on the ROI's population or housing sector.

5.9.9.2.3 Community Services

Construction and operations: **CPC.** There would be no impact to ROI community services because increases in the ROI population would be less than 1 percent.

Construction and operations: **UPF.** There would be no impact to ROI community services because increases in the ROI population during construction would be less than 1 percent. Once operational, there would be no impact to ROI community services because any jobs lost from more efficient operations in the UPF would likely be met through normal attrition.

5.9.9.3 *CCE Alternative*

5.9.9.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.9.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.9.3.2 CNPC (CPC + UPF + A/D/HE Center)

Regional economic characteristics: **A/D/HE Center construction.** Construction of the A/D/HE Center would require 6,850 worker-years of labor. During peak construction, 3,820 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that

16,044 indirect jobs would be created, for a total of 19,864 jobs. This represents approximately 10 percent of the total ROI labor force. Income within the ROI would increase as a result of the new jobs created. Based on the ROI average earnings of $44,900 for the construction industry, direct income would increase by $171.5 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $700.5 million ($171.5 million direct and $529 million indirect). Table 5.9.9-3 describes the impacts to socioeconomic resources from construction of the AD/HE Center.

Table 5.9.9-3—Socioeconomic Impacts from Construction of A/D/HE Center

Socioeconomic Factor	AD/HE
Worker Years	6,850
Peak Workers	3,820
Indirect Jobs Created	16,044
Total Jobs Created	19,864
ROI Average Earning (direct)	$44,900
Direct Income Increase	$171,518,000
Indirect Income Increase	$529,019,000
Total Impact to the ROI	$700,537,000

Source: NNSA 2007, BEA 2007.

***Regional economic characteristics:* CNPC operations.** Operation of the CNPC would require 4,165 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that 17,493 indirect jobs would be created, for a total of 21,658 jobs. The ROI income would increase as a result of the new jobs created. Based on the ROI average earnings of $49,200 for the government services industry, direct income would increase by $204.9 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $729 million ($205 million direct and $524 million indirect).

***Population and housing:* A/D/HE Center construction.** The influx of new workers would increase the ROI population and create new housing demand. For the peak year of construction (3,820 workers), a total of 5,730 new residents would be expected in the ROI. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-3 presents the impacts to socioeconomic resources from construction of the A/D/HE Center.

***Population and housing:* CNPC operations.** The influx of new workers would increase the ROI population and create new housing demand. For operations (4,165 workers), a total of 4,500 new residents would be expected in the ROI. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population. Table 5.9.9-2 presents the impacts to socioeconomic resources from operation of the facilities that would comprise a CNPC.

***Community services:* A/D/HE Center construction.** The increase in population would not increase demand on local community services. Comparable levels of service could be maintained without increased staffing. Table 5.9.9-3 describes the impacts to socioeconomic resources from construction of the A/D/HE Center.

***Community services:* CNPC operations.** There would be no significant impact to the ROI community services from a 5 percent increase over the current population.

5.9.9.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to socioeconomics, reduced operations would reduce the workforce from 6,500 to 3,900. This workforce, which currently represents approximately 3.1 percent of the ROI employment, would fall to 1.9 percent. DOE has a significant impact on the economies both of the ROI and of Tennessee. The loss of 2,600 direct jobs could result in the loss of up to 10,920 indirect jobs. The total job loss in the ROI (13,520 jobs) would represent 6.5 percent of the total ROI employment. The No Net Production/Capability-Based Alternative would reduce the workforce from 6,500 to 3,400.

5.9.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.9.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Impacts for all of the alternatives do not differ significantly, as such; the analysis in this section discusses potential environmental justice impacts for all impacts.

In 2000, minority populations comprised 7.4 percent of the ROI population surrounding Y-12. In 2000, minorities comprised 30.9 percent of the population nationally and 20.8 percent of the population in Tennessee. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 13.4 percent, which is higher than the 2000 national average of 12.4 percent, but slightly lower than the statewide figure of 13.5 percent.

Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation activities at Y-12 are expected under any of the alternatives; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.9.11, Human Health and Safety, there are no large adverse impacts to any populations.

5.9.11 Health and Safety

5.9.11.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.9. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that total dose to the MEI for continued Y-12 activities would be about 0.4 mrem per year. Existing health and safety at Y-12 is discussed in Section 4.9.11.

5.9.11.2 *DCE Alternative*

***Construction:* CPC, UPF, and Upgraded Y-12 facilities.** No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the CPC and UPF reference sites are "Greenfield" sites, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA. Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS makes associated calculated fatality rates statistically invalid.

The potential risk of occupational injuries and fatalities to workers constructing the CPC, UPF, or upgrading Y-12 facilities would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown below in Table 5.9.11-1.

Table 5.9.11-1—Injury, Illness, and Fatality Estimates for Construction of the CPC, UPF, and A/D/HE Center–Y-12

Injury, Illness, and Fatality Categories	Projects Under Consideration			
	CPC	UPF	Upgrade Y-12	A/D/HE Center
Peak Annual Employment	850	900	300	3,820
Total Recordable Cases	81	85	28	329
Total Lost Workday Cases	38	41	14	159
Total Fatalities	0.2	0.2	0.1	0.8
Project Duration				
Total Recordable Cases	276	292	97	1,128
Total Lost Workday Cases	143	141	47	541
Total Fatalities	0.7	0.7	0.2	2.6

Source: NNSA 2007, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the CPC. Construction workers would be protected from

overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of worker protection programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

Operations. The release of radioactive materials and the potential level of radiation doses to workers and the public are regulated by DOE for its facilities. Environmental radiation protection is currently regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine DOE operations of 100 mrem through all exposure pathways. The Order requires that no member of the public receives an EDE in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from ingestion of drinking water. In addition, the dose requirements in the *Radionuclide National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61, Subpart H) limit exposure to the MEI of the public from all air emissions to 10 mrem per year.

NNSA expects minimal public health impacts from the radiological consequences of CPC and UPF operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.9.11-2—Annual Radiological Impacts on the Public from CPC, UPF, Y-12 Upgrade, and A/D/HE Center Operations–Y-12

Receptor	Projects Under Consideration		
	CPC	UPF or Y-12 Upgrade	A/D/HE Center
Population within 50 miles			
Collective dose (person-rem)	3.2×10^{-3}	1.2	9.2×10^{-4}
Percent of natural background radiation[a]	6.2×10^{-7}	2.3×10^{-4}	1.8×10^{-7}
LCFs[b]	2×10^{-6}	7×10^{-4}	6×10^{-7}
Offsite MEI			
Dose (mrem)	4.5×10^{-4}	0.2	1.3×10^{-4}
Percent of regulatory dose limit	4.5×10^{3}	2	1.3×10^{-3}
Percent of natural background radiation[a]	1.3×10^{-4}	0.06	3.9×10^{-5}
Cancer fatality risk[b]	3×10^{-10}	1×10^{-7}	8×10^{-10}

Source: Tetra Tech 2008.

[a] The average annual dose from background radiation at Y-12 is 335 mrem; the 1,548,207 people living within 50 miles of Y-12 in the year 2030 would receive an annual dose of 518,650 person-rem from the background radiation.

[b] Based on a cancer risk estimate of 0.0006 Latent Cancer Fatalities per rem or person-rem.

[c] The offsite MEI is assumed to reside at the site boundary, 1.3 miles from facilities. An actual residence may not currently be present at this location..

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from CPC operations would be approximately 3×10^{-10} per year (i.e., about 3 chances in 100 billion years of operation) for the CPC and approximately 1×10^{-7} per year (i.e., about 1 chance in 10 million years of operation) for the UPF.

Occupational radiation protection at DOE facilities is regulated under 10 CFR Part 835, *Occupational Radiation Protection*, which limits the occupational dose for an individual worker at 5,000 mrem per year. DOE/NNSA has set administrative exposure guidelines at a fraction of this exposure limit to help enforce the goal to manage and control worker exposure to radiation and radioactive material ALARA. The worker radiation dose projected in this SPEIS is the total effective dose equivalent incurred by workers as a result of routine operations. This dose is the sum of the external whole body dose and internal dose, as required by 10 CFR Part 835.

Estimates of annual radiological doses to workers involved with CPC operations are independent of geographical location. These dose estimates are solely a function of:

- The number of radiological workers, as determined in the development of the CPC staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each work group based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.
- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.
- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct “hands-in-gloves” labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem per year) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers are provided in Table 5.9.11-3. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR Part 835) and the DOE-recommended control level of 1,000 mrem (10 CFR Part 835). Operations in the CPC would result in an average individual worker dose of approximately 290 mrem annually. The total dose to workers associated with the CPC operations would be approximately 333 person-rem. Statistically, a total dose of 333 person-rem would result in 0.2 annual LCFs to the CPC workforce. The projected number of fatal cancers in the workforce from CPC annual operations would be 0.2 (or 2 chances in 10 that the worker population would experience a fatal cancer per year of operations).

Table 5.9.11-3—Annual Radiological Impacts on CPC, UPF, and A/D/HE Center Workers at Y-12 from Operations

	CPC	UPF or Y-12 Upgrade	A/D/HE Center
Number of Radiological Workers	1,150	600[d]	400
Individual Workers[a]			
Average individual dose, mrem/yr[b]	290	21	103
Average worker cancer fatality risk[c]	2×10^{-4}	1.3×10^{-5}	6.2×10^{-5}
Worker Population			
Collective dose (person-rem)	333	12.6	41.2
Cancer fatality risk[c]	0.20	0.008	0.025

Source: Tetra Tech 2008.
[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR Part 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR Part 835. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.
[b] Less than one third of all radiological workers would receive doses greater than, but no more than 90 percent above, the average worker dose.
[c] Based on a cancer risk estimator of 0.0006 LCFs per rem or person-rem.
[d] Total workforce for UPF is 600., of which 315 are considered "radiatiological workers". For purposes of assessing UPF worker impacts, it is assumed all 600 workers receive radiation dose.

Operations in the UPF or upgraded facilities would result in a total dose to workers of approximately 12.6 person-rem. Statistically, a total dose of 12.6 person-rem would result in 0.008 annual LCFs to the Y-12 workforce.

During normal (accident-free) operations, total facility staffing at the CPC and UPF (or upgraded facilities) would be approximately 1,780 and 600, respectively. The potential risk of occupational injuries and fatalities to workers operating the CPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are presented below in Table 5.9.11-4.

Table 5.9.11-4—Injury, Illness, and Fatality Annual Estimates for Normal Operations of the CPC, UPF, and CNPC–Y-12

Injury, Illness, and Fatality Categories	Projects Under Consideration		
	CPC	UPF or Y-12 Upgrade	CNPC
Total Workers	1,780	600	4,500
Total Recordable Cases	77	26	195
Total Lost Workday Cases	40	14	101
Total Fatalities	0.07	0.02	0.18

Source: NNSA 2007, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of the CPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.9.11.3 *CCE Alternative*

5.9.11.3.1 CNC (CPC + UPF)

By definition, there is no "CNC Alternative" at Y-12. The CPC and UPF, discussed in Section 5.9.11.2, would constitute a "CNC" if both projects were implemented at Y-12.

5.9.11.3.2 CNPC (CPC + UPF + A/D/HE Center)

Health and safety impacts from the construction and operation of the CNPC would include the CPC and UPF impacts discussed in Section 5.9.11.2 as well as the impacts discussed below.

Construction. No radiological risks would be incurred by members of the public from the A/D/HE Center construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, because the A/D/HE Center reference site is a "Greenfield" site, the likelihood of exposure from contamination is considered to be low during construction. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable. The potential risk of occupational injuries and fatalities to workers constructing the A/D/HE Center would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities. These values are shown in Table 5.9.11-1.

Operations. DOE expects minimal public health impacts from the radiological consequences of A/D/HE Center operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table. As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem per year set by both EPA (40 CFR Part 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity.

The estimates of annual radiological doses to workers are provided in Table 5.9.11-3. As shown in the table, approximately 400 radiological workers would be required to conduct A/D/HE Center operations. Operations in the A/D/HE Center would result in an average individual worker dose of approximately 103 mrem annually. The total annual dose to workers associated with the CNPC operations would be approximately 41.2 person-rem. Statistically, an annual dose of 41.2 person-rem would result in 0.025 LCFs to the A/D/HE Center workforce.

The potential risk of occupational injuries and fatalities to workers operating the CNPC would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for facility operations. These values are shown in Table 5.9.11-4.

No chemical-related health impacts are associated with normal (accident-free) operations of the CNPC. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness.

5.9.11.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to health and safety, reduced operations would reduce the number of workers involved in radiological operations from approximately 839 to 500. This would reduce the total worker dose to 24.3 person-rem. The No Net Production/Capability-Based Alternative would reduce the number of workers involved in radiological operations from approximately 839 to 450. This would reduce the total worker dose to 21.6 person-rem. Statistically, the number of LCFs would be less than 0.015 for either of the Capability-Based Alternatives. This means that 1 LCF would be expected to workers every 68 years of operations.

5.9.12 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the CPC, UPF, and the A/D/HE Center at Y-12. Additional details supporting the information presented here are provided in Appendix C.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictates the accident's progression and the extent of materials released. Initiating events fall into three categories:

- ***Internal initiators.*** Normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.
- ***External initiators.*** Independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.
- ***Natural phenomena initiators.*** Natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, NNSA predicted the dispersion of released hazardous materials and their effects. However, prediction of potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency preparedness. Each NNSA site has established an emergency management program to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

Radiological impacts. NNSA estimated radiological impacts to three receptors: 1) the MEI at the Y-12 boundary; 2) the offsite population within 50 miles of Y-12; and 3) a non-involved worker 3,281 feet from the accident location. NNSA did not evaluate total dose from accidents to the involved workforce because this would depend upon the specific location of the facilities on each site, which is not an issue that will be decided as a result of this SPEIS. In any tiered, project-specific EIS, accident impacts to the non-involved workforce would be analyzed to evaluate alternative locations on the selected site.

5.9.12.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities at Y-12 would continue as required to support the missions described in Section 3.2.3. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in existing documentation included by reference (DOE 2001a). Section 4.9.11.1 includes an analysis of accidents associated with existing enriched uranium operations, which would be applicable to the No Action Alternative.

5.9.12.2 *Consolidated Plutonium Center*

5.9.12.2.1 Radiological Accidents

Table 5.9.12–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of a CPC) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to

0.0012. Table 5.9.12-2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur.

The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the CPC. Thus, in the event that any other accident that was not evaluated in this SPEIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.9.12-1—CPC Radiological Accident Frequency and Consequences–Y-12

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Beyond Evaluation Basis Earthquake and Fire	1.0×10^{-5}	219	0.263	295,000	177	857	1
Fire in a single building	1.0×10^{-4}	173	0.208	152,000	91.2	4,760	1
Explosion in a feed casting furnace	1.0×10^{-2}	203	0.244	178,000	107	5,580	1
Nuclear Criticality	1.0×10^{-2}	0.000301	1.81×10^{-7}	0.117	7.02×10^{-5}	0.00544	3.26×10^{-6}
Fire-induced release in the CRT Storage Room	1.0×10^{-2}	13.5	0.0081	11,900	7.14	372	0.446
Radioactive material spill	1×10^{-2}	0.406	0.000244	357	0.214	11.2	0.00672

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-2—Annual Cancer Risks for CPC–Y-12

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Beyond Evaluation Basis Earthquake with Fire	2.63×10^{-6}	1.77×10^{-3}	1×10^{-5}
Fire in a Single Building	2.08×10^{-5}	9.12×10^{-3}	1×10^{-4}
Explosion in a Feed Casting Furnace	2.44×10^{-3}	1.07	1×10^{-2}
Nuclear Criticality	1.81×10^{-9}	7.02×10^{-7}	3.26×10^{-8}
Fire-induced Release in the CRT Storage Room	8.1×10^{-5}	7.14×10^{-2}	4.46×10^{-3}
Radioactive Material Spill	2.44×10^{-6}	2.14×10^{-3}	6.72×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The results of the accident analysis indicate potential consequences that exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for a CPC. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in a CPC design to ensure compliance with exposure guidelines if NNSA were to decide to build a CPC at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect radioactive materials from release and to contain any material that might be released.[2] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into a CPC design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-1) is the beyond evaluation basis earthquake and fire. Approximately 177 LCFs in the offsite population could result from this accident in the absence of mitigation. An offsite MEI would receive a dose of 219 rem. Statistically, the MEI would have a 0.1 chance of developing a LCF, or about 1 in 10. This accident has a probability of occurring once every 100,000 years.

When probabilities are taken into account (see Table 5.9.12-2), the accident with the highest risk to the MEI is the explosion in a feed casting furnace. For this accident, the LCF risk to the MEI would be $2x10^{-3}$, or approximately 1 in 500. For the population, the LCF risk would be 1.07, meaning that approximately 1 LCF would statistically occur once every year in the population.

5.9.12.2.2 Hazardous Chemicals Impacts

The adverse effects of exposure vary greatly among chemicals. They range from physical discomfort and skin irritation to respiratory tract tissue damage and, at the extreme, death. For this reason, allowable exposure levels differ from substance to substance. For this analysis, ERPG values are used to develop hazard indices for chemical exposures. ERPG definitions are provided below.

ERPG DEFINITIONS

ERPG-1 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.*

ERPG-2 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.*

ERPG-3 *is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.*

[2] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the CPC. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Table 5.9.12-3 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released.

The impacts of chemical releases are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Both Gaussian Plume and ALOHA methodologies were used to evaluate the potential consequences associated with a release of each chemical in an accident situation. Table 5.9.12-3 shows the consequences of the dominant loss of containment accident scenarios.

The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

Table 5.9.12-3—CPC Chemical Accident Frequency and Consequences–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}
Hydrofluoric acid	550	20	0.35	2.0	0.016	10^{-4}
Formic acid	1,500	10	0.08	0.07	0	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.2.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.3 *Uranium Processing Facility or Upgrade of Y-12 Facilities*

5.9.12.3.1 Radiological Accidents

Table 5.9.12-4 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the UPF or upgraded facilities) and a hypothetical non-involved worker, as well as the accident risks (Table 5.9.12-5), obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the UPF or upgraded facilities.

Table 5.9.12-4—UPF or Upgraded Facilities, Radiological Accident Frequency and Consequences–Y-12

		Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Frequency (per year)**	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Major fire	$10^{-4} – 10^{-6}$	0.592	0.000355	520	0.312	16.3	0.00978
Explosion	$10^{-4} – 10^{-6}$	0.0577	0.0000346	51.2	0.0307	1.18	0.000708
Fire in UPF Warehouse	$10^{-4} – 10^{-6}$	0.689	0.000413	608	0.365	17.4	0.0104
Design-basis fires for HEU Storage	$10^{-2} – 10^{-4}$	0.0734	0.000044	66.1	0.0397	1.08	0.000648
Aircraft crash	$10^{-4} – 10^{-6}$	0.259	0.000155	665	0.399	0.388	0.000233

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-5—Annual Cancer Risks for UPF or Upgraded Facilities–Y-12

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Major fire	3.55×10^{-8}	3.12×10^{-5}	9.78×10^{-7}
Explosion	3.46×10^{-9}	3.07×10^{-6}	7.08×10^{-8}
Fire in UPF Warehouse	4.13×10^{-8}	3.65×10^{-5}	1.04×10^{-6}
Design-basis fires for HEU Storage	4.4×10^{-7}	3.97×10^{-4}	6.48×10^{-6}
Aircraft crash	1.55×10^{-8}	3.99×10^{-5}	2.33×10^{-8}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-4) 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 offsite 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 (see Table 5.9.12-5), 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 $5x10^{-7}$, or about 1 in 2 million. For the population, the LCF risk would be $4x10^{-4}$, or about 1 in 2,500.

The UPF Alternative would decrease the overall Y-12 facility accident risks presented above. This is 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. However, detailed design descriptions for the UPF are not available. Without these detailed descriptions, this reduction in accident risks cannot be quantified. New facilities such as the UPF would be constructed to current building design standards and would be designed and built to withstand higher seismic accelerations and thus would be more resistant to earthquake damage. These new facilities would experience damage from earthquakes and other external initiators less frequently. 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 bounding for the UPF; but not overly bounding given that the risks presented above are small.

5.9.12.3.2 Hazardous Chemicals Impacts

The UPF or upgraded facilities would store and use a variety of hazardous chemicals. The quantities of chemicals vary, ranging from small amounts in individual laboratories to bulk amounts in processes and specially designed storage areas. In addition, the effects of chemical exposure on personnel would depend upon its characteristics and could range from minor to fatal. Minor accidents within a laboratory room, such as a spill, could result in injury to workers in the immediate vicinity. A catastrophic accident such as a large uncontrolled fire, explosion, earthquake, or aircraft crash could have the potential for more serious impacts to workers and the public. NNSA estimated the impacts of the potential release of the most hazardous chemical used at the CUC. Chemical accident consequences were obtained from review of the Y-12 chemical accident scenarios reported in previous NEPA documents. Appendix C provides a listing of the Y-12 documents reviewed in performing this comparison. The chemical analyzed for release was nitric acid.

The impacts of a nitric acid release are measured in terms of ERPG-2 protective concentration limits given in ppm. The distances at which the limit is reached are also provided for the ERPG-2 limit. The concentration of the chemical at 1,000 meters (3,281 feet) from the accident is shown for comparison with the concentration limit for ERPG-2. The distance to the site boundary and the concentration at the site boundary are also shown for comparison with the ERPG-2 concentration limits and for determining if the limits are exceeded offsite. Conservative

modeling of chemical release over the period of 1-hour was based on a spill and subsequent pool with evaporation resulting calculated down-wind concentrations. Table 5.9.12-6 shows the consequences of the dominant loss of containment accident scenario.

Table 5.9.12-6—Chemical Accident Frequency and Consequences of UPF or Upgraded Facilities–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Nitric acid	10,500	6	0.28	0.5	0.01	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.3.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.4 *Assembly/Disassembly/High Explosives Center*

5.9.12.4.1 Radiological Accidents at Y-12

The accident scenarios and representative source terms for the A/D/HE Center are shown below:

Representative Source Terms		
Scenario	**Pu Release (Ci)**	**Tritium Release (Ci)**
Scenario 1: Explosive Driven Plutonium and Tritium Dispersal from an Internal Event	400	3.0×10^{5}
Scenario 2: Tritium Reservoir Failure from an Internal Event	0	2.0×10^{5}
Scenario 3: Pit Breach from an Internal Event	1.8×10^{-5}	0
Scenario 4: Multiple Tritium Reservoir Failure from an External Event or Natural Phenomena	0	4.0×10^{7}
Scenario 5: Fire Driven Dispersal Involving Stored Pits from an External Event or Natural Phenomena	50	0
Scenario 6: Plutonium and Tritium Dispersal from an External Event or Natural Phenomena	1.2×10^{-2}	3.0×10^{5}

Source: Tetra Tech 2008.

Tables 5.9.12-7 and 5.9.12-8 shows the consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 50 miles of the A/D/HE Center) and a hypothetical non-involved worker. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The LCF values are calculated using a dose-to-LCF

conversion factor of 0.0006 LCFs per rem (MEI and worker) or person-rem (population). If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.0012. The accidents listed in this table was selected from a wide spectrum of accidents described in the *Topical Repor—Supporting Documentation for the Accident Impacts Presented in the Complex Transformation Supplemental Programmatic Environmental Impact Statement* (Tetra Tech 2008). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this SPEIS bound the impacts of all reasonably foreseeable accidents that could occur at the A/D/HE Center.

Table 5.9.12-7—A/D/HE Center Radiological Accident Consequences–Y-12

	Maximally Exposed Individual[a]		Offsite Population[b]		Noninvolved Worker[c]	
Accident	**Dose (rem)**	**Latent Cancer Fatalities**	**Dose (Person-rem)**	**Latent Cancer Fatalities**	**Dose (rem)**	**Latent Cancer Fatalities**
Scenario 1	54.7	0.0656	48,100	28.9	1,500	1
Scenario 2	0.0392	2.35×10^{-5}	34.4	0.0206	1.08	0.000648
Scenario 3	3.28×10^{-6}	1.97×10^{-9}	0.00288	1.73×10^{-6}	9.02×10^{-5}	5.41×10^{-8}
Scenario 4	2.3	0.00138	5,390	3.23	4.11	0.00247
Scenario 5	2.41	0.00145	5,630	3.38	4.3	0.00258
Scenario 6	0.0179	1.07×10^{-5}	41.8	0.0251	0.0319	1.91×10^{-5}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

Table 5.9.12-8—Annual Cancer Risks for A/D/HE Center Accidents–Y-12

Accident	Maximally Exposed Individual[a]	Offsite Population[b]	Noninvolved Worker[c]
Scenario 1	6.56×10^{-6}	2.89×10^{-3}	1×10^{-4}
Scenario 2	2.35×10^{-7}	2.06×10^{-4}	6.48×10^{-6}
Scenario 3	1.97×10^{-11}	1.73×10^{-8}	5.41×10^{-10}
Scenario 4	1.38×10^{-9}	3.23×10^{-6}	2.47×10^{-9}
Scenario 5	1.45×10^{-7}	3.38×10^{-4}	2.58×10^{-7}
Scenario 6	1.07×10^{-7}	2.51×10^{-4}	1.91×10^{-7}

Source: Tetra Tech 2008.
[a] At site boundary, approximately 1.3 miles from release.
[b] Based on a projected future population (year 2030) of approximately 1,548,207 persons residing within 50 miles of Y-12 location.
[c] At 1000 meters from release.

The results of the accident analysis indicate potential consequences that exceed the NNSA exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases are based on unmitigated releases of radioactive material in order to identify any differences among candidate sites for an A/D/HE Center. Additional NEPA analyses would be conducted to identify specific mitigating features that would be incorporated in an A/D/HE Center design to ensure compliance with exposure guidelines if NNSA were to decide to build an A/D/HE Center at one of the candidate sites. These could include procedural and equipment safety features, HEPA filtration systems, and other design features to protect

radioactive materials from release and to contain any material that might be released.[3] Upon completion of these additional analyses, NNSA would prepare safety analysis documentation such as a safety analysis report to further ensure that exposure guidelines would not be exceeded. The results of the safety analysis report are incorporated into facility and equipment design and establish procedures to ensure public and worker safety. Once specific mitigation measures were incorporated into an A/D/HE Center design and operating procedures, it is unlikely that the potential consequences would exceed the guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest potential consequences to the offsite population (see Table 5.9.12-8) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 28.9 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 55 rem. Statistically, this MEI would have a 0.03 chance of developing a LCF, or about 1 in 30. The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.9.12-9), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be $7x10^{-6}$, or about 1 in 150,000. For the population, the LCF risk would be $3x10^{-3}$, or about 1 in 350.

5.9.12.4.2 Hazardous Chemicals Impacts

NNSA estimated the impacts of the potential release of the most hazardous chemicals used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Additional information on the evaporation and dispersion of each chemical is provided in Appendix C. Table 5.9.12–9 provides information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. The distance to the nearest site boundary is 5.4 miles. None of the chemicals released in the accident would exceed ERPG-2 limits offsite.

[3] For example, installing safety basis HEPA filters could reduce releases by orders of magnitude.

Table 5.9.12-9—A/D/HE Center Chemical Accident Frequency and Consequences–Y-12

Chemical Released	Quantity Released (kg)	ERPG-2		Concentration		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary (ppm) [a]	
Chlorine	408.23	3	2.3	16	4.5	10^{-4}

Source: Tetra Tech 2008.
[a] Site boundary is at a distance of approximately 1.3 miles.

5.9.12.4.3 Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.9.12.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to accidents, potential consequences would be virtually unaffected, as consequences are related to the *types* of operations which are conducted, including the material-at-risk, which would not change. The probability that a particular accident would occur would also be relatively unchanged, as most probabilities are small (less than once every 100-1,000,000 years), which means that accident probabilities are largely a function of the operation being conducted, rather than the number of times the operation is conducted. Nonetheless, it is acknowledged that performing an operation less frequently would have a linear reduction in the overall probability that an accident would occur.

5.9.13 Transportation

5.9.13.1 *No Action Alternative*

Under the No Action Alternative, there would be no change in the transportation activities at Y-12, and impacts would remain unchanged from the baseline presented in Section 4.9.12.

5.9.13.2 *DCE Alternative*

5.9.13.2.1 Construction

CPC, UPF, and Upgrade to Y-12 facilities. Construction of the CPC, UPF, or upgrades would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on

local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12 and would be temporary.

5.9.13.2.2 Operations

Radiological transportation for the CPC, UPF, or upgraded facilities would include transport of pits from Pantex to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. Section 5.10 presents the impacts of radiological transportation.

The addition of new employees for the CPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.9.12.

5.9.13.3 *CCE Alternative*

5.9.13.3.1 CNC (CPC + UPF)

By definition, the DCE Alternatives at Y-12 would amount to a CNC.

5.9.13.3.2 CNPC (CPC + UPF + A/D/HE Center)

Construction: **A/D/HE Center.** Construction of the A/D/HE Center would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12 and would be temporary.

Operations: **CNPC.** If the A/D/HE Center were located at Y-12 as part of a CNPC, the annual radiological transportation impacts associated with the CPC and UPF would not occur, with the exception of TRU waste transportation for the CPC. There would be a one-time transport of SNM from Pantex to the CNPC, as described in Section 5.10. The addition of new employees for the CNPC would represent an increase in ROI employment of less than 1 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.9.12.

5.9.13.4 *Capability-Based Alternatives*

Under the Capability-Based Alternative, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to local transportation, a reduction in total ROI workers by 13,520, which would represent 6.5 percent of the total ROI employment, could cause a short-term decrease in road congestion, although it is acknowledged that these employees could seek and find other employment in the ROI. Regarding the radiological transportation of secondaries and cases between Y-12 and Pantex, reduced operations would reduce these transportation requirements by approximately 25 percent. As

discussed in Section 5.10, the annual transportation impacts for secondaries and cases, for both incident-free transportation and potential accidents, would be small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts).

5.9.14 Waste Management

5.9.14.1 *No Action Alternative*

Under the No Action Alternative, current and planned activities a Y-12 would continue as required to support the missions described in Section 3.2.9. Y-12 presently manages LLW, hazardous waste, mixed LLW, high-level waste, and sanitary waste. here would be no additional impacts to waste management resources beyond current and planned activities that are independent of this action. Table 4.9.13-1, in Chapter 4, shows annual waste generation volumes from Y-12 operations for 2003. For convenience, this table is shown again, below, as Table 5.9.14-1 to facilitate comparisons of the additional alternatives presented.

Table 5.9.14-1—Waste Generation Totals by Waste Type for Routine Operations–Y-12

Waste Type	Waste Volume (FY-2003)
Low-Level Waste (Liquid) (yd^3)	17.42
Low-Level Waste (Solid) (yd^3)	7,796.69
Mixed Low Level Waste (Liquid) (yd^3)	17.87
Mixed Low Level Waste (Solid) (yd^3)	21.12
RCRA (hazardous)Waste (tons)	14.37
TSCA Waste (tons)	14.84
Mixed TSCA (tons)	32.04
Non-hazardous Sanitary Waste (tons)	7923.71

Source: NNSA 2007.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Y-12 does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed-LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective,

exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW waste where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted, where necessary, to address changes in the options available to DOE/NNSA for disposition of these specific waste streams.

5.9.14.2 *DCE Alternative*

5.9.14.2.1 CPC Construction Impacts

Construction of a CPC would generate liquid hazardous waste and both liquid and solid non-hazardous waste. Table 5.9.14–2 summarizes the total volume of waste expected to be generated over the 6 years of construction activity for the proposed CPC.

Table 5.9.14-2—Total Waste Generation from CPC Construction–Y-12

Waste Type	CPC
TRU Waste, solid (yd^3)	0
LLW (yd^3)	0
Hazardous Waste (tons)	7.0
Non-hazardous Solid (yd^3)	10,900
Non-hazardous Liquid (gal)	56,000

Source: NNSA 2007.

Hazardous waste generated by the construction of the CPC would amount to less than 30 percent of the normal annual hazardous waste generation at Y-12. Y-12 collects, packages, and ships hazardous waste, off-site, to either another DOE site or a commercial facility for treatment and disposal. The hazardous waste generated from construction of the CPC at Y-12 would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The total amount of solid non-hazardous waste generated over the entire construction period for

the CPC at Y-12 is a fraction of the amount of non-hazardous waste Y-12 currently generates in a year. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

Non-hazardous liquid wastewater at Y-12 is collected, commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. At 56,000 cubic yards, the total amount generated throughout the entire construction process amounts to a very small percentage of the amount of wastewater treated and discharged by Y-12 in a year of routine operation. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the construction of the CPC at Y-12.

A retention pond would be constructed to manage stormwater runoff from the entire CPC site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate a CPC site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once CPC construction was completed.

Waste generation impacts associated with operation of s CPC at Y-12 are discussed in Section 5.9.14.2.3, together with the operation of a UPF.

5.9.14.2.2 UPF Construction Impacts

Construction of an UPF at Y-12 would generate small levels of LLW, Low Level Mixed Waste, hazardous waste, and non-hazardous solid waste. Table 5.9.14-3 shows the expected wastes to be generated from the construction of the UPF at Y-12.

Table 5.9.14-3—Waste Generation from Construction of the UPF

Waste Category	Volume
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	70
Low Level Mixed Solid Waste (yd^3)	4
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	4
Non-Hazardous Solid Waste (tons)	800

Source: NNSA 2007.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Construction of the UPF is expected to generate 70 cubic feet of solid LLW over the entire

construction period. This amounts to less than one percent of annual amount of solid LLW generated by routine operations at Y-12. There is more than sufficient capacity to collect this waste ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12. Once packaged, this waste will either be sent to NTS or a commercial facility for treatment and disposal.

Mixed LLW waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW waste. The 4 cubic yards of mixed LLW waste expected to be generated throughout the entire construction process of the UPF amounts to about ten percent of the annual amount of mixed LLW waste generated by routine operations at Y-12. There is more than sufficient capacity to collect this waste transport it to the West End Treatment Facility where it would be treated, packaged for storage and ultimate disposal along with quantities of this type of waste generated on a routine basis at Y-12.

At four tons, the amount of hazardous waste expected to be generated by the construction of the UPF at Y-12 is comparable to the normal annual generation of 14 tons. Y-12 collects, packages, and ships hazardous waste off-site, either to another DOE site or to a commercial facility for treatment and disposal. The hazardous waste generated from construction of the UPF, at Y-12, would be collected and would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in a construction/demolition landfill. At 800 tons, the total amount of solid non-hazardous waste generated over the entire construction period for the UPF at Y-12 is a little more than ten percent of the amount of non-hazardous waste Y-12 currently generates in a year. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the UPF at Y-12.

A retention pond would be constructed to manage stormwater runoff from the entire UPF site including the construction laydown area and concrete batch plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 1 acre per 40 acres of developed land.

A concrete batch plant would operate at the UPF site during the construction phase. The concrete batch plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 10 acres adjacent to the PIDAS. The concrete batch plant would be disassembled and the area would be restored once UPF construction is completed.

The upgrade of existing facilities would generate minimal wastes compared to existing waste quantities shown on Table 5.9.14-1.

5.9.14.2.3 CPC and UPF Operation Impacts

Normal operation of the CPC and UPF, at Y-12, would generate LLW, hazardous waste, and sanitary waste. Table 5.9.14-4 summarizes the estimated waste generation rates for the operation of the CPC and UPF, at Y-12.

Table 5.9.14-4—Waste Generation from Operations of CPC and UPF–Y-12

	CPC	UPF	CNC
TRU Solid Waste (including Mixed TRU)(yd^3)	950	0	950
Mixed TRU Solid Waste (included in TRU, above) (yd^3)	340	0	340
Low Level Solid Waste (yd^3)	3,900	7,800	11,700
Low Level Liquid Waste (gal)	0	3,515	3,515
Mixed Low Level Solid Waste (yd^3)	2.5	70	72.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	3,616.4
Hazardous waste solid (tons)	4.0	15	19
Hazardous waste liquid (yd^3)	0.6	0	0.6
Non-Hazardous Solid Waste (tons)	8,100	7,500	15,600
Non-Hazardous Liquid Waste (gal)	75,000	50,000	125,000

Source: NNSA 2007.

Y-12 does not now generate or manage any TRU waste. Quantities of TRU waste generated through the operation of the CPC (the UPF does not generate TRU waste) would be collected at the CPC, packaged in accordance with the WIPP WAC, placed in TRUPACT containers and transported to the WIPP for disposal. If needed, this waste could be collected, transported to the West End Treatment Facility for any treatment required to meet the WIPP WAC, and then packaged, placed in TRUPACTs and transported to the WIPP for disposal.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Operation of the DCE Alternative (CPC and UPF) would generate just a little under 11,700 cubic yards of solid LLW. Although this amount is more than double the amount of LLW routinely generated at Y-12, there is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed, the liquid waste solidified, and packaged with the LLW generated by normal operational activities at Y-12. It would then be shipped off-site, either to the NTS or a commercial facility, for treatment and disposal.

Mixed LLW waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW. The amount of mixed LLW expected to be generated by the operation of the DCE Alternative (CPC and UPF) represents an 86 percent increase. A CPC, however, would incorporate a waste handling module sufficient to accumulate, treat and package this LL-mixed waste and either dispose of this waste onsite, if acceptable to the regulators, or have it shipped to a commercial LLW disposal site, or NTS.

Like TRU waste, Y-12 does not now generate mixed TRU waste. Quantities of TRU mixed waste generated through the operation of the CPC (the UPF does not generate TRU waste) would be collected at the CPC, transported to the West End Treatment Facility where it would be treated, packaged in accordance with the WIPP Waste Acceptance Criteria, placed in TRUPACT containers and transported to the WIPP for disposal.

The 19 tons of hazardous waste generated by the operation of the DCE Alternative (CPC and UPF) would amount to substantially more hazardous waste than is presently generated, on a routine basis, by Y-12. Y-12 collects, packages, and ships hazardous waste off-site to either another DOE site or a commercial facility for treatment and disposal. The hazardous waste generated from operation of the DCA Alternative would be handled in the same manner. Sufficient on-site resources and off-site capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The 15,225 cubic yards of solid non-hazardous waste which would be generated from the operation of the DCE Alternative (CPC and UPF) at Y-12 would amount to more than the amount presently generated at Y-12. Sufficient on-site capacity; however exists to accommodate the projected volumes of non-hazardous waste generated by the operation of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized. Metal and other recyclable materials would be removed from this waste stream, to the extent practicable, prior to disposal.

Non-hazardous liquid wastewater at Y-12 is collected commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. The amount of wastewater generated by the CPC would be well within the capacity of the wastewater treatment and discharge capability of Y-12. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the operation of the DCA Alternative (CPC and UPF) at Y-12.

5.9.14.3 *CCE Alternative (CPC + UPF)*

For Y-12, by definition, there is no CNC Alternative. The CPC and UPF, as already discussed in Section 5.9.14.2, would constitute a “CNC” if both projects were to be implemented at Y-12.

5.9.14.4 *CNPC Alternative (CPC + UPF + A/D/HE Center)*

Waste management impacts from the construction and operation of the full CNPC would include the CPC and UPF impacts, already discussed in DCE Alternative, in Section 5.9.14.2, above, and the A/D/HE Center, the impacts of which will be presented in this section. The expected waste impacts of construction and operation of the CNPC at Y-12 are discussed below.

5.9.14.4.1 CNPC Construction Impacts

Construction of CNPC would entail the construction of the DCE Alternative, discussed in Section 5.9.14.5, above, and the construction of an A/D/HE Center, discussed in this section. The additional construction of the A/D/HE Center would generate low level waste (LLW), and solid

and liquid sanitary waste. Table 5.9.14-5 summarizes the total volume of waste generated over the construction period for an A/D/HE Center.

Table 5.9.14-5—Annual Waste Generation from Construction of the A/D/HE Center–Y-12

Waste Category	A/D/HE Center
TRU Solid Waste (yd^3)	0
Low Level Solid Waste (yd^3)	9,900
Mixed TRU Solid Waste (yd^3)	0
Hazardous waste (tons)	0
Non-Hazardous Solid Waste (yd^3)	7,100
Non-Hazardous Liquid Waste (gal)	45,000

Source: NNSA 2007.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is routinely generated at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid LLW. Construction of the A/D/HE Center would generate an expected 9,900 cubic yards over the entire construction period. This is about thirty percent more than Y-12 routinely generates in a year. There is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12, and shipped off-site, either to the NTS, or a commercial facility, for treatment and disposal.

Non-hazardous solid waste at Y-12 is disposed of on-site in a construction/demolition landfill. Construction of an A/D/HE Center at Y-12 is expected to generate 7,100 cubic yards of non-hazardous solid waste over the entire construction period. This amounts to about the same amount Y-12 generates in a year of normal operation. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the A/D/HE Center at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

The 45,000 gallons of non-hazardous liquid waste could easily be handled by the existing infrastructure and wastewater treatment facilities at Y-12.

5.9.14.4.2 CNPC Operation Impacts

Normal operation of the CNPC would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.9.14-6 summarizes the estimated waste generation rates for the operation of a CNPC at Y-12.

Table 5.9.14-6—Annual Waste Generation from Operations of the CNPC–Y-12

Waste Type	CPC	UPF	A/D/HE Center	CNPC
TRU Solid Waste(including mixed TRU) (yd^3)	950	0	0	950
Mixed TRU Solid Waste(included in TRU, above)(yd^3)	340	0	0	340
Low Level Solid Waste (yd^3)	3,900	7,800	40	11,740
Low Level Liquid Waste (gal)	0	3,515	5,410	8,925
Mixed Low Level Solid Waste (yd^3)	2.5	21	0	23.5
Mixed Low Level Liquid Waste (gal)	0.4	3,616	6	3,622.4
Hazardous waste solid (tons)	4.0	14	.9	18.9
Hazardous waste liquid (tons)	0.6	0	5.9	6.5
Non-Hazardous Solid Waste (yd^3)	8,100	7,125	12,000	27,225
Non-Hazardous Liquid Waste (gal)	75,000	50,000	46,000	171,000

Source: NNSA 2007.

Y-12 does not now generate or manage any TRU waste. Quantities of TRU waste generated through the operation of the CNPC would be collected at the CNPC, packaged in accordance with the WIPP WAC, placed in TRUPACT containers and transported to the WIPP for disposal. If treatment of this waste needed to meet the WIPP WAC, this waste could be collected, transported to the West End Treatment Facility for any required treatment, and then packaged, placed in TRU PACS and transported to the WIPP for disposal.

Solid LLW, consisting primarily of radioactively contaminated scrap metal, construction debris, wood, paper, asbestos, filters containing solids, glovebox parts, and discarded process equipment and parts, is generated routinely at Y-12. In 2003, Y-12 generated 7,797 cubic yards of solid low level waste. Operation of the CNPC would generate an expected 11,740 cubic yards of LLW. Although this amount is more than the amount of LLW routinely generated at Y-12, there is more than sufficient capacity to collect this waste, ship it to the West End Treatment Facility where it would be processed and packaged with the low level waste generated by normal operational activities at Y-12, and shipped off-site, either to the NTS or a commercial facility, for treatment and disposal.

Low level mixed waste is presently generated and stored at Y-12 under the provisions of a State Agreement (October 1, 1995) and pursuant to the provisions of this agreement, Y-12 will dispose of this waste in accordance with the Site Treatment Plan for Mixed Waste on the Oak Ridge Reservation and in compliance with a Federal Facilities Compliance Act Agreement (June 12, 1992). In 2003, Y-12 generated about 39 cubic yards of mixed LLW. The LLW expected to be generated by the operation of the CNPC (18 cubic yards solidified liquid, 21 cubic yards solid) is about equal to the amount routinely generated by Y-12. There is sufficient capacity to collect this waste, transport it to the West End Treatment Facility where it would be treated, packaged for storage and ultimate disposal along with quantities of this type of waste generated on a routine basis at Y-12.

Like TRU waste, Y-12 does not now generate mixed TRU waste. Quantities of TRU mixed waste generated through the operation of the CNPC would be collected at the CNPC, transported to the West End Treatment Facility where it would be treated, packaged in accordance with the WIPP WAC, placed in TRUPAC containers and transported to the WIPP for disposal. Hazardous

waste generated by the CNPC would exceed levels generated at Y-12. These wastes would be captured at the CNPC, packaged, and shipped off-site, either to another DOE facility or a commercial facility for treatment and disposal. Sufficient infrastructure at Y-12 and off-site disposal capacity exist to allow for this.

Non-hazardous solid waste at Y-12 is disposed of on-site in construction/demolition landfills. The total amount of solid non-hazardous waste which would be generated from the operation of the CNPC at Y-12 would amount to just under fifty percent more than the normal amount generated at Y-12. Sufficient on-site capacity exists to accommodate the projected volumes of non-hazardous waste generated by the construction of the CPC at Y-12. Every opportunity to minimize waste generation in this category will be made and waste reduction techniques will also be utilized.

Non-hazardous liquid wastewater at Y-12 is collected commingled with industrial waste and then treated and discharged in accordance with Industrial and Commercial User Wastewater Permit No. 1-91. At a little more than 120,000 gallons, the amount generated by the operation of the CNPC is a little less than a sixth of the amount of industrial wastewater treated and discharged by Y-12 in a year of routine operation. There is more than sufficient treatment capacity to handle the liquid non-hazardous waste generated by the operation of the CNPC at Y-12.

5.9.14.5 *Capability-Based Alternatives*

Under the Capability-Based Alternatives, current and planned activities at Y-12 would continue as required to support smaller stockpile requirements. With respect to waste management, reduced operations would have a direct impact reduction on wastes generated as shown in Table 5.9.14-7.

Table 5.9.14-7—Annual Radiological Wastes Generated by Y-12 for the No Action Alternative and the Capability-Based Alternatives

Waste Category	No Action Alternative	Capability-Based Alternative	No Net Production/Capability-Based Alternative
Low-level Waste			
Liquid (yd^3)	17.4	10.4	9.6
Solid (yd^3)	7,800	4,700	4,400
Mixed Low-level Waste			
Liquid (yd^3)	17.9	10.7	9.9
Solid (yd^3)	21.1	12.7	11.7

Source: NNSA 2007, NNSA 2008.

Because Y-12 has adequate facilities to manage the wastes under either alternative, no major impacts to waste management are expected. Reductions in LLW generation would reduce the transportation of LLW to NTS. As discussed in Section 5.10, these impacts are small (less than 1 death related to nonradiological impacts and less than 1 LCF for radiological impacts) under the No Action Alternative.

5.9.15 Closure and D&D of the Production Facilities at Y-12

The closing of the Y-12 production facilities would entail a substantial D&D and remediation effort. Although it is not possible without specific and extensive site characterization to give a precise estimate of what this would entail, it is possible to look at known contamination issues, to look at other sites at which DOE has closed facilities and performed D&D, and to develop general estimates of what the D&D effort associated with the closure of the Y-12 production facilities might be. The Rocky Flats Plant has completed extensive D&D activities and closure. For nearly 40 years, the plant, located about 16 miles northwest of Denver, served as a nuclear weapons production facility. Over the years in which this site manufactured plutonium parts for nuclear weapons, the site developed both chemical and radioactive contamination issues affecting the soil, groundwater, surface water, and many of the buildings at the site. Contaminants included radionuclides, such as plutonium and uranium; toxic metals, such as beryllium; and hazardous chemicals, such as cleaning solvents and degreasers. While the site comprises approximately 6,300 acres, the majority of that land was a buffer zone with the industrialized area concentrated in the center of the site on about 385 acres. About one-fourth of the sites more than 800 original structures (buildings and storage tanks) were radioactively or chemically contaminated.

Although not on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) NPL, Rocky Flats was cleaned-up pursuant to CERCLA requirements (as well as RCRA) through a Federal Facilities Compliance agreement developed and signed by EPA, the State of Colorado and DOE. The D&D of the plant identified 360 separate clean-up areas. D&D activities started in 1995 and were completed (except for some groundwater treatment activities which will continue) in 2006, with about 90 percent of the work being accomplished from 2001 to 2005. Remediation included the removal of more than 15,000 cubic meters of transuranic and other radioactive waste, more than 800,000 cubic meters of sanitary waste and more than 4,300 cubic meters of hazardous waste. A substrata of shale minimized contamination of deeper aquifers. More than 11 million gallons of contaminated groundwater had to be treated. In addition, 5 million gallons of seep water was collected and treated. Between 1995 and 2005, 6,616 employees (including salaried employees, hourly employees, and security policy officers) were involved in the clean-up activities at a cost of more than $10 billion.

The Y-12 site is similar to Rocky Flats, but at 811 acres is twice the size. Although Y-12 has about 450 buildings they are all much larger than the structures at Rocky Flats. For the past 65 years, Y-12 has been involved in, the enrichment of uranium for use in weapons, and in the design and manufacture of the HEU secondary components for nuclear weapons. Environmental issues include known releases of mercury, beryllium, uranium, cesium, PCPs and degreasing chemicals. In November 1989 the Oak Ridge Reservation, on which Y-12 is located, was placed on the CERCLA National Priority List. Closure of the production facilities on Y-12 would require compliance with the CERCLA clean-up standards, and approval of EPA.

Using this comparison it is possible to get a general idea of the costs and the effort involved in the closure and cleanup of the production facilities at Y-12. Table 5.9.15-1 provides a summary of the Rock Flats actions and multiplies them by a factor of two giving an idea of what the D&D of the production facilities at Y-12 might entail:

Table 5.9.15-1—Y-12 Plant D&D Estimates

	Rocky Flats	Y-12
Time for clean-up	6 Years	12 Years
TRU Waste Removed	15,000 m^3	0[a]
LLW Removed	500,000 m^3	1,000,000 m^3
Sanitary Waste Removed	800,000 m^3	1,600,000 m^3
Hazardous Waste Removed	4,300 m^3	8,600 m^3
Groundwater Treated	11 million gal	22 million gal
Seep Water Treated	5 million gal	10 million gal
Shipped to other DOE sites	21 tons SNM	247 tons HEU to CNPC
Employment	40,000 worker-years	80,000 worker-years
Cost	$10 billion	$20 billion

Source: NNSA 2007.
[a] Y-12 has never handled plutonium, so it is not expected that any TRU waste would be involved.

5.10 COMPLEX-WIDE TRANSPORTATION IMPACTS

This section presents the environmental impacts of transporting Category I/II SNM for the programmatic alternatives.

5.10.1 No Action Alternative

Since the 1940s, NNSA and its predecessor agencies have moved nuclear weapons, nuclear weapons components, and SNM by a variety of commercial and Government transportation modes. In the late 1960s, worldwide terrorism and acts of violence prompted a review of procedures for safeguarding these materials. As a result, a comprehensive new series of regulations and equipment was developed to enhance the safety and security of these materials in transit.

The Transportation Safeguards Division (TSD) subsequently was established in 1975 at the Albuquerque Operations Office. That office is now referred to as the Office of Secure Transportation (OST), which will be the name used here. OST modified and redesigned transport equipment to incorporate features that more effectively enhance protection and deny unauthorized access to the materials. During that time, OST curtailed the use of commercial transportation systems and moved to a total federal operation.

5.10.1.1 *OST Management*

Management, control, and direction of OST is centralized at Albuquerque, New Mexico. The federal agents who drive the transportation vehicles, as well as the escorts, are Nuclear Materials Couriers or Couriers for short. There are three federal agent operations centers located at Amarillo, Texas; Oak Ridge, Tennessee; and Albuquerque. Approximately 100 shippers and receivers of SNM and other sensitive materials are served at approximately 33 locations throughout the continental United States.

5.10.1.2 *Transportation Safety*

Since its establishment in 1975, OST has accumulated over 100 million miles of experience transporting DOE cargo with no accidents causing a fatality or release of radioactive material. This is due largely to the OST philosophy that safety and security are of equal and paramount importance in the accomplishment of DOE's transportation safeguards mission.

5.10.1.3 *Transportation & Emergency Control Center (TECC)*

Transportation and Emergency Control Center (TECC) is a nationwide communications system operated by the OST and located in Albuquerque. This system provides a capability to monitor the status, location and maintain real-time communications 24 hours a day, 365 days a year, with every convoy. The control center maintains an emergency contact directory of federal, state, and local response organizations located throughout the contiguous U.S. This capability is available to OST 24 hours a day, 365 days a year.

5.10.1.4 *Transportation Vehicles*

The Safeguards Transporter (SGT) is a specially designed trailer for an 18-wheel rig that incorporates various deterrents to prevent unauthorized removal of cargo. The trailer has been designed to afford the cargo protection against damage in the event of an accident. This is accomplished through superior structural characteristics and a highly reliable cargo tie-down system similar to that used aboard aircraft. The tractors are standard production units which have been modified to provide protection against attack. The thermal characteristics of the SGT would allow the trailer to be totally engulfed in a fire without incurring damage to the cargo. These vehicles are equipped with communications, electronic, radiological monitoring, and other equipment that further enhance safety and security.

The vehicles used by OST must meet maintenance standards significantly more stringent than those for similar commercial transport equipment. All vehicles undergo an extensive maintenance check prior to every trip, as well as periodic preventative maintenance inspections. In addition, these vehicles are replaced more frequently than commercial shippers. As a result, OST experiences few en route breakdowns and has had no accidents due to equipment malfunction.

5.10.1.5 *Travel Precautions*

OST convoys do not travel during periods of inclement weather (ice, fog, etc.). Should the convoys encounter adverse weather, provisions exist for the convoys to seek secure shelter at previously identified facilities. Although OST provides sleeper berths in all vehicles, couriers accompanying OST shipments do not exceed 32 hours of continuous travel without being afforded the opportunity for eight hours of uninterrupted, stationary bed rest. OST has also imposed a maximum 65 mile/hour speed limit on its convoys, even if the posted limit is greater.

5.10.1.6 *Law Enforcement Liaison*

OST has a liaison program through which it communicates with law enforcement and public safety agencies throughout the country, making them aware of these shipments. OST has established procedures should a Safeguards Transporter be stopped by an officer. The liaison program provides law enforcement officers information to assist them in recognizing one of these vehicles should it be involved in an accident, and what actions to take in conjunction with the actions of the couriers in the rig and escort vehicles. Through the liaison program OST offers in-depth briefings at the state level.

5.10.1.7 *Armed Couriers*

Armed nuclear materials couriers accompany each shipment containing special nuclear material. They also drive the highway tractors and escort vehicles while operating the communications and other convoy equipment. Couriers are non-uniformed federal agents and are authorized by the *Atomic Energy Act* to make arrests and carry firearms in the performance of their duties. They carry both a photo identification card and a shield that certify their federal status. Couriers are required to obey all traffic laws and to cooperate with law enforcement officers.

After careful screening and selection, courier trainees undergo a 16-week basic training course, during which they receive instruction in tractor-trailer driving, electronic and communications systems operation, and firearms. Tests in operating procedures, physical fitness, driving, firearms, and other job-related subjects must be passed in order to pass the training and be certified as a courier. Following basic training, the courier spends the balance of the first year in on-the-job training. The first year of employment is probationary, which the courier must successfully complete to be retained. Couriers are given in-service training throughout their careers. These classes are designed to refresh and update the training taught during basic training, in addition to preparing couriers for demonstrations or armed attacks. Subjects such as team tactics, terrorist tactics, and new adversary technology are taught. Additionally, physical and firearm proficiencies are tested.

Couriers must continue to meet periodic qualification requirements relative to firearms, physical fitness and driving proficiency. They must also undergo and pass an annual medical examination for continued certification under the DOE Human Reliability Program. In addition, couriers are subject to the DOE's randomized drug and alcohol testing program. If a courier fails to meet any of the minimum requirements necessary for courier certification, the individual is temporarily removed from active status and provided additional training until demonstrated performance reaches an acceptable level.

OST operations are in compliance with the requirements of 49 CFR Part 177 for selecting, notifying drivers of, and adhering to preferred routes. The majority of OST travel (90 percent) is over interstate highway; the remaining 10 percent is over routes that meet the conditions for deviating from the preferred route. Regulations permit deviation from the preferred route when safety or security requirements dictate such deviation. Regulations permit OST deviation from the requirements regarding notification of the routes used. Routes used are classified, compartmented information that may not be disseminated except to persons with appropriate security clearance and a need to know.

All SGT couriers wear radiation dosimeters. Because of the nature of the material and the design of the containers, the transport of both nuclear explosives and plutonium/uranium weapons components has led to ionizing radiation doses to SGT couriers. SGT couriers are required to inspect the cargo within the trailer prior to shipment. This action is the primary contributor to dose for the crew.

Under the No Action Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 20 pits per year) would continue to be shipped between Pantex and LANL;
- Canned subassemblies (CSAs) (assume approximately 200 units per year) would continue to be shipped between Pantex and Y-12; and
- Removal of SNM from LLNL.

CSAs that may contain HEU and depleted uranium (DU) are shipped between Pantex and Y-12. CSAs are transported intersite by SGTs in DOT-criteria Type B packages. The actual number of CSAs shipped to and from Pantex is classified. When a shipment of CSAs is made from Pantex,

the containers, staged in an approved storage facility, are loaded onto a pallet and driven by electric forklift to a loading dock. These containers are loaded and secured into an SGT that is then driven to Y-12. Arriving containers are unloaded and brought into a facility where a transfer check is performed. The transfer check confirms the identity and quantity of the shipment and verifies the integrity of the tamper-indicating devices on the containers.

Pits shipped between Pantex to LANL are transported intersite by SGTs in approved Type B packages. When a shipment of pits to LANL is required, the pits are repacked into Type B containers and sealed with a tamper-indicating device. The containers are loaded onto a pallet and driven by electric forklift to a loading dock. The containers are loaded and secured into an SGT and driven to LANL. The actual number of pit shipments to and from Pantex is classified.

Table 5.10-1 presents the estimated radiological impacts of the annual transportation activities associated with the A/D/HE mission at Pantex, a 20 pits per year capacity at LANL, and a 200 unit capacity for CSAs at Y-12. The radiological incident-free impacts provided in the following sections are an estimate of LCFs due to exposure of radiation from the radioactive materials payloads proposed in the SPEIS alternatives. The RADTRAN 5.6 computer analyzes the exposure within a half-mile zone surrounding the transportation routes.

Table 5.10-1—Annual Radiological Transportation Impacts–No Action Alternative

Movement Description	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
Pits	Handling	Note 1	0.00559	0.00559
	Intersite Transportation	3.58×10^{-12}	3.6×10^{-5}	3.6×10^{-5}
	Stops		2.7×10^{-10}	2.7×10^{-10}
	MEI		1.4×10^{-10}	1.4×10^{-10}
CSAs	Handling	Note 2	0.0224	0.0224
	Intersite Transportation	1.51×10^{-19}	0.00145	0.00145
	Stops		2.73×10^{-9}	2.73×10^{-9}
	MEI		1.51×10^{-9}	1.51×10^{-9}

Source: Dimsha 2007.
Note 1: accident impacts associated with handling accidents are included in the accident analyses for the No Action pit production at LANL.
Note 2: accident impacts associated with handling accidents are included in the accident analyses for the Y-12 No Action Alternative.
Assumptions: All materials in metal form
ES-3100 or similar container used
Release and aerosol fractions based on West Valley Demonstration Project (WVDP) Waste Management EIS (DOE 2004g) values, which were determined to bound release fractions for pits and secondaries.

With respect to accident impacts, RADTRAN calculates risks and consequences of potential accidents based a number of input parameters including:

- Probability and severity fraction of accident types;
- Deposition velocity of the material;
- Release fraction from the container;
- Aerosol and respirable factors for the material; and
- Weather conditions.

The inputs for the materials, containers, and vehicles were adopted from industry standards. The probability and severity fractions were taken from DOE-accepted studies and reports. The weather conditions were based on Pasquill weather stability classes. Analyses were conducted in Stability Class D (most frequently occurring weather conditions) and Class F (most stable weather conditions). All results presented in this chapter are for Stability Class F, which yields the most conservative case.

The maximally-exposed individual (MEI) results represent health impacts to a theoretical person that would receive the maximum exposure due to the proposed transportation. Often the MEI represents personnel associated with the material transport, such as a vehicle escort.

Handling impacts reflect the sum total exposure impacts to crews involved in the storage, packaging, and loading/unloading of the material to be transported. The number of personnel, time spent handling the material, and distance to the material are dependant on the individual transportation campaigns.

The impact results at stops are presented for two theoretical receptor groups: the worker at the truck stop and residents that live within a half-mile radius of the truck stop. An average suburban population density is assumed for the area residents results. Table 5.10-2 presents the estimated nonradiological impacts for the No Action Alternative.

Table 5.10-2—Annual Nonradiological Transportation Impacts–No Action Alternative

Origin/ Destination Pair	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
Pantex/LANL	Pits	1,500	5.64×10^{-4}	2.70×10^{-5}	6.9×10^{-7}
Pantex/Y-12	CSAs	17,700	6.06×10^{-3}	2.93×10^{-4}	3.41×10^{-5}

Source: Dimsha 2007.

5.10.2 Distributed Centers of Excellence Alternative

Under the DCE Alternative, the major radiological transportation actions involving Category I/II SNM would be as shown in Table 5.10-3. Table 5.10-3 provides the estimated radiological health impacts of proposed transportation 200 pits between Pantex and the four other CPC candidate sites. For incident-free transportation, impacts are presented for both the transport crew and the population along the routes. The MEI would receive an additional dose of 2.51×10^{-6} rem from the transport of the pits, translating to 1.51×10^{-9} additional LCFs. For accidents, impacts are presented in terms of risk (probability times consequence). Appendix C, Section C.7 presents additional information related to transportation accidents. The transportation impacts of CSAs would be the same as under the No Action Alternative.

Table 5.10-3—Annual Radiological Transportation Impacts–DCE Alternative

CPC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	200 ppy	1.43×10^{-11}	3.58×10^{-4}	3.58×10^{-4}
NTS	200 ppy	2.20×10^{-11}	1.08×10^{-3}	1.08×10^{-3}
SRS	200 ppy	1.18×10^{-10}	1.99×10^{-3}	1.99×10^{-3}
Y-12	200 ppy	2.85×10^{-11}	1.45×10^{-3}	1.45×10^{-3}

Source: Dimsha 2007.
Assumptions: All materials in metal form
ES-3100 or similar container used
Release and aerosol fractions based on WVDP Waste EIS values

Table 5.10-4 provides estimated exposure due to handling of the materials transported in this alternative and the estimated exposure at stops (inspections, refueling, others).

Table 5.10-4—Annual Estimated Impacts Due to Handling and Stops–DCE Alternative

	Per Shipment Dose (person-rem)	Total Dose (person-rem)	Total LCFs
Movement of pits from Pantex to CPC Sites			
Handling		37.3	0.0224
Person at truck stop	2.10×10^{-9}	3.36×10^{-8}	2.02×10^{-11}
Residents in vicinity of stop	2.82×10^{-7}	4.51×10^{-6}	2.71×10^{-9}

Source: Dimsha 2007.

Table 5.10-5 presents the estimated nonradiological transportation impacts for the DCE Alternative.

Table 5.10-5—Annual Nonradiological Transportation Impacts–DCE Alternative

CPC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	5,800	0.00226	0.000108	6.96×10^{-6}
NTS	Pits	14,200	0.00323	0.000206	1.30×10^{-5}
SRS	Pits	21,700	0.0109	0.000432	6.46×10^{-5}
Y-12	Pits	17,700	0.0606	0.000293	3.41×10^{-5}

Source: Dimsha 2007.

Additionally, if the CPC is located at a site other than LANL, as described in Section 3.4.1.4, all Category I/II inventories of radioactive material would be transferred from LANL to sites within the NNSA Complex. For purposes of this analysis, the radioactive materials have been categorized as *Programmatic*, *Surplus*, and *Excess*. The subsections below describe potential impacts for each material category.

5.10.2.1 *Programmatic Material*

Category I/II inventories of nuclear material essential to the programmatic mission of NNSA would be transferred to the eventual CPC/CNPC Site. This would represent 4 shipments of material. Shipments to the candidate sites (NTS, Pantex, SRS, and Y-12) were modeled and analyzed. A summary is provided in Table 5.10-6.

Table 5.10-6—Impacts of Transporting LANL Programmatic Materials

Candidate Recipient	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
NTS	4	0.294	1.76×10^{-4}	0.0680	4.08×10^{-5}	2.04×10^{-9}	1.22×10^{-12}
Pantex	4	0.120	7.20×10^{-5}	0.0291	1.75×10^{-5}	3.65×10^{-7}	2.19×10^{-10}
SRS	4	0.684	4.10×10^{-4}	0.285	1.71×10^{-4}	3.37×10^{-8}	2.02×10^{-11}
Y-12	4	0.552	3.31×10^{-4}	0.192	1.15×10^{-4}	1.09×10^{-8}	6.54×10^{-12}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.2.2 *Surplus Material*[1]

Surplus materials held at LANL are assigned to the Office of Fissile Material Disposition. This material has not been declared waste, but may potentially be added to waste streams at SRS. Table 5.10-7 presents the transportation impacts associated with disposition of all surplus HEU and plutonium from LANL to SRS. A second option is to transport surplus HEU to Y-12 and plutonium to SRS. Impacts associated with this option are provided in Table 5.10-8.

Table 5.10-7—Impacts of Transporting LANL Surplus Materials to SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	6.17×10^{-12}	3.70×10^{-15}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-8—Impacts of Transporting LANL Surplus Materials to Y-12 & SRS (Option 2)

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU to Y-12	1	0.138	8.28×10^{-5}	0.0481	2.88×10^{-5}	1.50×10^{-16}	9.00×10^{-20}
Pu to SRS	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	6.15×10^{-12}	3.69×10^{-15}
Total	**2**	**0.309**	**1.86×10^{-4}**	**0.119**	**7.15×10^{-5}**	**6.15×10^{-12}**	**3.69×10^{-15}**

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.2.3 *Excess Material*

Three scenarios have been analyzed for disposition of materials designated as *Excess* at LANL:

- Shipping excess HEU to Y-12 and excess plutonium to SRS;
- Shipping all excess materials to SRS; and
- Shipping all excess materials to Y-12.

Tables 5.10-9, 5.10-10, and 5.10-11 summarize these impacts.

[1] In 2007, the DOE prepared a SA, which determined that the potential environmental impacts associated with the consolidation at SRS of surplus, non-pit, weapons-usable plutonium from Hanford, LLNL and LANL would not be a significant change from the potential environmental impacts associated with the alternatives analyzed in previous NEPA reviews (DOE 2007b). As a result of this SA, DOE does not need to conduct additional NEPA review prior to transferring surplus non-pit weapons-usable plutonium materials from LANL to SRS for consolidated storage. Nonetheless, for completeness, this SPEIS includes an analysis of the transportation risk associated with disposition of all surplus plutonium from LANL to SRS.

Table 5.10-9—Impacts of Transporting LANL Excess Materials to Y-12 & SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU to Y-12	1	0.138	8.28×10^{-5}	0.0481	2.88×10^{-5}	6.50×10^{-16}	3.90×10^{-19}
Pu to SRS	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	1.91×10^{-11}	1.15×10^{-14}
Total	**2**	**0.309**	**1.86×10^{-4}**	**0.119**	**7.15×10^{-5}**	**1.91×10^{-11}**	**1.15×10^{-14}**

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-10—Impacts of Transporting LANL Excess Materials to SRS

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.171	1.03×10^{-4}	0.0712	4.27×10^{-5}	1.91×10^{-11}	1.15×10^{-14}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

Table 5.10-11—Impacts of Transporting LANL Excess Materials to Y-12

Shipment Description	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
HEU/Pu Consolidated	1	0.138	8.28×10^{-5}	0.0481	2.88×10^{-5}	6.18×10^{-12}	3.71×10^{-15}

Source: Dimsha 2007.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using a dose-to-LCF conversion factor of 0.0006 LCFs per rem.

5.10.3 Consolidated Centers of Excellence Alternative

5.10.3.1 *CNPC (CPC + CUC + A/D/HE Center at one site)*

Under the CNPC Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits currently stored at Pantex would be transported to the CNPC site;
- HEU currently stored at Y-12 would be transported to the CNPC site.

After these one-time shipments are completed, there would be no annual shipment of pits and CSAs.

Table 5.10-12 provides the estimated radiological health impacts of the one-time in-transit transportation of pits from Pantex, and HEU from Y-12, to the CNPC site alternatives. The MEI would receive an additional dose of 7.38×10^{-5} and 8.48×10^{-5} person-rem from the transport of the pits and secondaries respectively. These respective doses translate to 4.43×10^{-8} and 5.09×10^{-8} additional LCFs. Table 5.10-13 provides estimated exposure due to handling of the materials transported in this alternative and the estimated exposure at stops (inspections, refueling, others).

Table 5.10-12—Radiological Transportation Impacts Associated with the One-Time Transportation of Pits and HEU to the CNPC Site

CNPC Site	Transportation Segment	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	Pits	4.20×10^{-10}	0.0105	0.0105
	HEU	2.70×10^{-9}	0.0603	0.0603
	Total	***3.12×10^{-9}***	***0.0708***	***0.0708***
NTS	Pits	6.39×10^{-10}	0.0316	0.0316
	HEU	2.89×10^{-9}	0.0846	0.0846
	Total	***9.28×10^{-9}***	***0.116***	***0.116***
Pantex	Pits[a]	0	0	0
	HEU	1.86×10^{-9}	0.0489	0.0489
	Total	***1.86×10^{-9}***	***0.0489***	***0.0489***
SRS	Pits	3.46×10^{-9}	0.0584	0.0584
	HEU	5.89×10^{-9}	0.0251	0.0251
	Total	***9.35×10^{-9}***	***0.0835***	***0.0835***
Y-12	Pits	8.36×10^{-10}	0.0426	0.0426
	HEU[b]	0	0	0
	Total	***8.36×10^{-10}***	***0.0426***	***0.0426***

Source: Dimsha 2007.
[a] Pits are currently stored at Pantex. No pits would be transported from other sites.
[b] HEU is currently stored at Y-12. No HEU would be transported from other sites.
Assumptions:
- All materials in metal form
- ES-3100 or similar container used
- Shipments of Pu from Pantex to the CNPC would require 470 shipments
- Shipment of HEU from Y-12 to the CNPC would require 540 shipments
- Release and aerosol fractions based on WVDP Waste EIS values

Table 5.10-13—Estimated Impacts Due to Handling and Stops–CNPC Alternative

	per shipment dose (person-rem)	total dose for campaign (person-rem)	Total LCFs
Movement of pits from Pantex to CNPC Sites			
Handling		1,100	0.657
Person at truck stop	2.10×10^{-9}	9.87×10^{-7}	5.92×10^{-10}
Residents in vicinity of stop	2.82×10^{-7}	1.34×10^{-4}	7.95×10^{-8}
Movement of HEU from Y-12 to CNPC Sites			
Handling	8.18	4,420	2.65
Person at truck stop	2.10×10^{-8}	1.13×10^{-5}	6.80×10^{-9}
Residents in vicinity of stop	2.82×10^{-7}	1.52×10^{-4}	9.14×10^{-8}

Source: Dimsha 2007.

Table 5.10-14 presents the estimated nonradiological transportation impacts for the CNPC Alternative.

Table 5.10-14—Nonradiological Transportation Impacts–CNPC Alternative

CNPC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	170,000	0.00663	0.00317	0.000204
	HEU	782,000	0.270	0.0133	0.00138
	Total	953,000	0.277	0.0165	0.00158
NTS	Pits	416,000	0.0663	0.00317	0.000381
	HEU	1,180,000	0.364	0.0188	0.00182
	Total	1,596,000	0.430	0.0220	0.00220
Pantex	Pits	No transportation assessed (materials onsite)			
	HEU	597,000	0.205	0.00988	0.0115
	Total	597,000	0.205	0.00988	0.0115
SRS	Pits	637,000	0.319	0.0127	0.00190
	HEU	212,000	0.175	0.00589	0.00101
	Total	849,000	0.494	0.01859	0.00291
Y-12	Pits	520,000	0.178	0.00860	0.00100
	HEU	No transportation assessed (materials onsite)			
	Total	520,000	0.178	0.00860	0.00100

Source: Dimsha 2007.

Additionally, if the CNPC is located at a site other than LANL, all Category I/II inventories of radioactive material would be transferred from LANL to the CNPC, as discussed in Section 5.10.2.

5.10.3.2 *CNC (CPC + CUC at one site, A/D/HE Center at Pantex or NTS)*

For the CNC Option (the CCE Alternative that does not include the A/D/HE Center), pit production and CSA production would be consolidated at one of the candidate CNC sites (NTS, LANL, Pantex, Y-12, or SRS), and the A/D/HE activities would continue to be conducted at Pantex or transferred to NTS. Pit storage would be located with the A/D/HE Center. Table 5.10-15 provides the annual estimated radiological impacts of transporting pits and CSAs between the A/D/HE at Pantex and the four other CNC candidate sites. Tables 5.10-12 and 5.10-13 (located in Section 5.10.3.1) provide the estimated radiological health impacts of the one-time transportation of HEU from Y-12 to the CNC site alternatives.

Table 5.10-15—Annual Radiological Impacts for CNC (A/D/HE Center at Pantex)

CNC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	Incident-Free	Total
LANL	200 pits	4.20×10^{-10}	0.0105	0.0105
	200 CSAs	7.57×10^{-17}	3.58×10^{-4}	3.58×10^{-4}
NTS	200 pits	6.39×10^{-10}	0.0316	0.0316
	200 CSAs	1.16×10^{-16}	1.08×10^{-3}	1.08×10^{-3}
SRS	200 pits	3.46×10^{-9}	0.0584	0.0584
	200 CSAs	6.25×10^{-16}	1.99×10^{-3}	1.99×10^{-3}
Y-12	200 pits	8.36×10^{-10}	0.0426	0.0426
	200 CSAs	1.82×10^{-16}	$1.92\ 10^{-3}$	$1.92\ 10^{-3}$

Table 5.10-15—Annual Radiological Impacts for CNC (A/D/HE Center at Pantex) (continued)

Associated Impacts Common to both Pit and CSA Transportation Activities				
Handling	**Truck Stop**	**Impacts to Residents in Vicinity of Stop**	**In-Transit MEI Impacts**	
0.0224	2.02×10^{-11}	$2.71\ 10 \times 10^{-9}$	1.51×10^{-9}	

Source: Dimsha 2007.
Assumptions:

- All materials in metal form
- ES-3100 or similar container used
- Release and aerosol fractions based on WVDP Waste Management EIS values

Table 5.10-16 presents the annual impacts of transporting pits and CSAs between the A/D/HE Center at NTS and the CNC candidate sites.

Table 5.10-16—Annual Radiological Impacts for CNC (A/D/HE Center at NTS)

CNC Site	Transportation Assessed	Estimated Health Impacts (LCFs)		
		Accident	**Incident-Free**	**Total**
LANL	200 pits	7.98×10^{-12}	8.69×10^{-4}	8.69×10^{-4}
	200 CSAs	4.23×10^{-17}	8.69×10^{-4}	8.69×10^{-4}
SRS	200 pits	1.36×10^{-10}	2.76×10^{-3}	2.76×10^{-3}
	200 CSAs	7.20×10^{-16}	2.76×10^{-3}	2.76×10^{-3}
Y-12	200 pits	5.18×10^{-11}	2.48×10^{-3}	2.48×10^{-3}
	200 CSAs	2.74×10^{-16}	2.48×10^{-3}	2.48×10^{-3}

Associated Impacts Common to both Pit and CSA Transportation Activities			
Handling	**Truck Stop**	**Impacts to Residents in Vicinity of Stop**	**In-Transit MEI Impacts**
0.0224	2.02×10^{-11}	$2.71\ 10 \times 10^{-9}$	1.51×10^{-9}

Source: Dimsha 2007.
Assumptions:

- All materials in metal form
- ES-3100 or similar container used
- Release and aerosol fractions based on WVDP Waste Management EIS values

Tables 5.10-17 and 5.10-18 present the estimated nonradiological transportation impacts for the CNC Options.

Table 5.10-17—Annual Nonradiological Transportation Impacts–CNC Option (Pantex as A/D/HE)

CNC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	5,800	0.00226	0.000108	6.96×10^{-6}
	CSAs	23,200	0.008	0.000394	4.20×10^{-5}
	Total	29,000	0.0103	0.000502	4.90×10^{-5}
NTS	Pits	14,200	0.00323	0.000206	1.30×10^{-5}
	CSAs	35,000	0.0108	0.000558	5.38×10^{-5}
	Total	49,200	0.0140	0.000764	6.68×10^{-5}
Pantex	CSAs	17,700	0.00606	0.000293	3.41×10^{-5}
	Total	17,700	0.00606	0.000293	3.41×10^{-5}
SRS	Pits	21,700	0.0109	0.000432	6.46×10^{-5}
	CSAs	6,300	0.00518	0.000174	2.98×10^{-5}
	Total	28,000	0.0161	0.000606	9.44×10^{-5}
Y-12	Pits	17,700	0.0606	0.000293	3.41×10^{-5}
	Total	17,700	0.0606	0.000293	3.41×10^{-5}

Source: Dimsha 2007.

Table 5.10-18—Annual Nonradiological Transportation Impacts–CNC Option (NTS as A/D/HE)

CNC Candidate Site	Material Shipped	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
LANL	Pits	10,600	0.00323	0.000206	1.30×10^{-5}
	CSAs	23,200	0.008	0.000394	4.20×10^{-5}
	Total	33,800	0.0112	0.000600	5.50×10^{-5}
NTS	CSAs	35,000	0.0108	0.000558	5.38×10^{-5}
	Total	35,000	0.0108	0.000558	5.38×10^{-5}
SRS	Pits	39,000	0.0156	0.000698	8.42×10^{-5}
	CSAs	6,300	0.00518	0.000174	2.98×10^{-5}
	Total	45,300	0.0208	0.000872	1.15×10^{-4}
Y-12	Pits	35,000	0.0108	0.000558	5.39×10^{-5}
	Total	35,000	0.0108	0.000558	5.39×10^{-5}

Source: Dimsha 2007.

5.10.4 Capability-Based Alternatives

Under the Capability-Based Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 50 pits per year) would continue to be shipped between Pantex and LANL; and
- CSAs (assume 50 units per year) would continue to be shipped between Pantex and Y-12.

The impacts of transportation for this Alternative would be approximately 2.5 times larger than the No Action Alternative for pits and 25 percent as much as the impacts for the No Action Alternative for CSAs (see Section 5.10.1).

Under the No Net Production/Capability-Based Alternative, the major radiological transportation actions involving Category I/II SNM would be as follows:

- Pits (assume 10 pits per year) would continue to be shipped between Pantex and LANL; and
- CSAs (assume 15 units per year) would continue to be shipped between Pantex and Y-12.

The impacts of transportation for this Alternative would be approximately one-half as much as the No Action Alternative for pits and approximately 7.5 percent as much as the impacts for the No Action Alternative for CSAs (see Section 5.10.1).

5.10.5 Waste Shipments

5.10.5.1 *Low-level Waste (Y-12 to NTS)*

The radiological health impacts due to transportation of LLW from Y-12 to NTS were estimated

for three different annual waste generation levels; 7,800 cubic yards, 12,300 cubic yards, and 24,000 cubic yards. It is assumed that Class A 55-gallon drums would be used to transport this waste. Considering this, the number of containers and shipments of LLW provided in Table 5.10-19 would be required to meet the generation levels.

Table 5.10-19—Number of LLW Drums and Shipments

Annual Waste Generation (yd^3)	Number of Drums	Number of Shipments
7,800	30,620	383
12,300	48,300	604
24,000	94,200	1178

Source: Dimsha 2007.

For this analysis, waste inventories were assumed to be similar to those provided in the West Valley Demonstration Project Waste Management (WVDP WM) EIS (DOE 2003c). Accident conditional probabilities and release fractions were also used based on WVDP WM EIS values for Class A LLW and drum containers. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided in Table 5.10-20. Non-radiological impacts are summarized in Table 5.10-21.

Table 5.10-20—Health Impacts Due to LLW Transportation (in LCF)

	Annual Waste Generation (yd^3)		
	7,800	12,300	24,000
Handling	0.662	0.826	1.61
Incident-Free In-Transit Exposure	0.05680599	0.09456	0.184
Truck Stop Personnel	$4.57\ 82 \times 10^{-9}$	$7.21\ 60 \times 10^{-9}$	$1.40\ 48 \times 10^{-8}$
Resident Near Stop	$6.14\ 48 \times 10^{-8}$	$1.029.68 \times 10^{-7}$	$1.89\ 99 \times 10^{-7}$
Accident Exposure	$4.122.69 \times 10^{-8}$	$6.504.24 \times 10^{-8}$	$1.278.27 \times 10^{-8}$

Source: Dimsha 2007.

Table 5.10-21—Nonradiological Health Impacts Due to LLW Transportation

Annual Waste Generation (yd^3)	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
7,800	837,000	0.258	0.01340152	0.00129
12,300	1,320,000	0.408	0.02110240	0.00204
24,000	2,572,000	0.0794	0.04110467	0.00397

Source: Dimsha 2007.

5.10.5.2 *Low-level Waste (Pantex to NTS)*

The radiological health impacts due to transportation of LLW from Pantex to NTS were estimated for three different annual waste generation levels; 7,800 cubic yards, 12,300 cubic yards, and 24,000 cubic yards. It is assumed that Class A 55-gallon drums would be used to transport this waste. Considering this, the number of containers and shipments of LLW provided in Table 5.10-21 would be required to meet the generation levels.

For this analysis, waste inventories were assumed to be similar to those provided in the West Valley Demonstration Project Waste Management (WVDP WM) EIS (DOE 2004g). Accident conditional probabilities and release fractions were also used based on WVDP WM EIS values

for Class A LLW and drum containers. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided in Table 5.10-22. Non-radiological impacts are summarized in Table 5.10-23.

Table 5.10-22—Health Impacts Due to LLW Transportation (in LCF)

	Annual Waste Generation (yd^3)		
	7,800	**12,300**	**24,000**
Handling	0.662	0.826	1.61
Incident-Free In-Transit Exposure	0.0258	0.0407	0.0794
Truck Stop Personnel	4.82×10^{-9}	7.60×10^{-9}	1.48×10^{-8}
Resident Near Stop	6.48×10^{-8}	1.02×10^{-7}	1.99×10^{-7}
Accident Exposure	1.18×10^{-8}	1.86×10^{-8}	3.63×10^{-8}

Source: Dimsha 2007.

Table 5.10-23—Nonradiological Health Impacts due to LLW Transportation

Annual Waste Generation (yd^3)	Total Mileage	Accidents	Accident Fatalities	Nonradiological Emissions Fatalities
7,800	421,000	0.121	0.00670	4.77×10^{-4}
12,300	664,000	0.191	0.0106	7.52×10^{-4}
24,000	1,295,000	0.372	0.0206	0.00147

Source: Dimsha 2007.

5.10.5.2 *TRU Waste*

The radiological health impacts due to transportation of TRU waste from a CPC to WIPP were calculated as shown in Table 5.10-24. The estimated human health impacts for accidents and incident-free transportation in LCFs are provided.

Table 5.10-24—Health Impacts Due to TRU Waste Transportation

CPC Site	Estimated Health Impacts (LCFs)		
	Accident	**Incident-Free**	**Total**
LANL	1.3×10^{-7}	6.6×10^{-4}	6.6×10^{-4}
NTS	6.6×10^{-7}	2.2×10^{-3}	2.2×10^{-3}
Pantex	3.2×10^{-7}	7.8×10^{-4}	7.8×10^{-4}
SRS	7.2×10^{-6}	3.7×10^{-3}	3.7×10^{-3}
Y-12	3.7×10^{-6}	3.3×10^{-3}	3.3×10^{-3}

Source: Dimsha 2007.

5.11 NOT USED

5.12 CONSOLIDATING CATEGORY I/II SPECIAL NUCLEAR MATERIAL

This section analyzes the environmental impacts of consolidating Category I/II SNM as described in Section 3.7. The analysis focuses on the resources that are most likely to be affected. For removal of Category I/II SNM from LLNL, the analysis focuses on the: (1) transportation impacts of moving the Category I/II SNM from LLNL to receiver sites (SRS, LANL, NTS [as an interim storage location], and SNM (TRU) to WIPP [via the Idaho National Laboratory [INL]]); and (2) the impacts of phasing out Category I/II SNM operations from the LLNL Superblock**.** This SPEIS discusses the storage of LLNL materials at the potential receiver sites, as appropriate. For Category I/II SNM consolidation actions at Pantex, the analysis focuses on the potential construction impacts in Zone 12, the handling operations associated with the transfer of the Category I/II SNM on-site, and the decontamination and decommissioning impacts for vacated facilities in Zone 4.

5.12.1 Remove Category I/II SNM from LLNL

Although the exact quantities of Category I/II SNM are classified, the Category I/II SNM at LLNL can be divided up into three basic categories, in the approximate percentages indicated in Table 3.7-1. The LLNL SWEIS (DOE 2005a) assesses the environmental impacts of transporting SNM to and from LLNL and other NNSA sites, SRS, and the WIPP. That analysis includes consideration of transportation actions involving greater quantities of SNM and more shipments than are identified in Table 3.7-1 (see DOE 2005a, Appendix J, Section J.5.3). The Record of Decision for the LLNL SWEIS (70 FR 71491) authorized operations for the Proposed Action Alternative, which allows approximately 538 shipments annually of hazardous and radioactive materials and wastes. As such, the transportation activities identified in Table 3.7-1 are included in the existing No Action Alternative. For completeness, however, this SPEIS assesses the environmental impacts associated with:

- Packaging and Unpackaging Category I/II SNM
- Transporting Category I/II SNM from LLNL to Receiver Sites
- Storage of Category I/II SNM at Receiver Sites
- Phasing out Category I/II SNM Operations from LLNL

The maximum number of containers per shipment would be 75, the maximum number of shipments per year would be approximately 4, and all shipments would be made by truck.

- All oxide and non-weapon component metal would be packaged to meet the DOT 9975 Type B shipping container requirements.

- All weapon components would be packaged to meet DPP-1 Type B shipping container requirements. Mass in containers is dependent on weapon type.
- All Enriched Uranium oxide would be packaged to meet Type B shipping container requirements.
- Enriched Uranium excess metal would be packaged to meet DOT 6M, ES3100, or DPP-2 Type B Shipping container requirements.
- All TRU would be shipped in TRUPAC-II containers.
- All TRU shipped to WIPP would meet the WIPP waste acceptance criteria (WAC).

Transferring the LLNL Category I/II SNM would also mean that the Category I/II SNM operations from the Superblock would be phased out. This SPEIS describes the impacts from this phase-out in Section 5.12.2. As described in Section 3.7.1, all Category I/II SNM inventories at LLNL that are not waste would be transferred to LANL (or NTS for interim storage) and SRS as programmatic and surplus material respectively. Packaging used by NNSA for hazardous materials shipments are either certified to meet specific performance requirements or built to specifications described in DOT hazardous materials regulations (49 CFR Subchapter C). Plutonium and HEU are unique hazardous materials that require special protection. In addition to meeting the stringent Type B containment and confinement requirements of the NRC's 10 CFR Part 71 and DOT's 49 CFR, packaging for nuclear weapons and components must be certified separately by DOE/NNSA. NNSA employs a closed Transportation Safeguards System for the intersite transport of nuclear weapons and components, including Pu and HEU. Specially designed SGTs are utilized to ensure high levels of safety and physical protection.

Materials would be placed into packages for shipment. These packages would be loaded at LLNL, shipped to the receiving site, unpacked and placed into storage. The collective dose due to normal operational exposure to cargo handlers and other workers for each loading operation is estimated to be 0.06 person-rem and 0.004 person-rem, respectively (Dimsha 2008). Because the loading would take place at LLNL in a secure area, there would be no exposure to the public. Table 5.12-1 provides a summary of the impacts of the 19 radioactive material shipments. The total dose to workers for shipments of all Category I/II materials would be 3.1 person-rem (0.49 + 2.58), resulting in 0.002 LCF. The incident-free dose to the public from these shipments would be 1.05 person-rem (0.11 + 0.94), resulting in a potential increase of 6.3×10^{-4} LCFs. The total exposure due to potential accidents is estimated to be 9.6×10^{-7} person-rem, resulting in less than 1×10^{-10} LCFs to the general population. As a point of reference, LLNL is authorized to transport approximately 538 shipments annually under the LLNL ROD (70 FR 71491). These SNM shipments would represent approximately 3 percent of the 538 shipments.

Table 5.12-2 provides a summary of the impacts of transporting the LLNL Category I/II SNM to NTS for interim storage at the Device Assembly Facility (DAF) followed by transportation to LANL**.** The total dose to workers for shipments of all Category I/II materials would be approximately 0.64 person-rem, resulting in approximately 3.8×10^{-4} LCFs. The incident-free dose to the public from these shipments would be 0.14 person-rem, resulting in a potential increase of 8.2×10^{-5} LCFs.

Table 5.12-1—Risks of Transporting LLNL Non-Waste Category I/II Materials

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose[a]	LCF[b]	Dose[a]	LCF[b]	Dose[a]	LCF[b]
Programmatic Material to LANL	5	0.49	2.9×10^{-4}	0.11	7.04×10^{-5}	2.21×10^{-9}	1.33×10^{-12}
Surplus Material to SRS	10	2.58	1.55×10^{-3}	0.94	5.62×10^{-4}	9.57×10^{-7}	5.74×10^{-11}

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

Table 5.12-2—Risks of Transporting LLNL Programmatic Category I/II Materials to NTS for Interim Storage Followed by Transportation to LANL

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose	LCFs	Dose	LCFs	Dose	LCFs
LLNL-NTS	3	0.279	1.68×10^{-4}	0.195	1.17×10^{-4}	2.70×10^{-10}	1.62×10^{-13}
NTS-LANL	3	0.366	2.20×10^{-4}	0.161	9.67×10^{-5}	3.12×10^{-10}	1.87×10^{-13}
Total for LLNL-WIPP	**6**	**0.645**	**3.88×10^{-4}**	**0.356**	**2.14×10^{-4}**	**5.82×10^{-10}**	**3.49×10^{-13}**

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

Materials considered wastes currently held at the Superblock facility would be packaged and transported to INL. At INL, the material would be repackaged to meet waste acceptance criteria for transuranic waste disposal specified by the Waste Isolation Pilot Project (WIPP), located in southern New Mexico. Table 5.12-3 provides the estimated radiological impacts associated with the transportation of these materials. As a point of reference, LLNL is authorized to transport approximately 538 shipments annually of hazardous and radioactive materials and waste, based on the analysis in the LLNL SWEIS (70 FR 71491).

Table 5.12-3—Risks of Transporting TRU Wastes from LLNL to INL and INL to WIPP

Material Movement	Number of Shipments	Incident-Free				Accident	
		Crew		Population			
		Dose	LCFs	Dose	LCFs	Dose	LCFs
LLNL-INL	3	0.279	1.68×10^{-4}	0.509	3.05×10^{-4}	1.33×10^{-9}	7.97×10^{-13}
INL-WIPP	3	0.366	2.20×10^{-4}	0.161	9.67×10^{-5}	1.03×10^{-9}	6.18×10^{-13}
Total for LLNL-WIPP	**6**	**0.645**	**3.88×10^{-4}**	**0.670**	**4.02×10^{-4}**	**2.36×10^{-9}**	**1.42×10^{-12}**

Source: Dimsha 2008.
a – Dose presented in person-rem. b – Latent cancer fatalities calculated using conversion factor of 0.0006 LCF per person-rem.

The impacts of storage of Category I/II SNM at receiver sites would be as follows:

LANL: Category I/II SNM is stored at the TA-55 Plutonium Facility Complex, which provides storage, shipping, and receiving activities for the majority of the LANL SNM inventory (up to approximately 7.3 metric tons), which is mainly plutonium. The Category I/II SNM from LLNL would add less than 10 percent to the LANL inventory. No additional emissions, effluents, workers, or wastes would be associated with this increased storage.

NTS: The DAF stores approximately 2.8 metric tons of Category I/II SNM that was previously associated with the TA-18 criticality program at LANL. Storing this material at DAF requires minimal infrastructure support (less than 1 percent of the electricity and water used at NTS); requires approximately 20 workers; causes minimal doses to the public (less than 0.00007 person-rem); causes approximately 10 person-rem dose to workers; and would result in less than 1 LCF annually from accidents (DOE 2002). The Category I/II SNM from LLNL would add less than 20 percent to the existing DAF inventory. No additional emissions, effluents, workers, or wastes would be associated with this increased storage at DAF.

INL: INL would conduct a certification inspection of the TRU prior to shipment to WIPP. This would include real time radiography and analysis of any gases in the container to ensure the contents meet the WIPP WAC. There are no plans for drums to be repacaged at INL because they would be compliant when they leave LLNL. The impacts of conducting these certification inspections would be minimal.

SRS: In 2007, DOE prepared a Supplement Analysis (SA) that evaluated the potential environmental impacts of consolidation at SRS of surplus, non-pit, weapons-usable plutonium from Hanford, LLNL and LANL. The SA concluded that this consolidation would not produce a significant change to the potential environmental impacts identified in previous NEPA reviews (DOE 2007b).

5.12.2 Impacts of Phasing Out Category I/II SNM Operations from LLNL Superblock

Phasing out the Category I/II SNM operations from the Superblock would reduce the material-at-risk (MAR) for plutonium in the Superblock from 40 kg to lower limits associated with Category III SNM quantities (either 400g high purity Pu metal, 2000g Pu in high purity oxide, or 16 kg Pu in low grade materials). A reduction in the MAR would reduce the source term associated with potential accidents, thereby reducing potential accident impacts.

The bounding accident analyzed in the LLNL SWEIS for the Superblock was an evaluation-basis room fire of sufficient magnitude that the entire room is threatened, that all of the radioactive MAR within the room is engulfed in the fire, and the fire burns long enough to release the material from storage containers to the glovebox, room, and the environment (see LLNL SWEIS, DOE 2005, Appendix D, Section D.2.4.9). Table 5.12-4 lists consequences of this accident if the MAR in Superblock were reduced by approximately 60 percent.

Table 5.12-4—Consequences of Bounding Accident at Superblock with MAR of 40 kg and MAR of 16kg

Accident	Frequency (per year)	MEI		Offsite Population[b]		Individual Noninvolved Worker	
		Dose (rem)	LCFs[c]	Dose (person-rem)	LCFs[d]	Dose (rem)	LCFs[c]
Room Fire Unfiltered In Building 332 (Superblock) with MAR of 40 kg	3.90×10^{-7}	5.60	3.36×10^{-3}	2.17×10^{3}	1.30	29.8	0.0178
Room Fire Unfiltered in Building 332 (Superblock) with MAR of 16 kg	3.90×10^{-7}	2.24	1.34×10^{-3}	868	0.52	11.9	7.1×10^{-3}

Source: Tetra Tech 2007.

Once Category I/II SNM is phased out of Superblock, it is expected that several pieces of equipment and hardware that would not be needed for remaining Category III missions would undergo D&D. In the short term, this could increase the wastes from the Superblock. Because a study has not been conducted for these D&D activities, this SPEIS uses conservative assumptions. Based on the analysis in the LLNL SWEIS (DOE 2005a), LLNL is expected to generate approximately 50 cubic meters per year of routine TRU waste (equivalent to approx. 240 drums per year) and an additional 60 cubic meters per year of non-routine TRU waste. Similarly, LLNL is expected to generate 330 cubic meters per year of routine LLW (equivalent to approximately 1,600 drums per year) and an additional 710 cubic meters per year of non-routine LLW (DOE 2005a). In this SPEIS, it is expected that an additional 100 drums of TRU waste and 400 drums of LLW would be generated per year for several years due to D&D activities (NNSA 2007).

Initially, employment at the Superblock would be expected to increase because of the D&D work; however, this would likely not be significant and would be offset by the transfer of some personnel to LANL. It is also expected that scientists and engineers would travel back and forth between LLNL and LANL. After the D&D work is completed, it is expected that there would be some decrease in personnel at LLNL because of the Category I/II SNM component of LLNL's plutonium mission would be located at LANL. However, personnel required to conduct R&D activities involving Category III quantities of SNM and maintaining the Superblock in a safe operating mode would be expected to be the same. It has been estimated that there would be a decrease of approximately 165 security personnel (NNSA 2008). A reduction of 165 employees would represent a 2 percent decrease in LLNL employment.

Because there are no emissions of radionuclides from Superblock, phasing out Category I/II SNM would have no effect on population doses to the surrounding population. There would be no major impacts on the amount of utilities when missions involving Category I/II SNM operations have been eliminated because the ventilation systems, lighting, heat and cooling would still be required.

The Plutonium Facility (Building 332) in the Superblock has been determined eligible for listing on the National Register of Historic Places (NRHP) as a historic property by the California State Historic Preservation Officer (SHPO) (DOE 2005a). Prior to D&D activities, the building would

be recorded and photo-documented to accepted standards.

After phase-out of Category I/II SNM the Superblock facilities would continue to operate with Category III quantities of SNM. During Complex Transformation the Superblock facilities would continue to perform machining, foundry operations, analytical chemistry, and materials characterization on SNM originating from LANL facilities. These activities would produce impacts smaller than those analyzed for Superblock facilities in the LLNL SWEIS (see DOE 2005a).

5.12.3 Impacts of Transferring Category I/II SNM from Pantex Zone 4 to Zone 12

Consolidation of SNM at Pantex would entail the construction of a new storage facility in Zone 12, moving up to 60 metric tons of pits from Zone 4 to Zone 12, and the demolition of the old storage facilities in Zone 4 (Figure 5.12-1).

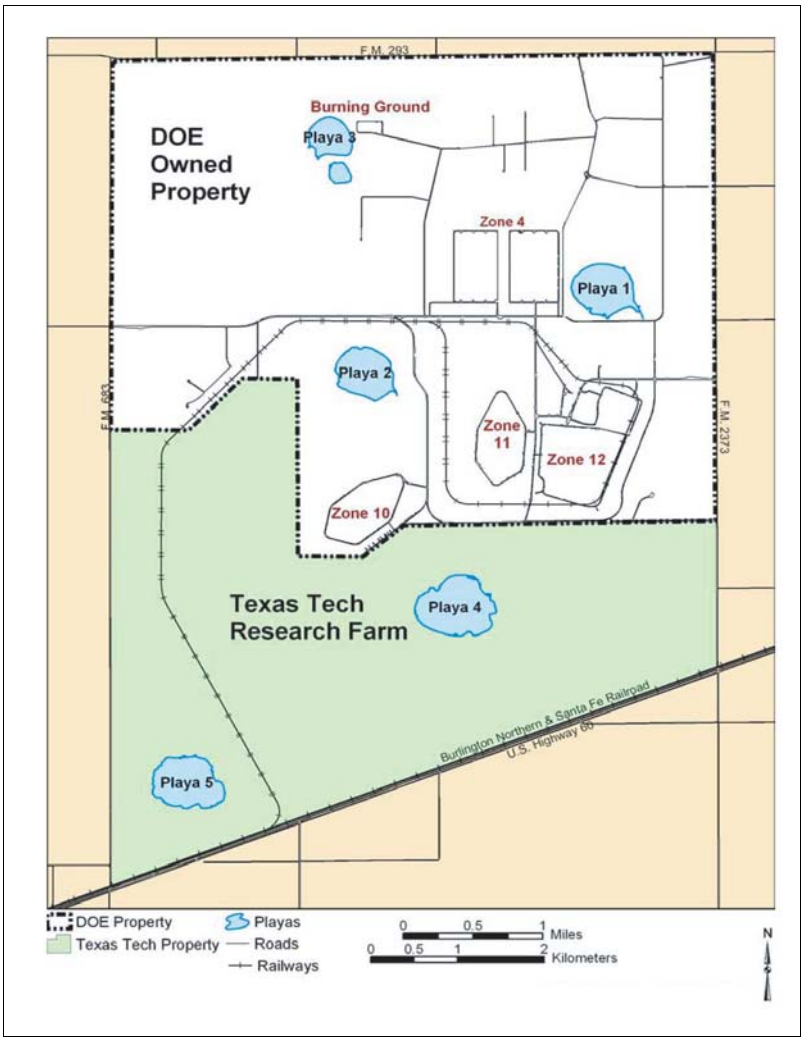


Figure 5.12-1—Zone 4 and Zone 12–Pantex

5.12.3.1 *Construction Impacts*

As shown in Table 3.7-3, the new SNM storage facility would be a steel-reinforced, concrete, underground structure of 95,900 square feet (for the minimum-sized storage facility) and up to 142,800 square feet (for the maximum-sized storage facility). The minimum-sized storage facility would disturb approximately 42 acres and the maximum-sized storage facility would disturb approximately 57 acres. The construction period would take 5 years for the either sized facility and the peak workforce during construction is estimated at 60 for the minimum-sized facility and 120 for the maximum-sized storage facility. The construction water requirement would be 1,500,000 gallons (minimum-sized storage facility) or 2,950,000 gallons (maximum-sized storage facility) over the construction period.

Zone 12 is a highly developed area of Pantex which contains gravel gerties atop the assembly/disassembly bays and cells. The new storage facility would be similar in size to existing structures in Zone 12, and being underground, would not change the visual character of this area. During the construction phase, a little more than two and a half acres of temporary laydown area would be required. After construction, this area would be used to site a 1.5 acre parking lot.

Pantex has known contamination of soils surrounding a cooling tower and a drainage ditch flowing into Playa 1. The soil surrounding the cooling tower contains chromates and other heavy metals associated with algae treatment. The drainage ditch and immediate perched groundwater surrounding this ditch is contaminated with VOCs, metals and explosives. There is a known gasoline spill from a motor pool maintenance facility. In addition several old landfills have been identified in Zone 12 as being contaminated with VOCs, pesticides, PCBs, and radionuclides. Because there are known areas of contamination in Zone 12, the construction or post-construction landscaping has the potential to disturb potential release sites (PRSs). Where possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until the Pantex project staff could review the site and identify appropriate procedures for working within that site area.

Construction of a new underground SNM storage facility in Zone 12 is not expected to have an appreciable negative impact on water resources at or near the Pantex Plant. The new facility is not proposed for construction within the delineated floodplains of the four onsite playas; thus, there would be no direct impacts to surface water features at Pantex or vicinity.

Facility construction could generate storm water runoff, but all construction activities would be conducted in accordance with best management practices for soil erosion and sediment control, and in accordance with applicable permit requirements. Although the new facility would increase site storm water runoff due to the creation of additional impervious surface area, the disturbed land (57 acres for the maximum-sized facility and 42 acres for the minimum-sized facility) would constitute less than 0.1 percent of the DOE-owned land at the site. The new facilities would be located primarily in previously developed areas of the site. Storm water runoff from the facilities would be routed to existing storm water discharge outfalls that are monitored and

regulated in accordance with permit requirements. Engineering best management practices would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These best management practices may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

The proposed storage facility would not require large volumes of water. After construction, where water would be used for dust suppression, water demands (approximately 70,000 gallons per year) would primarily be those needed to meet the sanitary and domestic needs of facility personnel. As a result, water use would not increase significantly over existing water uses (currently approximately 130,000,000 gallons/year are used at Pantex [Section 4.5.3.3]).

Clearing or excavation activities during site construction and during the D&D of the closed facility would have the potential to generate dust. Dust suppression would be conducted as necessary using best available control measures (BACMs), such as water spraying, to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. Noise from the construction would be audible primarily to the involved workers. Involved site workers would be required to wear appropriate personal protective equipment (PPE), including hearing protection.

Foot and vehicular traffic would be minimally affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 60 construction workers for the minimum-sized facility or 120 construction workers for the maximum-sized facility would be onsite during the peak construction period, adding an estimated additional 40-80 personal vehicles to local roadways during the construction period and another 10-20 construction vehicles (such as dump trucks, bulldozers, drill rigs, cranes, and cement mixer trucks). These vehicles would operate primarily during the daylight hours and could be left onsite over night. Temporary construction lighting would be directed toward the work area.

Because Zone 12 is highly developed, no adverse effects to cultural resources, or biological resources (specifically animal and plant species) would result from construction activities. Small animals and birds at the construction site could be temporarily displaced. The black-tailed prairie dog and the snowy plover have been recently added to the site listing at Pantex. The black-tailed prairie dog was designated a Federal candidate species in February 2000 (65 FR 5476); surveys of the Pantex Plant site in 2000 estimated a population of 1,426 black-tailed prairie dogs. This is a considerably lower population than estimates made in 1997 (10,000) and 1998 (13,000) that were based on burrows, rather than actual counts of prairie dogs (Pantex 2006). There are no prairie dog colonies in Zone 4 or Zone 12 at Pantex (Pantex 2007).

Construction of a new storage facility in Zone 12 could result in the loss of some vegetation and less mobile animals (i.e., reptiles, small mammals). Because the construction would occur in previously disturbed areas and would affect less than 1 percent of the DOE-owned land at the site, potential impacts on biological resources would be negligible. A biological assessment of the Pantex Plant completed in 1996 for the Pantex SWEIS which included planned, new construction, addressed the impacts of continuing operations on listed species and species of concern that may occur in or migrate through the area. The assessment was approved in 1996, and the Fish and Wildlife Service (FWS) concurred with the conclusion that continued Pantex Plant operations, including new construction, are not likely to adversely affect any federally listed threatened or endangered species (DOE 1996b, Pantex 2007).

During the construction, there would be no increase in the number of Pantex employees as a result of this project. The estimated additional 60-120 peak construction jobs would be easily filled by the existing employees in the regional work force. Because these temporary jobs would be filled by the construction contractor and subcontractors with workers from the existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in the Pantex ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in the immediate area.

Construction activities would not be expected to have any adverse health effects on Pantex workers or the public. NNSA and Pantex workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 120 peak-period construction workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for the construction industry. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). For the maximum-sized storage facility, if the peak construction period lasts for the entire five year construction period, no deaths (0.005) would be expected for the estimated 120 construction workers from construction or demolition-related activities that include falls, exposure to harmful substances, fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles. These numbers would be proportionally smaller for the smaller-sized storage facility.

Outside of the Amarillo metropolitan area, most of the minority and low-income population continue to be located at the outer reaches of the ROI. Therefore, the minority and low-income populations have not experienced any disproportionately high or adverse human health, social, economic, or environmental effects from Pantex activities. The construction of a new storage facility at Pantex would not result in any new environmental impacts that could give rise to any environmental justice impacts.

5.12.3.2 *Movement of Category I/II SNM from Pantex Zone 4 to Zone 12*

Section 5.10.3.1 of this SPEIS estimates the impacts, including handling, of moving Category I/II SNM (pits) from Pantex to the various CNPC alternative sites. Moving this same material from Zone 4 to Zone 12, within the Pantex site, would have similar health effects related to the handling portion of this analysis. Table 5.12-5 presents the handling (loading and offloading) impacts associated with the Category I/II SNM (pits). These handling impacts are associated with the total amount of pits that would be moved and would not be expected to be greater for a smaller Zone 12 storage facility because the shipment of excess pits to SRS directly from Zone 4 would actually involve less overall handling than if these pits were first moved from Zone 4 to Zone 12 prior to their move to SRS. As shown in Table 5.12-4, the total handling doses would be 1,100 person-rem, which would translate into approximately 0.657 LCFs. Because the actual transportation would be within the Pantex sites, no doses to the public would result from transportation. Worker doses, which would be a fraction of the doses for moving the Category I/II SNM (pits) from Pantex to the various CNPC alternative sites, would result in much less than 1 LCF (see Table 5.10-12). The impacts of moving any excess pits to SRS have been addressed in previous NEPA documents (see DOE 1996d and DOE 1996e).

Table 5.12-5—Radiological Impacts of Handling Zone 4 Pits

	per shipment dose (person-rem)	total dose for campaign (person-rem)	Total LCFs
Movement of pits from Pantex Zone 4 to Zone 12			
Handling		1,100	0.657

Source: Dimsha 2007.

5.12.3.3 *Operation of New Storage Facility*

Once placed in the new storage facility, the material would be stored in a manner similar to the current storage in Zone 4, with the exception that it would be underground. The number of workers associated with storage operations would not change, although there would be a reduction in security force requirements, due to the consolidation of storage into an already secure area. The number of workers associated with storage operations would be small (approximately 40 workers, 10 of whom would be considered “radiation workers”). This is considered a minimum workforce for storage operations, and would not tend to vary with differing quantities of stored materials. As such, this workforce and is expected to be the same for both the minimum- and maximum-sized storage facility.

Because the new storage facility would be located underground, the risks associated with external hazards would be expected to be reduced compared to the existing, above ground Zone 4 storage. Risks associated with internal hazards should not change. Likewise, risks associated with a minimum-sized storage facility would be expected to be similar to those for the maximum-sized storage facility. Because water use would be used to meet the sanitary and domestic needs of facility personnel, the use would be small and the same for either sized facility. No radioactive wastes or emissions would occur due to storage operations. Table 5.12-6 displays the operational requirements associated with the operation of the new storage facility.

Table 5.12-6—Operational Requirements for Zone 12 Storage Facility

	Maximum Sized Storage Facility Consumption/Use	Minimum-Sized Storage Facility Consumption/Use
Data		
Plant footprint (acres)	11	8
Employment (no. of workers)		
Total	40	40
Radiation Workers	10	10
Average Dose to Radiation Worker(mrem)	12	12
Water Use (gallons/year)	70,000	70,000
Waste Generation		
TRU (yd^3)	0	0
Low Level(yd^3)	0	0
Emissions		
Radionuclide emissions (Ci/yr)	0	0

Source: NNSA 2008.

5.12.3.4 *D&D of Zone 4 Facilities*

Once all Category I/II SNM is removed from Zone 4, these storage facilities would be demolished and facilities in Zone 4 would undergo D&D. Table 5.12-7 displays the relevant information associated with the D&D of these Zone 4 facilities. As shown on that table, approximately 700 cubic yards of LLW would result over the 2-year D&D period. This LLW would be packaged for shipment and transported to NTS for disposal. The annual LLW from this D&D would represent an increase of approximately 350 percent compared to the 96.8 cubic yards of LLW generated by Pantex in 2005. These wastes would be transported to NTS for disposal. The impacts of such transportation would be approximately one-tenth as much as the impacts presented in Table 5.10-22 (7,800 cubic yards) for the shipment of LLW from Pantex to NTS. These impacts would be approximately 0.068 person-rem.

Table 5.12-7—Demolition and D&D of Existing Storage Facilities

Requirements	Wastes and Employment
Solid D&D (yd^3)	12,300
LLW generated (yd^3)	700
Hazardous Waste (yd^3)	0
D&D Related Employment	15
Peak workers	15
Total worker hours	62,400

Source: NNSA 2008.

Steel and other non-hazardous debris would be disposed of on-site at one of the Pantex landfills. This material could also be used for backfill at other Pantex construction sites. An additional 15 construction workers with an additional 10 personal vehicles would be added to the local roadways for the D&D activities. There would also be an additional 5 construction vehicles to enable the D&D activities to be conducted.

5.13 PROJECT-SPECIFIC ANALYSIS OF HE R&D

This section analyzes the environmental impacts of the reasonable alternatives, described in Section 3.8, for HE R&D. For each alternative, the analysis focuses on the resources that are most likely to be affected. For example, for alternatives that do not involve new construction, and no associated land disturbance, the following resources would not be affected: land use, visual resources, air and noise, water resources, geology and soils, biotic resources, and cultural resources. As such, this analysis does not discuss these resources any further. Rather, the analysis focuses on the following resources: emissions and exposures, which affect human health, socioeconomic impacts, and wastes. For alternatives that do involve new construction, and associated land disturbance, this analysis discusses impacts to all relevant resources.

As explained in Section 3.8.1, HE R&D activity is currently distributed primarily among five sites within the nuclear weapons complex based on their respective roles in support of the nuclear weapon stockpile. This SPEIS analyzes a full spectrum of alternatives associated with HE R&D as shown on Table 5.13-1.

Table 5.13-1—HE R&D Alternatives

Alternatives		Donor Site	Receiver Site
1	No Action Alternative	N/A	N/A
2a	Downsize in Place	N/A	N/A
2b	Relocate HE Processing & Fabrication from Site 300	LLNL	Pantex, LANL
2b’	LLNL HEAF Annex for local part fabrication	LLNL	Pantex, HEAF, Private industry
2c	Consolidate open-air 1-10 kg HE R&D experiments from LANL and SNL/NM to HEAF and over 10 kg thru 100 kg HE R&D experiments at LANL.	1-10 kg HE R&D LANL, SNL/NM, Pantex 10-100 kg HE R&D LLNL. SNL/NM	1-10 kg HE R&D LLNL 10-100 kg HE R&D LANL, NTS
2d	Consolidate unconfined firing to one or no sites.	ALL	One site or No Site
2e	Consolidate Main Charge HE R&D Experiments and Testing to one or both nuclear labs.	SNL/NM	LANL, LLNL
3a	Consolidate HE R&D Experimentation and Fabrication Activities to LANL	SNL/NM, LLNL, Pantex	LANL
3b	Consolidate HE R&D Experimentation and Fabrication Activities to LLNL	SNL, LANL, Pantex	LLNL
3c	Consolidate HE R&D Experimentation and Fabrication Activities to Pantex	SNL/NM, LANL, LLNL	Pantex
3d	Consolidate HE R&D Experimentation and Fabrication Activities to SNL/NM	LANL, LLNL, Pantex	SNL/NM
3e	Consolidate HE R&D Experimentation and Fabrication Activities from LANL to LLNL or Pantex or NTS	LANL	LLNL, Pantex, NTS
3f	Consolidate HE R&D Experimentation and Fabrication Activities from LLNL to LANL or Pantex or NTS	LLNL	LANL, Pantex, NTS
3g	Consolidate HE R&D Experimentation and Fabrication Activities from LANL and LLNL to Pantex or NTS	LANL, LLNL	Pantex, NTS
3h	Consolidate HE R&D Experimentation and Fabrication Activities to NTS	LANL, LLNL, SNL/NM, Pantex	NTS

Source: NNSA 2007.

For all alternatives, activities involving the handling or work on HE could lead to the accidental detonations resulting in severe or fatal injury of many personnel. The consequences of an accidental detonation of HE could include severe injury or death to the facility workers and the destruction of the building or facility that the accident occurred in. These potential consequences could occur at any site that conducts HE operations. Blast pressures and fragments could also cause injury to other personnel in the open area outside the facility and cause damage to nearby facilities. Additionally, low-level environmental releases and low-level exposures of personnel to airborne hazardous materials may occur from resulting plumes. Because the potential impacts are generally localized, off-site impacts from HE accidents are not expected.

No Action Alternative. Under the No Action Alternative, HE R&D activities would continue at five sites within the weapons complex, as described in Section 3.8.1. LLNL and LANL are where most of the R&D related to main charge explosives is performed. SNL has responsibility for the cradle-to-grave of the non-nuclear explosive components such as gas generators, ignitors, actuators, and timer-drivers. HE R&D is also conducted at the Pantex Plant, principally for safety and quality control purposes and manufacturing process development and improvement. NTS is used for testing of high explosives. At all five sites, compared to other NNSA activities, HE R&D activities comprise a minor part of the overall operations. HE R&D activities are responsible for less than 1 percent of the air emissions, electrical usage, water use, employment, and generated wastes (NNSA 2007). At all sites, high-explosive detonations produce impulse noises which could be audible off-site and potentially cause annoyances. In some instances, NNSA procedures require notification of potentially affected offsite residents prior to such detonations. For example, at Pantex, procedures require telephone notification of potentially affected offsite residents, as well as the use of warning sirens and lights prior to detonations greater than 1 pound. In general, these noises would be intermittent rather than continuous events and would be similar to thunder in their intensity.

5.13.1 HE R&D Minor Downsizing/Consolidation Alternatives

5.13.1.1 *Alternative 2a—Downsize in Place*

Under this alternative, LLNL and LANL would downsize existing HE R&D experimentation and fabrication activities in place, with no transfer of activities between any HE R&D sites. At LANL, any further downsizing would be accomplished within the bounding analysis of the previous DX Consolidation Plan EA and FONSI. At LLNL, B825/B826, B817, and some machining bays in B806/B807 would close. No construction would be required for this alternative, however, B825 and B826 would be decommissioned. There would be no staffing change for this alternative (175 scientists, engineers, and technicians) and no significant change in effluents, emissions, or wastes compared to the No Action Alternative (see Section 3.8.1). As some building close and the work is transferred to other buildings, as specified above, the effluents, emissions and wastes would transfer also. As such, the net effect at LLNL would be no change in effluents, emissions, and wastes. No additional downsizing would occur at Pantex, SNL/NM, or NTS. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

5.13.1.2 *Alternative 2b—Relocate HE Processing & Fabrication from Site 300*

Under this alternative, NNSA would relocate HE processing and fabrication from Site 300. The activities and configuration of the High Explosives Application Facility (HEAF), as described in the No Action Alternative, would remain unchanged. However, the HE R&D facilities at Site 300 would be closed, and HE R&D parts that are fabricated at Pantex or LANL would be shipped to LLNL for testing in HEAF.[2]

The facilities at Site 300 that would close under this alternative are:

Chemistry Area *(scale-up of formulation and synthesis of HE)*

- B825—1- and 2-inch mechanical presses
- B826—small deaerator/loader; 1-pint, 1-gallon mixers
- B827 Complex—50-pound deaerator/loader; heating ovens; 2-gallon to 5-gallon mixers; melt cast kettles; synthesis pilot plant; slurry kettles, grinders, reaction vessels

Process Area

- B809 Complex—25-inch isostatic press, drying ovens
- B817 Complex—14- & 18-inch isostatic presses, drying ovens
- B823 Complex—9-Mev, 2-Mev, 120-kev radiography of HE R&D parts
- B806 Complex, B807—machining of HE R&D parts
- B855 Complex—Large HE part machining
- B810 Complex—assembly of HE R&D parts
- B805—general machine shop, explosive waste packaging, numerically controlled (NC) machine programming

No construction at LLNL would be required for this alternative. Approximately 50 staff would lose their positions. Table 5.13-2 shows changes from eliminating the HE R&D mission from the Site 300 buildings.

Table 5.13-2—Operational Changes at LLNL Site 300–Alternative 2b

Requirements	Reductions
Plant footprint (acres)	2
Employment (workers)	50
Waste Category	**Volume**
Low level	
Liquid (gal)	100
Solid (yd^3)	10
Hazardous	
Liquid (gal)	20,000
Solid (yd^3)	25
Nonhazardous (Sanitary)	
Liquid (gal)	200,000

Source: NNSA 2007.

[2] This alternative could only be implemented if other activities at Site 300 that require a HE processing and fabrication infrastructure, specifically hydrotesting at the Contained Firing Facility (see Section 5.16) and system environmental testing at the Environmental Test Facility (see Section 5.17), have been transferred to new facilities.

HEAF averages about 500 HE R&D shots per year. The explosive parts for these shots would have to be shipped from Pantex or LANL to LLNL. This would require an estimated 100 truck trips per year, inasmuch as R&D parts often have to be made and tested one-off before the design of the next part can be finalized. Relative to existing truck traffic, these increased trips would not be noticeable. Relocating the Site 300 processing and fabrication activities would reduce impacts from these HE R&D activities as follows:

In the short-term, land use would be unaffected. However, the vacated facilities at Site 300 could eventually undergo decommissioning, if there is not enough work-for-other to support continued site activities. This would entail the cleanup and demolition of these facilities. The specific impacts of such demolition cannot be estimated until detailed site-specific surveys are conducted.

Before any demolition, surfaces and fixtures would be tested or sampled to determine if contamination is present and in what quantities. Based on the sampling results, the buildings to be demolished would then be divided into contaminated and uncontaminated zones. Physical barriers would be established between work areas to protect workers and manage wastes and emissions. Workers would remove contaminated materials before demolition of uncontaminated areas begins. Asbestos could be present in the buildings being considered for demolition. The asbestos would be removed according to established industry and regulatory procedures. Asbestos wastes generated during renovation and demolition activities are regulated under the NESHAP for Asbestos (40 CFR Part 61) and would be managed in accordance with all applicable regulations. Air emissions generated during asbestos removal activities would be controlled by use of containment tents (such as plastic drapes) and of high-efficiency particulate air (HEPA) filtered particulate collection devices, as necessary. Similar methods of containment would be used for removal and demolition of materials and structures that are contaminated with radioactive or hazardous materials. As wastes are removed, they would be packaged and managed according to established LLNL procedures.

After contaminated materials are removed, general demolition of the remaining materials and structural elements would begin. Demolition of uncontaminated and decontaminated structures would be performed using standard industry demolition processes. After roof and walls are removed, concrete foundations and paved areas would be removed. A variety of equipment and techniques may be used in the demolition process. Typical equipment used in demolition include front-end loaders, bulldozers, wrecking balls, and pneumatic hammers, as well as various hand tools for removing such items as windows and copper wiring. Materials removed in the demolition process would be segregated to the extent feasible to facilitate recycling and waste management. Dust suppression would be conducted as necessary using best available control measures (BACMs), such as spraying with water or chemical dust suppressants. The application of specific BACMs would be determined on a case-by-case basis. After demolition is completed and waste and recycled materials are removed from the site, the area would be recontoured and revegetated or landscaped as appropriate.

Before starting demolition activities, a site-specific health and safety plan would be prepared and approved. Appropriate personnel protection measures, such as the use of personnel protection equipment (PPE) (gloves, hard hats, steel-toed boots, eye shields, and ear plugs or covers),

monitoring of hazards and worker exposures, and engineered controls would be a routine part of the demolition activities required to protect worker health and safety. In addition, LLNL staff can provide site-specific hazard training as needed. Waste Minimization and Pollution Prevention Plans would be prepared under the Proposed Action to address waste issues for the demolition of the vacated buildings. As already discussed, building demolition materials would be recycled and reused to the extent practicable. All waste requirements for demolition-generated wastes would be met.

Waste minimization practices (such as material substitution, source reduction, hazard segregation, recycling, and reuse) would be incorporated into all waste-generating activities. Waste disposal would occur only after waste minimization options have been implemented or when other options are not safe or are not technically or economically feasible. Wastes would be recycled or salvaged in accordance with LLNL's property management process. Wastes would be managed through the LLNL waste management program. Solid waste would be disposed of offsite; hazardous waste would be shipped offsite to commercial facilities for treatment and disposal. Clean fill dirt would be placed on the sites of the demolished buildings, and the entire area would be landscaped.

Buildings 825, 826, 817A, B, & F, 806 A & B, and 807 are contributing elements to the Hydrodynamics Test Facility Historic District, determined eligible for listing on the NRHP as a historic property by SHPO (SHPO, 2005). Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards. Following decommissioning, NNSA would use best management practices to restore the land to a natural state. Because the facilities to be closed represent much less than one percent of the acreage at Site 300, no impacts to biological resources, soils, geology, and cultural resources would be expected.

Because the Site 300 HE R&D facilities do not utilize any significant quantities of water or electricity, infrastructure demands would not change. Additionally, none of the Site 300 facilities that would close emit significant quantities of air pollutants (individually and cumulatively all facilities emit less than 1 ton of any NAAQS pollutant or other hazardous air pollutants). As such, no changes to air quality would be expected. The changes to employment (reduction of 50 workers) would be inconsequential to the ROI. Reductions in wastes generated would be less than one percent of wastes generated at LLNL and would not change the overall waste management impacts for the site.

5.13.1.3 *Alternative 2b'—LLNL HEAF Annex for Local Part Fabrication*

Under this alternative, NNSA would implement alternative 2b (described above in Section 5.13.1.2), then construct an annex onto HEAF for local fabrication of HE R&D parts. A HEAF Annex would be constructed adjacent to HEAF containing explosives processing cells and support areas (e.g. control room, explosive storage) to provide fabrication capability that is currently provided at Site 300 and does not exist in HEAF. Construction and operational data for this alternative are shown in Tables 5.13-3 and 5.13-4, respectively.

The construction activities at HEAF would add about 1,500 square feet. Operationally, approximately 25 workers might lose their positions in this alternative. Infrastructure

requirements, emissions, and wastes from the Site 300 buildings would be reduced as described in Section 5.13.2. At the LLNL Main Site, the effluents, emissions, and wastes from HEAF would increase about twenty percent over the existing values from HEAF (see Appendix A for a listing of effluents, emissions, and wastes from the HEAF). These increases in effluents, emissions, and wastes would amount to a less than one percent increase in these values compared to the overall LLNL Main Site values.

Table 5.13-3—Construction Data at LLNL–Alternative 2b'

Construction Requirements	Consumption / Use
Electrical energy (MWe)	13
Concrete (yd^3)	600
Steel (t)	50
Water (g)	1500
Land (acre)	0.2
Laydown Area Size (size of parking lot) Parking Lots (sq. ft.)	3000
Employment	
Total employment (worker years)	8
Peak employment (workers)	15
Construction period (years)	1
Waste Generated	
Hazardous	
Liquid (gal)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal)	2000
Solid (yd^3)	0
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd^3)	150

Source: NNSA 2007.

Table 5.13-4—Operational Changes at LLNL–Alternative 2b'

Requirements	Additions/Subtractions
Plant footprint (acres)	-2
Net Change in Employment (workers)	-25
Waste Category	**Volume**
Low level	
Liquid (gal)	-100
Solid (yd^3)	-10
Hazardous	
Liquid (gal)	-7,000
Solid (yd^3)	-25
Nonhazardous (Sanitary)	
Liquid (gal)	-200,000

Source: NNSA 2007.

5.13.1.4 *Alternative 2c—Consolidate Open-Air 1–10 kg HE R&D Experiments from LANL and Sandia to HEAF and Over 10–100 kg HE R&D Experiments at LANL or NTS*

Under this alternative, NNSA would consolidate open-air 1-10 kg HE R&D experiments from LANL and Sandia to HEAF, and >10 kg through 100 kg HE R&D experiments at LANL or the NTS. There would be no new construction.

To accommodate the higher firing load at HEAF, more LLNL staff would be required to support the work in addition to the staff that LANL and SNL would rotate in for their respective experiments. Because no new facilities would be required for this alternative, there would be no construction impacts. Operationally, approximately 15 additional workers would be required, which would be inconsequential relative to the No Action Alternative. No significant changes in effluents, emissions, and waste would be expected from this transfer.

At SNL, this alternative would not eliminate HE R&D experiments and testing that are conducted at the ECF, nor would it decrease the laboratory space currently required to do this work. The impact to work at the TBF is also not likely to experience a major impact in this scenario, as most tests at TBF are less than 10kg. The SNL firing sites most likely affected by this alternative would be 9920, 9939, 9940 and Thunder Range. However, because these facilities are mostly funded by work-for-others, no significant changes in operational data at SNL are expected.

At LANL, consolidation of open-air 1-10 kg shots at HEAF with simultaneous consolidation of 10-100 kg shots to LANL would be expected to have no significant net effect on HE product effluent. Consolidation of 1-10 kg shots to HEAF would result in the transfer of the firing and assembly of approximately 200-250 shots/year to LLNL. LANL would transfer from 4-8 technicians to LLNL. At LANL or NTS, receiving the 10-100 kg shots could be accepted without additional environmental impacts. LANL or NTS would need to hire up to 5 individuals to meet these demands. However, none of these impacts would be consequential.

5.13.1.5 *Alternative 2d—Consolidate Unconfined Firing to One or No Site*

Under this alternative, all unconfined firing operations would be consolidated at one site or eliminated. In any case, unconfined firing operations would be eliminated at LLNL. Currently, HE R&D unconfined firing at LLNL is limited to destruction of excess explosive parts and explosives waste, through open burn or open detonation (OB/OD) at the Explosives Waste Treatment Facility located at Site 300. Therefore, the impact of this alternative to LLNL is the elimination of OB/OD destruction of explosives.

At LLNL, Building 845 would be decommissioned. Eliminating Building 845 would change effluents, wastes, and emissions by less than one percent compared to the No Action Alternative. The number of HE shipments from LLNL would increase, as a large fraction of explosive waste is shipped to other disposal sites. This could require an additional 50 shipments per year. LANL currently has the capacity to absorb all unconfined firing operations, but would need additional contained firing facilities to eliminate open-air firing in the future. Thus, construction of a

2,000 square foot facility would be the bounding case, and would fall within the bounding condition set by the DX Consolidation Plan, which is covered under the No Action Alternative.

If NNSA were to cease open burn/open detonation activities at its other sites, there would be very slight improvements to local air quality. At LANL, open burn and open detonation activities account for 2.3 and 1.1 percent, respectively of total air emissions for the site (Perea 2008). Open burn and open detonation activities at Pantex contribute about 2.03 percent of emissions of nitrogen oxides, 0.14 percent of carbon monoxide emissions, 0.3 percent of emissions of volatile organic compounds, 0.78 percent of particulate matter emissions, and 8.13 percent of hazardous air pollutants emissions (Ely, 2008). At the NTS, open burn/open detonation activities annually contribute to air emissions at the average rate of about 273 pounds of PM_{10}, 215 pounds of carbon monoxide, 130 pounds of nitrogen oxides, 10 pounds of sulfur dioxide, 44 pounds of VOC, and less than one pound of hazardous air pollutants (Plummer 2008). During 2007, open burn/open detonation activities at SNL/NM produced about 121 pounds of carbon monoxide, 232 pounds of nitrogen oxides, 2 pounds of sulfur dioxide, 1,419 pounds of PM_{10}, and 2.3 pounds of hazardous air pollutants (Lacy 2008).

5.13.1.6 *Alternative 2e—Consolidate Main Charge HE R&D Experiments and Testing to One or Both Nuclear Labs*

In this alternative, main charge[3] HE R&D experiments at SNL would be transferred to LANL or LLNL. Pantex main charge experiments are considered part of production or plant support or surveillance, not HE R&D, and are therefore not in the scope of this alternative. If the SNL experiments were transferred to LLNL, they could be accommodated in existing laboratories in HEAF. The main charge HE R&D effort is small at SNL, so there would be a negligible impact on current HEAF activities. No new facilities are required in this alternative. There would be no construction required for this alternative, no impact on staffing, and effluents, emissions, and wastes would be unchanged from the No Action Alternative.

If the SNL experiments were transferred to LANL, LANL has the current infrastructure to absorb main charge HE R&D experiments and testing that SNL is currently conducting at its site, with minimal or no impact. No new facilities would be required for this alternative. There would be no impact on staffing, and effluents, emissions, and wastes would be unchanged from the No Action Alternative. If SNL had LLNL or LANL conduct the experiments instead, this would not decrease the need for supporting work at SNL. Design of components and experiments up to the point of HE assembly would continue. SNL also has components that utilize secondary HE, which is the same family of explosives as the main charge explosives. Furthermore, SNL uses these same capabilities for the explosive materials in the non-nuclear components. If work on the main charge explosives ceased at SNL, the work would continue on the other explosive materials that are in the non-nuclear components. As a result, there would be no change in personnel and no net downsize in facility footprints.

[3] Main charge refers to HE surrounding the pit.

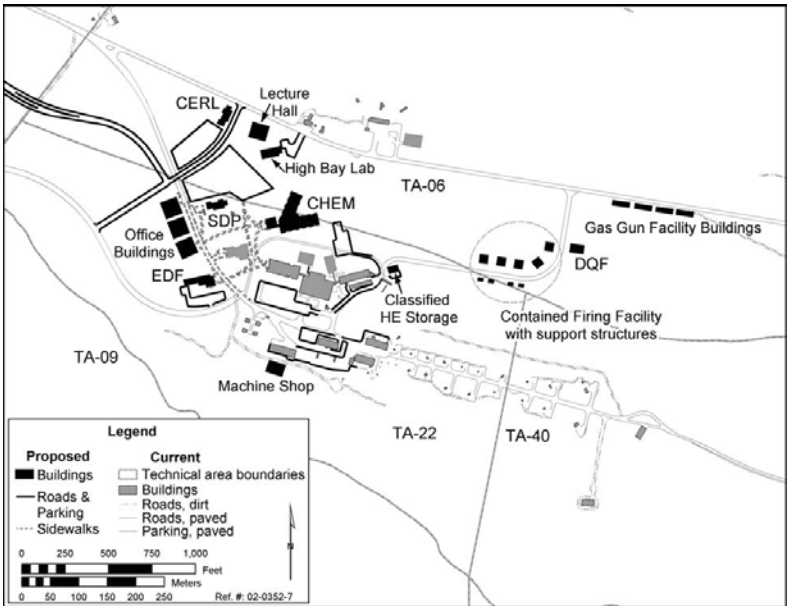
5.13.2 HE R&D Major Consolidation Alternatives

Alternatives 3a through 3g address alternatives that would transfer the entire HE R&D experimental and fabrication activities from one site to one or more other sites. It is noted that the R&D *mission* that has been assigned to each laboratory and plant would continue to be conducted by the scientists and engineers at those sites, although they may have to travel to a "user facility" at the consolidation site. It is the *capability*, i.e. facilities, machines, equipment, that is being consolidated at a single site or smaller number of sites. Some personnel (facility operating staff and technicians) may move with the capability to the consolidation site. The potential environmental impacts of each alternative would be as follows.

5.13.2.1 *Alternative 3a—Consolidate HE R&D Experimentation and Fabrication Activities to LANL*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to LANL. The following impacts at the potentially affected sites would occur:

LANL: Consolidating HE R&D at LANL would involve an increase of capacity for the types of experiments and capabilities that currently exist at LANL. LANL would need to add approximately 170,000 square feet of office and laboratory space to add the LLNL and SNL experimental and fabrication activities. Figure 5.13-1 shows the proposed location for this new facility.



Source: NNSA 2007.

Figure 5.13-1—New Construction Location–LANL Consolidation Alternative

Data for the construction and operation at LANL are contained in Table 5.13-5 and Table 5.13-6, respectively. No additional construction would be needed to add the Pantex HE R&D experimentation and fabrication activities. LANL would add up to 300 jobs under this consolidation.

Construction impacts could disturb approximately 5 acres in the vicinity of the Two-Mile Mesa Complex, which includes portions of TA-6, TA-22, and TA-40, as shown on Figure 5.13-1. Some mature trees may need to be removed from areas near the periphery of the complex. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and Homestead Era cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work would cease in that area until LANL's cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

Table 5.13-5—Construction Requirements at LANL–Alternative 3a

Construction to absorb SNL and LLNL	Consumption/Use
Peak Electrical energy (MWe)	ND
Diesel Generators (Yes or No)	Yes
Land (acre)	< 5 acres
Lay down Area Size, Parking lots	5
Water (gal)	6,000,000
Employment	
Total employment (worker years)	125
Peak employment (workers)	125
Construction period (years)	1
Waste Generated	**Volume**
Non-hazardous Solid (yd^3)	4,930

Source: NNSA 2007.
ND= no data.

Table 5.13-6—Annual Operational Requirements at LANL–Alternative 3a

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	2.6
Additional water (millions of gal.)	4.7
Added plant footprint (acres)	5
Added employment (workers)	300
NAAQS emissions (lbs/yr)	
PM_{10}	1,495
NOx	1,105
CO	940
VOC	180
SOx	58
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	60
Nonhazardous	
Liquid (gal.)	200,000
Solid (pounds)	10,500

Source: NNSA 2007.

The construction or post-construction landscaping could disturb some potential release sites (PRSs). When possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LANL's Project staff could review the site and would identify procedures for working within that site area.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new building would be designed according to general design criteria for a new facility (LANL 1999a), with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

The building exterior (such as surface finish, roof lines, and windows) would be designed to be architecturally compatible with one another and with other recent buildings in the Two-Mile Mesa Complex. Typically roof drains would collect snowmelt and rain water from these buildings and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. The Two-Mile Mesa Complex is generally not visible from public roads; the proposed building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of the existing Two-Mile Mesa Complex. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects. After completion of proposed construction, the Two-Mile Mesa Complex would still resemble an industrial park but on an expanded scale.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) at the Two-Mile Mesa Complex are currently being reconfigured and upgraded for efficient distribution to new buildings associated with the DX Consolidation.

LANL is considered a major air emission source under the State of New Mexico Operating Permit program because it emits more than 100 tons per year of certain non-radioactive substances. Specifically, LANL is a major source of nitrogen oxides, emitted primarily from the TA-3 steam plant boilers. Combustion units are the primary point sources of criteria pollutants

(nitrogen oxides, sulfur oxides, particulate matter, and carbon monoxide) emitted at LANL. The new building would be located in Los Alamos County, which is in attainment with NAAQS and all New Mexico Ambient Air Quality Standards (NMAAQS). The ambient air quality in and around LANL meets all EPA and DOE standards for protecting the public and workers (LANL 2001a).

Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in the Two-Mile Mesa Complex area. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased HE testing. Such testing currently occurs at LANL. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points. The public is not allowed within the fenced TAs that have firing sites, and noise levels produced by explosives tests are sufficiently reduced at locations where the public would be present to preclude hearing damage.

Such tests would not be expected to adversely affect offsite sensitive receptors (such as those at Bandelier National Monument or at White Rock). Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LANL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas and their continued presence on the LANL site over the past 10 years. In

fact, the continued thriving of resident and long-term migratory populations of these sensitive species on the LANL site indicates that the level of noise generated by explosives testing under the No Action Alternative is at least tolerable to these particular species (LANL 2007).

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 120 construction workers would be onsite during the peak construction period, adding approximately 60 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

There would be no effects to sensitive species or their critical habitat due to construction. Small mammals and birds at the Two-Mile Mesa Complex building sites would be temporarily displaced by construction activities. These would be expected to return to the area after construction was completed. Game animal migration is not likely to be altered.

There are no floodplains or wetlands within the area of the proposed action. There are, however, riparian and wetland areas immediately north of the Two-Mile Mesa Complex and a floodplain in Two-Mile Canyon north of Two-Mile Mesa Complex. The new building would not entail any direct effects on floodplains or wetlands since there are none within the areas proposed for construction or demolition. BMPs would be established so that there would be no indirect effects from construction.

During construction, 125 peak construction jobs would be filled by the existing employees in the regional work force, which includes mostly Los Alamos, Rio Arriba, and Santa Fe Counties. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Los Alamos or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction would not be expected to have any adverse health effects on LANL workers or the public. NNSA and LANL workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not

expected to result in an adverse effect on the health of construction workers. Approximately 120 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). If the peak construction period lasts for the entire one year construction period, no deaths (0.0049) would be expected for the estimated 125 onsite construction workers from construction nor demolition-related activities that include falls, exposure to harmful substances, fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

The new construction would generate non-hazardous solid waste that would be disposed of at the Los Alamos Country Landfill, its replacement facility, or other New Mexico solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 4,930 cubic yards.

Proposed operations would have minimal effects on the LANL environment. Operations would produce the same types of waste as are generated in other LANL facilities in the Two-Mile Mesa Complex. No new radioactive or other wastewater or hazardous waste streams would be generated. The operations would not affect or be affected by geological conditions. A review of existing information on local geology at the Two-Mile Mesa area indicates that there are no *known* geologic hazards in the immediate vicinity of this site. With respect to air quality, the new facility would emit less than one percent of the existing LANL emissions.

Water quality in this area would not be affected by the operations. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by implementing the Proposed Action. Water quality would not change as a result of operations of the new building in the Two-Mile Mesa Complex.

Removal of asphalt in some areas would decrease surface water runoff and would increase surface water infiltration. Establishment of new asphalt parking areas would have the reverse effect. Water use would be expected to be static. The net increased infiltration is not expected to have any adverse effects on groundwater quality.

During operations, there would be a 300 person increase in the number of LANL employees as a result of this project. Compared to the existing workforce at LANL, this project would not have a long-term effect on socioeconomic conditions in north-central New Mexico.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease to zero. In

the short-term, land use would be unaffected. However, the vacated facilities at Site 300 would eventually undergo decommissioning. This would entail the cleanup and demolition of these facilities. The specific impacts of such demolition cannot be estimated until detailed site-specific surveys are conducted. Following decommissioning, NNSA would use best management practices to restore the land to a natural state. Because the facilities to be closed represent much less than one percent of the acreage at Site 300, no impacts to biological resources, soils, and geology would be expected. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

Because the Site 300 HE R&D facilities do not utilize any significant quantities of water or electricity, infrastructure demands would not change. Additionally, none of the Site 300 facilities that would close emit significant quantities of air pollutants (individually and cumulatively all facilities emit less than 1 ton of any NAAQS pollutant or other hazardous air pollutants). As such, no changes to air quality would be expected. The changes to employment (reduction of 50 workers) would be inconsequential to the ROI. Reductions in wastes generated would be less than one percent of wastes generated at LLNL and would not change the overall waste management impacts for the site.

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease to zero. A minor decrease in operational impacts would be expected from phasing-out HE testing. This could result in a reduction of the emissions shown on Table 5.13-6a.

Table 5.13-6a—SNL HE R&D Annual Air Emissions (in Pounds Based on 2006 Data)

Facility	CO	NOx	SO2	PM10	HAPs
Explosive Components - Bldg 905	0.5	0.8	0.0	4.3	0.0
Terminal Ballistic Site(Bldg 6750)	3.8	6.4	0.1	35.3	0.0
Site 9940	15.5	26.0	0.2	144.2	0.0
Thunder Range	100.0	168.0	1.4	930.0	0.0
Sites 9920, 9930, 9939	9.0	15.1	0.1	83.7	0.0
Star Facility (Bldg 9956	10.3	15.5	0.0	221.5	2.3

Source: NNSA 2007.

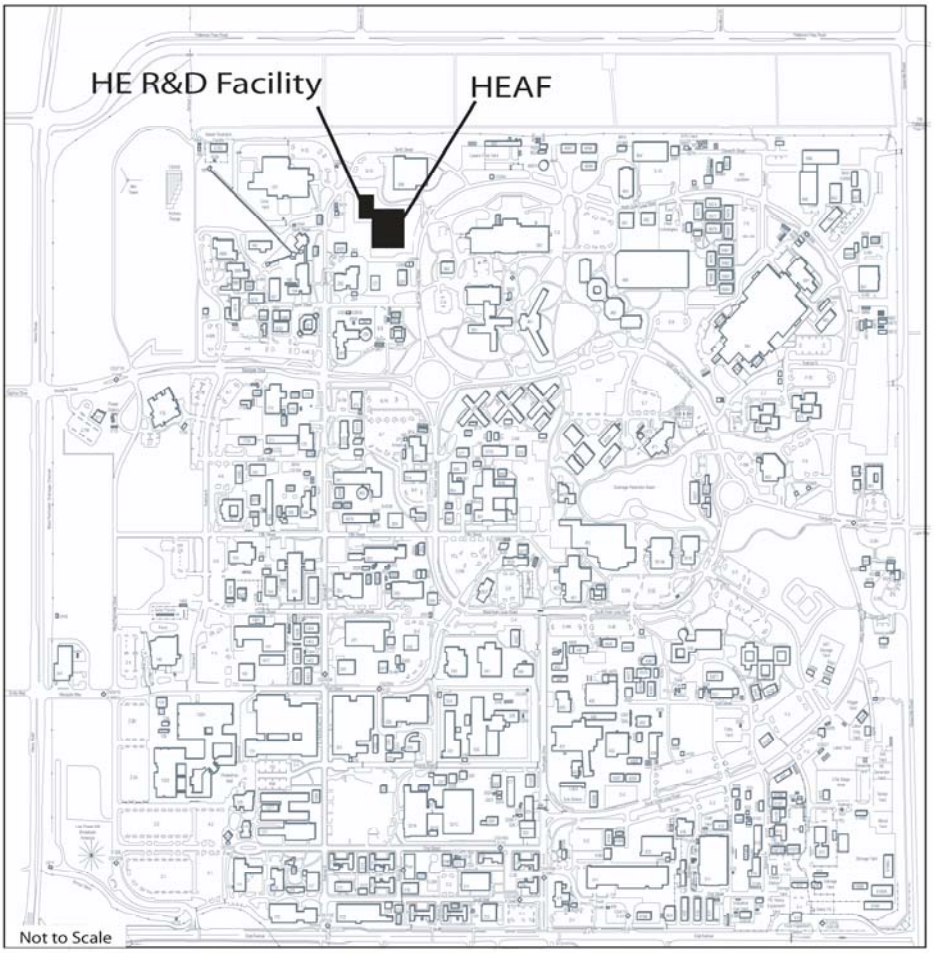
These reductions would represent less than 5 percent of SNL emissions, and would not have a noticeable affect on air quality.

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operations. Water use, effluents, emissions, and wastes from HE R&D experimentation and fabrication activities would decrease by approximately 5 percent.

5.13.2.2 *Alternative 3b—Consolidate HE R&D Experimentation and Fabrication Activities to LLNL*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to LLNL. The following impacts at the potentially affected sites would occur:

LLNL: Construction of a new facility at LLNL would be necessary to provide the HE R&D experimentation and fabrication activities capacity from LANL and SNL[4]. A new experimental facility with about 400,000 square feet and 300 offices is projected. The new facility would be located nearby HEAF, as shown below in Figure 5.13-2. Construction data for this new facility would be as shown in Table 5.13-7.



Note: map not to scale

Figure 5.13-2—Location for New HE R&D Facility at LLNL

[4] For this alternative, HE R&D at Site 300 would have to remain in place – alternatives 2b or 2b' could not also be adopted.

Table 5.13-7—Construction Requirements at LLNL–Alternative 3b

Construction Requirements	Consumption/Use
Electrical energy (MWh)	526
Concrete (yd^3)	24,400
Steel (t)	2,000
Water (gal)	1,500,000
Land (acre)	8-10
Laydown Area Size (part of parking lot) Parking Lots (sq feet)	120,000
Employment	
Total employment (worker years)	315
Peak employment (workers)	150
Construction period (years)	3.5
Waste Generated	**Volume**
Nonhazardous (sanitary)	
Liquid (gal)	87,500
Nonhazardous (other)	
Solid (yd^3)	6,200

Source: NNSA 2007.

Operationally, the HE R&D staff would increase by approximately 300 personnel. The effluents, emissions, and waste would increase as shown below in Table 5.13-8.

Table 5.13-8—Operational Requirements at LLNL for Alternative 3b

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6
Additional water (gal.)	4.7 million
Added plant footprint (acres)	8-10
Added employment (workers)	300
NAAQS emissions (lbs/yr) PM10 NOx CO VOC SOx	 5,200 4,275 3,460 420 375
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	0
Solid (cubic yd)	0
Hazardous	
Liquid (gal.)	300
Solid (pounds)	35
Nonhazardous	
Liquid (gal.)	63,000
Solid (pounds)	10,500

Source: NNSA 2007.

Construction impacts could disturb approximately 8-10 acres in the vicinity of the HEAF, as shown on Figure 5.13-2. Some mature trees may need to be removed to support construction. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and historic cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work

would cease in that area until LLNL's cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

New building construction could disturb some previous areas of unknown contamination. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LLNL's Project staff could review the site and would identify procedures for working within that site area.

Construction of the new building would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would typically consist of a concrete slab foundation with a one- or two-story superstructure. The total height of the building above ground level would be less than 32 feet.

The building exterior (such as surface finish, roof lines, and windows) would be designed to be architecturally compatible with other buildings at LLNL. Typically roof drains would collect snowmelt and rain water and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction would be expected to be minimal. The visual effects of construction would be confined to the immediate area of LLNL. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects. After the completion of construction, LLNL would still resemble a highly-developed industrial area.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility from the HEAF.

As described in Section 4.2.4.1.2 both the Bay Area and San Joaquin Valley have been designated as nonattainment areas with respect to both the Federal ozone standard and the more stringent state standard. The Bay Area air district is classified as nonattainment with respect to California standards for particulates, attainment for the Federal PM_{10} annual standard, and unclassified for both $PM_{2.5}$ and 24-hour PM_{10} standards. The San Joaquin Valley air district is classified as nonattainment for state particulate matter standards and as a serious nonattainment

area for Federal PM_{10} standards. Although particulates are not measured in Tracy, it is recognized as a regional problem.

Both the Bay Area Air Quality Management District (BAAQMD) and San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) have adopted "no net increase" provisions within their clean air plans. The "no net increase" programs require that, as a precondition to the issuance of an air permit for a significant new or modified emission source, any increases in emissions of nonattainment pollutants or precursors be offset by mandatory reductions in emissions of other sources onsite or potentially at other facilities. In the BAAQMD, the offset requirement is triggered for mid-size facilities (emissions of 15 tons per year or more of nonattainment pollutants), and a greater burden is placed on large facilities (emissions of 50 tons per year or more). The Livermore Site falls into the mid-size facility category and must abide by the requirements of the BAAQMD for emission offsets. Site 300, the majority of which lies within San Joaquin County, is under the jurisdiction of the SJVUAPCD.[5] In SJVUAPCD, offset requirements are triggered at 10 tons per year. The new building, which would be located at the Livermore Site, would have emissions well below the requirements of the BAAQMD for emission offsets.

Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in HEAF area. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LLNL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by "thunder-like" explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas. The noise would be sporadic and would be mitigated by the

[5] A small portion of Site 300 falls within Alameda County, which is under the jurisdiction of the BAAQMD.

distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased HE testing. Such testing currently occurs at LLNL. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 150 construction workers would be onsite during the peak construction period, adding approximately 75 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

There would be no effects to biological resources, as the area under consideration is located in an area of previous development. There are no floodplains or wetlands within the area of the proposed action.

During construction, approximately 150 peak construction jobs would be filled by the existing employees in the regional workforce. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in LLNL or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in California.

Construction would not be expected to have any adverse health effects on LLNL workers or the public. NNSA and LLNL workers would perform site inspections and monitor construction during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 150 peak-

period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (3.5 years), no deaths (0.012) would be expected for the estimated 315 worker-years.

The new construction would generate non-hazardous solid waste that would be disposed of off-site in solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 6,200 cubic yards.

Proposed operations would have minimal effects on the LLNL environment. Operations would produce the same types of waste as are generated in the HEAF. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing LLNL emissions. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately one percent of the current usage at the Livermore Site. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 300 person increase in the number of LLNL employees as a result of this project. Compared to the existing workforce at LLNL, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities, which could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality.

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Similar to LANL, a minor decrease in operational impacts would be expected from phasing-out HE testing. This could result in a reduction of the emissions shown on Table 5.13-6a. These reductions would represent less than 5 percent of SNL emissions, and would not have a noticeable affect on air quality.

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation

and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operation. Effluents, emissions, and wastes from HE R&D would decrease by approximately 5 percent.

5.13.2.3 *Alternative 3c—Consolidate HE R&D Experimentation and Fabrication Activities to Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to Pantex. The following impacts at the potentially affected sites would occur:

Pantex. Consolidating HE R&D experimentation and fabrication activities at Pantex would result in the need for both new construction and modifications to existing facilities. Data for the construction at Pantex are contained in Table 5.13-9.

Operationally, the HE R&D staff would increase by approximately 160 personnel, and office accommodations for traveling laboratory staff would be added. The effluents, emissions, and waste would increase as shown below in Table 5.13-10.

Table 5.13-9—Construction Requirements at Pantex–Alternative 3c

Construction Requirements	Consumption/Use
Peak electrical energy (MWe)	23
Concrete (yd3)	10,700
Steel (tons)	500
Water (gal)	1,500,000
Land (acre)	5.7
Laydown Size	1.7
Parking Lots	1
Total Footprint (new or added) square feet	100,000
Employment	
Total employment (worker years)	420
Peak Employment (workers)	210
Construction period (years)	3
Waste Generated (yd3)	
Low-Level Hazardous	1
Hazardous	12

Source: NNSA 2007.

Table 5.13-10—Operational Requirements at Pantex–Alternative 3c

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6 MWh
Additional water (gal.)	4.7 million
Added plant footprint (acres)	5.7
Added employment (workers)	160
NAAQS emissions (lbs/yr)	
PM10	5,300
NOx	5,150
CO	4,300
VOC	600
SOx	540
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	60
Nonhazardous	
Liquid (gal.)	263,000
Solid (pounds)	10,500

Source: NNSA 2007.

Construction impacts could disturb approximately 5.7 acres in the vicinity of Zone 11 and Zone 12, as shown on Figure 5.13-3. No construction would be conducted within a floodplain or a wetland.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. Plant facilities are visible from U.S. 60 and the local Farm-to-Market roads adjacent to the Pantex boundaries. The new building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of Zones 11 and 12. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.

The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM_{10}) (40 CFR 81.344). Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, increases in pollutants would be less than approximately 1 percent of site emissions and would have no noticeable affect on any air quality concentrations.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Zones 11 and 12. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging.

Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be reclaimed or used for permanent parking.

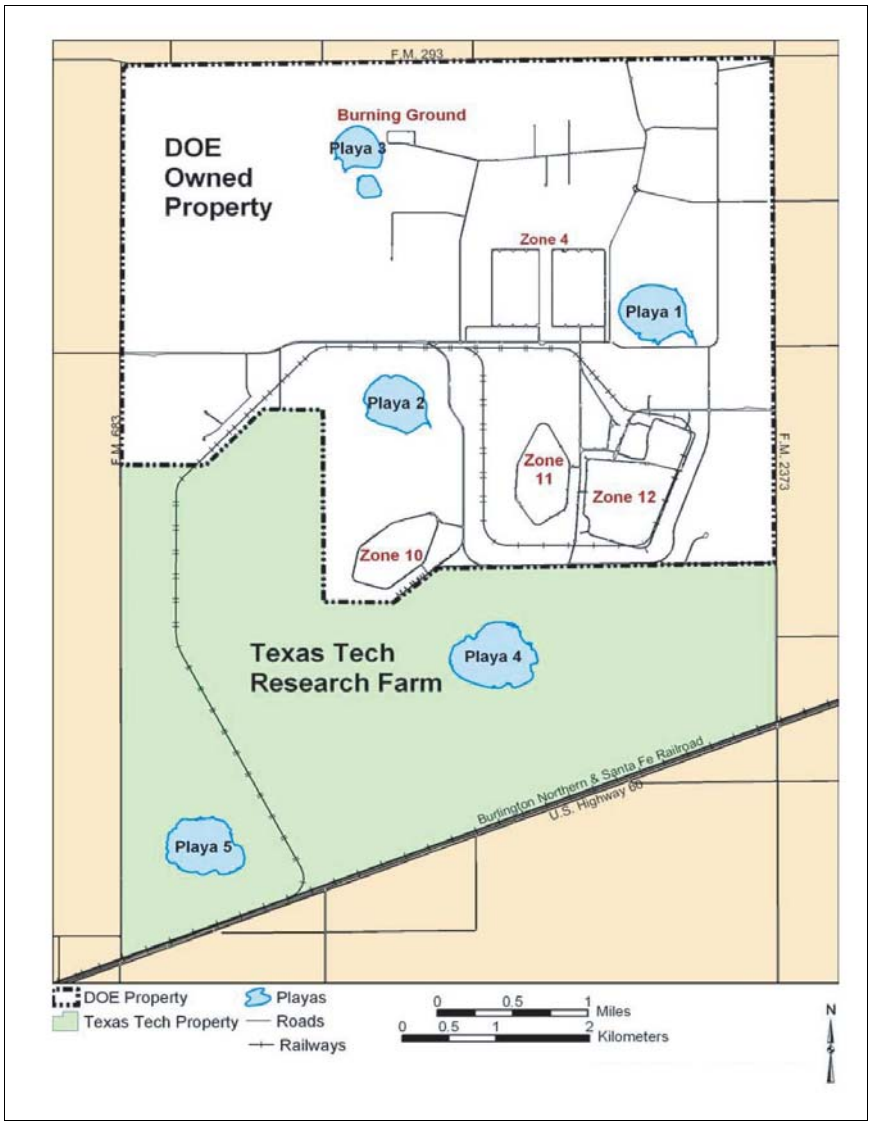


Figure 5.13-3—Zone 11 and Zone 12 at Pantex

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 210 construction workers would be onsite during the peak construction period, adding approximately 105 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the 210 peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Amarillo or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in Texas.

Construction would not be expected to have any adverse health effects on Pantex workers or the public. NNSA and Pantex workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 210 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (3 years), no deaths (0.016) would be expected for the estimated 420 worker-years. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

There would be no effects to sensitive species or their critical habitat due to construction as construction would take place in previously disturbed areas. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan. Construction solid waste is estimated at 1,550 cubic yards.

Proposed operations would have minimal effects on the Pantex environment. Operations would produce the same types of waste as are generated in other Pantex facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing Pantex emissions.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately three percent of the current usage at Pantex. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 160 person increase in the number of Pantex employees as a result of this project. Compared to the existing workforce at Pantex, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards

SNL. Under this alternative, SNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 45 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. This could result in a reduction of the emissions shown on Table 5.13-6a.

5.13.2.4 *Alternative 3d—Consolidate HE R&D Experimentation and Fabrication Activities to SNL/NM*

Under this alternative, HE R&D experimentation and fabrication activities would be consolidated to SNL/NM. The following impacts at the potentially affected sites would occur:

SNL: SNL could absorb the HE R&D experimentation and fabrication activities currently performed at Pantex and activities from LANL and LLNL conducted at outdoor firing sites. In order to transfer operations from the LLNL HEAF and Site 300 operations and storage, and the LANL activities located at various facilities there, an additional total of 480,000 square feet of office and laboratory space would be required to be constructed. The construction would likely be located in Technical Areas 2 or 3, as shown on Figure 5.13-4.

The construction data that are associated with the transfer of the HE R&D experimentation and fabrication activities from LLNL and LANL are presented in Table 5.13-11. No construction would be required to accommodate the work that is currently conducted at Pantex. New firing sites would not be required to be constructed. About half of the new construction represents office space for traveling scientists and engineers, and the remaining as laboratory space.

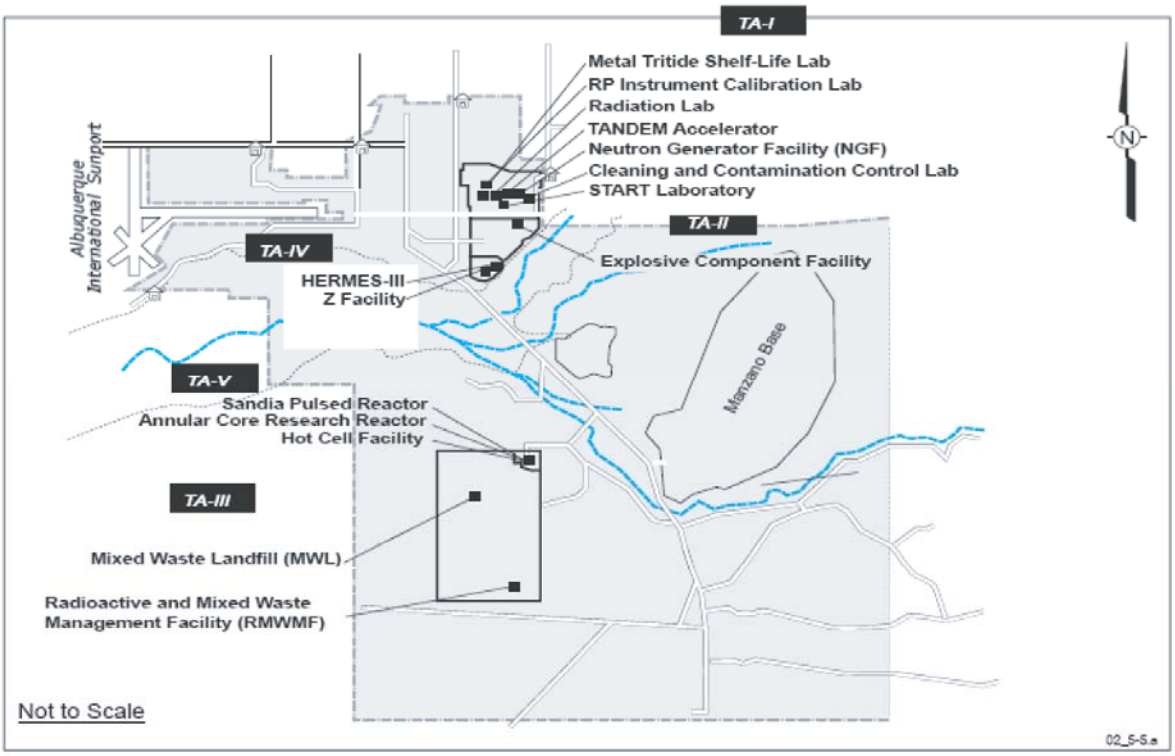


Figure 5.13-4—SNL Technical Areas

Table 5.13-11—Construction Requirements at SNL–Alternative 3d

Construction Requirements	Consumption/Use
Peak Electrical energy (MWe) (Fully occupied 6 MW)	100 KW [c]
Concrete (yd^3)	7500 [c]
Steel (t)	6000 [c]
Water (gal)	7,200,000
Land (acre)	
Laydown Area Size Parking Lots (Based on ½ offices & ½ Lab Space)	5 acres [a] 8.5 acres [c]
Employment	
Total employment (worker years)	225 [a]
Peak employment (workers)	220 [a]
Construction period (years)	2 years [a]
Waste Generated	**Volume**
Hazardous	
Liquid (gal) (no anticipated spills)	0
Solid (yd^3)	0
Nonhazardous (Sanitary)	
Liquid (gal) (Portable Toilet waste to be hauled off site)	0
Solid (yd^3)	0
Nonhazardous (Other)	
Liquid (gal)	0
Solid (yd^3)	2,650 [b]

Source: NNSA 2007.
[a] Based on data from the recently completed MESA/WIF (Weapons Integrated Facility) Project.
[b] Based on recently completed office buildings on the SNL Site.
[c] System Engineers input based on square feet of building and code requirements.
[c] Parking Lot Size based on a 480,000 sq. ft. building to be occupied ½ offices and ½ lab space has no large presentation rooms.

Operationally, approximately 325 new jobs would be added at SNL/NM to support the new processes and capabilities at the new lab. The existing SNL/NM waste management infrastructure without modification can be applied to manage and treat all anticipated waste streams from this alternative. SNL/NM does not have an OBOD site to expel excess or waste explosive samples. SNL/NM utilizes the EOD on the USAF base for this capability. Transportation would require explosive transportation from the donor sites (LANL, LLNL, Pantex) to SNL. The effluents, emissions, and waste would increase as shown below in Table 5.13-12.

Table 5.13-12—Operational Requirements at SNL–Alternative 3d

Operation Requirements	Consumption/Use
Additional electrical energy (megawatt-hours [MWh])	25.6 MWh
Additional water (gal.)	4.7 million
Added plant footprint (acres)	13.5
Added employment (workers)	325
NAAQS emissions (lbs/yr)	
PM_{10}	5,300
NOx	4,900
CO	4,125
VOC	600
SOx	540
Waste Category	**Volume**
Low-Level	
Liquid (gal.)	1,800
Solid (cubic yd)	13
Hazardous	
Liquid (gal.)	120,000
Solid (pounds)	25
Nonhazardous	
Liquid (gal.)	261,000
Solid (pounds)	0

Source: NNSA 2007.

Construction impacts could disturb approximately 13.5 acres in the vicinity of Technical Areas 2 or 3. No construction would be conducted within a floodplain or a wetland.

Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a one- to two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. Most SNL/NM

facilities are well within the KAFB boundary and away from public view. Because of their location and the surrounding terrain characteristics, most facilities are not visible from roads and areas with public access. The new building would be similar in height to existing buildings. The visual effects of construction would be confined to the immediate area of Technical Areas 2 or 3. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.

SNL is located within the Bernalillo County AQCR, which has been designated as a maintenance area under the CAA for carbon monoxide (CO) emissions and is in attainment for other federally regulated pollutants. In 2005, there were no exceedences of the criteria pollutant standards at SNL/NM. Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. During operations, NAAQS emissions would increase by approximately 7 tons annually, which is well below the 100 tons per year threshold that would require an air conformity analysis (20 NMAC Part 11.04.II.1.2, paragraph B).

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Technical Areas 2 or 3. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be used for permanent parking. Construction solid waste is estimated at 2,650 cubic yards.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with HE tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside SNL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average

lightning event areas. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because the HE R&D would be similar in nature to existing HE R&D at SNL, it is not expected to introduce any significant new noise impacts.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 220 construction workers would be onsite during the peak construction period, adding approximately 110 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas.

Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the 220 peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Albuquerque or the region. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction would not be expected to have any adverse health effects on SNL/NM workers or the public. NNSA and SNL/NM workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 220 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (2 years), no deaths (0.009) would be expected for the estimated 225 worker-years.

There would be no effects to sensitive species or their critical habitat due to construction. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan.

Proposed operations would have minimal effects on the SNL/NM environment. Operations would produce the same types of waste as are generated in other SNL/NM facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing SNL/NM emissions.

Water quality in this area would not be affected by the operations. The facility would require approximately 4.7 million gallons of water per year, which would be approximately four percent of the current usage at SNL/NM. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 325 person increase in the number of SNL/NM employees as a result of this project. Compared to the existing workforce at SNL/NM, this project would not have a long-term effect on socioeconomic conditions in the ROI.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Air pollution emissions would be reduced by about 0.30 tons per year, which would not have a noticeable affect on air quality

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards

Pantex. Under this alternative, Pantex would cease HE R&D activities. However, because there are currently no Pantex facilities or personnel dedicated entirely to HE R&D experimentation and fabrication activities, only approximately 10 jobs would be lost at Pantex and there would be no major changes in facility operation. Water use, effluents, emissions, and wastes from HE R&D would decrease by approximately 5 percent.

5.13.2.5 *Alternative 3e—Consolidate HE R&D Experimentation and Fabrication Activities from LANL to Either LLNL or Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LANL to either LLNL or Pantex. The following impacts at the potentially affected sites would occur:

LANL: Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Effluents, emissions, and wastes from HE R&D would decrease to zero.

LLNL (if receiver). Construction of a new facility at LLNL would be necessary to provide the HE R&D experimentation and fabrication activities capacity from LANL. The impacts of this facility would be similar to the impacts described under alternative 3b. Operationally, approximately 300 jobs would be added at LLNL.

Pantex (if receiver). Construction of new facilities and upgrades to existing facilities at Pantex would be necessary to support the HE R&D capacity from LANL. The impacts of this facility would be similar to the impacts described under alternative 3c. Operationally, approximately 96 jobs would be added at Pantex, and accommodations for traveling laboratory staff would be added.

5.13.2.6 *Alternative 3f—Consolidate HE R&D Experimentation and Fabrication Activities from LLNL to Either LANL or Pantex*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LLNL to either LANL or Pantex. The following impacts at the potentially affected sites would occur:

LANL (if receiver). Consolidating the LLNL HE R&D experimentation and fabrication activities at LANL would involve an increase of capacity for the types of experiments and capabilities that currently exist at LANL. LANL would need to absorb approximately 65,000 square feet of office and laboratory space to absorb the LLNL experimentation and fabrication activities. The impacts of this facility would be similar to the impacts described under Alternative 3a. Operationally, approximately 175 jobs would be added at LANL.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero.

Pantex (if receiver). Construction of new facilities and upgrades to existing facilities at Pantex would be necessary to support the HE R&D experimentation and fabrication activities capacity from LLNL. The impacts of this facility would be similar to the impacts described under Alternative 3c. Operationally, approximately 96 jobs would be added at Pantex, and office accommodations for traveling laboratory staff would be added.

5.13.2.7 *Alternative 3g—Consolidate HE R&D Experimentation and Fabrication Activities from LLNL and LANL to Either Pantex or NTS*

Under this alternative, HE R&D experimentation and fabrication activities would be transferred from LLNL and LANL to either Pantex or NTS (see 5.13.2.8 for the NTS discussion). The following impacts at the potentially affected sites would occur:

Pantex. Consolidating HE R&D experimentation and fabrication activities at Pantex would result in the need for both new construction and modifications to existing facilities. Data for the construction at Pantex are contained in Table 5.13-13. The impacts of this facility would be similar to the impacts described under Alternative 3c. Operationally, approximately 116 jobs would be added at Pantex.

Table 5.13-13—Construction Data at Pantex for Consolidating LANL & LLNL HE R&D at Pantex–Alternative 3g

Construction Requirements	Consumption/Use
Peak electrical energy (Mwe)	27
Concrete (yd3)	13,500
Steel (tons)	2,100
Water (gal)	1,500,000
Land (acre)	8.1
Laydown Size	1.9
Parking Lots	1
Total Footprint (new or added)	78,000
Employment	
Total employment (worker years)	475
Peak Employment (workers)	235
Construction period (years)	3
Waste Generated	**Volume**
Low-Level Hazardous (yd^3)	12
Hazardous (yd^3)	304.8

Source: NNSA 2007.

LANL. Under this alternative, LANL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 150 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero.

LLNL. Under this alternative, LLNL would cease HE R&D experimentation and fabrication activities. This could result in a loss of approximately 175 jobs. Water use, effluents, emissions, and wastes from HE R&D would decrease to zero. Several buildings at Site 300 that have been determined eligible for listing in the NRHP would be affected by decommissioning. Prior to D&D activities, these buildings should be recorded and photo documented to accepted standards.

5.13.2.8 *Alternatives 3e Through 3g—Consolidate HE R&D Experimentation and Fabrication Activities to NTS*

NTS is being considered for the following: (1) alternative 3e: consolidation of LANL HE R&D experimentation and fabrication activities to NTS; (2) alternative 3f: consolidation of LLNL HE R&D experimentation and fabrication activities to NTS; (3) alternative 3g: consolidation of LANL and LLNL HE R&D experimentation and fabrication activities to NTS; and (4) alternative 3g: consolidation of all HE R&D experimentation and fabrication activities at NTS. For purposes of this analysis, the bounding environmental impacts would result from alternative 3g, in which all HE R&D experimentation and fabrication activities are transferred from LLNL, LANL, SNL/NM, and Pantex to the NTS. As such, this analysis focuses on that alternative.

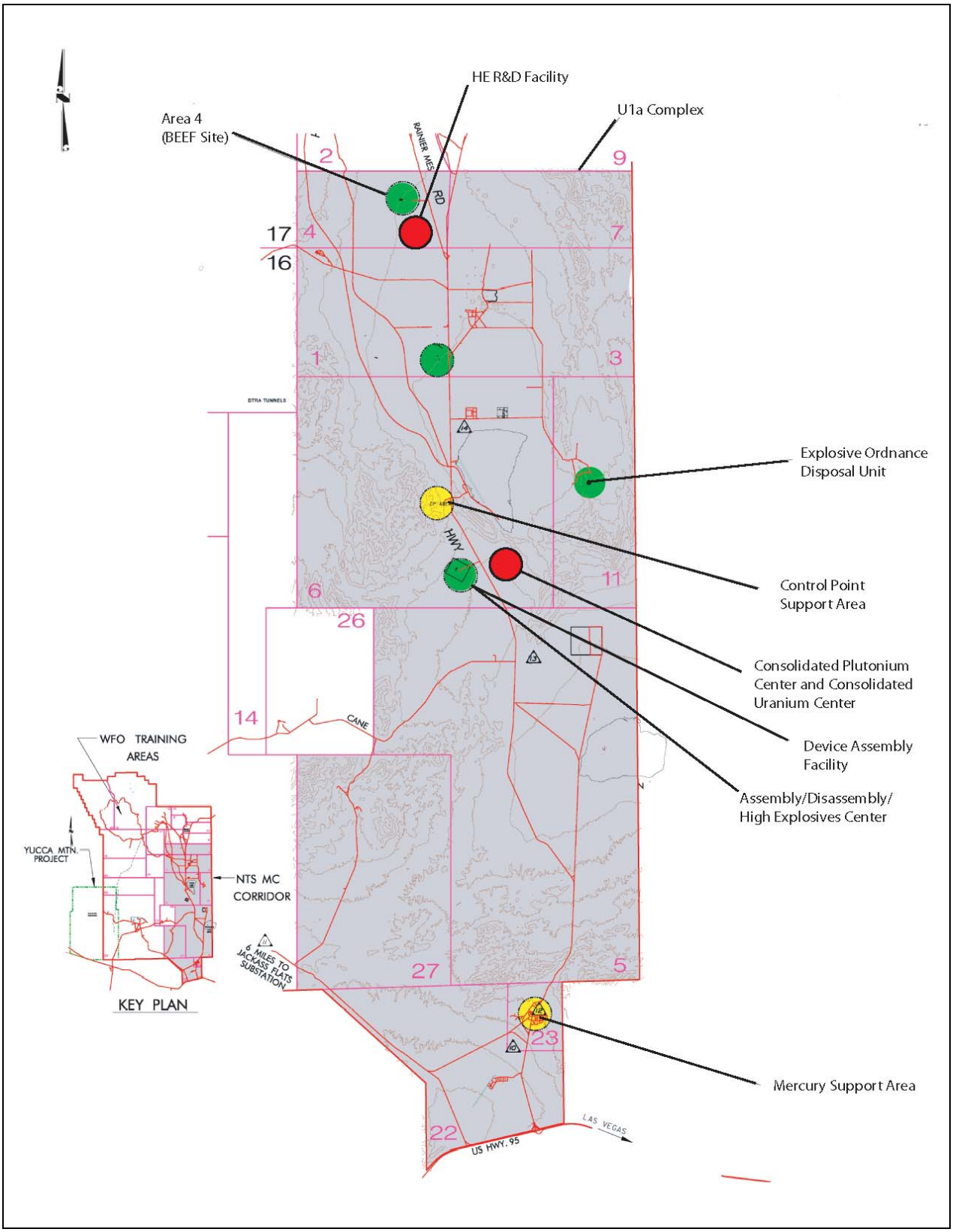
To consolidate all HE R&D experimentation and fabrication activities to the NTS would require a 100,000 square feet Explosive Components type facility to conduct SNL/NM activities and 200,000 square feet of mix use space would be required for HE R&D activities currently being conducted at LANL, LLNL, and Pantex. Construction impacts could disturb approximately 15 acres in the vicinity of the Big Explosives Experimental Facility (BEEF) (see Figure 5.13-5).

No construction would be conducted within a floodplain or a wetland. Construction would be performed using common construction industry methods since the operational uses of these structures do not have potential hazards that would entail unique structural requirements. The new building would be constructed in accordance with seismic criteria in current building codes. The building would not be constructed over known faults or within 50 feet of known seismic faults. The new building would be designed according to general design criteria for a new facility, with a minimum lifetime expectancy of 30 years of operation. The building would consist of a concrete slab foundation with a two-story superstructure. The total height of the building above ground level would be less than 32 feet.

Roof drains would collect snowmelt and rain water from the building and would channel the runoff to appropriate release points, such as landscaped areas. Storm water runoff systems would be designed to minimize soil erosion.

Construction activities would have some local short-term adverse effects; long-term effects on the viewscape from construction and demolition are expected to be minimal. All NTS facilities are not visible from roads and areas with public access. The visual effects of construction would be confined to the immediate area of Area 4 at NTS. Short-term temporary adverse visual effects would occur during the construction period. These effects involve staging and use of construction vehicles and erecting construction fences. Occasional fugitive airborne dust from soil disturbance may temporarily obscure local views for short periods of time. In the long term, the area would experience minimal effects.

The newly constructed building would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) would be extended to the new facility.



Source: NNSA 2007.

Figure 5.13-5—NTS Location for HE R&D Facility

NTS is located in the Nevada Intrastate AQCR 147. The region is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and particulate matter) under the NAAQS. Clearing or excavation activities during site construction have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality.

Work at the site would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers housed in Area 4. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, space in the immediate vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases. These areas would be used for permanent parking. Construction solid waste is estimated at 4,650 cubic yards.

During operations, the primary noise would be generated by air blast waves and ground vibration impacts associated with HE tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. Noises heard at that distance would be similar to thunder in their intensity. Because of the great distance from NTS activities to any off-site receptors, noise impact would be minimal. Any sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 250-300 construction workers would be onsite during the peak construction period, adding approximately 125-150 personal vehicles to local roadways during the construction period. These construction workers would park their personal vehicles either in existing parking lots or in other designated parking areas. Vehicles (such as dump trucks) and heavy machinery (such as bulldozers, drill rigs, dump trucks, cranes, and cement mixer trucks) would be used onsite during the construction phase. These vehicles would operate primarily during the daylight hours and would be left onsite over night. Temporary construction lighting would be directed toward the work area.

During construction, the peak construction jobs would be filled by the existing employees in the regional work force. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in the ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in Nevada.

Construction would not be expected to have any adverse health effects on NTS workers or the public. NNSA and NVO workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 250–300 peak-period construction workers, including approximately 50 construction vehicles, would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). During the construction period (2 years), no deaths (0.02) would be expected for the estimated 250 to 300 worker-years.

There would be no effects to sensitive species or their critical habitat due to construction. The new construction would generate non-hazardous solid waste that would be disposed of off-site at a solid waste landfill in accordance with the waste minimization plan.

Proposed operations would have minimal effects on the NTS environment. Operations would produce the same types of waste as are generated in other NTS facilities. No new radioactive or other wastewater or hazardous waste streams would be generated. With respect to air quality, the new facility would emit less than one percent of the existing NTS emissions. Because no significant off-site health risks are associated with the HE R&D operations, no environmental justice impacts are expected.

Water quality in this area would not be affected by the operations. The facility would require approximately 5 million gallons of water per year, which would be less than 1 percent of the NTS sustainable site capacity of 1.36 billion gallons per year. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by operating the new building. Water quality would not change as a result of operations of the new building.

During operations, there would be a 250 person increase in the number of NTS employees as a result of this project. Compared to the existing workforce at NTS, this project would not have a long-term effect on socioeconomic conditions in the ROI.

5.14 PROJECT-SPECIFIC ANALYSIS OF TRITIUM R&D ALTERNATIVES

This section analyzes the environmental impacts of the reasonable alternatives, described in Section 3.9, for tritium R&D. For each alternative, the analysis focuses on the resources that are most likely to be affected. For example, because there would be no new construction associated with any of the alternatives, and no associated land disturbance, the following resources would not be affected: land use, visual resources, air and noise, water resources, geology and soils, biotic resources, and cultural resources. As such, this section does not discuss these resources any further. The analysis focuses on the following resources: emissions and exposures, which affect human health, socioeconomic impacts, and wastes.

No Action Alternative. Under the No Action Alternative, tritium R&D activities would continue at LLNL, LANL, SRS, and SNL/NM, as described in Section 3.9.1. At all four sites, tritium R&D activities comprise a minor part of the overall operations compared to other NNSA activities. For example, at LLNL, tritium R&D activities amount to basically one glove box system. At LANL, tritium R&D activities take place in one facility, the Weapons Engineering Tritium Facility (WETF), and affect approximately 25 people. At SRS, tritium R&D activities are conducted in conjunction with tritium production activities and thus, do not require dedicated facilities or personnel. At SNL/NM, tritium operations are primarily associated with the Neutron Generator Production Facility (NGPF) and would be unaffected by the SPEIS alternatives. At all four sites, tritium R&D activities are responsible for less than 1 percent of the air emissions, electrical usage, water use, employment, and generated wastes (NNSA 2007).

5.14.1 Consolidate Tritium R&D at SRS Alternative

Under this alternative, tritium R&D currently conducted at LLNL[6] and LANL would be consolidated at SRS into the following existing facilities: (1) H-Area New Manufacturing Building (HANM); (2) H-Area Old Manufacturing Building (HAOM); and (3) Building 773-A. No new construction would be necessary to consolidate these missions, although minor upgrades to existing laboratories may be required. Consolidating tritium R&D at SRS would increase tritium emissions at SRS, increase radiation exposures at SRS, create jobs at SRS, and increase wastes generated at SRS.

5.14.1.1 *Potential Impacts at SRS*

Tritium emissions. Tritium emissions at SRS would increase by approximately 1,000 Curies (Ci) per year at SRS.[7] During 2005, about 40,800 Ci of tritium were released from SRS, compared to about 61,300 Ci in 2004. Emitting approximately 1,000 Ci of tritium per year at SRS from increased tritium R&D would represent an increase of approximately 2.4 percent over current tritium emissions.

[6] This does not include NIF target R&D and NIF production target filling. Those operations would remain at LLNL under all alternatives (see Section 3.7.3.5).

[7] LANL tritium R&D emissions are approximately 1,000 Ci/year, which includes a spike of 7,600 Ci from a legacy bottle that failed in 2001 (NNSA 2007).

Health impacts from tritium emissions. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. Tritium oxide releases accounted for 66 percent of the dose to the MEI. In 2005, the collective 50-mile population dose was estimated at 2.5 person-rem—less than 0.01 percent of the collective dose received from natural sources of radiation (about 214,000 person-rem). Tritium oxide releases accounted for about 68 percent of the collective dose. Increasing the tritium emissions by 2.4 percent would increase these doses as follows:

- MEI: increased dose by 0.0008 mrem/year;
- 50-mile population dose: increased dose by 0.041 person-rem.

Based on a risk estimate of 0.0006 LCFs per person-rem, the increased likelihood of a LCF for the MEI would be 4.8×10^{-7} and the likelihood of a LCF to the 50-mile population would be 2.5×10^{-5}. Accident risk at SRS would be unaffected, as these new operations would be inconsequential compared to existing tritium production operations. Because no significant off-site health risks are associated with the tritium R&D operations, no environmental justice impacts are expected.

Health impacts to workers. Approximately 25 new jobs would be created at SRS. The average exposure to a worker from tritium R&D would be approximately 4.3 mrem, resulting in a total worker dose 0.11 person-rem. Based on a risk estimate of 0.0006 LCFs per person-rem, the likelihood of a LCF to workers would be 6.6×10^{-5}.

Accidents. At SRS, receiving the tritium R&D operations from LANL could produce additional consequences due to accidents that release tritium. Assuming that the same tritium releases could occur at SRS as were analyzed at LANL (LANL 2008), consequences to the MEI at SRS would be expected to be lower than the MEI at LANL due to a much greater distance to the tritium facilities (at SRS, the MEI would be more than ten times further from the facility than the MEI at LANL). Increasing the distance to the MEI by approximately ten times would decrease the MEI dose by approximately a factor of 100. Consequently, the MEI dose at SRS would be expected to be less than 1 rem (statistically, this means that there would be less than a 1 percent chance that an LCF would result from this accident). For the 50-mile population at SRS (assumed to be 985,980 in the year 2030), it is conservatively assumed[8] that the population dose at SRS could be approximately twice as large as at LANL. For the 50-mile population surrounding SRS, the highest population dose from an accident would be expected to be less than 380 person-rem, which translates to an LCF risk of 0.22 (statistically, this means that there would be an 22 percent chance that an LCF would result if this accident were to occur).

Socioeconomic impacts. The addition of 25 new workers at SRS would increase the site work-force by much less than 1 percent and would not be noticeable in the ROI.

[8] The assumption is conservative because the off-site population density within the initial ten mile radius at SRS is less than LANL. Radiological impacts to the 50-mile population are generally the highest within the initial ten miles of a release, as radiological concentrations generally decrease by the inverse of the distance squared.

Wastes. Wastes at SRS from tritium R&D would increase as follows:

- Mixed Waste: 28 gallons
- High Activity Waste: 330 gallons waste total
- Compactable waste: 84 cubic feet
- Non-Compactable, <20mCi/m^3: 176 cubic feet
- Mop water (low level liquid waste): 3,000 gallons

These wastes would represent less than 1 percent of current wastes generated at SRS and would be inconsequential.

5.14.1.2 Potential Impacts of Phasing Out Operations at LANL

Under this alternative, tritium R&D currently conducted at LLNL and LANL would be phased out. Phasing out tritium R&D operations from the WETF at LANL would reduce tritium emissions, wastes, and exposure to personnel as shown in Table 5.14-1.

Table 5.14-1—Reductions at LANL from Tritium R&D Phase Out

Resource Affected	Amount Reduced
Tritium Emissions	WETF average tritium emissions are approximately 1,000 Ci/year, which includes a spike of 7,600 Ci from a legacy bottle that failed in 2001.
Wastes	Mixed Waste: 28 gallons High Activity Waste: 330 gallons waste total Compactable waste: 84 cubic feet Non-Compactable, <20mCi/m^3: 176 cubic feet Mop water (low level liquid waste): 3000 gallons
Personnel Exposure	Average dose for 2006 was 4.3 mrem.
Jobs	25 maximum

Source: NNSA 2007.

At LANL, the impacts of these reductions would be as follows:

Tritium emissions. Tritium emissions at LANL would decrease by approximately 1,000 Ci per year. During 2005, about 2,400 Ci of tritium were released from LANL. Phasing out the tritium R&D at LANL would reduce tritium emissions by approximately 42 percent.

Health impacts from tritium emissions. In 2005, the estimated dose from tritium to the LANL MEI was 0.0036 mrem and the collective 50-mile population dose was estimated at 0.09 person-rem. Decreasing the tritium emissions at LANL by 42 percent would decrease these doses as follows:

- MEI: decrease dose by 0.0015 mrem per year;
- 50-mile population dose: decrease dose by 0.038 person-rem.

Based on a risk estimate of 0.0006 LCFs per person-rem, the decreased likelihood of a LCF for the MEI would be 9.0×10^{-7} and the likelihood of a LCF to the 50-mile population would be decreased by 1.6×10^{-2}.

Health impacts to workers. Approximately 25 workers at LANL would be reassigned to new jobs. Assuming these workers would no longer receive a 4.3 mrem dose, total worker dose would decrease by 0.11 person-rem. Based on a risk estimate of 0.0006 LCFs per person-rem, the likelihood of a LCF to workers would decrease by 6.6×10^{-5}.

Accidents. Phasing out LANL R&D operations at the WETF would eliminate the accident consequences associated with those operations. The accidents analyzed for WETF have included tritium releases from the following initiating events: a facility fire, a site-wide seismic event, and a wildfire (LANL 2008). For the maximally exposed individual (MEI) (assumed to be located at a distance of 2,885 feet from the facility), the highest dose from an accident was determined to be 17 rem, which translates to a statistical latent cancer fatality risk of 0.01 (statistically, this means that there would be a 1 percent chance that an LCF would result from this accident). For the 50-mile population (approximately 405,000 people), the highest population dose from an accident was determined to be 190 person-rem, which translates to LCF risk of 0.11 (statistically, this means that there would be an 11 percent chance that an LCF would result if this accident were to occur).

Socioeconomic impacts. Because the tritium R&D workers would be reassigned to other jobs at LANL, no socioeconomic impacts would result.

Wastes. Wastes at LANL from tritium R&D would decrease as follows:

- Mixed Waste: 28 gallons
- High Activity Waste: 330 gallons waste total
- Compactable waste: 84 cubic feet
- Non-Compactable, <20mCi/m^3: 176 cubic feet
- Mop water (low level liquid waste): 3000 gallons

These wastes represent less than 1 percent of current wastes generated at LANL.

Current LLNL tritium R&D (primarily to support gas transfer system development) is very small and is only included here for completeness. Transferring the LLNL tritium R&D (not NIF tritium work) to SRS would basically amount to one glove box system, which could be accommodated in the SRS facilities without any significant changes. Phasing out tritium R&D operations from LLNL would have no significant effects.

5.14.2 Consolidate Tritium R&D at LANL Alternative

Under this alternative, tritium R&D currently conducted at LLNL[9] would be consolidated at LANL into the WETF. No new construction would be necessary to consolidate these missions. Transferring the LLNL tritium R&D to LANL would basically amount to one glove box system, which could be accommodated in the WETF without any significant changes. LANL already

[9] This does not include NIF target R&D and NIF production target filling. Those operations would remain at LLNL under all alternatives.

performs same type work within WETF. Phasing out tritium R&D operations from LLNL would have an insignificant effect on tritium emissions, wastes, and exposure to personnel at either LLNL or LANL.

5.14.3 Reduce Tritium R&D In-Place Alternative

Under this alternative, no changes in assigned tritium R&D missions would result. Instead, LLNL, LANL, and SRS would downsize tritium operation in-place. This alternative would result in the least transition impact in the Complex. All three sites would increase efficiencies in tritium operations by increasing emphasis on planning and scheduling. Any reductions in tritium emissions, wastes, and exposure to personnel are expected to be small, as these are a function of requirements rather than planning/scheduling.

5.15 PROJECT-SPECIFIC ANALYSIS OF NNSA FLIGHT TEST OPERATIONS

NNSA Flight Test Operations is a SNL-managed program to assure compatibility of the hardware to interface between NNSA weapons and DoD delivery systems. The actual flight tests are conducted at the Tonopah Test Range, located 140 miles northwest of Las Vegas, Nevada, with one or more denuclearized weapons, called Joint Test Assemblies (JTAs), which are dropped from DoD aircraft. In some cases, JTAs are not dropped, but simply attached to aircraft and flown. There are five alternatives for Flight Test Operations: (1) the No Action Alternative to continue activities at TTR; (2) an alternative to upgrade operations at TTR; (3) an alternative to operate TTR in a Campaign Mode (three options are assessed under this alternative): Option 1—Campaign from NTS; Option 2—Campaign Under Existing Permit; Option 3—Campaign Under Reduced Footprint Permit); (4) an alternative to transfer NNSA Flight Testing to the WSMR in New Mexico; and (5) an alternative to transfer NNSA Flight Testing to the NTS.

The following information and impacts are common to all of the alternatives analyzed in this section.

The Flight Test Program conducts about 10 flight tests in an average year. Compared to the 474,500 commercial flights that take place annually over the U.S., these 10 flights represent about 0.002 percent. These flight tests are typically conducted using the B-52 and B-2 bomber aircraft and the F-15E and F-16C fighter aircraft. The bomber aircraft generally originate from the 2nd Bomb Wing, at Barksdale AFB, in Louisiana, the 5th Bomb Wing, at Minot AFB, in North Dakota, or the 509th Bomb Wing, at Whiteman AFB, in Missouri. Fighter aircraft usually deploy from Nellis AFB, in Nevada, or Eglin AFB, in Florida. Flight paths to and from a test range would occur over FAA-controlled routes. Flight test ranges are controlled airspace. Once over the flight test range, flight tests are conducted at varying altitudes, ranging from as low as 200 feet to as high as 50,000 feet.

For each of the alternatives, potential accidents related to flight testing could include an aircraft crash or an inadvertent release of a JTA. These accidents could happen at any of the locations where flight testing might occur and, as discussed below, would have similar consequences. As such, these potential consequences are not expected to represent a meaningful discriminator with respect to selecting a site for flight testing. Nonetheless, for completeness, they are addressed.
With respect to an aircraft crash during flight testing, such an accident has never occurred in the past. Nonetheless, for purposes of this analysis, such an accident is assumed to occur. If an aircraft accident occurred, flight crews and people in the vicinity of the crash site could be killed or seriously injured. Given that the flight test operations would occur over generally low-populated areas (for all three potential locations), the likelihood of anyone on the ground being adversely affected is very small. This conclusion is also supported by a previous study which estimated the probability of a given location being struck by an aircraft to be so low (less than 1×10^{-7}) as to not be considered as a credible accident scenario[10] (DOE 1996g).

With respect to an inadvertent release of a JTA, such an accident could occur due to pilot error, equipment error, or other human error (for example, mistakenly identifying the incorrect target

[10] For more information, see "Accident Analysis for Aircraft Crash into Hazardous Facilities," DOE Standard DOE-STD-3014-2006, October 1996, Reaffirmation May 2006.

drop location). If such an error occurred, people on the ground could be killed or seriously injured. The impacts of such an accident would be less than an aircraft crash. Operating procedures, including equipment safety checks, pre-briefs, radar tracking, controlled flight ranges, and constant communications between the ground and pilots, minimize the potential for such accidents to occur.

5.15.1 No Action Alternative—Continue Operations at TTR

Under the No Action Alternative, NNSA would continue to conduct the Flight Test Mission at TTR. There would be no construction impacts associated with this alternative. However, some minimal one-time investments would be required to maintain TTR in order to meet mission requirements. These investments would primarily be associated with equipment replacements. The operational requirements are shown in Table 5.15-1. The impacts of the No Action Alternative, which are described in the TTR Affected Environment Section (see Section 4.4), would continue if no changes are made at TTR. Under the No Action Alternative, there would be no change in the workforce currently at TTR. Therefore, there would be no impacts to the ROI employment, income, or labor force.

Table 5.15-1—TTR No Action Annual Operational Requirements

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595
Peak electrical demand (MWe)	812
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range including AF)	6 million gallons
Range size (square miles)	280
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Maximum inventory of fissile material/throughput	0
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

Past weapons destruction tests, unrelated to the Flight Test Program, have contaminated soil at TTR in three areas. These sites have been characterized and remediation is ongoing. Additional details on this can be found in Section 4.4.6.2.1, of this document. In addition to these remediation projects there are several structures that must undergo D&D in order to continue ongoing operations at TTR. It is estimated that the soil and structure remediation would be a two year project requiring 80,000 worker hours, and would produce the waste volumes listed in Table 5.15-2. The soil remediation activities involve only the petroleum-contaminated areas under the buildings that are scheduled for demolition. The small quantities of LLW and hazardous wastes generated by this effort would be transported to NTS, or a commercial facility, for treatment and disposal. Non-hazardous waste would be disposed of at TTR.

Table 5.15-2—D&D Associated with TTR Operations–No Action Alternative

D&D Ongoing at TTR	D&D Amounts
Soil D&D (yd^3)	0
LLW generated (yd^3)	20
Non-Hazardous waste (yd^3)	8000
Hazardous waste (yd^3)	3703
Debris/Earth moving equip.(dozers/trucks)	2/3
D&D Related employment	
Peak	20
Total worker hours	80000

Source: NNSA 2007.

5.15.2 Upgrade of Tonopah Test Range Alternative

This section describes the impacts associated with upgrading the NNSA Flight Test Operations activities presently being conducted at TTR. This alternative, referred to as the High-Tech Mobile (HTM) option, would allow for a reduction in the operational costs at TTR through the introduction of newer, more efficient and more technologically advanced equipment. This option would lower manpower test operational needs and keep all test equipment highly reliable and operational between test dates, thereby reducing recalibration and start-up costs. There would be no construction required for this alternative as all new equipment would be in mobile vehicles or trailers. Annual operating requirements would be the same as for the No Action Alternative discussed in Section 5.15.1. Under the HTM Option, the maintenance required to update existing facilities could be conducted by current staff and would result in negligible effects to ROI employment, income, or labor force.

5.15.3 Campaign Mode Operation Alternative

An alternative to relocating flight test operations to another site would be to conduct JTA tests at TTR on a campaign basis from NTS, Sandia NM and CA, while doing work for others as time and workload permit. SNL would continue to be the program manager. This alternative would reduce the number of full-time employees to the level necessary to maintain facilities and equipment; employees from other facilities would complement resident staff in performing the actual tests. The operational requirements for this alternative are shown in Table 5.15-3.

Table 5.15-3—TTR Annual Operational Requirements–Campaign Mode

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours [MWh])	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or cubic yd)	
Other process gas (N, Ar, etc.)	480 ft^3
Diesel generators	44
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Range size (square miles)	280
Employment (workers)	43
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

For option 1 (campaign from NTS), this alternative would result in the loss of approximately 92 full-time jobs at TTR through the downsizing of the permanent workforce from 135 to 43. This level of job reductions is different from the two alternatives that terminate all permanent TTR employment through the transfer of flight test operations to another facility. A discussion of the impacts associated with such a reduction in a community where supporting TTR is the primary employer is detailed in the next section. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the no-action alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area.

For option 2 (campaign under existing land use agreement), this alternative would result in the loss of approximately 57 jobs, but would create approximately 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. Other impacts, such as fuel,

electricity and water usage and waste generation would remain about the same as the no-action alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area.

For option 3 (campaign under reduced footprint under a revised land use agreement), this alternative would result in the loss of approximately 70 jobs, but would create 20 jobs for security guards as the AF takes over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. Under this alternative, the JTA tests would be conducted on a campaign basis at TTR with support from the NTS, Sandia/NM and Sandia/CA. The remaining staff at TTR would also perform Work for Others (WFO) as time and workload permits. There would be no construction required as the existing facilities at TTR would be used and upgraded to sustain reliable test support. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the No Action Alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area. Other impacts, such as fuel, electricity and water usage and waste generation would remain about the same as the No Action Alternative, since there would be no change in the number of tests performed. A reduction in employment of this level would have secondary impacts on the service sector and commercial establishments of the area. This option could reduce the NNSA permitted area at TTR to potentially less than 1 square mile.

5.15.4 Transfer to WSMR Alternative

This alternative would move Flight Test Operations from TTR to WSMR. The WSMR has an extensive network of radar, global positioning system (GPS), telemetry, and optics sites (fixed and mobile), which interface with the Real Time Data Display System located in the Range Control Center and can be provided to remote locations both on and off range via the test support network and Defense Research Engineering Network.

5.15.4.1 *Construction and Operations Data*

The only construction that would be required to support JTA flight test at the WSMR would be the installation of a circular concrete target. The target would be used to aid in recovery efforts. It would also be used for free-fall test units. The concrete target would be constructed of 4000 psi non-reinforced concrete, 500 feet in diameter with a depth of 12 inches. Tables 5.15-4 and 5.15-5 provide the construction and operational requirements associated with relocating NNSA Flight Test Operations to the WSMR.

Table 5.15-4—WSMR Construction Requirements

Construction Requirements	Consumption/Use
Peak Electrical Energy Use	40,000 KW-hr
Diesel Generators (Yes or No)	Yes
Concrete (yd3)	800
Steel (t)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000

Table 5.15-4—WSMR Construction Requirements (continued)

Construction Requirements	Consumption/Use
Lay down Area Size	Two 11.5 acre sites
Parking Lots	N/A
Total employment (worker years)	37
Peak employment (workers)	30
Construction period	15 months
Waste Generated	**Volume**
Hazardous	
Liquid (gal)	0
Solid (yds^3)	0
Non-hazardous (Sanitary)	
Liquid (gal)	0
Solid (yds^3)	6,000
Non-hazardous (Other)	
Liquid (gal)	0
Solid (yds^3)	45

Source: NNSA 2007.

Table 5.15-5—WSMR Operational Requirements

Operation Requirements	Consumption/Use
Annual electrical energy (megawatt-hours	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or yds^3)	32,150 gallons
Other process gas (N, Ar, etc.)	480cu.ft.
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range)	6 million gallons
Steam (tons)	0
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—	0
NAAQS emissions (tons/yr)	13.32
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Category	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

The required construction is a small project and it is not anticipated that the employment of 30 construction personnel over a 15 month period would have a significant impact on the existing labor pool of the area.

During flight test operations, the primary noise would be generated by aircraft flying over the WSMR drop areas. The noise would be consistent with the existing use of the WSMR, sporadic, and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to those employed by WSMR. They would not likely result in any adverse effect on sensitive wildlife species or their habitats, and would be similar to the effects discussed under the No Action Alternative.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased flights at WSMR as a result of NNSA conducting an additional 10 flights per year. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are remotely located from the flightpath of the aircraft. The public is not allowed on WSMR and noise levels produced by the aircraft are sufficiently reduced at locations where the public would be present to preclude hearing damage. Because no significant off-site health risks are associated with the flight test operations, no environmental justice impacts are expected.

5.15.4.2 *Impacts of Phasing Out TTR Operations*

Relocating NNSA flight test operations to WSMR would entail termination of the NNSA flight test operations activities presently being conducted at the TTR. NNSA would continue the cleanup of its flight test facilities at TTR. About 135 jobs would be lost. Since the flight test operations would be conducted by existing WSMR personnel under this alternative, these jobs would not be transferred to WSMR. This section provides a detailed analysis of socioeconomic characteristics and impacts at TTR as a result of the discontinuance of flight test operations at TTR. The analysis includes a more detailed description of current socioeconomic conditions at TTR and an assessment of impacts to socioeconomic conditions from implementation of the alternatives that would transfer the Flight Test Operations to either WSMR or NTS.

Any removal of capital or employment, such as the transfer of activities from TTR, would impact the existing socioeconomic environment to some degree. The transfer and associated termination of NNSA's Flight Test Operations activities at TTR would impact the existing socioeconomic environment of the southern Nevada ROI which includes Clark and Nye counties. The existing economic environment of these counties is discussed in the first part of this section.

5.15.4.2.1 Socioeconomic Methodology and Impacts

Socioeconomic impacts consist of both direct and indirect impacts. Direct impacts are those changes that can be directly attributed to the proposed action, such as changes in employment. Indirect impacts to the ROI occur based on the direct impacts from the proposed action.

The direct impacts estimated in the socioeconomic analysis are based on data provided by TTR. Total employment and earnings impacts were estimated using Regional Input-Output Modeling

System multipliers developed specifically by the U.S. Bureau of Economic Analysis (BEA) for the southern Nevada ROI, which includes Nye and Clark Counties. These multipliers are developed from national input-output tables maintained by the BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the U.S. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels. For this analysis, the term *direct jobs*, refers to the employment created by the project and *direct income* refers to project workers' salaries. The term *indirect jobs*, refers to the jobs lost in other employment sectors as an indirect result of direct jobs lost from the transfer of TTR activities and *indirect income* refers to the income lost as a result of the loss of indirect jobs.

This section provides a more detailed description of current socioeconomic conditions at TTR. A general description of the socioeconomic environment, including population, is presented in Section 4.4.9 of this SPEIS.

Employment and income. Employment by sector has changed slightly from 2003 to 2005 as shown in Table 5.15-6. The arts, entertainment, recreation, accommodation and food services sector provides the highest percentage of the employment in the ROI, 23 percent in 2005, followed by construction, with 10.7 percent, and the retail trade, with 10.4 percent.

Table 5.15-6—2003 and 2005 Employment by Sector (%)

Sector	Clark		Nye		ROI	
	2003	2005	2003	2005	2003	2005
Farm employment	0.04	0.03	1.92	1.61	0.07	0.06
Nonfarm employment	99.96	99.97	98.08	98.39	99.93	99.94
Private employment	90.37	90.80	85.92	87.34	90.30	90.75
Forestry, fishing, related activities, and other 3/	0.03	0.03	0.40	0.45	0.04	0.04
Mining	0.14	0.12	6.73	5.88	0.24	0.21
Utilities	0.35	0.32	**(D)**	**(D)**	**(D)**	**(D)**
Construction	9.12	10.67	6.83	9.45	9.08	10.65
Manufacturing	2.52	2.52	1.15	1.66	2.50	2.50
Wholesale trade	2.50	2.46	1.00	1.05	2.47	2.43
Retail trade	10.76	10.39	11.88	11.76	10.77	10.41
Transportation and warehousing	3.10	3.13	**(D)**	**(D)**	**(D)**	**(D)**
Information	1.45	1.24	1.01	0.84	1.44	1.24
Finance and insurance	5.11	4.92	2.51	2.52	5.07	4.88
Real estate and rental and leasing	5.49	5.67	6.44	6.86	5.50	5.69
Professional and technical services	5.05	5.04	15.88	14.74	5.22	5.20
Management of companies and enterprises	0.71	0.95	**(D)**	0.16	**(D)**	0.94
Administrative and waste services	6.69	7.07	**(D)**	6.04	**(D)**	7.06
Educational services	0.53	0.58	**(D)**	0.39	**(D)**	0.58
Health care and social assistance	5.94	5.83	**(D)**	4.13	**(D)**	5.81

Table 5.15-6—2003 and 2005 Employment by Sector (%) (continued)

Sector	Clark		Nye		ROI	
	2003	2005	2003	2005	2003	2005
Accommodation and food services	23.96	23.32	10.12	9.55	23.75	23.11
Other services, except public administration	3.78	3.69	5.13	4.89	3.80	3.71
Government and government enterprises	9.60	9.16	12.16	11.06	9.64	9.19
Federal, civilian	1.13	1.03	1.15	0.92	1.13	1.03
Military	1.17	1.06	0.53	0.50	1.16	1.05
State and local	7.29	7.07	10.49	9.63	7.34	7.11
State government	1.33	1.33	**(D)**	0.91	**(D)**	1.32
Local government	5.96	5.74	**(D)**	8.72	**(D)**	5.79

Source: BEA 2007.
(D) No Data.

Current TTR employment. Approximately 67 percent of the workforce at TTR resides in Nye County with over 60 percent residing in Tonopah. Another 20 percent of the workforce resides within the cities of Henderson (3 percent) and Las Vegas (17 percent) in Clark County, Nevada. The remaining 13 percent of the workforce resides within the cities and counties listed in Table 5.15-7. There are 37 TTR employees (33.6 percent) who do not reside in Tonopah while working but instead reside on site at the Man Camp.

Table 5.15-7—Summary of Workforce Residence

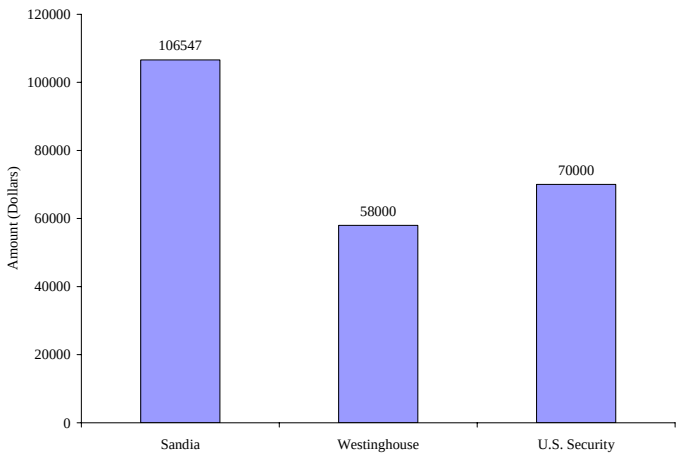
City	Percent (%)
Tonopah	64.5
Henderson	2.7
Albuquerque	0.9
Santa Clara	0.9
Las Vegas	17.3
Reno	0.9
Deeth	0.9
Boulder City	0.9
Meadview	0.9
Carson City	0.9
Fernley	0.9
Pahrump	0.9
Rio Rancho	0.9
Fallon	1.8
Caliente	1.8
Enterprise	2.7
County	**Percent (%)**
Nye	67.3
Clark	20.9
Bernalillo	0.9
Washington	1.8
Washoe	0.9
Elko	0.9
Mohave	0.9
Carson City	0.9

Table 5.15-7—Summary of Workforce Residence (continued)

County	Percent (%)
Lyon	0.9
Sandoval	0.9
Churchill	1.8
Lincoln	1.8

Source: NNSA 2007.

The average annual salary of a TTR employee is $78,182. Sandia employees earn an average annual salary of $106,547, while Westinghouse and U.S. Security employees earn an average annual salary of $58,000 and $70,000, respectively (Figure 5.15-1).



Source: NNSA 2007.

Figure 5.15-1—Average Annual Salaries of TTR Workforce

Community services. A large number of TTR employees are also involved in community associations as shown in Table 5.15-8. If operations were discontinued at TTR, it is anticipated that involvement in these reported community activities would decrease.

Table 5.15-8—Summary of Community Involvement–TTR Employees

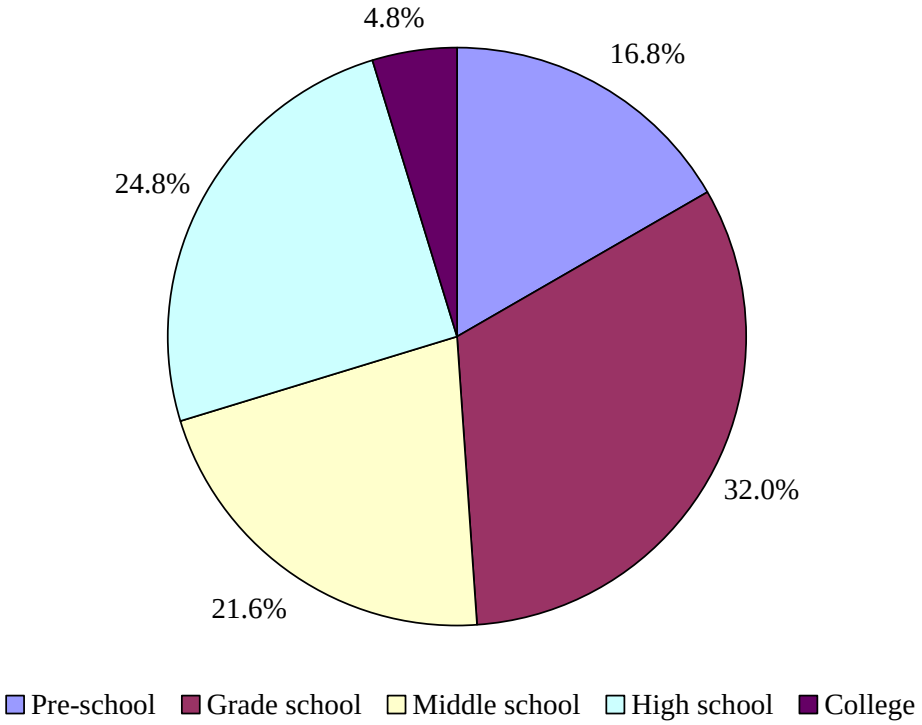
Community Activity/Association	Number of TTR Employee Participants
Greater Las Vegas Association of Realtors	6
Realtors Association	5
Church	11
Outdoor club	5
Business owner	4
Scouts	24
PTA	29
Booster Club	2
Tonopah Little League	7
MSBL Baseball League	1
Elks	14

Table 5.15-8—Summary of Community Involvement–TTR Employees (continued)

Community Activity/Association	Number of TTR Employee Participants
VFW	3
Beta Sigma Phi	1
HS Basketball Coach	1
4 R Kids	6
Nye County Search & Rescue	32
Central NV Officials Assn (NCOO)	2
HS Wrestling Coach	1
MS Wrestling Coach	1
Tonopah Volunteer Fire Department	19
Trap Shoot Assn	2
Nye County Regional Ambulance Services	3

Source: NNSA 2007.

Educational systems. There are two schools in Tonopah: Tonopah Elementary/Middle (grades K-8) and Tonopah High school (grades 9-12). As of the 2005-2006 school year, the Tonopah Elementary/Middle school had an enrollment of 212 and the Tonopah High school (grades 9-12) had 169 students enrolled for a total of 381 students. There are a total of 125 dependents of TTR employees attending school. Of these, 21 (16.8 percent) are in pre-school, 40 (32 percent) in grade school, 27 (21.6 percent) in middle school, 31 (24.8 percent) in high school, and 6 (4.8 percent) in college (see Figure 5.15-2) (NNSA 2007).



Source: NNSA 2007.

Figure 5.15-2—Percentage of TTR-Employee Dependents at Certain Stages of Schooling System

It is assumed that the 87 TTR employee dependents attending grade, middle, and high school all

attend either Tonopah Elementary/Middle or Tonopah High school, representing approximately 22.8 percent of the total enrollment for both schools as shown in Table 5.15-9. The student-to-teacher ratio for the Tonopah Elementary/Middle school was 17.1 for the 2005-2006 school year. For the 2005-2006 school year, there were 13 teachers at the Tonopah High School. The average classroom sizes for Tonopah Elementary/Middle and Tonopah High school were 20.75 and 20, respectively (Table 5.15-9) (NNSA 2007).

Table 5.15-9—School Characteristics in Tonopah

School Characteristics	Tonopah Elementary/Middle	Tonopah High School	Total
Current			
TTR Students	63	24	87
Total Enrollment	212	169	381
Average Classroom Size	21.5	20	20.75
Classroom Teachers	12	13	25
Student to Teacher Ratio	17:1	13:1	16:1
After Transfer			
Total Enrollment	149	145	294
Average Classroom Size	15.1	17.2	16.15
Classroom Teachers	12	13	25
Student to Teacher Ratio	13:1	12:1	12:1

Source: NCES 2007; State of Nevada 2007.

Housing characteristics for TTR employees. There are approximately 900 occupied housing units in the Tonopah area. Of these, 351 (39 percent) are owner-occupied, while the remaining 549 (61 percent) are renter-occupied as shown in Table 5.15-10 (USCB 2007). According to the Nye County Assessor's Office (2007), an average of 35 houses were sold annually between the years 2001 and 2006 for an average price of $65,882 as shown in Table 5.15-11.

Approximately 78 percent of TTR employees own residences, while the remaining 22 percent are renters. Fifty nine percent of the residences are stick-built (i.e. built on site), 26 percent are manufactured housing, 7 percent are mobile housing units, and 8 percent are apartments as shown in Figure 5.15-3 (NNSA 2007).

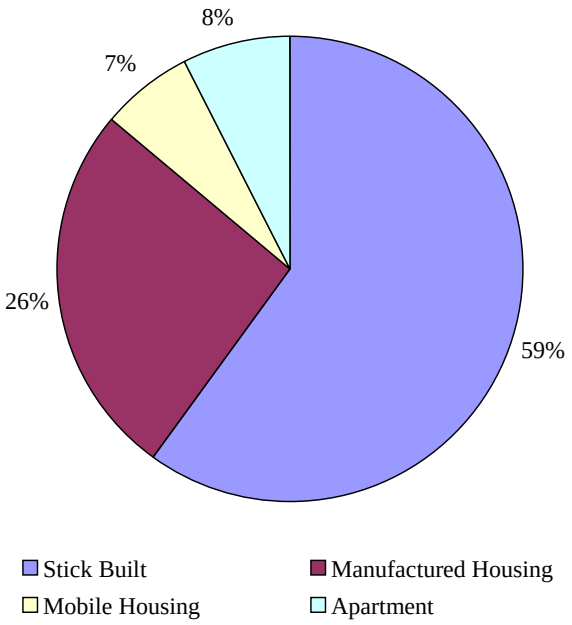
Table 5.15-10—Housing Characteristics in Tonopah

Housing Characteristics	Tonopah Area Total	TTR Employees
Current		
Owner-Occupied	351	86
Renter-Occupied	549	24
Total Occupied Units	**900**	**110**

Table 5.15-11—Home Sales Statistics for Tonopah, 2001–2006

Year	Number of Homes Sold	Average Price ($)
2001	23	65,646
2002	37	56,915
2003	30	63,491
2004	45	61,278
2005	39	72,153
2006	36	75,814
Annual Average	**35**	**65,883**

Source: Nye County Assessor 2007.



Source: NNSA 2007.

Figure 5.15-3—Types of TTR Employee Housing

Socioeconomic impacts. If the NNSA flight test operations were transferred to either WSMR or NTS, approximately 130 direct jobs in the professional, scientific, and technical services industry would be lost at TTR. WSMR would not gain any jobs in the professional, scientific and technical services industry and TTR would lose approximately 92 jobs in the campaign mode during the assignment transfer to the WSMR. Indirect effects on employment outside of this industry sector would include a loss of approximately 108jobs within the Regional Economic Area for a total job loss of about 238.

Based on the ROI average income of $78,182 for workers employed at TTR, direct ROI income would decrease by approximately $10.2 million. This would also result in additional losses to indirect income in supporting industries. The total impact to the ROI income from both TTR worker and supporting industry losses would be approximately $15.9 million ($10.2 million direct and $5.7 million indirect).

The population would experience a decrease of approximately 238 persons residing within the ROI at TTR. There could be a population increase of approximately 238 in the WSMR or NTS ROI from discontinued operations at TTR. Community organizations could lose the services of 180 persons involved in community activities at TTR.

As shown in Table 5.15-9, the enrollment at Tonopah Elementary/Middle School would potentially decrease by 63 students, reducing the total enrollment to 149, the average classroom size to 15.1, and, assuming current staffing levels, the student-to-teacher ratio to 12. The Tonopah High School would potentially lose 24 students, reducing the total enrollment to 145 and the average classroom size to 17.2.

It is assumed that the many of the 86 TTR employees who own their houses would place them on the market if the Flight Operations Program were to be transferred, reducing the number of owner-occupied units to a level below 351. Exactly how far below this level is difficult to assess, because if all 86 houses were placed on the market it would amount to more than 20 percent of the houses in a town where a primary employer had stopped operations. As compared to the 35 average annual homes for sale in Tonopah over the past 6 years, the addition of 86 homes for sale would increase this annual statistic by 245 percent, representing a potentially significant impact on the housing market. Housing prices would likely drop and some houses could continue to be occupied by the owners or sit vacant.

Of the 549 renter-occupied residences in the area, it is assumed that the 24 TTR employees who rent their residences would not renew their leases, reducing the number of renter-occupied units to 525 as shown in Table 5.15-10 and Figure 5.15-4. This would represent only 4.4 percent of the total number of units for rent within the Tonopah area, and would not result in a significant impact on the rental market.

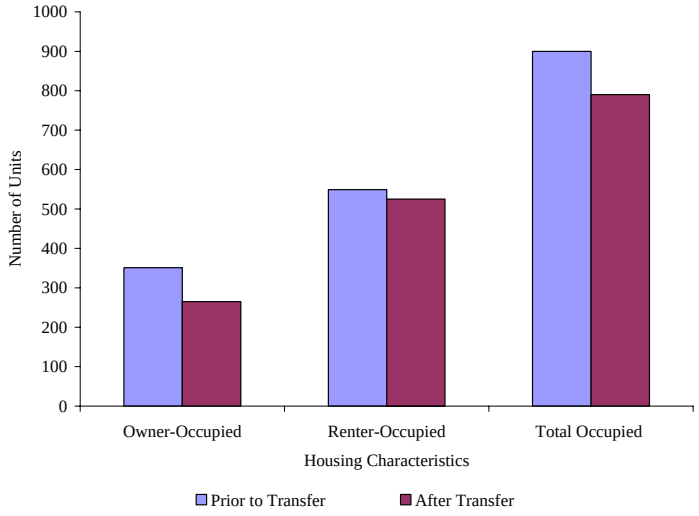
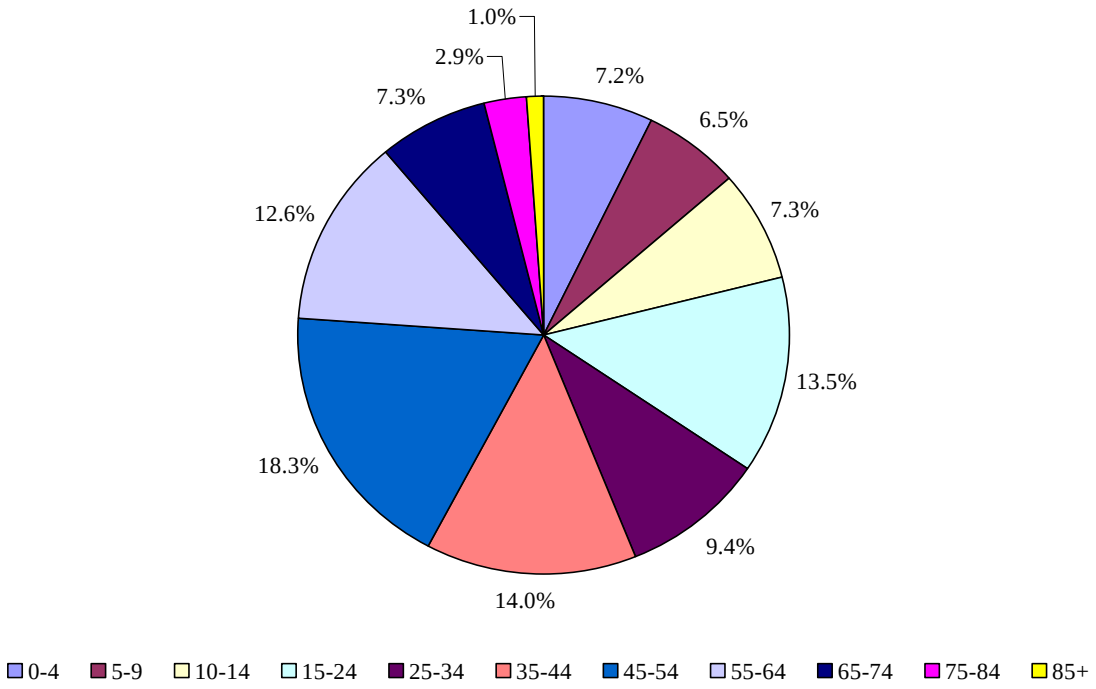


Figure 5.15-4—Potential Housing Changes with Transfer of Operations–TTR

5.15.4.2.2 Supplemental Socioeconomic Analysis

Supplemental information pertaining to socioeconomic characteristics of the region surrounding TTR has been provided in the University of Nevada 2007 report, "Complex 2030 Proposal Estimated Economic Impacts on Northern Nye and Esmeralda Counties." The primary study area researched in this report consists of the communities of Tonopah, Round Mountain, Manhattan, Goldfield, and Silverpeak, also known as the Central Nevada Regional Study Area (CNRSA). The UN 2007 Report focused on detailed socioeconomic characteristics of the Tonopah region, including results from a survey of residents and an independent analysis of direct, indirect, and total impacts to socioeconomic resources in Tonopah and surrounding areas. The following section provides relevant information derived from the UN 2007 Report, which is included in Chapter 12.

In 2007, there were 7,221 individuals living in the CNRSA. Over 55 percent of the total CNRSA population resides in Tonopah, which also has the largest concentration of families (1,034) and households (1,726). Approximately 32.3 percent of the population in Tonopah is between the ages of 35 and 54 as shown in Figure 5.15-5. The average family size in Tonopah is 2.93 persons, which has decreased since the 2000 estimate of 2.97 persons (UN 2007).



Source: UN 2007.

Figure 5.15-5—CNRSA Percent Age Distribution, 2007

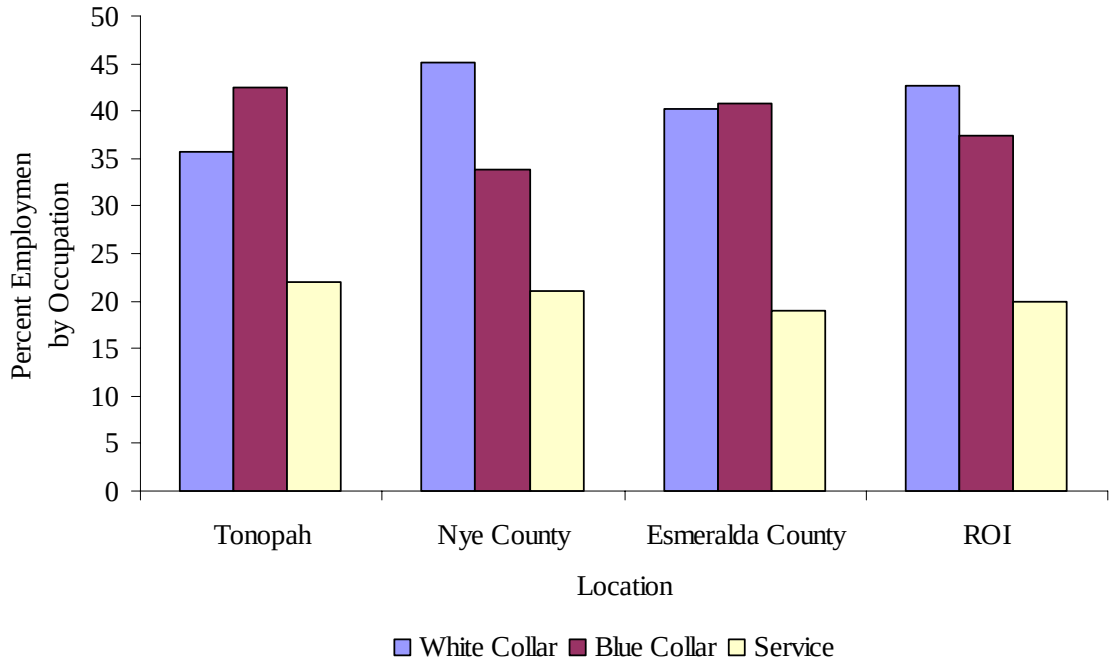
As of 2000, approximately 46.7 percent of Tonopah residents 25 and older have a high school diploma and 22.8 have some college education without the attainment of a college degree as shown in Table 5.15-12. An estimated 16.5 percent of the Tonopah population 25 and older has less than a high school education, which is less than the 20.9 percent for the ROI, 19.3 percent for the State of Nevada, and 19.6 percent for the United States (UN 2007).

Table 5.15-12—Number and Percent of Tonopah Population, Age 25 and Older by Highest Level of Educational Attainment, 2000

Level of Education	Individuals	Percent
>9th Grade	2,761	3.1
9th-12th (no diploma)	11,933	13.4
High School Graduate	41,586	46.7
Some College (no diploma)	20,303	22.8
Associate Degree	4,541	5.1
Bachelor Degree	5,254	5.9
Master/Doctorate Degree	2,582	2.9

Source: UN 2007.

According to the University of Nevada study (2007), 35.8 percent of the civilian labor force in Tonopah was considered to have white collar jobs (professional, managerial, or administrative employment), 21.9 percent service jobs, and 42.4 percent held blue collar positions (manual labor employment). When compared to the ROI, Tonopah has a higher percentage of blue collar employees and a lower percentage of white collar employees as shown in Figure 5.15-6 (UN 2007).



Source: UN 2007.

Figure 5.15-6—Percent Employment by Occupation in Tonopah Compared to the ROI, 2007

In 2007, the average household income in Tonopah was $45,296, which was comparable to the ROI average of $44,663 but less than the State of Nevada average of $62,564 and the national average household income of $62,737 (UN 2007).

Results from the UN survey (2007) indicate that households of TTR employees have lived within the CNRSA for a longer period of time and typically have a larger, younger household with larger average income versus households of non-TTR employees as shown in Table 5.15-13. Individuals within both types of households (TTR employees and non-TTR employees) appear to have attained similar levels of education as shown in Table 5.15-14.

Table 5.15-13—Comparison of Key Characteristics of TTR and Non-TTR Household Respondents

Characteristic	TTR	Non-TTR	Total
Average Years in CNRSA	5.4	4.5	4.8
Average Household Size	2.7	2.4	2.5
Average Respondent Age	48.1	53.5	52
Average Household Income	$64,200	$48,300	$52,800

Source: UN 2007.

Table 5.15-14—Comparison of Education Levels of TTR and Non-TTR Household Respondents

Education Level	TTR	Non-TTR	Total
Some High School	3.40%	3.10%	3.20%
High School Diploma	38.60%	29.30%	31.90%
Some College	35.20%	34.70%	34.80%
Associate Degree	13.60%	10.20%	11.20%
Bachelor Degree	6.80%	11.10%	9.90%
Graduate Degree	2.30%	11.60%	8.90%

Source: UN 2007.

As shown in Table 5.15-15, TTR households appear to have greater monthly expenditures when compared to non-TTR households and the CNRSA average household (UN 2007).

Table 5.15-15—Comparison of Estimated Monthly Expenditures for TTR Households and Non-TTR Households

Expenditure Category	TTR Household	Non-TTR Household	CNRSA Average Household
Housing			
Rent	$71	$133	$114
Mortgage	$562	$266	$359
Property Tax	$230	$162	$180
Grocery	$493	$481	$484
Food Away from Home	$179	$132	$146
Utilities (Electric, Natural Gas, Propane, Water, Cable/Satellite, Phone)	$576	$460	$492
General Merchandise	$251	$146	$178
Medical (Doctor, Dentist, Optometrist, Hospital, Prescription)	$404	$283	$315
Insurance (Vehicle, Health, Life)	$388	$351	$362
Recreation (Gaming, Indoor, Outdoor)	$99	$88	$91
Vehicle Expenses (Oil, Maintenance, Gas)	$323	$312	$315

Table 5.15-15—Comparison of Estimated Monthly Expenditures for TTR Households and Non-TTR Households (continued)

Expenditure Category	TTR Household	Non-TTR Household	CNRSA Average Household
Services (Accounting, Lawyer, Child Care, Miscellaneous)	$159	$111	$127
Credit Card (Principal and Interest)	$439	$340	$372
Miscellaneous	$796	$385	$156
Savings and Retirement	$140	$170	$163
Total Monthly Expenses (except housing)	$4,547	$3,421	$3,740
Total Monthly Income	$5,350	$4,025	$4,400
Allocation for Housing and Miscellaneous Taxes	$803	$604	$660

Source: UN 2007.

5.15.4.3 *Potential D&D Requirements*

TTR contains approximately 105 major buildings, with a total area of 161,505 square feet of space. TTR facilities also include approximately 90 smaller buildings, including towers and small sheds. These structures encompass an additional 18,000 square feet. If flight testing were transferred to either WSMR or NTS, NNSA would undertake D&D of approximately 180,000 total square feet (structures) and remediation of contaminated soils surrounding these structures. As detailed in Section 4.4.6.2.1, remediation of contamination resulting from former weapons destructions tests is ongoing at TTR and not scheduled to be completed until 2022. If flight testing were transferred, the required additional D&D would be limited to the existing structures and some small amount of immediately co-located soils. It is estimated that the D&D required by the closure of TTR would be a two year project requiring a total of close to 300,000 worker hours to complete and generate the waste volumes shown in Table 5.15-16. D&D of the facilities and cleanup of the site would have to meet the standards of the Air Force, which is the landlord, and the State of Nevada. Non-hazardous waste generated by this project would be disposed of on-site. LLW and hazardous waste generated by this effort would be transported to NTS or a commercial facility for treatment and disposal.

Table 5.15-16—D&D Associated with Transfer of Flight Testing–TTR

D&D Required	D&D Amount
Soil D&D (yd^3)	20,000
LLW generated (yd^3)	500
Non-Hazardous waste (yd^3)	45,619
Hazardous waste (yd^3)	7,462
Debris/Earth moving equip.(dozers/trucks)	5/10
D&D Related employment	
Peak	75
Total worker hours	299,300

Source: NNSA 2007.

5.15.5 Transfer to NTS Alternative

This alternative would entail the termination of flight test operations at TTR and the relocation to NTS. Existing communications systems and empty storage and office facilities at NTS could easily be adapted to allow for the JTA Flight Test Program.

5.15.5.1 *Construction Requirements*

As in a transfer to WSMR, a target area would have to be constructed and a few enhancements to Building CP-40 (existing building at NTS) would have to be made. Tables 5.15-17 and 5.15-18 present the requirements for construction and operation of Flight Test Operations at NTS.

Table 5.15-17—Construction Requirements–NTS

Requirements	Consumption/Use
Peak Electrical Energy (KW-hr)	40,000
Diesel Generators (Yes or No)	Yes
Concrete (yds^3)	800
Steel (tons)	1
Liquid fuel and lube oil (gal)	32,000
Water (gal)	2,880,000
Lay down Area Size	Two 11.5 acre sites
Parking Lots	N/A
Total employment (worker years)	37
Peak employment (workers)	30
Construction period	15 months
Hazardous	
Liquid (gal)	0
Solid (yds^3)	0
Non-hazardous (Sanitary)	
Liquid (gal)	0
Solid (yds^3)	6,000
Non-hazardous (Other)	
Liquid (gal)	0
Solid (yds^3)	45

Source: NNSA 2007.

Table 5.15-18—Operating Requirements–NTS

Annual Operations	Consumption/Use
Annual electrical energy (megawatt-hours [MWh]	595MWh
Peak electrical demand (MWe)	812MWe
Fuel usage (gal or cubic yd)	32,150 gallons
Other process gas (N, Ar, etc.)	480cu.ft.
Diesel generators	44 (about 20 per test)
Water (Yearly for entire range including AF)	6 million gallons
Steam (tons)	0
Employment (workers)	135
Number of radiation workers	25
Average annual dose	<10 mrem
Radionuclide emissions and effluents—nuclides and curies	0
NAAQS emissions (tons/yr)	13.32

Table 5.15-18—Operating Requirements–NTS (continued)

Annual Operations	Consumption/Use
Hazardous Air Pollutants and Effluents (tons/yr)	3.7×10^{-6}
Chemical use	0
Maximum inventory of fissile material/throughput	0
Waste Generated	**Volume**
Hazardous	
Liquid (gal.)	150
Solid (yds^3)	3
Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Mixed Low-Level	
Liquid (gal.)	0
Solid (yds^3)	0
Nonhazardous (sanitary)	
Liquid (gal.)	0
Solid (yds^3)	63
Nonhazardous (Other)	
Liquid (gal.)	700
Solid (yds^3)	15

Source: NNSA 2007.

The required construction is a small project and it is not anticipated that the employment of 30 construction workers over a 15-month period would place any drain on the existing labor pool of the area.

During flight test operations, the primary noise would be generated by aircraft flying over the NTS target drop areas. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to those employed by NTS. These individuals would not likely even be exposed to any high levels of noise as they are remotely located and not in proximity to the actual drop target areas. In addition, these tests are not likely to result in any adverse effect on sensitive wildlife species or their habitats.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased flights at NTS as a result of NNSA conducting flight tests. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are remotely located from the flightpath of the aircraft. The public would not be allowed access to those areas on NTS where flight test operations would occur; in fact, for safety reasons, such areas would be cleared of all personnel and closely monitored so as to exclude any access during such tests. Those areas of NTS where the public is allowed access would be sufficiently remote that the public probably would not perceive the presence of the aircraft, at all. Because no significant off-site health risks are associated with the flight test operations, no environmental justice impacts are expected.

Sensitive wildlife species are unlikely to be adversely affected by the aircraft noise. NTS has conducted large HE test detonations on a regular basis, for a number of years. There has been no apparent, adverse impacts to any species associated with these tests.

5.15.6 Transportation

Due to the proximity of all alternative sites, the transportation requirements are similar for all three action alternatives. All transportation of JTAs is conducted in NNSA Safeguards Transporters operated by the Office of Secure Transportation, based in Albuquerque, New Mexico. Vehicles are state-of-the-art and all personnel associated with such shipments are highly trained both initially and on an ongoing basis. Shipments by such transport have an exemplary safety record. Although routes have been determined and environmental impacts evaluated for such transport, specifics of this information are classified.

5.15.6.1 *Removal of Test Weapon from the Stockpile*

In order to conduct tests at TTR, weapons are removed from the stockpile at various locations across the U.S. and abroad and transported to Pantex. Once the weapon has been inspected, the SNM is removed from the weapon, and instrumentation is added to it, the weapon becomes a JTA. Transportation required to support this activity would be the same as for existing operations and would be the same for all alternatives.

5.15.6.2 *Transport of JTAs to Air Force Installations*

Once the JTAs have been inspected and certified at Pantex, they are transported to U.S. Air Force (USAF) installations on NNSA's fleet of SGT vehicles, and then loaded onto test aircraft. The specific locations of the USAF installations use to support this operation are not relevant and would be similar for all alternatives. Transportation required to support this activity would be the same as for existing operations and would be the same for all alternatives.

5.15.6.3 *Transport of JTAs from Test Site to Pantex*

Once the JTA test has been completed, the JTA is returned to Pantex for post testing analysis and disposition. For fly-over tests, this transportation route would be from the Air Force installation from which the aircraft originated to Pantex. Transportation required to support this activity would be the same for existing operations as it would be for all alternatives for fly over tests. Dropped JTAs would be transported from the test facility to Pantex. Transportation required to support this activity would be site specific and vary for each alternative site. The No Action Alternative, the TTR Upgrade Alternatives, and the Relocation to NTS would all be similar, since the distances and routes to Pantex are about the same for TTR and NTS. The transportation route from the Relocation to the WSMR Alternative is less than half of the other two alternatives.

5.16 PROJECT-SPECIFIC ANALYSIS OF HYDRODYNAMIC TESTING

Hydrodynamic testing (hydrotesting) is the execution of high-explosive-driven experiments to assess the performance and safety of nuclear weapons. Hydrodynamic tests, except for some underground sub-critical experiments at the NTS, do not normally employ fissile materials, but must not preclude the potential to do so should the stewardship mission require it. The alternatives for meeting the goal of the NHP are explained in the section 3.11. These alternatives are: (1) the No Action Alternative, which would continue operations at the existing facilities of LANL, LLNL, NTS, SNL, and Pantex; (2) an alternative to downsize the number of hydrotesting facilities at LANL, LLNL, NTS, SNL, and Pantex; (3) an alternative to consolidate hydrotesting activities at LANL; and (4) a next generation alternative to consolidate all hydrotesting activities at the NTS.

5.16.1 No Action Alternative

This alternative entails the continued operation of the hydrotesting facilities and missions currently being conducted at five weapons complex sites: LLNL, LANL, NTS, Sandia, and Pantex. Under the No Action Alternative, NNSA would continue to conduct hydrotesting at these facilities and sites. There would be no construction impacts associated with this alternative. The impacts of the No Action Alternative are described in the relevant sections of the Affected Environment Chapter of this SPEIS (Chapter 4). The impacts described in that chapter would continue under the No Action Alternative. Additionally, more details regarding the No Action Alternative for hydrotesting is contained in Section 3.11.1, and in Appendix A. The major No Action Alternative facilities are summarized below.

5.16.1.1 *Hydrotesting Facilities at Lawrence Livermore National Laboratory*

LLNL's Site 300 has been used since 1955 to perform experiments that measure variables important to nuclear weapon safety, conventional ordnance designs, and possible accidents (such as fires) involving explosives. The facilities used for Site 300 firing activities consist of four firing point complexes; the 801, 812, 850, and 851, and several other associated smaller support facilities. Of particular note is the Contained Firing Facility (CFF) located at the 801 complex. There are 30 employees at LLNL's hydrodynamic test facilities. 30 employees are at the 801 complex, of which 10 of these employees are at the CFF.

5.16.1.2 *Hydrotesting Facilities at Los Alamos National Laboratory*

The primary hydrotesting facility at LANL is the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT), which has an intense high-resolution, dual-machine radiographic capability. Some other smaller firing sites at LANL support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments. LANL hydrodynamic testing has 34 employees of which 29 are at the DARHT.

5.16.1.3 *Hydrotesting Facilities at the Nevada Test Site*

The NTS has several facilities which are utilized for very large explosion-type experiments. The

Big Explosives Experimental Facility (BEEF) is one such facility at NTS which is the only NNSA facility where some experiments, due to the amount of HE utilized, can be conducted. The U1a Complex is an underground facility that would continue to conduct HE/Pu tests. NTS has three additional, smaller outdoor facilities. No employees are associated with these facilities.

5.16.1.4 *Hydrotesting Facilities at Sandia National Laboratory and Pantex*

Smaller hydrotesting facilities are located at Pantex, near Amarillo, Texas, and Sandia National Laboratory (SNL or Sandia) in Albuquerque, New Mexico. Both Pantex and Sandia have several outside blasting table facilities which are primarily used for HE R&D activities and can only handle small hydrotesting experiments. No employees are associated with these facilities.

5.16.2 Downsize–in-Place Alternative

The Downsize-In-Place Alternative would continue hydrotest activities by, consolidating LLNL activities at Building 801 Complex in the CFF, consolidating LANL activities at the DARHT, closing the smaller facilities at both of these sites, and moving tests requiring larger amounts of HE to the BEEF, at NTS. This alternative would entail the closure of a number of facilities both at LLNL and LANL. It would also entail the closure of all hydrotesting facilities at Pantex and SNL. It should be noted that some of the facilities used for hydrotesting at SNL are shared facilities with the HE R&D Program and that any decisions to close these facilities would require a joint decision on the part of both programs. NTS would close all of its facilities, except for BEEF.

5.16.2.1 *LLNL Impacts*

At LLNL, the Downsize-In-Place Alternative would entail the closing of the Building 812 Complex and the Building 850 Complex. The Building 851 Complex would either be closed or turned over to other non-NNSA programs. The associated support facilities would probably not be impacted by this alternative as they are smaller, multi-purpose facilities which could be of use to other program activities. This would entail the D&D and disposal of an estimated 3,200 cubic yards of hardened concrete, steel and other non-hazardous material, and an estimated 9,200 cubic yards of soils which would require D&D. It is estimated that emissions would be reduced by approximately 20 percent, and waste generation reduced by approximately 10 percent. The majority of the reductions in air emissions would be a result of the closing of the smaller outdoor facilities and the increased utilization of the enclosed CFF-like facility. There would be a loss of 26 jobs. These impacts are presented in Table 5.16-1. Buildings 850, and 851A at Site 300 have been determined eligible for listing in the NRHP and would be affected by decommissioning. Prior to D&D activities, these buildings would be recorded and photo documented to accepted standards. A thorough review would be conducted to assure that there would be no impacts to any cultural or archeological resources.

5.16.2.2 *LANL Impacts*

Under the Downsize-In-Place Alternative LANL would close all hydrotesting facilities except for the DARHT, which has an intense high-resolution, dual-machine radiographic capability—

and a few of the other smaller firing sites at LANL, which support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments. There would be a loss of 5 jobs. This would entail D&D and disposal of an estimated 8,500 cubic yards of hardened concrete, steel and other non-hazardous material and an estimated 17,000 cubic feet of soil which would have to undergo D&D. This alternative would result in reduced air emissions of up to 40 percent and reduce waste generation by approximately 10 percent. These impacts are presented in Table 5.16-1.

5.16.2.3 *Pantex and Sandia Impacts*

At Pantex, at least six outdoor burn areas would be closed. At SNL, at least three outdoor burn areas would be closed. It should be noted that some of the facilities used for hydrotesting at SNL are shared facilities with the HE R&D Program and that any decisions to close these facilities would require a joint decision on the part of both programs. There would be no job loss as there are no employees assigned to these facilities at Pantex and SNL/NM. These are all small facilities and could entail the D&D and disposal of an estimated 2,200 cubic yards of hardened concrete, steel and other non-hazardous materials, and generate an estimated 4,000 cubic feet of contaminated soil which would then have to undergo D&D. Because special nuclear materials were used in past tests, this would entail the generation of small levels of TRU and Low Level wastes. These impacts are presented in Table 5.16-1.

Table 5.16-1—Impacts of Facility Closures for the Downsize-in-Place Alternative

	LLNL	LANL	Pantex & SNL	NTS	TOTAL
Employment loss	26	5	0	0	31
Soil D&D (yds^3)	9,200	17,000	4,000	2,000	32,200
LLW generated (yds^3)	1,350	28,112	10,000	5,000	44,462
TRU generated (yds^3)	0	0	20	10	30
MLLW generated (yds^3)	0	0	20	10	30
Non-Hazardous waste					
Liquid (gal)	13,165	0	0	10	13,175
Solid (yds^3)	3113	8,487	2,200	1,000	16,246
Hazardous Waste					
Liquid (gal)	220	0	0	0	220
Solid (yds^3)	317	492	80	45	934
Employment					
Peak	20	107	20	12	159
Total Worker-Years	45	200	45	23	313

Source: NNSA 2007.

5.16.2.4 *NTS Impacts*

BEEF and the U1a Complex would remain open, but NTS would close the smaller outdoor facilities. This would entail the generation, D&D, and disposal of an estimated 1,000 cubic feet of hardened concrete, steel and other non-hazardous material, and the generation of an estimated 2,000 cubic yards of contaminated soil which would require D&D. Because special nuclear materials were used in past tests, it is expected that this D&D would generate small quantities of TRU waste and low level wastes. Reductions in air emissions and waste generation would be small since the facilities eliminated by this alternative are small in comparison to the BEEF and

the U1a Complex, which would continue to operate. These impacts are presented in Table 5.16-1.

5.16.2.5 *Summary of Impacts for the Downsize-in-Place Alternative*

Closure of close to a dozen facilities would entail a substantial clean-up and D&D effort. Although not heavily contaminated, these facilities all have a substantial amount of reinforced concrete and steel structures designed to withstand sizeable HE explosions. There would be a total job loss of 31 (26 at LLNL and 5 at LANL). It is estimated that at least 10,000 gross square feet of hardened concrete and steel structures and soil immediately surrounding these structures would have to be dismantled, razed, dug up, undergo D&D, and disposed of. Table 5.16-1 presents the cumulative impacts of the Reduce-In-Place Alternative.

After these closures, the Hydrotesting Program would operate the DARHT and a few support facilities at LANL, the CFF and Building Complex 801 at LLNL, and the BEEF and the U1a Complex at NTS. The option of using facilities maintained by the HE R&D Program would continue to exist for smaller experiments, under this alternative.

5.16.3 Consolidation at LANL Alternative

This alternative would consolidate all large-scale hydrotesting at the single location of LANL. Since LLNL and NTS both have required capabilities not presently at LANL, this alternative would entail maintaining the CFF at the Building 801 Complex and its associated support facilities at LLNL until these capabilities could be established at LANL. In addition, it is not anticipated that it would be possible to transfer the capability to conduct Hydrotesting experiments requiring very large amounts of HE, presently being conducted at the BEEF, at NTS, to LANL. Accordingly, under a consolidation of hydrotest capabilities at LANL, the BEEF would still be required to maintain its operational status at NTS.

This alternative would entail a large amount of clean-up and D&D associated with the closure of all hydrotesting facilities at LLNL, SNL, NTS (except for BEEF and the U1a Complex), Pantex, and a substantial number of facilities at LANL. It is estimated that this alternative would entail the closure and clean-up of close to 17,000 square feet of hardened concrete and steel structures designed to withstand very large HE explosions.

5.16.3.1 *LLNL Impacts*

This alternative would entail the closure of all of the LLNL hydrotesting facilities. This would result in the loss of 56 jobs at LLNL. The CFF would remain in operation until a new CFF-like replacement facility could be constructed at LANL. Once this CFF-like replacement facility was operational at LANL, the CFF would be closed and undergo D&D. This would result in the D&D and closure of a substantial number of facilities at LLNL. It is estimated that this would generate 15,700 cubic yards of hardened concrete, steel and other non-hazardous material, and that an estimated 25,500 cubic yards of soil would be required to undergo D&D. In addition, quantities of LLW and hazardous waste would be generated. Because all hydrotesting would cease after a replacement CFF was constructed and in operation at LANL air emissions and

waste generation attributable to this activity would decrease to zero. These impacts are presented in Table 5.16-2. Five buildings and two districts at the Livermore Site and Site 300 have been determined eligible for listing in the NRHP and could be affected by decommissioning. Prior to D&D activities, these buildings would be recorded and photo documented to accepted standards. A thorough review would be conducted to assure that there would be no impacts to any cultural or archeological resources.

5.16.3.2 *LANL Impacts*

Under this alternative, LANL would close the same facilities as it would for the Downsize-In-Place Alternative, the impacts of which are discussed in Section 5.16.2. As discussed in the LLNL section, above, this alternative could require the construction of a new CFF-like facility at LANL. In this process it would make sense to collocate LANL's distant support facilities (storage, staging and assembly) during the construction of such a new facility. The construction of such a facility would involve a two to three year process resulting in an 8,000 to 12,000 square foot primary structure, with two to three smaller support buildings, situated on a five to seven acre site. There would be an increase of 10 employees associated with the operation of the new CFF-like facility. With the five jobs lost through the closing of the smaller facilities at LANL, this would result in a net gain of 5 jobs. These impacts are presented in Table 5.16-2. The impacts associated with the construction and operation of a CFF-like facility, at LANL, are shown in Table 5.16.3.

5.16.3.3 *Pantex and Sandia Impacts*

The impacts to Pantex and Sandia would be the same as for the Downsize-In-Place Alternative, the impacts of which are detailed in Section 5.16.2.

5.16.3.4 *NTS Impacts*

The impacts to NTS would be the same for this alternative as they would be for the Downsize-In-Place Alternative, the impacts of which are detailed in Section 5.16.2.

5.16.3.5 *Consolidated Impacts*

The Consolidation at LANL Alternative would close all hydrotesting facilities at Pantex, Sandia, and LLNL, and all but the BEEF, at NTS. The CFF would remain open, at LLNL, until a replacement CFF could be constructed and brought on-line at LANL. Table 5.16-2 presents the impacts associated with the closing of facilities required by the Consolidation at LANL Alternative, and Table 5.16-3 presents the impacts associated with the construction of a replacement CFF, at LANL and the operation of facilities resulting from the Consolidation at LANL Alternative.

Table 5.16-2—Impacts of Facility Closures–LANL Consolidation Alternative

	LLNL	LANL	Pantex & SNL	NTS	TOTAL
Employment changes	-56	+ 5	0	0	-51
Soil D&D (yds^3)	25,500	17,000	4,000	2,000	48,000
LLW generated					
Liquid (gal)	40,000		10,000	5,000	55,000
Solid (yds^3)	100	0	20	12	130
TRU generated (yds^3)	0	0	20	10	30
MLLW generated (yds^3)	0	0	0	0	0
Non-Hazardous waste					
Liquid (gal)	13,165	0	0	0	13,165
Solid (cubic yards)	15,692	8,487	2,200	1,000	27,379
Hazardous Waste					
Liquid (gal)	517	0	0	0	517
Solid (cubic yards)	15,270	492	80	45	15,887
D&D Related Employment					
Peak	120	107	20	12	259
Total Worker-Years	240	200	45	23	508

Source: NNSA 2007.

Table 5.16-3—Construction and Operation Impacts of a CFF-Like Facility–LANL

Construction	Consumption/Use
Electric use MWh/yr	150
Diesel generators number & size	
Concrete (yds^3)	5,000
Steel (tons)	2,500
Water (gallons)	200,000
Land (acres)	5 to 7
Laydown area (acres)	3
Parking lots (acres)	2
Employment	
Total (worker years)	60
Peak (workers)	50
Construction period	24 months
Waste	
Hazardous (yds^3)	0
Non-hazardous	0
Liquid	22,000
Solid (yds^3)	1,300
Electricity (MWh/yr)	14
Water (gal/yr)	40,000
Footprint Acres	0.12
Employees	10
Explosives Lbs/yr	234
DU lbs/yr	207
Beryllium lbs/yr	4
LLW	
Liquid (gal)	9,000
Solid (yd^3)	64
MLLW	
Liquid (gal)	0
Solid (kg/yr)	7,200

Table 5.16-3—Construction and Operation Impacts of a CFF-Like Facility–LANL (continued)

Construction	Consumption/Use
TRU Waste	
Liquid (gal)	0
Solid (yd^3)	0
Hazardous Waste	
Liquid (gal)	569,713
Solid (yd^3)	2.8
Non Hazardous Waste	
Liquid (gal)	2,412
Solid (yd^3)	0.1
NOx emissions (tons/yr)	0.0271
CO emissions (tons/yr)	0.0167
SOx emissions (tons/yr)	0.0018

Source: NNSA 2007.

In addition, this alternative could require the construction of a new containment facility at LANL. In this process it may be possible to locate support facilities (storage, staging and assembly) at the facility. The construction of such a facility would involve a two to three year process resulting in a primary containment structure, with possibly two to three smaller support buildings situated at an existing firing site. Options for sites include TA-15-306 and TA-36-12 as well as DARHT. Construction at TA-15-306 would present no conflicts as no experimental program is using that site at this time. Table 5.16-3, which is based on the construction and operation of CFF, gives an idea of what the impacts associated with a new facility capable of performing the experiments presently being conducted at CFF would be. Although the new facility would probably be smaller than the existing CFF, it would accommodate the co-location of LANL facilities presently located at other TA locations.

Construction impacts required for a new CFF like facility would be expected to disturb from 5 to 7 acres at one of two potential sites on TA-15, or at a third potential site on TA-36. No construction would be conducted within a floodplain or a wetland. The construction area would be sited to avoid impacts to prehistoric and Homestead Era cultural resources and to sensitive habitat areas. Should previously unknown cultural resources be discovered during construction, work would cease in that area until LANL's cultural resources specialists could review the evidence, identify procedures for working in the vicinity of the cultural resources, and initiate any necessary consultations with Federal, state, and tribal entities.

The construction or post-construction landscaping could disturb some potential release sites (PRSs). When possible, PRSs would be avoided. If disturbance of PRSs were necessary, soils from PRSs would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately. Should a previously unknown or suspect disposal site be disclosed during subsurface construction work, work would cease until LANL's Project staff could review the site and would identify appropriate procedures for working within that site area.

The new CFF-like facility would be constructed in accordance with seismic criteria in current building codes. This facility would not be constructed over known faults or within 50 feet of known seismic faults active since the beginning of the Holocene (approximately 100,000 years ago). The new facility would be designed according to general design criteria for a new facility (LANL 1999a), with a minimum lifetime expectancy of 30 years of operation.

The newly constructed facility would be designed with safety and security features appropriate to the work to be performed in that building. These features could include air handling and filtration systems, standby emergency generators, alarms, security equipment, monitoring equipment, emergency lighting, and similar kinds of equipment and systems. Onsite utilities (gas, water, sewer, electric, communications, computer networks) at the Two-Mile Mesa Complex are currently being reconfigured and upgraded for efficient distribution to new buildings associated with the DX Consolidation.

LANL is considered a major air emission source under the State of New Mexico Operating Permit program because it emits more than 100 tons per year of certain non-radioactive substances. Specifically, LANL is a major source of nitrogen oxides, emitted primarily from the TA-3 steam plant boilers. Combustion units are the primary point sources of criteria pollutants (nitrogen oxides, sulfur oxides, particulate matter, and carbon monoxide) emitted at LANL. The new building would be located in Los Alamos County, which is in attainment with NAAQS and all NMAAQS. The ambient air quality in and around LANL meets all EPA and DOE standards for protecting the public and workers (LANL 2001a).

Clearing or excavation activities during site construction and during the D&D of the closed facilities would have the potential to generate dust. Dust suppression would be conducted as necessary using BACMs (such as water spraying or use of soil tackifiers[5]) to minimize the generation of dust during construction activities. The application of specific BACMs would be determined on a case-by-case basis. Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality

Work at both the new facility construction site and the D&D sites would require the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at these sites would be audible primarily to the involved workers. Involved site workers would be required to wear appropriate PPE, including hearing protection. During the construction phase, two acres of temporary parking lots, three acres of laydown yards, and construction access roads would be required. At the completion of the construction process these areas would be reclaimed or used for permanent parking. Additional laydown and temporary storage yards would be required at the D&D sites.

Engineering BMPs would be implemented as part of a construction Storm Water Pollution Prevention Plan required by the NPDES General Permit. These BMPs may include but not be limited to, the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction, loose soil and debris that was not part of the landscaping design would be removed from the area.

Foot and vehicular traffic would be minimally affected for short periods during delivery of construction materials and by the addition of construction workers in the area. Approximately 50 construction workers would be onsite during the peak construction period, adding an estimated additional 40 personal vehicles to local roadways during the construction period and another 20 construction vehicles (such as dump trucks, bulldozers, drill rigs, cranes, and cement mixer trucks). These vehicles would operate primarily during the daylight hours and could be left onsite over night. Temporary construction lighting would be directed toward the work area. An additional 107 construction workers with an additional 90 personal vehicles would be added to the local roadways for the 24 months of the D&D activities. There would also be an additional 30 to 35 construction vehicles to enable the D&D activities to be conducted.

There would be no effects to sensitive species or their critical habitat due to construction or D&D activities. Small mammals and birds at the construction site or at the temporary storage yards for D&D activities would be temporarily displaced. These would be expected to return to the general area after construction and D&D activities were completed. Game animal migration is not likely to be altered.

The new building or D&D activities would not entail any direct effects on floodplains or wetlands since there are none within the areas proposed for construction or demolition. BMPs would be established so that there would be no indirect effects from construction.

During the construction and D&D period, there would be no increase in the number of LANL employees as a result of this project. The estimated additional 50 peak construction jobs and the 107 D&D jobs would be filled by the existing employees in the regional work force, which includes mostly Los Alamos, Rio Arriba, and Santa Fe Counties. Because these temporary jobs would be filled by existing regional work force, there would be no effect on area population or increase in the demand for housing or public services in Los Alamos or the region. There would be short-term benefits during construction and D&D process in the form of jobs and procurement. Most materials would be purchased in New Mexico.

Construction and D&D activities would not be expected to have any adverse health effects on LANL workers or the public. NNSA and LANL workers would perform site inspections and monitor construction activities during periods of peak activity. Applicable safety and health training and monitoring, PPE, and work-site hazard controls would be required for these workers. The construction is not expected to result in an adverse effect on the health of construction workers. Approximately 157 peak-period (50 construction and 107 D&D) workers. Approximately 60 (20 construction and 40 D&D) of these workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and building construction.

An estimate of the potential number of fatalities that might occur from construction-related activities was derived from recent risk rates of occupational fatalities for all industries. The average fatality rate in the U.S. is 3.9 deaths per 100,000 workers per year (Saltzman 2001). If the peak construction period lasts for the entire one year construction period, no deaths (0.0049) would be expected for the estimated 157 (50 construction and 107 D&D) onsite workers from construction nor demolition-related activities that include falls, exposure to harmful substances,

fires and explosions, transportation incidents, and being struck by objects, equipment, or projectiles.

The new construction and the D&D of the facilities to be closed would generate non-hazardous solid waste that would be disposed of at the Los Alamos Country Landfill, its replacement facility, or other New Mexico solid waste landfills in accordance with the waste minimization plan. Construction solid waste is estimated at 1,300 cubic yards and the D&D activities is expected to generate 13,165 cubic yards of soil and 15,270 cubic yards of solid waste. No new radioactive or other wastewater or hazardous waste streams would be generated.

Water quality in this area would not be affected by the construction, D&D or the operation of the new facility. The new facility would be designed using pollution prevention processes that lead to minimal waste generation. No new outfalls, wastewater, or hazardous waste streams would be created by implementing the Proposed Action. Water quality would not change as a result of operations of the new facility.

During operations, there would be only a 10 person increase in the number of LANL employees as a result of this project. Compared to the existing workforce at LANL, this project would not have a long-term effect on socioeconomic conditions in north-central New Mexico.

During operations, the primary noise generated by air blast waves and ground vibration impacts associated with high explosives tests, would be minimized by the containment vessel of the new facility. It is not expected that any incremental noise would be detectable outside of the new CFF-like facility. Accordingly, there would not be any adverse effect on non-involved workers, the public, or sensitive wildlife species or their habitats.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased explosions resulting from hydrotesting. Such testing currently occurs at LANL both in the Hydrotesting Program and in the HE R&D Program. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control their entry into explosives firing site detonation points. The public is not allowed within the fenced TAs that have firing sites, and noise levels produced by explosives tests are sufficiently reduced at locations where the public would be present to preclude hearing damage.

Such tests would not be expected to adversely affect offsite sensitive receptors (such as those at Bandelier National Monument or at White Rock). Noises heard at that distance would be similar to thunder in their intensity, and air blast and ground vibrations are not expected to be present outside LANL at intensities great enough to adversely affect real properties. Sensitive wildlife species are unlikely to be adversely affected by “thunder-like” explosives testing events, given their continued presence in areas of the country that are known to be within higher-than-average lightning event areas and their continued presence on the LANL site over the past 10 years. In fact, the continued thriving of resident and long-term migratory populations of these sensitive species on the LANL site indicates that the level of noise generated by explosives testing under the No Action Alternative is at least tolerable to these particular species (LANL 2008).

The reasonably foreseeable hydrotest accident scenarios associated with a CFF-like facility, which could produce the greatest potential impacts, are the following:

- **Case 1.** Accidental detonation of a test of a 60-kg charge of explosives at an outdoor firing table.
- **Case 2.** Accidental detonation of a 60-kg explosives test which could release up to 20 mg (200 curies) of tritium with dispersal through an unsecured blast door in the CFF or at the new CFF-like facility constructed to replace the CFF.

In each case, the involved workers would probably be fatally injured from blast effects due to peak overpressure and debris, but there would be no injury offsite to members of the general public. No damage to current buildings offsite or in other areas of LANL would be expected from such accidents. Potential impacts from the two accident scenarios are summarized in Table 5.16-4.

Table 5.16-4—Potential Impacts from Accidents at a CFF-Like Facility

Scenario	Involved Worker at 30 meters (rem)	Uninvolved Worker at 50 meters (rem)	Offsite Member of Public at 1,340 meters (mrem)	Excess LCFs, Offsite Member of the Public
Case 1	0	0	0	0
Case 2	0.026	0.015	1.1×10^{-4}	5.5×10^{-8}

Source: DOE 1996d.

These projected radiation doses are lower than DOE guideline limits for workers and for the general public; thus the greatest effects would be fatalities or injuries to workers due to primary blast effects. Because no significant off-site health risks are associated with the operations of a CFF-like facility, no environmental justice impacts are expected.

5.16.4 Consolidation at NTS

Moving hydrodynamic testing to NTS would consolidate the capabilities that currently exist at LANL, LLNL, SNL, Pantex, and NTS to one location and provide the next generation capabilities required to maintain the nuclear deterrent in the 2020 to 2050 timeframe. This potential alternative provides the maximum consolidation with the greatest number of facility closures. However, both DARHT at LANL, and CFF at LLNL, are relatively new facilities that would be expensive to replace in the near term. Consequently, a decision on a next generation hydrotesting facility probably would be premature at this time. However, the alternative is analyzed in this section for completeness.

To the extent the potential environmental impacts of the next generation hydrodynamic test facility can be forecast at this time, a significant part of the public and worker exposures and impacts due to normal operation of the next generation hydrodynamic test facility would be those related to the conduct of hydrodynamic tests and dynamic experiments at the facility. While the impacts are inherently site-dependent, the hydrodynamic tests and dynamic experiments themselves can be anticipated to be similar to such activities as analyzed at DARHT in the

DARHT Facility EIS (DOE 1995a); therefore the DARHT Facility impacts are summarized here for reference. Table 5.16-5 presents the construction and operational requirements for such a facility at NTS.

Table 5.16-5—Construction and Operational Requirements–Consolidation at NTS

Construction	Consumption/Use
Electric use MWh/yr	365
Diesel generators number & size	3
Concrete (yds^3)	16,000
Steel (tons)	1,600
Water (gallons)	350,000
Land (acres)	17
Laydown area (acres)	3.5
Parking lots (acres)	2
Employment	
Total (worker years)	175
Peak (workers)	40
Construction period	24 months
Non-hazardous	0
Liquid	22,000
Solid (yds^3)	1,300
Operation	**Consumption/Use**
Electricity (MWh/yr)	2,520
Water (gal/yr)	100,000
Footprint Acres	17
Employees	29
Avg. Annual dose (rem)	0.097
Maximum worker dose (mrem)	1.84
Explosives (lbs/yr)	3,300
Depleted U (lbs/yr)	720
Lead (lbs/yr)	14
LLW	
Liquid (gal)	0
Solid (yd^3)	12,500
TRU Waste	
Liquid (gal)	0
Solid (tons)	2
Hazardous Waste	
Liquid (gal)	2,500
Solid (yd^3)	310
Non Hazardous Waste	
Liquid (gal)	0
Solid (ft^3)	9,400
NOx emissions (lbs/yr)	31.5
CO emissions (lbs/yr)	93
SOx emissions (lbs/yr)	0.42

Source: NNSA 2007.

Population-based impacts may be expected to be lower at NTS. The normal radiological impacts of the DARHT Facility to the annual collective dose to the population residing within 50 miles would be expected to be 0.57 person-rem. Latent cancer fatalities at this dose would not be

expected. The maximum annual dose to any nearby resident would be about $2x10^{-5}$rem with a corresponding latent cancer fatality of $1x10^{-8}$. The average annual dose to individual workers would probably not exceed 0.02 rem with a corresponding maximum probability of latent cancer fatality of $8x10^{-6}$. Routine exposure to chemicals is expected to be low. The likelihood of a severe facility accident occurring would be very small. The population dose resulting from acute accidental release in the bounding facility accident, accidental uncontained detonation of a plutonium-containing assembly, evaluated on a what-if basis (related DOE safety studies indicate a probability of less than 10^{-6} per year), would be expected to range from 9,000 to 24,000 person-rem in the maximally exposed sector, based on 50th or 95th percentile atmospheric dispersion factors, respectively. Five to twelve latent cancer fatalities would be expected from this dose. Population dose from acute accidental plutonium release from a containment breach was estimated to range from 210 to 560 person-rem, for which no latent cancer fatalities would be expected. For workers, the likelihood of a severe accident occurring and resulting in death would be minimized by a comprehensive training program and an explosives safety program.

Because the concept of this facility has not developed to the point where it is even possible to define the structure size or type, it is not possible to estimate the specific impacts associated with the construction and operation beyond the general emission concepts discussed above. If this alternative were eventually pursued, the appropriate NEPA environmental impact analysis would be performed at the time data to enable such analysis became available.

In addition to the next generation facility which would be constructed for the consolidation at NTS Alternative, an alternative to also construct a new CFF-like facility at NTS in the 2040 timeframe is also being considered. The impacts associated with the construction and operation of this facility would be similar to the impacts detailed in the LANL Consolidation Alternative (see Section 5.16.3).

5.17 PROJECT-SPECIFIC ANALYSIS OF MAJOR ENVIRONMENTAL TEST FACILITIES

5.17.1 Introduction

This section discusses the environmental impacts which could result from actions supporting the following Alternatives for Major ETFs located at LANL, LLNL, SNL, and NTS.

Major ETF Alternatives
• **No Action.** Maintain status quo at each site. All facilities must be maintained, or upgraded to meet current safety and security standards. • **Downsize-in-Place.** No duplication of capability within a given site, but there may be duplication from site to site - phase out aging and unused facilities. • **Consolidate ETF Capabilities at One Site (NTS or SNL).** Would entail closings at sites not selected and construction of new facilities if NTS were selected. This alternative also includes an option to move the LLNL Building 334 ETF capabilities and the LLNL Site 300 Building 834 Complex to Pantex.

5.17.2 No Action Alternative

ETFs are currently located at three National Laboratories (SNL, LANL and LLNL) and the NTS. Under the No-Action Alternative, DOE/NNSA would continue to operate the existing ETFs at these four sites at the current levels of activity. Only those upgrades and maintenance required to allow for the current activities would take place. There would be no changes to current resource requirements, waste generation, emissions, infrastructure, or employment. A full description of these ETF facilities at these four sites, along with the operational requirements, may be found in Appendix A.

At LLNL, six small structures at the Thermal Test Facility are currently being demolished and surrounding soils will be regarded to the preexisting state. These facilities have not been included in this analysis, as the project has been on-going for a number of years and is expected to be completed prior to any decisions resulting from this SPEIS.

It should be pointed out that the use of Category I/II SNM is an issue that affects the ETF program. SNL/NM is currently removing its Category I/II SNM, and by the end of 2008 should no longer maintain any Category I/II SNM. After that date, any ETF testing requiring such material at SNL/NM would use it in a “campaign mode” only while the test is being conducted. Special security arrangements will be implemented during the test and the material would be removed and returned to the site it came from after the test is completed. For the actions proposed by the ETF Alternatives, use of Category I/II SNM would be dealt with in a similar manner.

5.17.3 Downsize-in-Place Alternative

The Downsize-in-Place Alternative entails the elimination of duplicate activities within a given site, and the closing of unused facilities and facilities which require major upgrades to bring them on-line. This Alternative would entail the closure of the following facilities listed in Table 5.17-1.

Table 5.17-1—ETF Closures– Downsize-in-Place Alternative

LANL	LLNL	Sandia National Labs[3]
Thermo-Conditioning Facility (5 structures)	Dynamic Testing Facility Building (836 Complex)	ACRR and Sandia Pulsed Reactor Facility[1]
PIXY	Building 834 Complex	Low Dose Rate Gamma Irradiation Facility
		Auxiliary Hot Cell Facility
		Centrifuge Complex
		SNL/CA Environmental Test Complex[2] (4 structures)

Source: NNSA 2007.
[1]The reactor, itself has been moved to NTS
[2]These buildings might not be demolished and undergo D&D; in that event, they would be reused for other purposes.
[3]Downsize in place would not effect the SNL/CA facilities

The scheduled closure of SNL facilities in Table 5.17-1 would be contingent upon completion and time phasing of existing programmatic work at the sites, as previously discussed in Section 3.12.2. The Downsize-In-Place Alternative would not effect the SL/CA facilities

Unless other customers/sponsors are found for these facilities are found, they will be subject to closure and would require the demolition of more than 27 structures, some of which are hardened concrete and steel structures. Some of the structures are merely sheds and of a light construction material type. Some of these facilities have conducted experiments involving radioactive materials for a number of years and would require additional D&D beyond normal demolition activities. Some soils surrounding the structures would be disturbed and some of these soils might prove be contaminated with radioactive materials and/or hazardous wastes. A complete site assessment would be made at and around each of these facilities prior to any demolition activities.

Demolition and D&D would result in the generation of solid, non-hazardous waste, hazardous wastes, low level radioactive wastes, and potentially some mixed wastes. It is not envisioned that there would be any TRU waste generated as a result of the closure and D&D of facilities associated with this alternative.

In the case of the Sandia Pulsed Reactor if no other customer/sponsor is found, its fuel would be removed and taken to NTS and stored for future use. The buildings it occupies will be D&D. The reactor itself will undergo D&D and be disposed of at NTS as LLW.

In addition to the closing of structures, there would be minor job losses at SNL/NM (16), and at LLNL (6). The potential for 6 job losses at LLNL comes from the closure of the SNL/CA facility. The LLNL and the LANL ETF staff would be unaffected by facility closures, as the

work and the tests being conducted at these sites would continue at other ETFs. Because the two facilities at NTS would not be affected by this alternative, they would continue operations, and there would be no impacts.

An assessment of the environmental impacts resulting from the closure and D&D (if needed) was made for each structure which would close as a result of this alternative and is summarized in Table 5.17-2.

Table 5.17-2—Impacts from ETF Closures– Downsize-in-Place Alternative

NNSA Site	Facility Closures	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	2	2,849	2,741	2,000	2	40	8,518	0	13,040
LLNL[a]	2	100	0	6,374	199	85	44,000	6	17,202
SNL	5	5,100	37	8,700	42	107	48,880	16	42,717,

Source: NNSA 2007.
[a]For downsize in Place Alternative SNL/CA facilities would not be effected

The potential environmental impacts at LANL, LLNL, SNL/NM, and NTS which could result from the Downsize-In-Place Alternative are presented below:

5.17.3.1 *Downsize-in-Place Alternative Impacts at LANL*

The Downsize-in-Place Alternative would entail the closing and the D&D of the Thermo-Conditioning Facility and PIXY. This would reduce the ETF floor space by 13,040 square feet and leave the K Site Environmental Test Facility and the Weapons Component Test Facility in operation. Closure and D&D of the two facilities at LANL is expected to entail 8,518 total worker hours, involve three large earth movers and six large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL. These construction vehicles would not be utilized for off-site runs during either the morning or evening rush hours and would remain on site over night. The peak employment would total 40 construction workers with the average work-force being slightly smaller. This would add another 30 vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take eleven months to complete.

It is expected that 2,849 cubic yards of soil would have to be excavated. None of this soil is expected to be contaminated with hazardous waste or radioactive materials, but a thorough site characterization would be conducted prior to any soil disturbance and soil would be sampled at regular intervals during the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering the mounds with either vegetation or tarps. Once the demolition process is completed this soil would be used as landscaping grade material. If some of this soil was determined to be contaminated, it would be treated according to applicable regulatory requirements and then taken to TA-54 for final treatment and disposal. It is expected that 2,741 cubic yards of low level waste will be generated. This waste would consist mainly of equipment, glove-boxes and contaminated concrete. This LLW would be sorted, compacted, and packaged on-site and transported directly to Area G, located in TA-54.

The 2 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercially licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste are generated through this process, they would be packaged, on-site, for transport and taken to Area G of TA-54 for treatment and final disposition. An estimated 2,000 cubic yards of non-hazardous, solid waste would be generated by the demolition of these facilities. This waste would consist primarily of concrete, steel reinforcement, and metal scrap. This waste would be transported to the Los Alamos County Landfill for disposal.

LANL is located within the New Mexico Intrastate AQCR 157. None of the area within LANL and its surrounding counties is designated as nonattainment areas with respect to any of the NAAQS (40 CFR 81.332). The only pollutant of concern resulting from this action would be particulate matter, the emissions of which could exceed the 24-hour limits established by the New Mexico Environmental Improvement Board. Dust suppression measures utilizing water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Los Alamos, Santa Fe, Rio Arriba, Taos, Mora and San Miguel, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would be no loss of jobs attributable to this action as the ETF program would continue at LANL, and the tests would be conducted at other facilities.

5.17.3.2 *Downsize-in-Place Alternative Impacts on LLNL*

For LLNL, the Downsize-in-Place Alternative would entail the closing and the D&D of the Thermal Test Facility and the Dynamic Testing Facility (836 Complex), at Site 300, and the

SNL/CA Environmental Test Complex near the Main LLNL Site. This action would reduce the ETF floor space by approximately 17,200 square feet by closing all ETF facilities at LLNL Site 300 and the SNL/CA environmental test complex.[11] It is expected this would entail 44,000 total worker hours, involve four large earth movers and 12 large dump-trucks. Peak employment would total 85 construction workers with the average daily work-force being smaller. It is estimated that the total job would take thirty-six months. Construction vehicles would be entering and leaving LLNL during the day, at non-rush hours. The construction vehicles would not operate on the highways during rush hour times. The workforce would add an estimated additional 60 personal vehicles, but work arrival times and departure times could be staggered to minimize impacts on the existing traffic patterns.

It is expected that only 100 cubic yards of soil would need to be excavated. This soil is not expected to be contaminated, but a thorough site characterization of the buildings and surrounding soils would be done prior to any demolition, and soil would be monitored closely for contaminants throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering with either vegetation or tarps and then used as landscape grade once the demolition process is completed. No LLW is expected to be generated. The expected 199 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercial licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste were to be generated through this process, it would be packaged, on-site, for transport and taken to the Nevada Test Site for treatment and disposal. 6,374 cubic yards of non–hazardous, solid waste would be generated in the demolition of these structures. This waste would consist mainly of concrete, reinforcement steel, metal scrap and wood. This waste would be transported to the nearby Corral Hollow Sanitary Landfill, for disposal.

LLNL is located within the San Francisco BAAQMD and the SJVUAPCD. This area has been designated a nonattainment area for carbon monoxide, ozone, and particulate matter. LLNL could be required to submit a Risk Analysis Study to the State of California prior to commencing any demolition activities. The pollutant of concern would be particulate matter. Dust suppression measures utilizing the spraying of water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices.

[11] The 58,803 square feet of floorspace at the SNL/CA environmental test complex was not included, as this space could be utilized by other programs.

Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Santa Cruz, Santa Clara, Stanislaus, Tuolumne, and Calveras which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. Closure of the SNL/CA Environmental Test Complex would lead to the loss of 6 jobs. This number in relation to the total employment of LLNL, or the region, is not significant enough to have measurable impacts for LLNL or within the ROI.

5.17.3.3 *Downsize-in-Place Alternative Impacts on SNL/NM*

For SNL, the Downsize-in-Place Alternative would entail the closing and the D&D of 42,717 square feet of floor space by closing the ACRR and Sandia Pulsed Reactor Facility, the Low Dose Rate Gamma Irradiation Facility, the Auxiliary Hot Cell Facility, and the Centrifuge Complex. This is expected to entail 48,880 total worker hours, involve eight large earth movers and twenty large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around SNL. These construction vehicles would remain on site over night. The Peak employment would total 107 construction workers with the average work-force being smaller. This would add another 70 personal vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take twenty months to complete.

It is expected that 5,100 cubic yards of soil would have to be excavated. Small portions of this soil would probably be contaminated with hazardous wastes. A thorough site characterization would be conducted prior to any soil disturbance. Any quantities of contaminated soil would be taken to SNL's Hazardous Waste Management Facility, where it would be packaged for shipment off site to a commercial RCRA permitted facility. Any asbestos material would be handled in accordance with the requirements of TSCA and be shipped off site to a licensed commercial facility for disposal. Non-contaminated soil would be mounded and protected from the environment by vegetation or tarps and used as landscaping grade once the demolition activities would be completed. An estimated 8,700 cubic feet on non-hazardous waste would be generated by the demolition of these structures. This waste would consist of concrete, steel, plastic, wood, and general refuse. This waste would be transported to the nearby Albuquerque Landfill for disposal.

It is expected that 37 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, and a small quantity of contaminated concrete. This LLW would be taken to TECH Area III, where it would be sorted, compacted, and packaged for shipment to NTS. The estimated 8,700 cubic feet of non-hazardous waste, along with any asbestos waste

would likewise be taken to Tech Area III, where it would be sorted and packaged for shipment off site to a commercial RCRA permitted facility or TSCA approved facility. It is estimated that this sorting would generate 42 cubic yards of hazardous waste. It is not expected, but if any quantities of mixed waste were to be generated through this process, they would be packaged at Tech Area III and taken to NTS for treatment and disposal.

Bernalillo County has been designated as a maintenance area under the CAA for CO and PM_{10}. Prior to any demolition activities, SNL would be required to perform a conformity analysis and obtain a pre-construction permit from the State of New Mexico. Required dust suppression activities would be determined through this process.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers. Because no significant off-site health risks are associated with the ETF operations, no environmental justice impacts are expected.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Albuquerque, Valencia, Socorro, Torrance, Cibola and Sandoval, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would a loss of 16 jobs attributable to this action. This number is small in relation to the total employment of SNL, or the region, and is not significant enough to have measurable impacts within SNL or within the ROI.

5.17.4 Consolidate ETF Capabilities at One Site (NTS or SNL) Alternative

There are two options for the Consolidate all ETF Capabilities at One Site Alternative. One would consolidate existing ETF capabilities to the NTS. This option would close all ETF facilities at LANL, LLNL, and SNL and require construction of new facilities at NTS to replace some of the required capabilities lost through facility closings. The two NTS facilities at the DAF and the U1a Complex would remain in operation. Building 334 at LLNL and three of the

facilities at SNL (considered to be capabilities critical to the continuance of the ETF Program) would remain open until the new replacement facilities could be constructed and begin operation.

A second option would consolidate existing large scale ETF capabilities to SNL. This alternative would close all ETF facilities at LANL and LLNL, but would continue operations of the DAF and the U1a Complex at NTS. For this option, the operations conducted in the Engineered Test Bay (Building 334) at LLNL would be transferred to NTS (as discussed above), or transferred to Pantex, as discussed in Section 5.17.4.3. The Engineered Test Bay (Building 334) at LLNL would remain open until its new replacement could begin operation.

5.17.4.1 *Option 1—Consolidate ETF Capabilities at NTS*

This option would entail the closing of all ETF facilities at LLNL, LANL and SNL and the construction of the following five facilities at NTS: (1) an ACRR Facility (to be closed at SNL); (2) an Engineered Test Bay (Building 334-type facility to be closed at LLNL); (3) an Aerial Cable Facility and Control Building (to be closed at SNL); (4) a Building 334 and a Building 834 (to replace closed facility at LLNL Site 300); and (5) an Underground Sled Track Complex (sled tracks to be closed at LLNL and SNL). An alternative to constructing a new Building 334-type facility and Building 834 Complex at NTS would be to move the equipment from these two LLNL facilities to existing facilities at Pantex or to a planned replacement facility at Pantex (see Section 5.17.4.3). As a result of this option, the facilities listed in Table 5.17-3 would close.

Table 5.17-3—ETF Closures–NTS Consolidation Alternative

LANL	LLNL	Sandia National Lab
K Site Environmental Test Facility	Building 834 Complex	Centrifuge Complex
Weapons Component Test Facility	Building 836 Complex	Auxiliary Hot Cell Facility
PIXY	Building 834	Low Dose Rate Gamma Irradiation Facility
Thermo-Conditioning Facility (5 Structures)		ACRR and Sandia Pulsed Reactor Facility
		Simulation Tech Lab (HERMES and RHEPP)
		PBFA Saturn and Sphinx
		Radiation Metrology Lab
		Gamma Irradiation Facility
		Model Validation and System Cert Test Center
		Complex Wave Test Facility
		Light Initiated HE Test Facility
		Sled Track Facility
		Aerial Cable Facility and Control Building
		Radiography Building and Nondestructive Test
		Mobile Guns Complex
		Thermal Test Complex
		Vibration Acoustics and Mass Properties Lab
		Engineered Sciences Experimental Facility
		Component Environmental Test & Advanced Diagnostic Facility
		SNL/CA Environmental Test Complex (4 structures)
		Photometrics/Data Acquisition Complex
		Mechanical Shock Facility

Source: NNSA 2007.

Closure of the above listed facilities would entail a substantial effort. Some of these facilities have conducted experiments involving radioactive materials for a number of years and would require additional D&D beyond normal demolition activities. Some soils surrounding the structures would be disturbed and some of these soils might prove to be contaminated with radioactive materials and/or hazardous wastes. A complete site assessment would be made at and around each of these facilities prior to any demolition activities. Additional soil sampling would be conducted throughout the demolition process.

Demolition and D&D would result in the generation of solid, non-hazardous waste, hazardous wastes, low level radioactive wastes, and potentially some mixed wastes. It is not envisioned that there would be any TRU waste generated as a result of the closure and D&D of facilities associated with this alternative.

In addition to the closing of structures, there would minor job losses associated with this Alternative at SNL/NM, LANL, and LLNL. An assessment of the environmental impacts resulting from the closure and D&D (if needed) was made for each structure which would close as a result of this alternative and is summarized in Table 5.17-4, below:

Table 5.17-4—Environmental Impacts from ETF Consolidation at NTS Alternative

NNSA Site	Facility Closures	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	3	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	3	300	20	7,174	239	95	100,475	6	89,466*
SNL	22	5,300	478	119,193	3,654	1,016	456,340	224	404,352

Source: NNSA 2007.
[a] Assumes D&D of SNL/Environmental Test Complex, and attributes such impacts to LLNL as this is geographic area where the impacts would be incurred.

5.17.4.1.1 Impacts on LANL from the ETF Consolidation at NTS Alternative

The consolidation alternatives would entail the closing and the D&D of all ETF facilities at LANL. Closure of these facilities would remove 43,567 square feet of floor space and is expected to entail 112,518 total worker hours, involve six large earth movers and twelve large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL. These construction vehicles would not be utilized for off-site runs during either the morning or evening rush hours and would remain on site over night. The peak employment would total 110 construction workers with the average work-force being slightly smaller. This would add another 70 vehicles to the normal commuting traffic but is not expected to impact the existing flow of traffic. It is estimated that the total job would take thirty months to complete.
It is expected that 9,849 cubic yards of soil would have to be excavated. None of this soil is expected to be contaminated with hazardous waste or radioactive materials, but a thorough site characterization would be conducted prior to any soil disturbance and soil would be monitored throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering the mounds with either vegetation or tarps. Once the demolition process is completed this soil would be used as landscaping grade material. If some of this soil was determined to be contaminated, it would be treated according to applicable regulatory requirements and then taken to TA-54 for final treatment and disposal. It is expected

that 12,743 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, glove-boxes and contaminated concrete. This LLW would be sorted, compacted, and packaged on-site and transported directly to Area G, located in TA-54.

Only 5 cubic yards of hazardous waste is expected to be generated. This waste would be shipped off site to a commercial RCRA licensed facility for treatment and disposal. Any asbestos wastes would be handled according to the requirements of TSCA, and shipped off site to a certified facility. It is not expected, but if any quantities of mixed waste were to be generated through this process, it would be packaged, on-site, for transport and taken to Area G of TA-54, for treatment and disposal. An estimated 503,000 cubic yards of non-hazardous waste would be generated by the demolition of these facilities. This waste would consist primarily of concrete, steel reinforcement, and metal scrap. This waste would be transported to the nearby Los Alamos County Landfill for disposal.

LANL is located within the New Mexico Intrastate AQCR 157. None of the area within LANL and its surrounding counties are designated as nonattainment areas with respect to any of the NAAQS (40 CFR 81.332). The only pollutant of concern is particulate matter, the emissions of which could exceed the 24-hour limits established by the New Mexico Environmental Improvement Board. Dust suppression measures utilizing water and other construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Los Alamos, Santa Fe, Rio Arriba, Taos, Mora and San Miguel which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would be a loss of 29 jobs attributable to this action at LANL. This amounts to less than 1 percent of the total employment of SNL.

5.17.4.1.2 Impacts on LLNL from the ETF Consolidation at NTS Alternative

For LLNL, the consolidation alternative would entail the closing and the D&D of all of the ETF facilities, with a loss of 89,466 square feet of floor space and would be expected to entail 100,475 total worker hours, involve eight large earth movers and 24 large dump-trucks. SNL/CA ETFs would undergo D&D but would not be demolished, as they are newer, multi-purpose facilities which may be useful for other purposes. Peak employment would total 95 construction workers with the average daily work-force being smaller. It is estimated that the total job would take thirty-six months. Construction vehicles would be entering and leaving LLNL during the day, at non-rush hours. The construction vehicles would not operate on the highways during rush hour times. The workforce would add an estimated additional 78 personal vehicles, but work arrival times and departure times could be staggered to minimize impacts on the existing traffic patterns.

It is expected that only 300 cubic yards of soil would need to be excavated. This soil is not expected to be contaminated, but a thorough site characterization of the buildings and surrounding soils will be done prior to any demolition and continued on a regular basis throughout the demolition process. Uncontaminated soil would be mounded and protected from the environment and erosion by covering with either vegetation or tarps and then used as landscape grade once the demolition process is completed. It is expected that 20 cubic yards of LLW would be generated. This waste would be packaged on site and shipped to NTS for treatment and disposal. The expected 239 cubic yards of hazardous waste and any asbestos waste would be shipped off site to a commercial licensed facility in accordance with the requirements of RCRA and TSCA. It is not expected, but if any quantities of mixed waste were to be generated through this process, they would be packaged, on-site, for transport and taken to the Nevada Test Site for treatment and disposal. 7,174 cubic yards of non–hazardous waste would be generated in the demolition of these structures. This waste would consist mainly of concrete, reinforcement steel, scrap metal and wood. This waste would be transported to the nearby Corral Hollow Sanitary Landfill for disposal.

LLNL is located within the San Francisco Bay Area Air Quality Management District and the San Joaquin Valley Unified Air Pollution Control District. This area has been designated a nonattainment area for carbon monoxide, ozone, and particulate matter. LLNL could be required to submit a Risk Analysis Study to the State of California prior to commencing any demolition activities. The pollutant of concern would be particulate matter. Dust suppression measures utilizing the spraying of water and other standard construction practices would be utilized to minimize this temporary emission.

Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Santa Cruz, Santa Clara, Stanislaus, Tuolumne, and Calveras, which constitute the ROI, are more than sufficient to support such an action without impinging upon other ongoing activities in the area. Closure of the SNL/CA Environmental Test Complex would lead to the loss of 6 jobs. This number in relation to the total employment of LLNL, or the ROI, is not significant enough to have measurable impacts.

5.17.4.1.3 Impacts on SNL from the ETF Consolidation at NTS Alternative

For SNL, the consolidation alternative would entail the closing and the D&D of all of the ETF facilities with the exception of about 14,000 square feet of the ACRR and Sandia Pulsed Reactor Facility. This would amount to 404,352 square feet of floor space that would close and undergo D&D at SNL/NM This effort would be expected to entail 456,340 total worker hours, involve sixteen large earth movers and forty large dump-trucks. These trucks would not be anticipated to add to the traffic congestion on or around LANL as they would not operate during peak traffic hours. These construction vehicles would remain on site over night. The peak employment would total more than 1000 construction workers with the average work-force being smaller. This would add another 560 personal vehicles to the normal commuting traffic and has the potential to affect the existing flow of traffic. Arrangements would have to be made to stagger shifts and consider alternative or night time working shifts. It is estimated that the total job would take forty months to complete.

It is expected that 5,300 cubic yards of soil would have to be excavated. Small portions of this soil would probably be contaminated with hazardous wastes. A thorough site characterization would be conducted prior to any soil disturbance and continued throughout the demolition process. Any quantities of contaminated soil would be taken to SNL's Hazardous Waste Management Facility, where it would be packaged for shipment off site to a commercial RCRA permitted facility. Non-contaminated soil would be mounded and protected from the environment by vegetation or tarps and used as landscaping grade once the demolition activities would be completed. An estimated 119,193 cubic feet on non-hazardous waste would be generated by the demolition of these structures. This waste would consist of concrete, steel, plastic, wood, and general refuse. This waste would be transported to the Albuquerque Landfill for disposal.

It is expected that 478 cubic yards of low level waste would be generated. This waste would consist mainly of equipment, and a small quantity of contaminated concrete. This LLW would be taken to TECH Area III, where it would be sorted, compacted, and packaged for shipment to NTS. The estimated 3,654 cubic feet of hazardous waste, along with any asbestos waste would likewise be taken to Tech Area III, where it would be sorted and packaged for shipment off site to a commercial RCRA permitted facility or TSCA approved facility. It is not expected, but if any quantities of mixed waste are generated through this process, they would be packaged at Tech Area III and taken to NTS for treatment and disposal.

SNL is located within the Albuquerque-Mid Rio Grande New Mexico Intrastate AQR 152. Portions of the ARQU are designated nonattainment for carbon monoxide and total suspended particulate matter. Prior to any demolition activities, SNL would be required to obtain a permit from the State of New Mexico. Required dust suppression activities would be determined through this process. Not all environmental testing involves the detonation of explosives. Some environmental testing, however, does, and during the conduct of such tests, the primary noise would be generated by air blast waves and ground vibration impacts associated with high explosives tests, although these explosions and the resulting noise would be occasional (rather than continuous) events. The noise would be sporadic and would be mitigated by the distance of the tests to the nearest public receptors. The effects of these operational activities would be primarily limited to involved workers.

All OSHA requirements would be followed and monitored closely and all workers would be required to be trained in the OSHA noise requirements as well as other OSHA safety practices. Similarly, workers, the public, and sensitive wildlife receptors are unlikely to be adversely impacted by increased environmental testing detonations of explosives. Such testing currently occurs at this site. Workers are allowed to experience impulsive/impact noise events up to a maximum of 140 dBC and are kept away from harmful noise levels and air blasts by gated exclusion zones that control entry into explosives firing site detonation points. The public is not allowed within the fenced area where such testing is conducted. In fact, neither are workers, during the actual detonations. At areas where the public is allowed, noise levels are sufficiently reduced so as not to create any adverse impacts.

The job markets and construction resources in the surrounding counties of Albuquerque, Valencia, Socorro, Torrance, Cibola and Sandoval, which constitute the ROI are more than sufficient to support such an action without impinging upon other ongoing activities in the area. There would a loss of 224 jobs attributable to this action. This number, in relation to the total employment of SNL of more than 6,000, is less than 4 percent. For the ROI, this is not a significant number.

5.17.4.1.4 Impacts on NTS from the ETF Consolidation at NTS Alternative

The Consolidate ETF Capabilities at NTS Alternative would require the construction of five new facilities at NTS: (1) an ACRR-like facility (replacing SNM testing capability lost at SNL); (2) an Engineering Test Bay (ETB) (replacing LLNL's Bldg 334, a required capability); (3) an Aerial Cable Test Facility (replacing capability lost at SNL); (4) a Building 834 Complex (to replace the closed facility at LLNL Site 300); and (5) a sled track (replacing a required capability

lost at LANL and SNL), which could be constructed above or below ground. The ACRR-like facility, the Building 334-like facility, and the Building 834 Complex could either be located in conjunction with the existing U1a Complex (underground) or within the PIDAS and in or adjacent to the DAF facility. The Aerial Drop facility would be sited at the Area 12 T Tunnel Complex Surface Area.

Annular Core Research Reactor (ACRR). The ACRR is a critical element in the neutron vulnerability and hardness testing and certification of stockpile weapon systems electronic components (e.g., transistors, integrated circuits), subsystems (e.g., fire sets, neutron generators), and systems (e.g., AF&F system). The ACRR is also a critical element in the hostile environment testing of weapon system physics packages (both primary and secondary) at the full-up system level, as well as material sample tests. In addition, ACRR performs neutron radiographic nondestructive examinations of weapons systems components (e.g., neutron generators).

This facility has required capabilities for the Complex which are not found elsewhere and must be maintained. The ETF Consolidation at NTS Alternative would require the construction and operation of such a facility at NTS. There are two proposed sites for this new facility. One would be a stand alone new building within the existing PIDAS of the DAF. The second alternative would be to construct the new ACRR underground at the U1a Complex. Tables 5.17-5 and 5.17-6 show the expected requirements for the construction and operation of a new ACRR at each of these two locations.

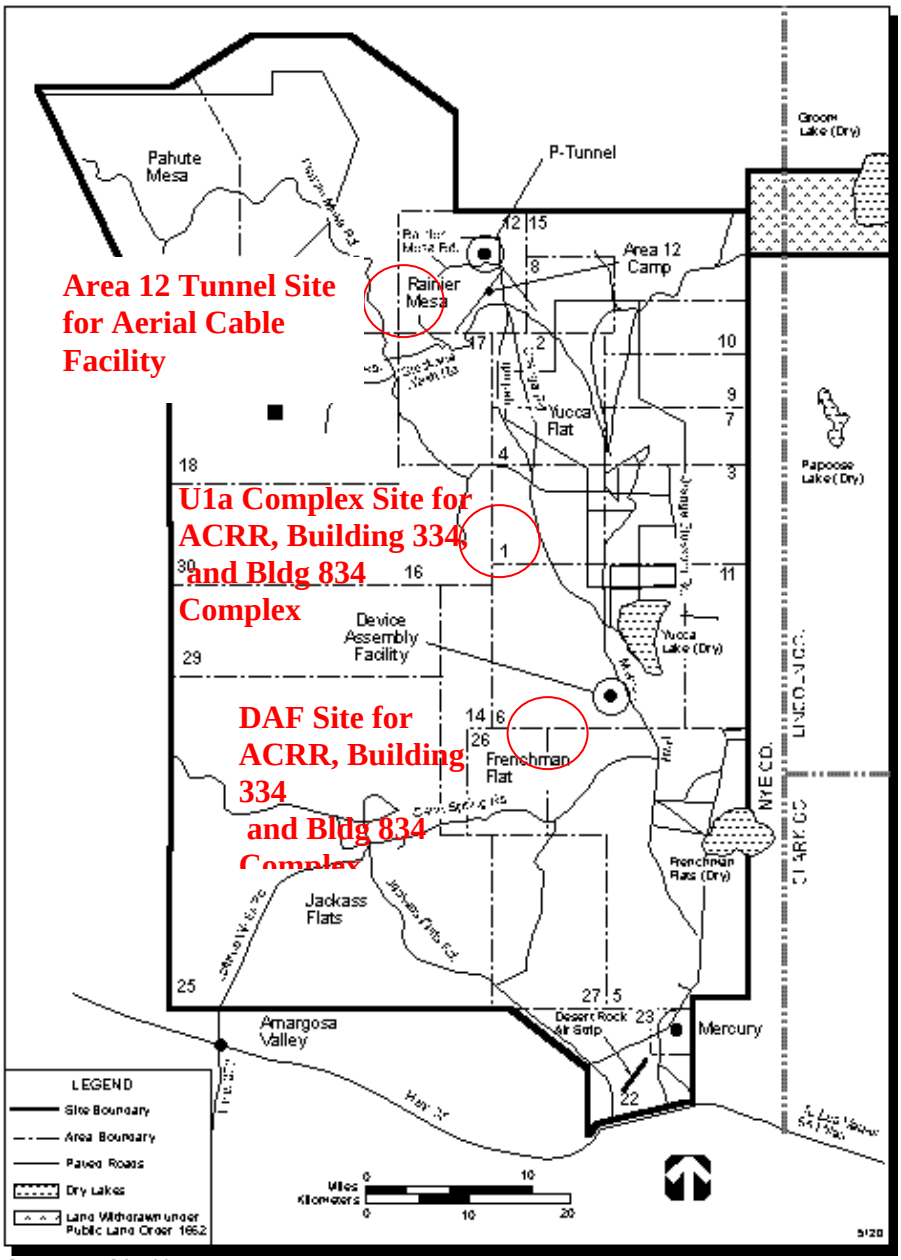
Table 5.17-5—Annular Core Research Reactor (ACRR) Sited within the DAF PIDAS

Construction	Consumption/Use
Water Needed for Construction (gal):	1,000,000 gallons
Total Square Footage of New Construction	2800 square feet
Total Land Area Disturbed by Facility Footprint (acres)	3.25 acres
Laydown Area Size (acres)	0.25 acres
Parking Lot (acres) Existing DAF Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	40 worker years
Peak construction employment (workers)	60 workers
Construction period (years)	3 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Mainly waste concrete with a smaller quantity of packaging materials (cardboard, pallets, etc.)	20 cubic yards
Operation	**Consumption/Use**
Electrical usage (MWh /yr)	489,787
Water use Gal/year)	13,793 existing ACRR Facility
Employment	
Total	42
Radiation workers	12
Waste Generation	
TRU (yd^3)	.2
Low Level (yd^3)	10

Table 5.17-5—Annular Core Research Reactor (ACRR) Sited within the DAF PIDAS (continued)

Operation	Consumption/Use
Hazardous (yd^3)	.4
Non-hazardous(gallons)	30,000
Emissions	
NAAQS (tons/year)	NOX .9, CO 1.6., PM 0.1, SOX .03, VOC 0.1
Radionuclide emissions	Argon-41

Source: NNSA 2007.



Source: NNSA 2007.

Figure 5.17-1—Location of New Facilities for Consolidation at NTS

Table 5.17-6—Annular Core Research Reactor (ACRR) Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	400,000 gallons
Land	
Total Square Footage of New Construction	8600 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	.25 acres
Parking Lot (acres) Existing U1a Complex Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	70 worker years
Peak construction employment (workers)	20 workers
Construction period (years)	4 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3)	8000 cubic yards
Construction	**Consumption/Use**
Electrical usage (MWh /yr)	489,787
Water use Gal/year)	13,793 existing ACRR Facility
Employment	
Total	42
Radiation workers	12
Waste Generation	
TRU (yd^3)	.2
Low Level (yd^3)	10
Hazardous (yd^3)	.4
Non-hazardous(gallons)	30,000
Emissions	
NAAQS (tons/year)	NOX .9, CO 1.6., PM 0.1, SOX .03, VOC 0.1
Radionuclide emissions (Ci/yr	Argon-41

Source: NNSA 2007.

If the ACCR operations at SNL were transferred to NTS, the accident risks associated with those operations at SNL would be eliminated. Previously, accidents analyzed for the ACRR have included a target rupture, a fuel handling accident, the rupture of a waterlogged fuel element, and an airplane crash and fire in the reactor room with unirradiated fuel and targets present (DOE 2006a). For the bounding accident (an airplane crash and fire with a 6.3×10^{-6} probability of occurring), the increased probability of an LCF for the maximally exposed individual (MEI) would be 1.0×10^{-10} (statistically, this means that there would be much less than a 1 percent chance that an LCF would result if this accident were to occur). This accident would result in 1.6×10^{-6} additional LCFs to the 50-mile population. For the noninvolved worker, this same accident would result in an increased probability of an LCF of 4.9×10^{-8}. Transfer of the ACRR mission to NTS would be expected to result in similarly low risks to the MEI, surrounding population, and non-involved workers. Due to the remoteness of the NTS, the large distance to the MEI (more than 13 miles), and the much smaller surrounding population, risks would be expected to be even lower than those presented above for SNL.

Building 334. Bulding 334 is in the Superblock at the LLNL main site and is often referred to as the Hardened Engineering Test Building (HETB). The building is primarily used for environmental testing of SNM. One half of the building is the Radiation Measurement Facility, including the Intrinsic Radiation (INRAD) Bay and the other half is the ETF, consisting of the Engineering Test Bay (ETB). The two bays are separated from each other by a thick concrete wall. With regard to environmental testing, Building 334 is currently the only building within the Complex that can facilitate environmental testing of special nuclear material (SNM) (i.e., pits and secondary assemblies containing SNM). Environmental testing includes vibration, shock, thermal conditioning, or combinations of these environments. This would necessitate the construction and operation of a Building 334-type facility at NTS. Note that only the Engineering Test Bay part of Building 334 is being proposed. Accordingly the Building 334-like facility proposed to be constructed at NTS will be referred to as Engineered Test Bay (slightly smaller than the existing Building 334 at LLNL).

As with the ACRR, the capabilities of Building 334 must be maintained and therefore a Building 334-type facility would have to be constructed at NTS. This facility could be constructed at one of two potential sites; the DAF and the U1a Complex. If constructed at the DAF, the facility would be located in two test bays, within the existing DAF structure, thereby not disturbing any new land, benefiting from existing infrastructures, and minimizing environmental impacts. The facility could also be sited underground at the U1a Complex. Tables 5.17-7 and 5.17-8 show the construction and operation impacts for such a facility at the two potential locations.

Table 5.17-7—Building 334-Like Facility Sited at NTS DAF

Construction	Consumption/Use
Water Needed for Construction (gal)	100,000 gallons
Land	None disturbed
Total Square Footage of New Construction: Facility would be located in an existing high bay at the DAF (High Bay is approximately 1800 square feet).	0 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is a retrofit of an existing facility, no additional surface land area is disturbed by this modification to the existing facility	0 acres
Laydown Area Size (acres)	2 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	20 worker years
Peak construction employment (workers)	15 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and reinforced concrete removed to allow for mounting of shock and vibration equipment to reactive masses in floor providing base isolation.	200 cubic yards
Operation	**Consumption/Use**
Electrical usage	480 MWh/yr
Water use	2,000 gal / yr
Employment	
Total	2

Table 5.17-7—Building 334-Like Facility Sited at NTS DAF (continued)

Operation	Consumption/Use
Radiation workers	2
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Table 5.17-8—Building 334-Like Facility Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	500,000 gallons
Land	
Total Square Footage of New Construction	9600 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	2 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	87.5 worker years
Peak construction employment (workers)	20 workers
Construction period (years)	4.5 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and Rock Mined to Create Space for this facility and removed to the surface.	8000 cubic yards
Operation	**Consumption/Use**
Electrical usage	480 MWh/yr
Water use	2,000 gal / yr
Employment	
Total	2
Radiation workers	2
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Aerial Cable Facility. Located in the Coyote Test Field at SNL, the aerial cable test facility performs gravity drop and accelerated pull-down tests in support of bomb qualification tests and weapons development activities. Gravity drop tests are performed from a cable suspended between two peaks, giving up to a 600-foot vertical distance for acceleration. A rocket-assisted (320-foot sled track) pull-down technique is used to provide higher impact velocities when gravity tests are not adequate. For the Consolidation of ETF Capabilities at NTS, this facility would have to be constructed at NTS, to replace an existing, required capability which would lost with the closing of all facilities at SNL. In addition, the proposed replacement site in Nevada

would allow for running the rocket sled into an existing (and currently unused) tunnel thereby greatly mitigating fire risks associated with use of the rocket sled in Aerial Cable Test activities. Table 5.17-9 shows the requirements and the impacts associated with the construction and operation of an Aerial Cable Test Facility at the 12T Tunnel complex at NTS.

Table 5.17-9—Aerial Cable Test Facility Sited at Area 12 T Tunnel Complex Surface Area

Construction	Consumption/Use
Water Needed for Construction (gal): The majority of this water consumption is for dust mitigation at the job site.	1,100,000 gallons
Land	None disturbed
Total Square Footage of New Construction	40,000 square feet
Total Land Area Disturbed by Facility Footprint (acres)	15 acres
Laydown Area Size (acres)	1 acre
Parking Lots (acres) Existing parking area is sufficient.	0 acres
Employment	
Total construction employment (worker years)	130 worker years
Peak construction employment (workers)	50 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3) waste concrete, excavated dirt, and small quantities of packaging materials	250 cubic yards
Operation	**Consumption/Use**
Electrical usage	100 MWh/year
Water use	62,720 Gal / year
Employment	
Total	6
Radiation workers	0
Emissions (tons / year)	NOX 3.55, CO 0.06, PM 10.87, VOC 1.67
Waste generation	
TRU	0
LLW	0
Hazardous	2 (yd^3)
Non-hazardous (sanitary)	0

Source: NNSA 2007.

Building 834 Complex

The Building 834 Complex, presently located at LLNL, Site 300, is comprised of four buildings totaling 4,289 square feet located of an 11.5 acre site in the Site 300 area of LLNL. The facilities located at this complex are used for thermal and humidity testing of weapons components and systems. The original layout had a total of 12 buildings, but through downsizing efforts now only 4 are used for thermal testing (1 control room, 2 test cells, and 1 temporary storage magazine). The strength of the test facilities at the Building 834 Complex is the ability to test large weapon assemblies with large quantities of HE. In addition to testing of HE, the Building 834 Complex has the authorization basis to test other hazardous materials commonly found in Legacy weapon assemblies. Relocation to NTS would only require 1 control room and 1 test cell, thereby requiring only 2,100 square feet of floor space. Table 5.17-10 shows the requirements and environmental impacts associated with the construction and operation of a Building 834 at the

existing DAF, at NTS, and Table 5.17-11 shows the requirements and environmental impacts associated with the construction of a Building 834 Complex at the existing U1a Complex, at NTS.

Table 5.17-10—Building 834 Complex Sited at NTS DAF

Construction	Consumption/Use
Water Needed for Construction (gal)	1,000 gallons
Land	None disturbed
Total Square Footage of New Construction: Facility would be located in an existing high bay and adjacent hall space at the DAF (High Bay is approximately 1800 square feet with 300 sq. ft. of adjacent hall space).	2,100 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is a retrofit of an existing facility, no additional surface land area is disturbed by this modification to the existing facility	0 acres
Laydown Area Size (acres)	1 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	4 worker years
Peak construction employment (workers)	5 workers
Construction period (years)	1 years
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and reinforced concrete removed to allow for mounting of shock and vibration equipment to reactive masses in floor providing base isolation.	50 cubic yards
Operation	**Consumption/Use**
Electrical usage	80 MWh/yr
Water use	1,000 gal / yr
Employment	
Total	2
Radiation workers	1
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Table 5.17-11—Building 834 Complex Sited at NTS U1a Complex

Construction	Consumption/Use
Water Needed for Construction (gal)	2,000 gallons
Land	
Total Square Footage of New Construction	2,100 square feet
Total Land Area Disturbed by Facility Footprint (acres) Since this is an underground mine, no surface land area is disturbed by this addition to the existing facility (Existing Surface Infrastructure and Facilities are adequate to support this addition)	0 acres
Laydown Area Size (acres)	1 acres
Parking Lot (acres) Existing Facility Parking Lot is Adequate	0 acres
Employment	
Total construction employment (worker years)	4 worker years
Peak construction employment (workers)	5 workers

Table 5.17-11—Building 834 Complex Sited at NTS U1a Complex (continued)

Construction	Consumption/Use
Construction period (years)	1 year
Estimates of Wastes Generated	
Hazardous (yd3)	0 cubic yards
Nonhazardous (yd3): Dirt and Rock Mined to Create Space for this facility and removed to the surface.	100 cubic yards
Operation	**Consumption/Use**
Electrical usage	80 MWh/yr
Water use	1,000 gal / yr
Employment	
Total	2
Radiation workers	1
Emissions	None
Waste generation	0
TRU	0
LLW	0
Hazardous	0
Non-hazardous (sanitary)	0.006 (yd^3/yr)

Source: NNSA 2007.

Underground sled track complex. Located in TA III, at SNL, the Sled Track Facility supports weapons system qualification testing and weapons development efforts that must simulate penetration, flight, high-acceleration, and high-shock environments. This environment may be provided through impact, reverse ballistic, or ejection testing. Sled Track capabilities will remain a key requirement for the ETF Program. Under the Consolidation of ETF Capabilities at NTS Alternative, maintenance of this capability would require the construction and operation of a new Sled Track Complex. Construction of a sled track in one of the tunnel complexes at the NTS would have the added benefit of minimizing safety issues. Table 5.17-12 shows the requirements and environmental impacts associated with the construction and operation of an underground Sled Track Complex in one of the existing tunnel complexes at NTS.

Table 5.17-12—Underground Sled Track Complex–NTS

Construction	Consumption/Use
Water Needed for Construction (gal)	350,000 gal
Land	
Total Square Footage of New Construction (not including parking areas (see below)	65,400 square feet
Total Land Area Disturbed by Facility Footprint (acres)	5 acres
Laydown Area Size (acres)	1.5 - 2.5
Parking Lots (acres)	0 - 1 acres
Employment	
Total construction employment (worker years)	100 worker years
Peak construction employment (workers)	50 workers
Construction period (years)	2 years
Estimates of Wastes Generated	
Hazardous (yd^3)	0
Nonhazardous (yd^3) waste concrete, excavated dirt, and small quantities of packaging materials	500 cubic yards
Operation	**Consumption/Use**
Electrical	2,000,000 KW-hr

Table 5.17-12—Underground Sled Track Complex–NTS (continued)

Operation	Consumption/Use
Water usage (gal)	200,000 gallons
Plant Footprint (square ft.)	110,000 square feet
Employment	
Total	20
Radiation Workers	2
Average Annual Dose	
Waste Generation	
TRU (yd3)	
Low Level (yd3)	
Hazardous (yd3)	0
Non-Hazardous (yd3)	<20 yd^3
Emissions	
NAAQS Emissions (tons/yr)	NOX 2.92, CO 1.48, PM 17.24, SOX 0.014, VOC 2.33
Radionuclide emissions (Ci/yr)	0
Hazardous air pollutants (tons/yr)	8.75

Source: NNSA 2007.

Construction of these five major facilities with a combined floor space of 119,900 square feet at NTS would be undertaken concurrently so the impacts must be viewed on an additive basis. Since two of these facilities could be constructed either above or below ground with differing construction requirements/impacts, the larger of the two requirements/impacts was used.

The combined construction water requirement would be for 2,952,000 gallons. NTS receives its water from a water system divided into four service areas with 11 groundwater wells for potable water, 2 wells for nonpotable water, approximately 30 usable storage tanks, 13 usable construction water sumps, and 6 water transmission systems. The annual maximum production capacity of site potable water is estimated to be approximately 1.36 billion gallons per year. With a current annual water usage of a maximum of 400 million gallons, there is more than sufficient water resources to support these construction projects, and furnish the 290,000 gallons/yr needed to operate them (NNSA 2008b).

The combined person-years for completion of the project would be 391.5 with a total peak employment of 195. One project would last for one year, two projects would last two years and two projects would last 4 and 4.5 years. The Las Vegas area is a rich resource for construction labor and qualified construction firms. There are ample resources in the immediate area to allow for these projects. Noise should only be an issue for workers at the four construction sites. Here the requirements of OSHA, including the training of workers, would be strictly adhered to. Dust suppression would be minimized during construction to the least amount possible.

In the past several years, NTS has been provided power under contracts with the Nevada Power Company and Western Area Power Administration. Electrical capacity at NTS is approximately 176,800 MWh per year and peak load capacity, approximately 45 MWe. In 2000, NTS electrical usage was approximately 101,000 MWh per year and peak load usage was 27 MWe (NNSA 2008b). There is more than sufficient capacity to furnish the 575,000 MWh of electricity to operate these facilities.

None of these facilities would generate measurable levels of wastes, all of which can be managed on site. NTS has an extensive waste management system, and can manage treatment and disposal of all wastes on site, except for the disposal of TRU waste. The proposed ACRR Facility is expected to generate 0.2 cubic yards of TRU waste on annual basis. This waste would be taken to the Transuranic Pad Cover Building at Area 5 of NTS. Here the waste would be stored until it could be characterized, visually examined, and packaged at the Waste Examination Facility, also in Area 5. Once this is done the waste would be packaged for shipment and disposal at WIPP, in accordance with the WIPP Waste Acceptance Criteria requirements.

The proposed sites for all four facilities are located in developed areas. Accordingly, it is not likely that archaeological, prehistoric cultural, historic, or Native American resources would be disturbed. The Consolidated Group of Tribes and Organizations has identified several sites at NTS that are important to Native American people, including storied rocks, rock shelters, wooden lodges, rock rings, springs and certain other archeological sites. None of the proposed construction sites infringe upon these areas.

The desert tortoise inhabits the southern one-third of NTS. Although these proposed sites are not in that portion of NTS, NTS would take every effort possible to assure that activities would not jeopardize the continued existence of the Mojave population of the species and that no critical habitat would be destroyed or adversely modified. There are no wetlands or aquatic resources in the vicinity of the proposed construction sites.

Geologically, NTS is a tectonically active area. This has been factored into the design process for the proposed facilities. The most recent volcanic activity in the immediate area was 3.7 million years ago and the likelihood for renewed activity in the next 10,000 years is slight. Additional information on the affected environment of NTS can be found in Chapter four of this SPEIS, in Section 4.3.

The noise from this construction would be limited to the remote areas of NTS where it would take place and as such only be an issue with associated workers. These workers would be trained in OSHA requirements and be required to work in accordance with those requirements. The noise associated with the construction would not interfere with sensitive habitats or indigenous wildlife species.

5.17.4.2 *Option 2: Consolidate ETF Capabilities at SNL*

This option would entail the closing of all ETF facilities at LLNL, LANL and constructing a new Building 334-like facility at SNL. This alternative would maintain the operation of the two NTS ETF facilities (at DAF and the U1a Complex) and allow for construction of an underground rocket sled track facility at NTS. The same facilities that would close at SNL for the Consolidation-In-Place Alternatives (see Table 5.17-1 in Section 5.17.3, above) would also close for this alternative. Table 5.17-13 lists the facilities that would close for this alternative.

Table 5.17-13—Facilities to Close for ETF Consolidation at SNL Alternative

LANL	LLNL	Sandia National Lab
K Site Environmental Test Facility	Engineered Building 834 Complex	Sandia Pulsed Reactor Facility (part of the ACRR and Sandia Pulsed Reactor)
Weapons Component Test Facility	Dynamic Testing Facility (836 Complex)	Low Dose Rate Gamma Irradiation Facility
PIXY with Sled Track	Building 334	Auxiliary Hot Cell Facility
Thermo-Conditioning Facility (5 Structures)		Centrifuge Complex
		SNL/CA Environmental Test Complex (4 structures)

Source: NNSA 2007.

The scheduled closure of SNL facilities in Table 5.17-1 would be contingent upon completion and time phasing of existing programmatic work at the sites, as previously discussed in Section 3.12.2.

Closure of the above listed LANL and LLNL facilities are the same as for the Consolidate ETF Capabilities at NTS Alternative which has already been described in Sections 5.17.4.1.1 and 5.17.4.1.2. For SNL, the facilities that would close are the same as for the Consolidation-In-Place Alternative already described in Section 5.17.3.3. A summary of the impacts incurred as a result of the closures required by the Consolidation of ETF Capabilities at SNL Alternative are shown in Table 5.17-14.

Table 5.17-14—Closure Impacts Resulting from ETF Consolidation at SNL Alternative

Facility	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak employment	Total Worker Hours	Jobs lost	Floor Space (ft^2)
LANL	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	300	20	7,174	239	95	100,475	6	89,466*
SNL	5,100	37	8,700	42	107	48,880	16	26,235

[a] Assumes D&D of SNL/Environmental Test Complex, and attributes such impacts to LLNL as this is geographic area where the impacts would be incurred.

5.17.4.2.1 Impacts on LANL from the ETF Consolidation at SNL Alternative

The ETF Consolidation at SNL Alternative impacts on LANL are the same as those discussed in Section 5.17.4.1.1, and as summarized in Table 5.17-12.

5.17.4.2.2 Impacts on LLNL from the ETF Consolidation at SNL Alternative

The ETF Consolidation at SNL Alternative impacts on LLNL are the same as those discussed in Section 5.17.4.1.2, and as summarized in Table 5.17-12.

5.17.4.2.3 Impacts on SNL from the ETF Consolidation at SNL Alternative

Under the ETF Consolidation at SNL Alternative, the SNL facilities identified in Table 5.17-11 would close. These facility impacts would be the same as discussed in Section 5.17.4.1.3 and as summarized in Table 5.17-12. Closing all ETF Facilities at both LLNL and LANL, and consolidating ETF capabilities at SNL, would require the construction of a new Building 334 and Building 834 Complex-type facilities at SNL, unless this mission were to be transferred to NTS (as previously discussed in Section 5.17.4.1.4) or to Pantex (see Section 5.17.4.3 below). Impacts associated with the construction of these two facilities at SNL would be similar to the impacts associated with constructing the same such facilities at the DAF, at NTS. The impacts associated with such construction may be found in Tables 5.17-7 and 5.17-10.

5.17.4.3 *ETF Pantex Option*

Should the Alternative to Consolidate ETF Capabilities at One Site (NTS or SNL) be selected, all ETF activities at LLNL would cease. Activities being conducted at Building 334 at LLNL, in Superblock, and at the Building 834 Complex, at LLNL Site 300, are critical to the Complex and would have to be relocated. An alternative to constructing a new Building 334-like facility and a Building 834 Complex facility at NTS would be to move the equipment and activities presently being conducted at Building 334 and Building 834 Complex to existing buildings at Pantex. The existing buildings at Pantex have bays used for similar testing activities, but not with SNM. The Pantex facilities (or the Weapons Surveillance Facility, presently being pursued as a replacement for these existing buildings) could accommodate these ETF activities with minimal refitting and no new construction. This Section assesses the environmental impacts of the option for moving the LLNL Building 334 and Building 834 Complex activities and equipment to Pantex.

Pantex conducts ETF-like work on a regular basis as a function of production certification and quality assurance. The existing facility at Pantex is a two story 3,000 square foot block and cement structure, with a concrete slab floor. Because this facility is used on an intermittent basis, it could easily share space with another program. Moving the activities and equipment from LLNL to Pantex would only require minor modifications.

The nature of the work presently being conducted in Building 334 and Building 834 Complex, at LLNL, is to test classified test objects made from SNM and to test actual weapons and weapons components, and as such needs to be located in a secure PIDAS (Perimeter Intrusion Detection and Assessment System) area similar to what is found at the LLNL Superblock, and at LLNL Site 300. Any other location for this work would need to be a Category II Nuclear Facility and have the facility infrastructure to support this hazard level of work.

Existing free workspace at Pantex would be sufficient to accommodate these additional activities, and has sufficient security, power, and water requirements. The only modifications to the Pantex facility would be the digging of a pit and the addition of a roof extension to allow for the installation of the measurement tower. This would require breaking-up the existing concrete floor, excavating a pit (12 feet by 12 feet by 14 feet deep), the addition of a roof extension (8 feet), and the pouring of concrete to line the pit. All modifications to the existing building

would be done without an increase in the building footprint. The following is a list of the equipment at Building 334 which would be relocated to Pantex:

1. ***Measurement tower.*** Expanded aluminum metal tower with a minimum footprint of 25' by 25' with a minimum load limit of 6,000 pounds with a 2,500 pound point load. This tower needs to be a minimum of 15 feet above the concrete floor. This height is required to again minimize the signal received by the detectors related to the building composition.
2. ***Sealed source storage pit.*** A sub floor pit for the storage of Class 1-4 sealed sources used in measurement activities. This would also require source cells be designed using lead shielding to aid in attenuation of any signal from the sources while in their storage locations.
3. ***5-ton bridge crane.*** Due to the size and weight of many of the test assemblies, as well as the necessary fixturing, an overhead bridge crane is needed to lift and position the objects within the test facility.

The existing crane, spin test equipment, and aerial measurement tower equipment would be shipped, via commercial transport, from LLNL to Pantex. This is estimated to require 3 standard container sized truckloads.

Fugitive dust emissions and noise resulting from modifications at Pantex would be minimized due to the enclosed environment. The 22 yards of concrete and dirt to be removed to allow for the measurement tower could easily be managed on-site, at one of Pantex's existing landfills. Noise emanating from this site would be limited to the involved site workers. Involved site workers would be required to wear the appropriate personal protective equipment, including hearing protection. The construction modifications would require four workers, a backhoe, and one dump truck. The building modifications are estimated to entail a total of about 2600 worker hours and last a period of about four months. The modification to the building would involve excavation, the pouring of steel reinforced concrete, the laying of block and brick, the repairing of the roof and the adding of a new roof structure, the transport of equipment from LLNL, the installation of LLNL equipment, and the wiring for the new equipment.

Transfer of this activity to Pantex would result in the addition of two new jobs, once modifications were completed and the new equipment installed. The four construction jobs and the two full time operational jobs are insignificant compared to the total employment in the ROI and at Pantex. Once operational, these activities would not be expected to create additional waste other than normal office refuse, occasional use of solvents and cleaning fluids, and would not use additional water other than the sanitary and personal usage for the two new employees. The increased electrical demand would be minimal and the new activities would not add to the current emissions.

An accident involving an aircraft impact into a Building 334-type facility (which would be similar to an assembly cell) at either Pantex or NTS would have the greatest potential to cause environmental impacts. Such an accident has previously been postulated and analyzed for an assembly cell (DOE 1996c). Although considered to be credible but an extremely unlikely event with an estimated probability in the range of $1x10^{-7}$ to 5×10^{-6} per year, this accident scenario is

presented because it could cause sufficient damage to release SNM. The MEI and offsite impacts from the previous analysis are considered to be bounding because the material at risk for the ETF mission would be significantly less. For the noninvolved worker, the analysis estimates that a worker at 100 meters (328 ft) would not survive the aircraft crash effects. The accident consequences to the MEI are estimated to be a dose 23 rem; this corresponds to an LCF risk of 0.01 (a risk of an LCF approximately once every 72 years). The 50-mile population dose at Pantex would be approximately $2.8x10^3$ person-rem; this would correspond to 1.7 LCFs. At NTS, these consequences would be significantly lower due to the greater distance to the MEI and the lower 50-mile population.

5.18 PROJECT-SPECIFIC ANALYSIS OF SANDIA NATIONAL LABORATORIES, CALIFORNIA (SNL/CA) WEAPONS SUPPORT FUNCTIONS

The SNL/CA Weapons Support mission has evolved over the past several decades into a robust weapons design and R&D activity. Conducting operations out of seven major facilities consisting of 29 buildings, this activity is a required and integral part of the Nuclear Weapons Complex. Additional information about the activities conducted by this formation is presented in Section 3.13.

There are two alternatives for the SNL/CA Weapons Support Functions: (1) the No Action Alternative to continue activities at SNL/CA; (2) an alternative to consolidate these functions with similar activities presently being conducted at SNL/NM.

5.18.1 No Action Alternative

Under the No Action Alternative, NNSA would continue to conduct the existing weapons non-nuclear component design and engineering work at the SNL/CA facilities. There would be no construction impacts associated with this alternative. However, some facilities investments would be required through the year 2030 in order to meet mission requirements, including renovation of space to meet future mission needs and building maintenance. These investments would primarily be associated with general building maintenance, wear and tear, and equipment replacements. Under the No Action Alternative, there would be no change in the workforce currently at SNL/CA. Therefore, there would be no impacts to the ROI employment, income, or labor force. Additionally, under the No Action Alternative, NNSA could also consider administrative actions at Sandia/CA that would: (1) change landlord responsibilities at the site; (2) share infrastructure with LLNL; and (3) share staff with LLNL or transfer staff to LLNL. None of these administrative actions would give rise to any significant potential environmental impacts.

5.18.2 Consolidate SNL/CA Weapons Support Functions to SNL/NM

This alternative would entail moving the weapons non-nuclear component design and engineering work at the SNL/CA facilities to SNL/NM, and transferring the positions and equipment associated with these functions to SNL/NM. Because the affected facilities are generally in good repair or are relatively new, they could be utilized by other ongoing programs, although a review of building conditions that includes the identification of any remediation and/or restoration issues would be required.

Moving some of the SNL/CA weapons support functions would impact a maximum of 500 jobs at SNL/CA. This number is not significant in relation to the total employment of LLNL of about 8,000, or the civilian labor force of 1,777,645 for the ROI. In addition, these changes could be more than offset by work separate from the weapons program. Acceptance of these activities at SNL/NM would be accommodated in existing facilities. The addition of 500 jobs is not significant enough to have measurable impacts either on the ROI, or SNL/NM. There would be no change in effluents, emissions, or wastes associated with the transfer of this mission.

5.19 TRITIUM PRODUCTION IN TENNESSEE VALLEY AUTHORITY REACTORS

DOE is responsible for providing the nation with nuclear weapons and ensuring that these weapons remain safe and reliable. Tritium, a radioactive isotope of hydrogen, is an essential component of every weapon in the U.S. nuclear weapons stockpile. Unlike other materials utilized in nuclear weapons, tritium decays relatively quickly, at a rate of 5.5 percent per year. Accordingly, the tritium in each nuclear weapon must be replenished periodically. The *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (Tritium PEIS), issued in October 1995, evaluated the alternatives for siting, construction, and operation of tritium supply and recycling facilities at five DOE sites for four different production technologies, including using a commercial light water reactor (CLWR) without specifying a reactor location (DOE 1995). In the ROD for the Tritium PEIS (60 FR 63878), issued December 12, 1995, DOE decided to pursue a dual-track approach on the two most promising tritium supply alternatives: (1) Initiate purchase of an existing CLWR (operating or partially complete) or reactor irradiation services; and (2) design, build, and test critical components of an accelerator system for tritium production.

The *Environmental Impact Statement for the Production of Tritium in a Commercial Light Water Reactor* (CLWR EIS) evaluated the environmental impacts associated with producing tritium at one or more of five CLWRs (DOE 1999). The CLWR EIS analyzed the potential environmental impacts associated with fabricating tritium-producing burnable absorber rods (TPBARs); transporting non-irradiated TPBARs from the fabrication facility to the reactor sites; irradiating TPBARs in the reactors; and transporting irradiated TPBARs from the reactors to the Tritium Extraction Facility at SRS in South Carolina. In a ROD dated May 6, 1999, DOE announced that the CLWR would be DOE's primary option for tritium production and designated the Tennessee Valley Authority's (TVA) Watts Bar and Sequoyah 1 and 2 Nuclear Plants as the Preferred Alternative for CLWR tritium production (64 FR 26369).

To produce tritium in a CLWR, TPBARs are inserted into the reactor core. The TPBARs are long, thin tubes that contain lithium-6, a material that produces tritium when it is exposed to neutrons in the reactor core. The exterior dimensions of the TPBARs are similar to the burnable absorber rods, so that they can be installed in fuel assemblies where burnable absorber rods are normally placed. Burnable absorber rods absorb excess neutrons and help control the power in a reactor to ensure an even distribution of heat and extend the reactor's fuel cycle. In addition to producing tritium, TPBARs provide the same role as burnable absorber rods in the operation of the reactor.

The neutron absorber material in the TPBARs is enriched in the isotope lithium-6, instead of the boron usually used in the burnable absorber rods. When the TPBARs are inserted into the reactor core, neutrons are absorbed by the lithium-6 isotope, thereby initiating a nuclear process that turns it into lithium-7. The new isotope then splits to form helium 4 and tritium. The tritium is captured in a solid metal nickel-plated zirconium material in the TPBAR called a "getter." The tritium is chemically bound in the TPBAR "getter" until the TPBAR is removed from the reactor during refueling and transported to the Tritium Extraction Facility at the Savannah River Site in South Carolina. There the tritium is extracted by heating the TPBARs in a vacuum to temperatures in excess of 1,000 degrees Centigrade (C) (1,800 degrees Fahrenheit [F]). Following extraction, the tritium is purified.

The replacement of burnable absorber rods with TPBARs has few impacts on the normal operation of the reactor. The normal power distribution within the core and reactor coolant flow and its distribution within the core remain within existing technical specification limits. Some tritium permeates through the TPBARs during normal operation, which increases the quantity of tritium in the reactor's coolant water system. Since tritium is an isotope, of the hydrogen atom, once the tritium is in the reactor's coolant water system, it could combine with oxygen to become part of a water molecule and could eventually be released to the environment.

During the Fall 2003 refueling cycle, the first 240 TPBARs were inserted in the Watts Bar core. Since that time, the reactor has completed two cycles with each having 240 TPBARs. The latest cycle has 368 TPBARs. The present tritium production cycle calls for an increase to 1,200 TPBARs by April 2011 and to continue at that level until March 2020 in the Watts Bar Reactor. There is no tritium production scheduled for the Sequoyah 1 & 2 reactors until April 2015. At this time the number of TPBARs scheduled to be inserted in a Sequoyah reactor would begin with 480 and increase to 1,000 through March 2021 (Hasty 2008). At these levels, the impacts of actual tritium production at the CLWRs would be expected to be approximately one-half those projected in the CLWR EIS.

In a tritium production mode, the Watts Bar and Sequoyah Nuclear Plants would continue to comply with all Federal, state, and local requirements. Tritium production has little or no effect on land use, visual resources, water use, air quality, archaeological and historic resources, biotic resources (including threatened and endangered species), and socioeconomics. It may have some incremental impacts in the following areas: radiation exposure (worker and public), water quality, spent fuel generation, and low-level radioactive waste generation. Tritium production affects the calculated accident and transportation risks associated with these reactors. Each of these areas is discussed below.

Radiation Exposure Tritium production could increase average annual worker radiation exposure by approximately 0.82 to 1.1 millirem per year. The resultant dose would be well within regulatory limits. Radiation exposure to the public from normal operations could also increase, but would still remain well within regulatory limits at each of the reactor sites. At either Watts Bar 1, Sequoyah 1, or Sequoyah 2, the total dose to the population within 50 miles could increase by a maximum of 1.9 person-rem per year. Statistically, this equates to one additional fatal cancer approximately every 1,000 years from the operation of Watts Bar 1, Sequoyah 1, or Sequoyah 2.

Water Quality The CLWR EIS indicated that tritium released in liquid effluent without the presence of TPBARS and tritium production would be about 639 Curies per year. It predicted that with tritium production the amount of tritium released each year would be about 0.9 Curies per year per TPBAR or 1,539 Curies with 1,000 TPBARS and 3,699 Curies with 3,400 TPBARS. During 2002, the year preceding installation of TPBARS in the Watts Bar 1 Reactor, the actual release of tritium in liquid effluent was 490 curies. Actual operating experience with 240 TPBARS in 2004 resulted in liquid effluent release of 726 Curies of tritium (NRC 2008). Based on this limited operating experience, the rate of tritium released in liquid effluent is actually slightly higher than predicted in the CLWR EIS at 0.98 Curies per year per TPBAR. Even with this somewhat higher rate of release, tritium levels in the Tennessee River

would be well below the 20,000 picocuries per liter level standard in the *Safe Drinking Water Act*.

Spent Fuel Generation Given irradiation of 3,400 TPBARs (the maximum number of TPBARs without changing the reactor's fuel cycle), additional spent fuel would be generated at Watts Bar 1, Sequoyah 1, or Sequoyah 2. In the average 18-month fuel cycle, spent fuel generation could increase from approximately 80 spent fuel assemblies up to a maximum of 140, a 71 percent increase. If fewer than approximately 2,000 TPBARs were irradiated, there would be no change in the amount of spent fuel produced by the reactors.

Low-Level Waste Generation Tritium production at Watts Bar 1, Sequoyah 1, or Sequoyah 2 may generate approximately 0.43 additional cubic meters per year of LLW. This represents a 0.1 (Sequoyah 1 or Sequoyah 2) to 1.0 (Watts Bar 1) percent increase in LLW generation over non-tritium production reactor operations.

Accident Risks Compared to normal operations, tritium production could change the potential risks associated with accidents at the nuclear plants. If a limiting design-basis accident occurred, tritium production at the 3,400 TPBAR level increases the risk of a fatal cancer for an individual living within 50 miles of the nuclear plants by from 1.4×10^{-9} to 2.1×10^{-9} at Watts Bar 1 and Sequoyah 1 or 2, respectively. Statistically, this equates to a risk to the individual of one fatal cancer from tritium production approximately every 710 million to 490 million years, respectively. For a beyond design-basis accident (an accident that has a probability of occurring approximately once in a million years or less), tritium production would result in small changes in the consequences of an accident. This is due to the fact that the potential consequences of such an accident would be dominated by radionuclides other than tritium.

Transportation Tritium production necessitates additional transportation to and from the reactor plants. Most of the additional transportation involves nonradiological materials. Impacts are limited to vehicle emissions and traffic fatalities. At each of the reactors, the nonradiological transportation risks are less than one fatality per year. Radiological materials transportation impacts include routine and accidental doses of radioactivity. The risks associated with radiological materials transportation are less than one fatality per 100,000 years.

The environmental impacts of CLWR tritium production at the Watts Bar and Sequoyah reactors are minor. However, if NNSA were to terminate the production of tritium at the Watts Bar and Sequoyah reactors some minor beneficial environmental impacts would ensue. The very small increases in radiological dose would not occur to either workers or the public. Statistically, there would be one less cancer fatality in 1,000 years in the population within 50 miles of the reactors. Water quality in the Tennessee River would improve marginally with a small decrease in tritium concentration. A very small amount of LLW associated with tritium production at the reactors would not be generated each year. The consequences of transportation associated with tritium production (i.e., potential for less than one traffic fatality per year and one LCF per 100,000 years) would not occur. Because NNSA has no plans to install over 1,200 TPBARs in any one fuel cycle at any of the reactors, there would be no change in spent fuel generation with or without tritium production.

5.20 IMPACTS OF THE PREFERRED ALTERNATIVES

NNSA's Preferred Alternative for Complex Transformation is described in Chapter 3, Section 3.17. The impacts of the separate pieces of the Preferred Alternative are addressed in detail in Sections 5.1, 5.5, 5.9, 5.12, 5.13, 5.14, 5.15, 5.16, and 5.17 of this SPEIS. This section summarizes the environmental impacts of the various areas incorporated in the Preferred Alternative. In order to reduce the bulk of the SPEIS relevant tables from the above noted sections were not reproduced in this section.

5.20.1 Restructuring SNM Facilities

NNSA would retain the three major SNM functional capabilities (plutonium, uranium, and weapon assembly/disassembly) involving Category I/II quantities of SNM at three separate sites. The preferred alternative would upgrade plutonium facilities at LANL for R&D, storage, processing, and manufacture of plutonium parts (pits) for the nuclear weapons stockpile. Production rates of up to 20 pits per year would be enabled by construction and operation of the Chemistry and Metallurgy Research Replacement – Nuclear Facility. Until completion of a new Nuclear Posture Review in 2009 or later, the net production at Los Alamos would be limited to a maximum of 20 pits per year. Other national security actinide needs and missions would be supported at TA-55 on a priority basis (e.g., emergency response, material disposition, nuclear energy). Highly-enriched uranium storage and uranium operations would continue at Y-12, including pursuit of a new Uranium Processing Facility (UPF) in order to provide a highly-enriched uranium production capability. The weapons Assembly/ Disassembly/High Explosives (A/D/HE) mission would remain at Pantex. Finally, SNM Category I/II operations at LLNL Superblock would be phased out and storage of Category I/II SNM at Pantex would be consolidated into Zone 12.

5.20.1.1 *Plutonium Manufacturing and R&D at LANL*

For plutonium manufacturing and R&D at LANL, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or consolidated within PF-4. Additionally, this alternative includes the CMRR-NF facility.[12]

The potential impacts of implementing the preferred alternative are addressed below. It should be noted that limiting production to a maximum of 20 pits per year, would be expected to result in the following changes, relative to the impacts of the 50/80 Alternative:

- Radiological air emissions would be reduced such that the 50-mile population dose would be reduced from 0.20 person-rem per year to 0.19 person-rem per year.
- Worker dose would decrease from 220 person-rem per year to 90 person-rem per year (LANL 2008). Statistically, a dose of 90 person-rem would result in a LCF risk of 0.05, which would equate to 1 LCF for every 20 years of operation.

[12] The CMRR, which is approximately 400,000 square feet, consists of both a nuclear and non-nuclear facility. The nuclear facility is approximately one-half of the CMRR.

- LLW and TRU wastes would decrease. LLW from plutonium operations would be reduced to 68 cubic yards per year, and TRU wastes would be reduced to 42 cubic yards per year.

Impacts to land use, visual resources, site infrastructure, noise, water, geology and soils, biological and cultural resources, socioeconomics and environmental justice would not be substantially affected by imposition of a 20-pit-per-year production limitation.

Land Use

Construction activities would result in an addition of approximately 2.5 acres to the permanent TA-55 footprint, with 6.5 acres of total area disturbed during construction. The area required for operation of the preferred alternative would represent approximately 2.7 percent of the total land area at TA-55, and approximately 5.4 percent of the undeveloped land at TA-55. Although there would be a change in land use (to nuclear materials production), the preferred alternative is compatible with existing LANL land use plans.

Visual Resources

Activities related to the construction and operation of the preferred alternative would result in a change to the visual appearance at TA-55. but would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

Site Infrastructure

The projected demand on electrical resources associated with construction activities of the facilities necessary to support the preferred alternative are 4,380 MWh with a peak load of 1.0 MWe. This represents less than 1 percent of site electrical capacity. The estimated annual electrical requirements for operation of the preferred alternative are 44,000 MWh with a peak load of 10 MWe. This represents 3.8 and 7.7 percent, respectively of site electrical capacity and 7.5 and 23 percent of available site capacity. The existing electrical infrastructure would be adequate to support construction and annual operations under the preferred alternative.

Air Quality and Noise

Construction associated with the preferred alternative at LANL, would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. The temporary increases in pollutant emissions due to construction activities would be too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the LANL site boundary (DOE 2003d).

Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The maximum concentrations of criteria pollutants at the LANL site boundary were modeled and are presented in Table 5.1.4-4. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For most pollutants, incremental

concentration increases would generally be small (less than 5 percent). The greatest increase would occur for total suspended particulates (TSP), which could increase by approximately 28 percent. Because of the relatively high baseline concentration of TSP, ambient concentrations could exceed the 24-hour standard. However, because estimated emissions are maximum potential emissions, and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Radioactive air emissions from pit manufacturing activities would involve plutonium, americium, and enriched uranium. NNSA estimated routine radionuclide air emissions (see Table 5.1.4-5). As shown in Table 5.1.4-6, the expected annual radiation dose to the offsite maximally exposed individual (MEI) would be 3.0×10^{-9} mrem per year, which is much smaller than the limit of 10 millirem (mrem) per year set by both EPA (40 CFR Part 61 Subpart H) and DOE Order 5400.5 for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would be 2.5×10^{-8} person-rem per year.

Although noise levels in construction areas could be as high as 110 A-weighted decibels (dBA), these high local noise levels would not extend far beyond the boundaries of the construction site. There would be little potential for disturbing wildlife outside a 400-foot radius of the construction site. Given the distance to the site boundary (more than 1 mile) there would be no change in noise impacts on the public except for a small increase in traffic noise levels from construction employees and material shipments. Operational noise impacts would be similarly minor.

Construction and Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Water Resources

Environmental impacts associated with the programmatic alternatives at Los Alamos could affect groundwater resources. No impacts to surface water are expected. In 2005, LANL used approximately 359 million gallons of groundwater. Discharges were in compliance with permits.

There would be no impact to surface water availability from construction or operations. Liquid wastes generated during construction would be from sanitary wastewater and concrete construction activities. Water runoff from construction would be handled according to the LANL discharge permit for stormwater involving construction activities. Appropriate soil erosion and sediment control measures would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. No impacts to surface water from potential construction-related spills would be expected. The location at TA-55 is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated.

No impacts on surface water resources are expected as a result of preferred alternative operations at LANL. Sanitary wastewater would be treated, monitored, and discharged into sewage lagoons and ponds according to permit requirements. The preferred alternative would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers in contaminated areas, the operation of decontamination stations, mopping floors in contaminated areas, and testing fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be converted to a solid and disposed in accordance with DOE procedures.

It is estimated that construction activities would require a total of approximately 550,000 gallons of groundwater mainly to support construction under the preferred alternative. This would increase LANL's annual water use by less than 1 percent.

Operations under the preferred alternative would use 43 million gallons of groundwater primarily to meet the potable and sanitary needs of facility support personnel and for cooling tower water makeup. Site water requirements for the operation of the preferred alternative would increase LANL's annual use by approximately 12 percent. A summary of water usage is provided in Table 5.1.5–2.

Geology and Soils

The dominant contributor to seismic risk at LANL is the Pajarito Fault System. Five small earthquakes (magnitudes of 2 or less on the Richter scale) have been recorded in the Pajarito Fault since 1991. These small events, which produced effects felt at the surface, are thought to be associated with ongoing tectonic activity within the Pajarito Fault zone (LANL 2006a).

A comprehensive update to the LANL seismic hazards analysis was completed in 2007. The geological and geotechnical aspects of the study, along with a summary of the seismic setting, are incorporated in the description in Section 4.1.6.3. The new study indicates that the seismic hazard is higher than previously understood. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and non-nuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes. All new facilities and building expansions at LANL would be designed to withstand the maximum expected earthquake-generated ground acceleration. Thus, site geologic conditions would not likely affect the facilities.

The land area to be disturbed by implementation of the preferred alternative is relatively small; the impact on geologic and soil resources would be minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's ER program and in accordance with LANL's Hazardous Waste Facility Permit.

Biological Resources

Construction would take place within the TA-55 built environment. Approximately 6.5 acres of low value vegetation and habitat would be affected during construction but only about 2.5 acres would be permanently affected. Wildlife and vegetation present are characteristic of species adapted to built environments with open settings, i.e., non-forested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and consists primarily of small mammals, lizards, and birds. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, plutonium operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

There would be no direct impacts to wetlands or aquatic resources from construction or operation of the preferred alternative as there are no wetlands or perennial or seasonal aquatic habitats within the area proposed for the construction of the facility or any of the associated construction staging and laydown areas. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution to the TA-55 watershed.

No Federal- and state-threatened and endangered species, or other species of special interest that may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*Strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging or hunting. It is expected that both construction and operation of a preferred alternative at LANL would have minimal affect on the core and buffer area for the Mexican spotted owl as the facility would be located in an existing highly developed environment. Prior to any habitat modifying activities, NNSA would conduct site specific surveys at the appropriate time and assess, in coordination with the U.S. Fish and Wildlife Service (USFWS), the potential impacts to special interest species. If threatened or endangered species were found, NNSA would consult with the USFWS, as appropriate, to discuss the potential impacts of the preferred alternative on any threatened and endangered species.

Cultural Resources

Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during preferred alternative construction anywhere on the LANL site, including TA-55.

Prior to any ground-disturbing activity, NNSA would identify and evaluate cultural resources that could potentially be impacted by the construction of the preferred alternative. In consultation with the New Mexico Site Historic Preservation Office (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995) NNSA would

determine the possibility for impacts to cultural resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. If previously unknown cultural resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by NNSA in consultation with the New Mexico SHPO.

Only one paleontological resource has been reported within LANL, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction activities associated with the preferred alternative.

Operation

Operation of the preferred alternative would have no impact on paleontological resources.

Socioeconomic Resources

During peak construction, 190 workers would be employed at the site. In addition to the direct jobs created by construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 201 indirect jobs would be created, for a total of 391 jobs. The total annual impact to ROI income would be approximately $11 million ($5.9 million direct and $5.2 million indirect). Table 5.1.9-4 presents the impacts to socioeconomic resources from construction.

Operation under the preferred alternative would require 680 workers. In addition it is estimated that approximately 721 indirect jobs would be created, for a total of approximately 1,401 jobs. Direct income in the ROI would increase by $32.1 million annually. This would also generate about $43.2 million in indirect income in supporting industries. The total impact to the ROI income would be approximately $75.3 million.

The influx of new construction and operations workers would not likely increase the demand for housing beyond the ability of the current housing market to absorb.

The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

Environmental Justice

Section 4.1.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation related to the preferred alternative at LANL are expected. To the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, cultural and archaeological resources. As shown in Section 5.1.11, Human Health and Safety, there would be no large adverse impacts to any populations.

NNSA also analyzed the potential risk due to radiological exposure through subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. This special pathways receptors analysis is important to the environmental justice analysis because those consumption patterns reflect the traditional or cultural practices of minority populations in the area (LANL 2006a).

Health and Safety

No radiological risks would be incurred by members of the public from construction activities associated with the preferred alternative. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site where construction would occur in the immediate vicinity of PF-4. Workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

The potential risk of occupational injuries and fatalities to workers constructing the preferred alternative would be expected to be bounded by injury and fatality rates for general industrial construction. Based on a peak workforce of 190 workers, the annual Total Recordable Cases would be 18, lost workdays would be 9, and total fatalities would be less than 0.1.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the preferred alternative. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards. Implementation of worker protection programs would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities.

The release of radioactive materials and the potential level of radiation doses to workers and the public from operation of NNSA facilities are regulated by DOE Order 5400.5. This Order sets annual dose standards to members of the public from routine operations of 100 mrem through all exposure pathways. The Order also requires that no member of the public receives an effective dose equivalent (EDE) in a year greater than 10 mrem from airborne emissions of radionuclides and 4 mrem from drinking water. In addition, EPA dose requirements in *National Emission Standards for Radionuclides Other than Radon from Department of Energy Facilities* (40 CFR Part 61, Subpart H) limit exposure to the offsite MEI from all air emissions to 10 mrem per year.

As shown in Table 5.1.11-2, the expected annual radiation dose to the offsite MEI from implementation of the preferred alternative would be 3×10^{-9}, which is ten orders of magnitude smaller than the limit of 10 mrem per year. The risk of a LCF to this individual from operations would be less than or equal to 1.8×10^{-12} per year, or about 1 chance in 1.8 trillion. With a collective dose of 2.5×10^{-8}, the projected number of fatal cancers to the population within 50 miles would be less than or equal to 1.5×10^{-11} per year, or about 1 chance in 15 billion.

The estimates of annual radiological doses to workers are provided in Table 5.1.11-3. As shown in the table, the annual doses to individual workers for all levels of production, including the preferred alternative would be well below the DOE limit of 5,000 mrem (10 CFR Part 835) and the DOE-recommended control level of 1,000 mrem (10 CFR Part 835). Operations under the preferred alternative would result in an average individual worker dose of approximately 380 mrem annually. The total dose to workers associated with operations would be approximately 154 person-rem. Statistically, a total dose of 154 person-rem would result in 0.09 annual LCFs to the workforce.

During normal (accident-free) operations, total facility staffing for the preferred alternative would be approximately 680. Based on this number of workers, the estimated annual injury and fatality rates for the preferred alternative are 29 total recordable cases, 15 lost workdays, and 0.02 fatalities.

No chemical-related health impacts are associated with normal (accident-free) operations of the preferred alternative. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the preferred alternative at LANL. General information regarding accidents may be found in Section 5.12 of this SPEIS. Additional details supporting the information presented here are provided in Appendix C.

The most severe accident analyzed for the preferred alternative is an explosion in a feed casting furnace. The frequency of such an event is 1.0×10^{-2} with consequences of 0.0878 LCF to the MEI and 19.4 LCF in the offsite population living within 50 miles (80 kilometers) of the accident. For this accident, the LCF risk to the MEI would be approximately 9×10^{-4}, or approximately 1 in 1,000. For the population, the LCF risk would be 0.19, meaning that an LCF would statistically occur once every 5 years in the population.

NNSA estimated the impacts of the potential release of the most hazardous chemicals under the preferred alternative. None of the chemicals released in an accident would exceed ERPG-2 limits offsite (see definition of ERPG values in the shaded box in section 5.1.12.2.2).

Transportation

Construction and operation of the preferred alternative would result in increased traffic due to commuting workers and deliveries of materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small (less than one percent based on employment increases) compared to the average daily traffic levels reported in

Section 4.1.12. NNSA analyzed the potential impacts of transporting radiological materials for plutonium manufacturing and R&D at LANL. Based on a bounding 200-pit-per-year production level, both nonradiological and radiological impacts of transportation would be very low. Radiological transportation impacts are presented in Section 5.10 for all the action alternatives.

Waste Management

Construction associated with the preferred alternative at LANL, would generate about 4 cubic yards of hazardous waste, 9,750 cubic yards of non-hazardous solid waste, and 7,800 cubic yards of liquid non-hazardous waste. These wastes, when added to ongoing LANL waste generation, would not exceed the capacity of existing waste management systems and facilities.

The preferred alternative would generate about 575 cubic yards of TRU waste and 2.6 cubic yards of TRU mixed waste per year. These wastes would be packaged in accordance with the WIPP Waste Acceptance Criteria (WAC), placed in TRUPACT-II shipping containers, and shipped to WIPP. This would be done within the Solid Waste Management Facility in TA-54. The liquid portions would be solidified.

Operation of the preferred alternative would generate an estimated 1,850 cubic yards of LLW per year. This waste would be processed at the Solid Waste Management Facility in TA-54 and disposed of on-site at TA-54 Area G.

About 265 tons of hazardous waste would be generated each year by operation of the preferred alternative. This amount is small in comparison to the total amount of hazardous waste generated by LANL routine operations and would be handled similarly to existing hazardous waste at LANL.

The preferred alternative is expected to generate 700 cubic yards of non-hazardous waste. This waste would be processed through the existing LANL waste management system and facilities and would not exceed existing capacities.

The preferred alternative is expected to generate approximately 16,000 cubic yards of non-hazardous liquid waste. This waste would be processed through the existing LANL waste management system and facilities and would not exceed existing capacities.

5.20.1.2 *Uranium Manufacturing and R&D at Y-12*

Under the Preferred Alternative, Y-12 would continue as the uranium center providing component and canned subassembly production, surveillance and dismantlement. In addition to completing construction of the Highly Enriched Uranium Materials Facility (HEUMF) and consolidating highly enriched uranium (HEU) storage in that facility, NNSA would pursue a UPF at Y-12.

Land Use

Construction of a UPF would require approximately 35 acres of land, which includes land for a construction laydown area and temporary parking. An estimated 8 acres of land for buildings, walkways, building access, parking, and buffer space would be required to operate the UPF. The land required for UPF operations would represent approximately one percent of Y-12's total land area of approximately 800 acres. The UPF would allow the PIDAS protected area at Y-12 to be reduced from approximately 150 acres to 15 acres. Although there would be a change in land use, a UPF would be compatible and consistent with land use plans and the current industrial land use designation. No impacts to Y-12 land use plans or policies are expected.

Visual Resources

Currently, there is no BLM classification for Y-12; however, the level of development at Y-12 is consistent with VRM Class IV, which is used to describe a highly developed area. Most of the land surrounding the Y-12 site would be consistent with VRM Class II and III (i.e., left to its natural state with little to moderate changes). Existing visual resources are discussed in Section 4.9.2.

Activities related to the construction of the UPF would result in a change to the visual appearance of the proposed location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These short-term visual impacts would not be out of character for an industrial site such as Y-12. With the UPF Y-12 would remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

Site Infrastructure

Construction of the UPF is expected to require 11,000 MWh per year of electricity with a peak load of 2.5 MWe; both representing less than one percent of present site capacity. Operation of the UPF is estimated to require 120,000 MWh per year with a peak load of 18.4 MWe, representing 2.1 percent and 4.7 percent, respectively of present site capacity. The existing electrical infrastructure at Y-12 would be adequate to support annual construction and operational requirements for the UPF.

Air Quality and Noise

Y-12 is completely within Anderson County. Tennessee. The EPA has designated Anderson County as a basic nonattainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties; and for $PM_{2.5}$ based on a revision to the standards (EPA 2005a). For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the NAAQS.

No radiological air emissions are expected in association with construction activities of a UPF. Construction of the UPF would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Fugitive dust generated during the clearing, grading, and other earth moving operations would also cause short-term impacts to air

quality, predominantly to particulate matter in the air. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the Y-12 site boundary, with the exception of $PM_{2.5}$ and PM_{10} concentrations (which could be mitigated using dust suppression), and the 8-hour ozone concentration (see Table 5.9.4-2). The 8-hour ozone concentration exceedance is not a result of Y-12-specific activities. The estimated maximum annual pollutant emissions resulting from construction in Table 5.9.4-1 and the nonradiological emissions presented in Table 5.9.4–2 would adequately bound non-radiological construction air impacts of the UPF.

UPF operations would not be expected to increase air emissions at Y-12 because it would replace existing EU operations. No significant new quantities of criteria or toxic pollutants would be generated from the new facility itself. Any releases of nitrogen and argon, which are used to maintain inert atmospheres for glovebox operations, would be less than current releases from existing EU operations. No new hazardous air emissions would result from the facility operation.

Operation of the UPF would result in some radiological airborne emissions. The current design calls for appropriately sized filtered HVAC systems. Under normal operations, radiological airborne emissions would be no greater than radiological airborne emissions from the existing EU facilities, and are likely to be less due to the incorporation of newer technology into the facility design. For purposes of this SPEIS analysis, the radiological airborne emissions and resulting impacts from the UPF would remain unchanged from the No Action Alternative, which are estimated to be 0.10 Curies of uranium, based on releases into the atmosphere in 2004 (DOE 2005a).

As shown in Table 5.9.4-6, the expected annual radiation dose to the offsite MEI from operation of the UPF would be 0.4 mrem per year, which is much smaller than the limit of 10 mrem per year set by both EPA (40 CFR 61 Subpart H) and DOE Order 5400.5 for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within a 50-mile radius would be 5.8 person-rem per year. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.9.11.

Construction of the UPF would result in a temporary increase in noise levels near the area. Although noise levels in construction areas could be as high as 110 dBA, these noise levels would not extend far beyond the boundaries of the construction site. Given the distance to the site boundary (approximately 1.3 miles) there would be no major change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels.

Given the distance to the site boundary (approximately 1.3 miles) noise emissions from operation of the UPF would not likely disturb the public. Noise from traffic associated with the operation of the UPF would likely increase traffic noise levels along roads used to access the site.

Construction and operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, NNSA has implemented appropriate hearing protection programs to minimize noise impacts on workers.

These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Water Resources

Y-12 uses approximately 2 billion gallons per year of water while the ORR uses approximately twice that amount. The ORR water supply system, which includes the city of Oak Ridge treatment facility and the East Tennessee Technology Park treatment facility, has a capacity to supply 11,715 million gallons of water per year (DOE 2005b).

At Y-12, surface water resources would likely be used to meet almost all construction and operations water requirements. As shown in Table 5.9.5-1 potential annual water requirements for construction of the UPF would be 4,000,000 gallons, which would not substantially affect the average annual water use for Y-12. The proposed UPF site is not located within either the 100-year or 500-year floodplains.

Operation of the UPF at Y-12 would require about 105,000,000 gallons of water, as shown in Table 5.9.5-2. This represents approximately 5.2 percent of current water usage. Operation of the UPF would not increase water demands at the site because EU operations would be phased out in existing facilities once the UPF becomes operational. No adverse impacts to surface water resources or surface water quality are expected because all discharges would be maintained to comply with NPDES permit limits.

Minimal amounts of groundwater could be used during construction for such uses as dust control and soil compaction, and washing and flushing activities. There would be no onsite discharge of wastewater to the subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of pollutants being released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.
Operation of the UPF could use minimal amounts of groundwater. No sanitary or industrial effluent would be directly discharged to the subsurface. Therefore, no operational impacts on groundwater quality would be expected. Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Use of these types of chemicals is standard and no adverse impacts would be expected.

Geology and Soils

Construction of the UPF would have no impact on geological resources, and the hazards posed by geological conditions are expected to be minor. Slopes and underlying foundation materials are generally stable at Y-12. Landslides or other non-tectonic events are unlikely to affect the UPF site. Sinkholes are present in carbonate units such as the Knox Dolomite, but it is unlikely that they would impact the project, as these karst-forming carbonate units are not present in areas of Y-12 under consideration for the UPF.

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

Biological Resources

The UPF would be constructed on approximately 8 acres of land within the fenced, developed portion of Y-12. About 35 acres of land would be disturbed during construction. There would be some short-term disturbance to typical urban terrestrial species due to construction, construction vehicle traffic, and associated utility and parking relocation. Because the proposed location of the UPF is largely developed and paved, terrestrial biotic impacts resulting from construction and operation would be few.

Additionally, the BMAP would ascertain any impacts from the UPF on local biota. Mitigation measures could be used to minimize the impacts to biota that might result from operation of the UPF.

There are wetlands along the East Fork Poplar Creek located to the southeast of the proposed UPF site but stormwater management measures would help protect them from any impacts. The BMAP would monitor effects in both wetlands and waterways from the construction and operation of UPF and other Y-12 activities. Mitigation measures could be used to minimize adverse impacts to wetlands and aquatic resources that might occur during construction or operation of the UPF.

Because any acreage modified from construction would be in previous developed areas and is accessible via existing roads, impacts to threatened and endangered species would not be expected. On January 19, 2007, the NNSA conducted consultations with the USFWS to discuss the potential impacts of the UPF on the Indiana bat (*Myotis sodalist*) and gray bat *(Myotis grisescens)*. As a result of that consultation, NNSA agreed to prepare a biological assessment (BA) to specifically address the potential impacts to the habitats of these bats. That BA will be prepared in 2009.

Monitoring as part of the Biological Monitoring and Abatement Program would ensure that threatened and endangered species, other special status species, and wetlands and aquatic resources are not adversely impacted by UPF operations.

Cultural Resources

Construction and operation of the UPF would take place in a previously developed or disturbed area of Y-12, outside of a proposed historic district that would be comprised of historic properties associated with the Manhattan Project, development of Y-12 as a nuclear weapon component plant, and early nuclear activities. Construction and operation of the UPF is not expected to affect any historic properties.

Socioeconiomics

Y-12 has a total site employment of about 6,500 contract and federal employees. Labor force statistics for the ROI are summarized in Table 4.9.9-1. Existing socioeconomic characteristics for the ROI are described in Section 4.9.9.

The construction of the UPF would require 900 workers during the peak year of construction and would create about 3,780 indirect jobs in the ROI. The total new jobs would represent an increase of less than 2 percent in ROI employment. Income increases would be equal to less than 1 percent of the ROI income. Direct income would increase by $23.5 million. Indirect income would be about $113.4 million per year. Overall, these changes would be temporary, lasting only the duration of the 6-year construction period, and would be similar in magnitude to the impacts experienced at Y-12 with construction of the HEUMF.

The operational workforce for the UPF is expected to be smaller than the existing EU workforce due to efficiencies associated with the new facility. NNSA estimates that the total number of EU workers should decrease by approximately 35 percent, to 600, which is a reduction of 350 workers. The consolidation of the Protected Area from 150 acres to 15 acres is also expected to reduce the security forces at Y-12 by 200 workers. Coupled together with efficiency gains in remaining plant operations, the total workforce reduction would be approximately 20-30 percent of the total Y-12 workforce. These reductions are expected to be met through normal attrition and retirements.

For construction 1,350 new residents would be expected in the ROI, including direct and indirect workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

The total workforce reduction associated with operation of the UPF should be 550 workers (including security personnel). The UPF should have a minimal impact on the ROI population or housing sector.

There would be no impact to ROI community services because increases in the ROI population during construction would be less than 1 percent. Once operational, there would be no impact to ROI community services because any jobs lost from more efficient operations in the UPF would likely be met through retirements and normal attrition.

Environmental Justice

Section 4.9.10 presents the existing environmental justice characteristics of the ROI. Based on the analysis of impacts for resource areas, few high and adverse impacts from construction and operation of the UPF at Y-12 are expected; to the extent that any impacts may be high and adverse, NNSA expects the impacts to affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in to following section, Health and Safety, there are no large adverse impacts to any populations.

Health and Safety

No radiological risks would be incurred by members of the public from construction activities. Construction workers could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. The likelihood of exposure from such contamination is considered to be low. Additionally, workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept ALARA.

The potential risk of occupational injuries and fatalities to workers constructing the UPF would be expected to be bounded by injury and fatality rates for general industrial construction. Based on 900 construction workers for the UPF, the Total Recordable Cases are estimated to be 85, Total Lost Workday Cases 41, and Total Fatalities 0.02. These values are shown in Table 5.9.11-1.

No chemicals have been identified that would be a risk to members of the public from construction or operation of the UFP. Construction workers would be protected from overexposure to hazardous chemicals by adherence to OSHA and EPA occupational standards. Facility design features that minimize the worker exposures during operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

NNSA expects minimal public health impacts from the radiological consequences of UPF operations. Table 5.9.11-2 lists incremental radiation doses estimated for the public and corresponding incremental LCFs. The calculated dose to the MEI would be 0.8 mrem per year, which would correspond to 4.8×10^{-4} LCFs per year (i.e., about 1 chance in 2000 years of operation). The collective dose to the offsite population within 50 miles (80 kilometers) would be 10.8 person-rem per year, which would correspond to 6.5×10^{-3} LCFs per year.

The estimate of annual radiological doses to workers are provided in Table 5.9.11-3. Operations in the UPF would result in a total dose to workers of approximately 12.6 person-rem, which would result in 0.008 annual LCFs to the Y-12 workforce.

The potential risk of occupational injuries and fatalities to workers would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Based on 600 workers for the UPF, the Total Recordable Cases are estimated to be 26, Total Lost Workday Cases 14, and Total Fatalities 0.02. These values are shown in Table 5.9.11-4.

Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with the operation of the UPF at Y-12. Because specific design information regarding the UPF is not available, the facility accident analysis is based on existing EU facilities. The UPF Alternative would decrease the overall Y-12 facility

accident risks because new facilities such as the UPF would be constructed to current building design standards Additional details supporting the information presented here are provided in Appendix C.

The accident with the highest potential radiological consequences to the offsite population (see Table 5.9.12-4) is an aircraft crash into the EU facilities. Approximately 0.4 LCFs in the offsite population could result from such an accident. An offsite MEI would receive a maximum dose of 0.3 rem, which would result in a 2×10^{-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.

NNSA estimated the impacts of the most severe potential chemical accident, the release of 10,500 kg of nitric acid (see Table 5.9.12-6). The impacts of such a release would be within acceptable limits (i.e., ERPG-2 protective concentration limits) 0.28 km from the accident site (see definition of ERPG values in the shaded box in section 5.9.12.2.2). The concentration at the site boundary would be 0.01 ppm.

Transportation

Construction of the UPF would result in increased traffic due to commuting workers and deliveries of materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.9.12. Operation of the UPF would result in slightly lower worker commuter traffic due to the decrease in the number of employees.

Radiological transportation for the UPF would include transport of pits from Pantex to Y-12, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. The impact of incident-free transportation associated with the UPF would be 1.45×10^{-3} LCF per year. Section 5.10 presents a detailed discussion of the impacts of radiological transportation.

Waste Management

Construction and operation of the UPF at Y-12 would generate small levels of LLW, Low Level Mixed Waste, hazardous waste, and non-hazardous solid waste. No TRU or mixed TRU waste would be generated by UPF operations.

Construction of the UPF is expected to generate 2.6 cubic yards of solid LLW, 4 cubic yards of mixed LLW, 4 tons of hazardous waste, and 800 tons of non-hazardous solid waste. All of these wastes are well within the capacity of the existing Y-12 waste management systems and facilities to handle.

Table 5.9.14-4 summarizes the estimated waste generation rates for the operation of the UPF at Y-12.

Operation of the UPF would generate about 7,800 cubic yards of solid LLW, 17.4 cubic yards of liquid LLW, 70 cubic yards of solid mixed waste, 3,616 gallons of liquid mixed low level waste, 15 tons of hazardous waste, 7,500 tons of solid non-hazardous waste, and 50,000 gallons of non-hazardous wastewater. These waste volumes appear, in some cases to approximately double the

current volume of wastes generated at Y-12 but it is important to bear in mind that the UPF would replace the existing EU facilities. The estimates for the UPF waste volumes would replace current EU facilities waste generation. Existing Y-12 waste management systems or facilities would be able to handle the projected waste volumes from operation of the UPF.

5.20.1.3 *Assembly/Dissassembly/High Explosives Production and Manufacturing at Pantex*

The NNSA Preferred Alternative for Assembly/Dissassembly/High Explosives Production and Manufacturing is the No Action Alternative. Under the Preferred Alternative the following major missions would continue to be performed at Pantex: nuclear weapon assembly, disassembly, maintenance, and surveillance; research and development of chemical high explosives for nuclear weapons; fabrication of high-explosive components essential to nuclear weapon function; and interim storage of plutonium components from dismantled weapons.

Land Use

Under the Preferred Alternative, current and planned activities at Pantex would continue on the 15,977 acre site, as required to support the missions described in Section 3.2.5. No additional buildings or facilities would be built beyond current and planned, but not built, and no additional impacts on land use would occur at Pantex beyond those of existing and future activities that are independent of this action. Existing land use at Pantex is discussed in Section 4.3.1. Table 5.5.1-2 presents a summary of the facilities at Pantex associated with the Preferred (No Action) Alternative.

Visual Resources

The Pantex Plant is located on the Llano Estacado portion of the Great Plains at an elevation of approximately 3,500 feet. The topography at the Pantex Plant is relatively flat and characterized by rolling grassy plains and numerous natural playa basins. The developed areas at Pantex Plant are consistent with a Visual Resource Management Class IV designation. The remainder of Pantex is consistent with a Visual Resource Management rating of Class III or IV.

Under the Preferred Alternative, current and planned activities at Pantex would continue as required to support the missions described for No Action in Section 3.2.5. There would be no additional impacts to visual resources beyond current and planned activities that are independent of this action. Existing visual resources at Pantex are discussed in Section 4.5.2.

Site Infrastructure

The analysis of site infrastructure focuses on the ability of the site to provide the electrical power needed to support the programmatic alternatives. The ability of the site to provide the water requirements is addressed in the water resource section (Section 5.5.5). Other infrastructure demands, such as fuels or industrial gases, are not expected to be major discriminators for the programmatic alternatives analyzed in this SPEIS.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to site infrastructure beyond current and planned activities that are independent of this action. Baseline characteristics are described in Section 4.5.3. Pantex is expected to continue using about 81,850 MWh per year of electricity, well below the available site capacity of 201,480 MWh per year.

Air Quality and Noise

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to air quality and noise beyond current and planned activities that are independent of this action. The Pantex Plant is located within the Amarillo-Lubbock Intrastate AQCR. The Amarillo-Lubbock Intrastate AQCR is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and PM10) (40 CFR 81.344). Pantex is in compliance with all NAAQs. Existing air quality and noise resources are discussed in Section 4.5.4.

Water Resources

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to water resources beyond current and planned activities that are independent of this action. Pantex is expected to continue using about 130 million gallons of water per year,

which is drawn from the Ogallala Aquifer. Existing water resources are discussed in Section 4.5.5.

Geology and Soils

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to the Pullman and Randall soil series, or other geological and soil resources, beyond current and planned activities that are independent of this action. Existing geology and soils are discussed in Section 4.5.6.

Biological Resources

At least 13 species of mammals were recorded at the Pantex Plant in 2005 during routine activities such as bird surveys, nuisance animal actions, and incidental observations. There are six playas on DOE-owned or leased land at Pantex: Playas 1, 2, and 3 are on the main Pantex Site; Playas 4 and 5 are on land leased from Texas Tech University; and Pantex Lake is on a separate parcel of DOE-owned property, approximately 2.5 miles northeast of the main portion of the Pantex Plant. There are no federally designated Wild and Scenic Rivers onsite. The Pantex Plant provides habitat for several species protected by Federal and state endangered species. The current status of threatened and endangered (T&E) species known to appear on, or in the vicinity of the Pantex Plant is shown in Table 4.5.7-1. Five special status species have been observed at the Pantex Plant.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to biological resources beyond current and planned activities that are independent of this action. Existing biological resources are discussed in Section 4.5.7.

Cultural Resources

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no expected impacts to the 69 identified cultural and archaeological resources beyond current and planned activities that are independent of this action. Current cultural and archaeological resources are discussed in Section 4.5.8.

Socioeconomic Resources

Under the Preferred (No Action) Alternative, Pantex would be expected to continue employing approximately 3,800 employees in order to maintain current and planned activities as required to support the missions described in Section 3.2.5. There would be no additional impacts to socioeconomic resources beyond current and planned activities that are independent of this action. Existing socioeconomic characteristics are discussed in Section 4.5.9.

Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

Section 4.5.10 presents the existing environmental justice characteristics of the ROI, including census tracts for minority and low-income populations. Under the Preferred Alternative, none of these impacts would change.

In 2000, minority populations comprised 30.1 percent of the ROI population surrounding Pantex. In 2000, minorities comprised 30.9 percent of the population nationally and 47.6 percent of the population in Texas. The percentage of persons within the ROI below the poverty level at the time of the 2000 Census was 13 percent, which is higher than the 2000 national average of 12.4 percent but lower than the statewide figure of 15.4 percent.

Based on the analysis of impacts for resource areas, there are few high and adverse impacts from operation activities at Pantex. To the extent that any impacts may be high and adverse, the impacts affect all populations in the area equally. There were no discernable adverse impacts to land uses, visual resources, noise, water, geology and soils, biological resources, socioeconomic resources, cultural and archaeological resources. As shown in Section 5.5.11, there are no large adverse impacts to any populations.

Health and Safety

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to health and safety beyond current and planned activities that are independent of this action. It is expected that Pantex would emit a dose to the MEI of 4.28×10^{-9} mrem per year. This is significantly below the EPA maximum permissible exposure limit to the public. Existing health and safety at Pantex is discussed in Section 4.5.11

Facility Accidents

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional accident risks beyond those associated with current and planned activities that are independent of this action. Potential accident scenarios for the No Action Alternative are addressed in Section 5.5.12.4.

Accidents associated with the A/D/HE Center, which are included under the No Action Alternative, are presented in Tables 5.5.12-7 through 5.5.12-9.

The accident with the highest potential consequences to the offsite population (see Table 5.5.12-7) is the explosive driven plutonium and tritium dispersal from an internal event. Approximately 0.876 LCFs in the offsite population could result from such an accident in the absence of mitigation. An offsite MEI would receive a dose of 3.6 rem. Statistically, this MEI would have a 0.002 chance of developing a LCF (i.e., about 1 chance in 460 of an LCF). The overall likelihood of this scenario occurring is less than 1×10^{-4} per year.

When probabilities are taken into account (see Table 5.5.12-8), the accident with the highest overall risk is also the explosive driven plutonium and tritium dispersal from an internal event. For this accident, the LCF risk to the MEI would be $2x10^{-7}$, or approximately 1 in 5 million. For the population, the LCF risk would be approximately $9x10^{-5}$, or approximately 1 in 10,000.

For chemical accidents, NNSA estimated the impacts of the potential release of the most hazardous chemical used at the A/D/HE Center. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the release of the chemical. Table 5.5.12–9 provides information on the chemical and the frequency and consequence of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 point increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase. Chlorine released in the accident would not exceed ERPG-2 limits offsite.

Transportation

Under the Preferred (No Action) Alternative, there would be no change in the transportation activities at Pantex, and impacts would remain unchanged from the baseline presented in Section 4.5.12.

Waste Management

The types of wastes generated at Pantex Plant include hazardous wastes, regulated under RCRA, universal waste, non-hazardous wastes, wastes regulated under TSCA, LLW, MLLW, and sanitary waste.

Under the Preferred (No Action) Alternative, current and planned activities at Pantex would continue as required to support the missions described in Section 3.2.5. There would be no additional impacts to waste management resources beyond current and planned activities. Table 5.5.14-1 presents annual waste generation volumes from Pantex Operations.

Previously, DOE has made decisions on the various waste types in a series of RODs that have been issued under the Waste Management PEIS (DOE 1997). With respect to wastes that could be affected by this SPEIS, the initial transuranic (TRU) waste ROD was issued on January 20, 1998 (63 FR 3629) with several subsequent amendments; and the low-level radioactive waste and mixed low-level radioactive waste ROD was issued on February 18, 2000 (65 FR 10061). The TRU waste ROD states that DOE will develop and operate mobile and fixed facilities to characterize and prepare TRU waste for disposal at WIPP. Pantex does not generate TRU waste. Each DOE site that has or will generate TRU waste will, as needed, prepare and store its TRU waste onsite until the waste is shipped to WIPP. The ROD for low-level waste (LLW) and mixed LLW (MLLW) states that, for the management of LLW, minimal treatment will be performed at all sites and disposal will continue, to the extent practicable, onsite at Idaho National Laboratory (INL), LANL, ORR, and SRS. In addition, the Hanford Site and NTS will be available to all DOE sites for LLW disposal. Mixed LLW will be treated at the Hanford Site, INL, ORR, and SRS and disposed of at the Hanford Site and the NTS.

It is current DOE policy to treat, store and dispose of low level and low level radioactive mixed waste at the site where the waste is generated, if practical; or at another DOE facility (DOE Order 435.1, DOE Manual 435.1-1). If DOE capabilities are not practical or cost-effective, exemptions to this policy may be approved to allow use of non-DOE facilities. The RODs under the Waste Management PEIS designate NTS and Hanford as the regional disposal facilities for DOE sites to send LLW or MLLW where it is not practical to treat, store or dispose of those wastes on-site. For purposes of analysis in this SPEIS, NTS is used as a representative site for LLW or MLLW disposal because it is the current site in use for this purpose. Over the life of the program, LLW or MLLW may be disposed of on the site where it is generated or, in compliance with DOE Order 435.1, at NTS, Hanford, other DOE sites, or at licensed commercial disposal facilities. DOE/NNSA also routinely ship LLW to off-site commercial LLW disposal facilities.

The DOE MLLW disposal facility at NTS is permitted by the State of Nevada through December 2010 and NNSA may not be able to ship MLLW to NTS after that. LLW and MLLW cannot currently be shipped to Hanford until the new Tank Waste and Solid Waste EIS are completed and RODs are in place. Hanford may be available for disposal of MLLW before the MLLW disposal facility at NTS closes. EM disposal facilities at Hanford are not scheduled to operate beyond the completion of the cleanup mission at Hanford, which would be in about 40 years. Commercial disposal facilities, such as Clive, UT, or a new facility in Texas may be available to dispose of LLW and MLLW. The analysis of disposition of LLW or MLLW at NTS in this SPEIS approximates the impacts that would be expected to occur at NTS, Hanford, other possible DOE sites or the available commercial sites. Appropriate NEPA review would be conducted where necessary to address changes in the options available to DOE/NNSA for disposition of these wastes.

5.20.1.3 Consolidation of Category I/II SNM

This section analyzes the environmental impacts of consolidating Category I/II SNM as described in Section 3.7. The analysis focuses on the resources that are most likely to be affected. For removal of Category I/II SNM from LLNL, the analysis focuses on the: (1) transportation impacts of moving the Category I/II SNM from LLNL to SRS, LANL, and

WIPP; and (2) reductions in emissions, exposures, and wastes from the phase out of Category I/II SNM operations at Superblock, and socioeconomic impacts. For Category I/II SNM consolidation actions at Pantex, the analysis focuses on the potential construction impacts in Zone 12, the handling operations associated with the transfer of the Category I/II SNM on-site, and the decontamination and decommissioning impacts for vacated facilities in Zone 4.

Remove Category I/II SNM from LLNL

Transferring the LLNL Category I/II SNM includes Category I/II SNM operations at Superblock. This SPEIS describes the impacts from this phase-out in Section 5.12.2. As described in Section 3.7.1, all Category I/II SNM inventories at LLNL that are not waste would be transferred to LANL (or NTS for interim storage) and SRS as programmatic and surplus material respectively.

Table 5.12-1 provides a summary of the impacts of the 19 radioactive material shipments. The total dose to workers for shipments of all Category I/II materials would be 3.5 person-rem, resulting in 0.002 LCF. The incident-free dose to the public from these shipments would be 1.15 person-rem, resulting in a potential increase of 6.8×10^{-4} LCFs. The total exposure due to potential accidents is estimated to be 1.13×10^{-7} person-rem, resulting in less than 1×10^{-10} LCFs to the general population.

Table 5.12-2 provides a summary of the impacts of transporting the LLNL Category I/II SNM to NTS for interim storage at the DAF followed by transportation to LANL**.** The total dose to workers for shipments of all Category I/II materials would be approximately 1.1 person-rem, resulting in approximately 6.6×10^{-4} LCFs. The incident-free dose to the public from these shipments would be less than 2.5 person-rem, resulting in a potential increase of 1.3×10^{-3} LCFs.

Because there are no emissions of radionuclides from Superblock, phasing out Category I/II SNM would have no effect on population doses to the surrounding population.

The packaging and handling of LLNL's materials would generate less than 90 pounds of TRU waste, representing less than one routine shipment to the Waste Isolation Pilot Plant (WIPP) in New Mexico. The impacts of this shipment would be less than 1/8 – 1/10 of the impacts presented in Table 5.12-1 for LANL and SRS, respectively.

Phasing out the Category I/II SNM operations from the Superblock would reduce the material-at-risk (MAR) for plutonium in the Superblock, which would reduce the source term associated with potential accidents, thereby reducing potential accident impacts. Table 5.12-3 lists consequences of the bounding accident if the MAR in Superblock were reduced by approximately 60 percent. The dose to the public from such an accident would be reduced from 2,170 person-rem per year to 868 person-rem per year, with a corresponding reduction in LCFs from 1.30 to 0.52.

Initially, employment at the Superblock would be expected to increase because of the D&D work. After the D&D work is completed, it is expected that there would be some decrease in personnel at LLNL because the Category I/II SNM component of LLNL's plutonium mission

would be located at LANL. However, personnel required to conduct R&D activities involving Category III quantities of SNM and maintaining the Superblock in a safe operating mode would be expected to be the same. It is expected that there would be some decrease in security personnel, but the decrease is unclear at this time.

After phase-out of Category I/II SNM the Superblock facilities would continue to operate with Category III quantities of SNM. During Complex Transformation the Superblock facilities would continue to perform machining, foundry operations, analytical chemistry, and materials characterization on SNM originating from LANL facilities. These activities involving Category III quantities of SNM are well within the bounds of impacts analyzed for Superblock facilities in LLNL SWEIS (DOE 2005a).

Transfer Category I/II SNM from Pantex Zone 4 to Zone 12

Consolidation of SNM at Pantex would entail the construction of a new storage facility in Zone 12, moving up to 60 metric tons of pits from Zone 4 to Zone 12, and the demolition of the old storage facilities in Zone 4 (see Figure 5.12-1 in Section 5.12.3).

Zone 12 is a highly developed area of Pantex which contains gravel gerties atop the assembly/disassembly bays and cells. The new storage facility would neither affect Pantex land use plans nor change the visual character of this area. In addition, cultural and biological resources (including threatened and endangered species) would not be affected by construction or operation of the proposed storage facility.

Construction or post-construction landscaping has the potential to disturb areas of soil contamination in Zone 12. Where possible, these soils would be avoided. If disturbance of contaminated soils were necessary, the soil would be returned to the excavated area after disturbance when feasible or would be characterized and treated or disposed of appropriately.

Construction of a new underground SNM storage facility in Zone 12 is not expected to have an appreciable negative impact on water resources at or near the Pantex Plant. The estimated construction water requirement would be 2,950,000 gallons over the five year construction period.

All storm water runoff would be managed in accordance with best management practices for soil erosion and sediment control, and in accordance with applicable permit requirements.

The proposed storage facility would replace an existing facility so it is not expected that there would be any increase in the present water use of the existing storage facility. As a result, wastewater generation volumes and water use should continue to be bounded by the levels forecast in the Pantex SWEIS.

Construction activities would be expected to produce only temporary and localized air emissions and the effects on air quality would also be temporary and localized. There would be no long-term degradation of regional air quality. Noise from the construction would be audible primarily

to the involved workers. Involved site workers would be required to wear appropriate personal protective equipment (PPE), including hearing protection.

The construction jobs would be filled by existing workers in the region. Therefore, there would be no effect on area population or increase in the demand for housing or public services in the Pantex ROI. There would be short-term benefits during construction in the form of jobs and procurement. Most materials would be purchased in the immediate area.

If the peak construction period lasts for the entire five year construction period, no deaths (0.005) would be expected for the estimated 120 construction workers from construction or demolition-related activities.

Moving SNM material from Zone 4 to Zone 12, within the Pantex site would have an estimated total dose to involved workers of 1,100 person-rem, which would statistically translate into approximately 0.657 LCFs. Because the actual transportation of the SNM would be within Pantex, no doses to the public are anticipated.

The SNM would be managed in the new facility similar to the current method, albeit underground. The number of workers associated with storage operations would not change, although there would be a reduction in security force requirements. Table 5.12-5 displays the operational requirements associated with the new storage facility.

Table 5.12-6 displays the relevant information associated with the D&D of the Zone 4 facilities. Approximately 700 cubic yards of LLW would be generated over the 2-year D&D period. This LLW would be shipped to NTS for disposal. The annual LLW from this D&D would represent a short-term increase of approximately 350 percent compared to the 96.8 cubic yards of LLW generated by Pantex in 2005.

5.20.2 Restructuring R&D and Testing Facilities

In pursuit of a more responsive and cost-effective Complex, NNSA is considering a restructuring of the R&D and testing facilities within the Complex. For the proposed action to restructure R&D and test facilities, the alternatives focus on near-term actions to consolidate, relocate, or eliminate facilities and programs and improve operating efficiencies. The following functional R&D capabilities and capacities are evaluated:

- High Explosives R&D
- Tritium R&D
- NNSA Flight Test Operations
- Major Hydrodynamic Testing
- Major Environmental Testing

5.20.2.1 *High Explosives R&D*

Under the Preferred Alternative, NNSA would consolidate weapons HE R&D and testing at the following locations by 2010:

- Pantex would remain the HE production (formulation, processing, and testing) and machining center. All HE production and machining to support nuclear explosive package (NEP) development is performed at Pantex. HE experiments up to 22 kg HE could remain at Pantex;
- NTS would remain the testing center for large quantities of HE (greater than 10 kg);
- LLNL would be the HE R&D center for formulation, processing, and testing (processing capability to handle up to 15 kg and testing less than 10 kg) HE at the High Explosives Applications Facility (HEAF); formulation and processing of HE would be conducted either at a new HEAF Annex to be built adjacent to HEAF, or at existing Site 300 facilities;
- SNL/NM would remain the HE R&D center for non-nuclear explosive package components (less than 1 kg of HE) at the Explosive Components Facility (ECF); and
- LANL would produce war reserve main charge detonators, conduct HE R&D experimentation and support activates, and move towards contained HE R&D experimentation as defined by program plans.

Maintain one weapon program open-burn and one weapons program open detonation area at each site for safety and treatment purposes.

The Preferred Alternative for HE R&D incorporates the No Action Alternative for Pantex with a 22 kg limitation on the amount of HE that may be used in explosive testing. For LANL, production of HE detonators and conducting contained HE R&D (up to 10 kg) is considered as part of the No Action Alternative. Other aspects of the Preferred Alternative are with Alternative 2c, “Move open-air experiments using 1-15 kg HE from LANL and SNL/NM to LLNL HEAF and experiments using 10 kg-100 kg HE to LANL or NTS.”

Impacts of the Preferred Alternative for HE R&D at Pantex would not change from current conditions.

At SNL/NM, this alternative would not eliminate HE R&D experiments and testing using less than 1 kg of HE that are conducted at the ECF, nor would it decrease the laboratory space currently required to do this work. HE R&D that is conducted at SNL/NM under the Work for Others Program would not be affected.

At NTS, receiving the 15-100 kg shots could be accepted without additional environmental impacts. NTS would need to hire up to 5 individuals to meet these demands. However, none of these impacts would be consequential.

All activities under this alternative would be conducted within the parameters of the sites’ *Clean Air Act* permits and other applicable environmental requirements. Because these kinds of activities are already being conducted at these sites and no new construction would be required to accommodate the work, the environmental impacts would be less than or only minimally greater than they are currently.

5.20.2.2 *Tritium R&D*

This section analyzes the environmental impacts of consolidating tritium R&D at SRS, as described in Section 3.9. The analysis focuses on the resources that are most likely to be affected: emissions and exposures, which affect human health, socioeconomic impacts, and wastes.

Under this alternative, tritium R&D currently conducted at LLNL, (except for that associated with NIF targets) and LANL would be phased out and consolidated at SRS into existing facilities. Neutron generator target loading at SNL/NM would continue and not be included under this consolidation.

Potential Impacts of Consolidating Tritium R&D at SRS

Tritium emissions at SRS would increase by approximately 1,000 Curies per year, which would represent an increase of approximately 2.4 percent over current tritium emissions. In 2005, the estimated dose from atmospheric releases to the MEI was 0.05 mrem, which is 0.5 percent of the DOE Order 5400.5 air pathway standard of 10 mrem per year. In 2005, the collective 50-mile population dose was estimated at 2.5 person-rem. Increasing the tritium emissions by 2.4 percent would increase these doses to 0.0508 mrem per year to the MEI and to 2.541 person-rem per year to the collective population. These doses would be equivalent to 3.1×10^{-5} and 1.5×10^{-3} LCF per year, respectively.

The average exposure to a worker from tritium R&D would be approximately 4.3 mrem, resulting in a total worker dose 0.11 person-rem. The likelihood of a LCF to workers would be 6.6×10^{-5}.

At SRS, receiving the tritium R&D operations from LANL could produce additional consequences due to accidents that release tritium. For the 50-mile population surrounding SRS, the highest population dose from an accident would be expected to be less than 380 person-rem, which translates to an LCF risk of 0.22 (statistically, this means no LCFs are expected to result if the bounding accident were to occur).

Because no significant offsite health risks are associated with the tritium R&D operations, no environmental justice impacts are expected.

The addition of 25 new workers at SRS would increase the site workforce by much less than 1 percent and would not be noticeable in the ROI.

Consolidating tritium R&D at SRS would cause waste generation to increase slightly. Mixed waste would increase by 28 gallons, high activity waste by 330 gallons, compactable waste by 2.4 cubic meters, non-Compactable, less than 20 million Ci per cubic meter by 5 cubic meters, and mop water (low level liquid waste) by 3000 gallons. These wastes would represent less than 1 percent of current wastes generated at SRS and would be inconsequential.

Potential Impacts of Phasing Out Tritium R&D at LANL

Phasing out tritium R&D operations from the WETF at LANL would reduce tritium emissions, wastes, and exposure to personnel as shown in Table 5.14-1.

Tritium emissions at LANL would decrease by approximately 1,000 Curies, or 42 percent per year**.** Decreasing the tritium emissions at LANL by 42 percent would decrease the MEI dose to 0.0021 mrem per year with a likelihood of a LCF of 1.2×10^{-6} and the 50-mile population dose would decrease dose to 0.052 person-rem per year with a likelihood of a LCF of 3.1×10^{-5}.

Approximately 25 workers at LANL would be reassigned to new jobs. Assuming these workers would no longer receive a 4.3 mrem dose, total worker dose would decrease by 0.11 person-rem. The likelihood of a LCF to workers would decrease by 6.6 × 10-5.

Because the tritium R&D workers would be reassigned to other jobs at LANL, no socioeconomic impacts would result.

Wastes at LANL would decrease by approximately the same amount as they would increase at SRS.

Potential Impacts of Phasing Out Tritium R&D at LLNL

Current LLNL tritium R&D (primarily to support gas transfer system development) is very small and is only included here for completeness. Transferring the LLNL tritium R&D (not NIF tritium work) to SRS would basically amount to one glove box system, which could be accommodated in the SRS facilities without any significant changes.

5.20.2.3 *NNSA Flight Test Operations*

NNSA's Preferred Alternative for flight test operations would be to conduct the JTA tests at TTR on a campaign basis, bringing in employees from other NNSA sites to conduct tests. Under this alternative, NNSA would implement a "reduced footprint" option. About one-half of current staff would remain at TTR and be supplemented in a campaign mode by up to 20 personnel from other NNSA sites, such as SNL/NM, SNL/CA, and NTS. The area of TTR that would be included in the land use permit from the U.S. Air Force would be reduced from 280 square miles to potentially less than one square mile. Some mission-related equipment would be upgraded under this alternative. Security and site infrastructure maintenance responsibilities would be returned to the Air Force.

Conducting flight test operations at TTR in a campaign mode within a reduced permit area would result in essentially the same impacts as the No Action Alternative, except in the area of socioeconomic impacts. Operating in a campaign mode would result in the loss of approximately 70 jobs, but would create 20 jobs for security guards as the AF would take over security responsibilities. The 14 full time Sandia staff is the minimum required to maintain and refurbish equipment to ensure operational readiness. This net loss of 50 jobs would have a noticeable impact on the community of Tonopah, Nevada. All aspects of the Tonopah economy would be

affected. The loss of relatively high paying jobs would reduce the overall economic base of the community. Home ownership would be reduced by families relocating to find employment. The local public school system would be affected through reduction in the number of students, likely loss of some teachers (spouses of impacted employees), and the support provided by parent and other volunteers in the schools.

5.20.2.4 *Hydrodynamic Testing*

NNSA's Preferred Alternative for Hydrodynamic Testing includes elements of the Downsize in Place Alternative, Consolidation at LANL Alternative, and Consolidation at NTS Alternative. Under the Preferred Alternative:

Contained hydrodynamic testing (consisting of Integrated Weapons Experiments and Focused Experiments) would be the standard practice for LLNL at the Contained Firing Facility (CFF) and LANL at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility by the end of fiscal year 2008. In addition:

- Hydrotesting at CFF would be consolidated to a minimal footprint by 2015.
- Open-air hydrotests at LANL DARHT would be allowed if needed for national security requirements.
- Firing site operations for Defense Programs Focused Experiments required by the national hydrodynamic test program would be transitioned to contained firing at LANL as defined by program plans and allow open-air firing at LANL TA-36 until adequate radiographic capabilities and associated supporting infrastructure, are available for open-air firing at NTS.
- As the LANL DARHT facility approaches end of life in approximately 2025, plan for the next generation facility at the NTS to be available prior to DARHT closure, so long as the mission analysis and business case support this option.

The impacts of these elements of the Preferred Alternative are addressed in detail in Section 5.16 of this SPEIS and are summarized in this section.

Under the Preferred Alternative, the outdoor burn areas at Pantex and SNL/NM would not be closed. These facilities are used for other activities and would continue to be used for those activities. In addition, the smaller outdoor facilities at NTS would not close and the consolidation of hydrotesting at NTS is considered to be a next generation facility and would not occur until after 2025.

At LLNL, the Preferred Alternative would entail closing the Building 812 Complex and the Building 850 Complex. The Building 851 Complex would either be closed or turned over to other non-NNSA programs. The associated support facilities would probably not be impacted by this alternative as they are smaller, multi-purpose facilities which could be of use to other program activities.

Under this alternative LANL would close all hydrotesting facilities except for the DARHT and a few of the other smaller firing sites at LANL, which support primarily HE R&D and Work For Others but can also be used for limited classes of hydro-like experiments.
There would be few changes at NTS. No facilities would be closed and high explosive experiments are currently conducted at BEEF and the U1a Complex. The number of experiments may increase but would remain within the limits previously analyzed in detail in the NTS Site-wide EIS (DOE 1996b). In addition, BEEF operates in accordance with the provisions of an Air Quality Operating Permit from the Nevada Bureau of Air Pollution Control.

Closure of facilities at LANL and LLNL would entail clean-up and D&D effort. Although not heavily contaminated, these facilities all have a substantial amount of reinforced concrete and steel structures designed to withstand sizeable HE explosions. There would be a total job loss of 31 (26 at LLNL and 5 at LANL). It is estimated that at least 10,000 gross square feet of hardened concrete and steel structures and soil immediately surrounding these structures would have to be dismantled, razed, dug up, undergo D&D, and disposed of. Table 5.16-1 presents the cumulative impacts of the Downsize-In-Place Alternative.

5.20.2.5 *Major Environmental Test Facilities*

Under the Preferred Alternative, NNSA would implement the Consolidate ETF Capabilities at One Site Alternative using SNL/NM as the preferred site. Section 5.17.4.2 contains a detailed analysis of the impacts of consolidating ETF capabilities at SNL/NM. A summary of the impacts incurred as a result of the closures required by the Consolidation of ETF Capabilities at SNL Option are shown in Table 5.20-1.

ETF functions currently performed in Building 334 at LLNL and at Building 834 Complex at LLNL Site 300 would be moved to an existing building at Pantex. This would require removal of equipment from Building 334 and for Building 834 Complex and the installation at Pantex of a measurement tower, a sealed source storage pit, and a 5-ton bridge crane. This installation would require only modification to the existing building at Pantex and no new construction. The impacts of this action would be inconsequential.

Table 5.20-1—Closure Impacts Resulting from ETF Consolidation at SNL

Facility	Soil (yd^3)	LLW (yd^3)	Solid Waste (yd^3)	Hazardous Waste (yd^3)	Peak Employment	Total Worker Hours	Jobs Lost	Floor Space (ft^2)
LANL	9,849	12,743	503,000	5	110	112,518	29	43,567
LLNL[a]	300	20	7,174	23	95	100,475	6	89,466*
SNL	5,100	37	8,700	42	107	48,880	16	26,235

[a]Assumes D&D of the SNL/Environmental Test Complex and attributes impacts to LLNL as this is physically where the impacts would be incurred.

Consolidation at SNL/NM would maintain the operation of the two NTS ETF facilities (at DAF and the U1a Complex) and allow for construction of an underground rocket sled track facility at NTS.

If an underground sled track complex were constructed and operated at the NTS, it would be sited in an existing tunnel complex and would have little direct impact on the environment. Existing site infrastructure is adequate to provide the required water and electrical capacities for both construction and operations. The number of employees required for construction would be less than about two percent of the existing workforce and the number of operational workers would be less than one percent. There would be no radiological air emissions and criteria and hazardous air pollutant emissions would not cause an exceedance of the limits in the NTS Air Quality Operating Permit. The amount of wastes generated by the facility would be inconsequential and easily managed by the ongoing NTS Waste Management Program. NNSA would ensure that sensitive animal species that may use the tunnel (i.e., bats) would not be harmed. Because of their association with the Cold War and nuclear weapon testing, some of the tunnels at the NTS may be considered historic properties. As part of planning for the sled track complex, NNSA would consult with the Nevada SHPO and complete all consultation requirements under Section 106 of the *National Historic Preservation Act*.