APPENDIX G
IMPACTS ANALYSES OF PROJECTS TO MAINTAIN EXISTING LOS ALAMOS NATIONAL LABORATORY OPERATIONS AND CAPABILITIES

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The projects discussed in this appendix are elements of the Expanded Operations Alternative as described in Chapter 3 of this *Final Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (SWEIS). The Expanded Operations Alternative reflects proposals that would expand the overall operations level at Los Alamos National Laboratory (LANL) above those established for the No Action Alternative. Additionally, the Expanded Operations Alternative includes a number of new projects whose purpose is not to expand the operations level, but to update existing facilities or provide new buildings in which to continue existing operations and capabilities. In some cases, the projects to maintain existing operations and capabilities have the potential to impact land use at LANL. However, not all new projects would affect land use, as many would involve actions within or modifications to existing structures or construction of new facilities within previously developed areas of LANL. This appendix presents the project-specific analyses for nine proposed construction or refurbishment projects that would be implemented or for which implementation decisions are needed within the timeframe under consideration in this SWEIS.

- Technical Area 3 (TA-3) Physical Science Research Complex (formerly the Center for Weapons Physics Research) (Section G.1)
- TA-3 Replacement Office Buildings (Section G.2)
- TA-48 Radiological Sciences Institute, including Phase I – The Institute for Nuclear Nonproliferation Science and Technology (Section G.3)
- TA-50 Radioactive Liquid Waste Treatment Facility Upgrade (Section G.4)
- TA-53 Los Alamos Neutron Science Center (LANSCE) Refurbishment (Section G.5)
- TA-55 Radiography Facility (Section G.6)
- TA-55 Plutonium Facility Complex Refurbishment (Section G.7)
- TA-62 (TA-3) Science Complex (Section G.8)
- TA-72 Remote Warehouse and Truck Inspection Station (Section G.9)

Collectively, the nine projects presented in this appendix represent one component of the National Nuclear Security Administration's (NNSA's) ongoing effort to replace much of the older workspace and physical infrastructure at LANL with corresponding modern equivalents, consolidate certain operations, and eliminate underutilized and redundant structures and buildings. To support this effort, NNSA has identified distinct areas to be addressed to ensure infrastructure sustainability. These include initiatives to reduce structure footprints and operating costs, and to improve safety, security, environmental protection, scientific interactions, and productivity. The proposed timeframes associated with construction or refurbishment and operation of the proposed facilities are depicted in **Figure G–1**.

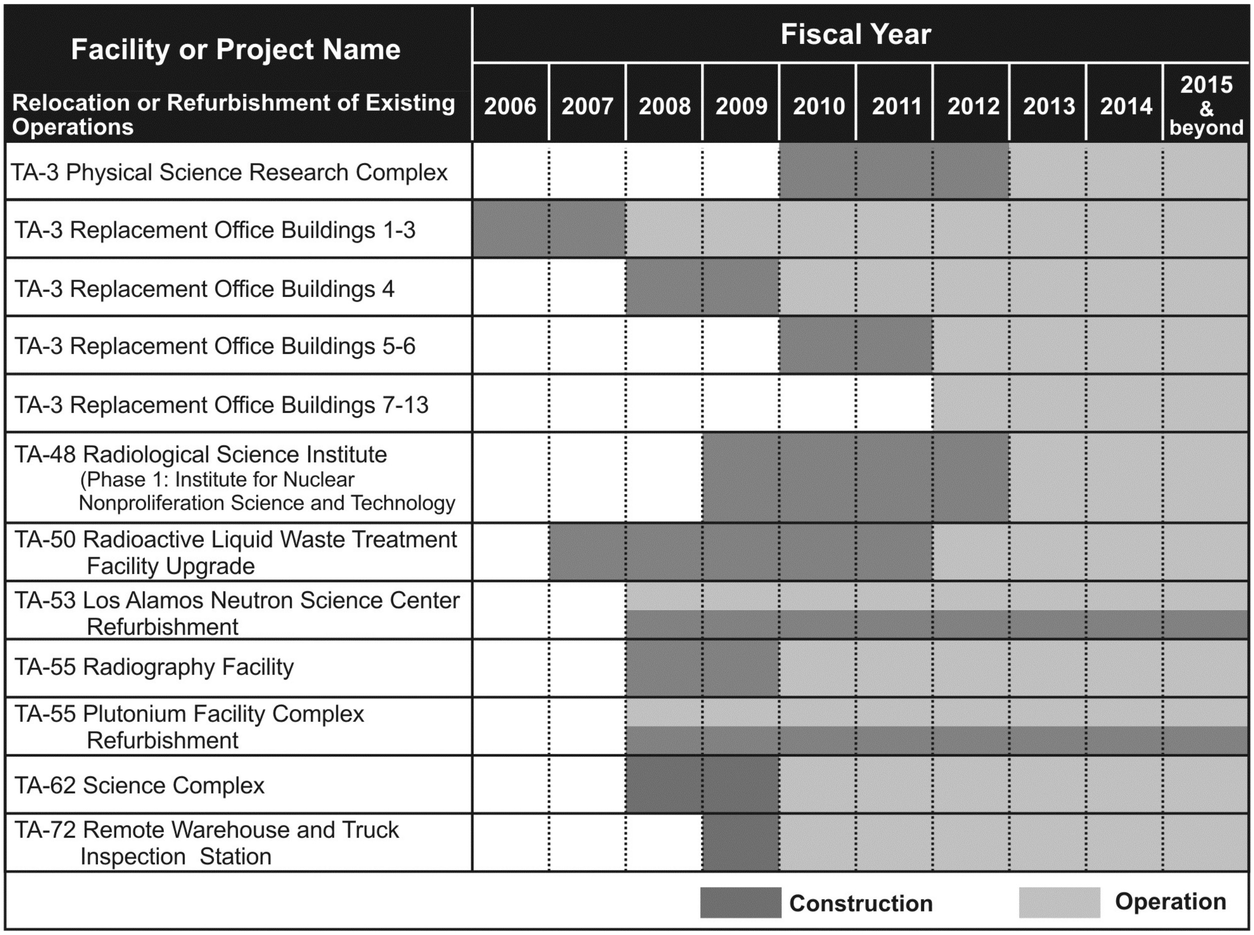


Figure G–1 Proposed Timeframes for Construction and Operation of Projects to Maintain Existing Los Alamos National Laboratory Operations and Capabilities

The projects included in this appendix are categorized into two broad groups: (1) those that would relocate existing operations to a completely new facility, with the former facility(ies) undergoing decontamination, decommissioning, and demolition (DD&D); and (2) those that would renovate or refurbish an existing facility to prolong its capabilities and bring it up to current standards. In keeping with congressional "one for one" space requirements, all proposed new building construction projects discussed in this appendix also include the DD&D of a comparable amount of space in older buildings or transportable structures that are no longer needed or that are unsuitable for future use. Standard construction practices applicable to all construction projects at LANL are described in the text box on the following page. The general process for DD&D of the structures is described in Appendix H.

Detailed project-specific work plans for DD&D of the structures would be developed and approved by NNSA before any actual work began. The plans would include those required for environmental compliance (such as stormwater pollution prevention plans) and monitoring activities (such as using real-time radiation monitors); all necessary legal and regulatory requirements in effect at the time would be undertaken before any DD&D activities were conducted.

Construction Work Elements

Design and Operation Standards: All new structures at LANL would be designed and constructed in compliance with applicable DOE Orders, requirements, and governing standards that have been established to protect public and worker health and the environment. DOE Order 420.1B (DOE 2005) requires that nuclear and nonnuclear facilities be designed, constructed, and operated so that the public, workers, and environment are protected from adverse impacts of natural phenomena hazards, including earthquakes. DOE Standard 1020-2002 (DOE 2002a) implements DOE Order 420.1B and provides criteria for the design of new structures, systems, and components and for evaluation, modification, or upgrade of existing structures, systems, and components so that DOE facilities safely withstand the effects of natural phenomena hazards, such as earthquakes. The criteria specifically reflect adoption of the seismic design and construction provisions of the International Building Code for DOE Performance Category 1 and 2 facilities. Prior to construction of any new facilities, an estimate of the seismic hazard at the proposed site would be conducted using the most current seismic information. The new facilities would also be designed to meet safety and engineering criteria specified in the *LANL Engineering Standards Manual*, OST220-03-01-ESM (LANL 2004b), and would meet current code requirements for electrical, plumbing, fire protection, and other utilities.

Facilities would be constructed according to Leadership in Energy and Environmental Design (LEED) standards (USGBC 2006). LEED for New Construction and Major Renovations is a green building rating system designed to guide and distinguish high-performance commercial and institutional projects, with a focus on office buildings. The standards used for new LANL buildings would increase energy use efficiency and probably achieve net reductions in energy use. LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, material selection, and indoor environmental quality. Under LEED standards, older, less-efficient buildings would be removed, and, in general, their former locations would be used for parking and open space.

Construction Safety and Health Plan: The work would be planned, managed, and performed to ensure that standard worker safety goals are met and that work would be performed in accordance with good management practices, regulations promulgated by the Occupational Safety and Health Administration, and LANL resource management plans. To prevent serious injuries, all site workers (including contractors, subcontractors, lessees and permit or easement holders or their contractors and subcontractors) would be required to submit and adhere to an approved construction safety and health plan.

Environmental Management: NNSA's goal for the construction of new facilities is to retain as much of the natural setting, vegetation, and overall environmental integrity of the site as practical. The site surrounding new buildings and parking would be professionally landscaped within the guidelines of the LANL Site and Architectural Design Principles (LANL 2002a) and LANL Sustainable Design Guide (LANL 2002b). Disturbance and removal of vegetation at the construction site would be limited to those areas necessary to accommodate building, roadway, parking, parking structure footprint, and work areas. Total tree removal would be allowed within only 50 feet (15 meters) of building footprints and 5 feet (1.5 meters) of parking and roadways. Trees greater than 10 inches (25.4 centimeters) in diameter measured 4.5 feet (1.35 meters) from the ground surface would not normally be cut and removed from areas with a slope less than 20 degrees at distances greater than 20 feet (6 meters) from building footprints or 10 feet (3 meters) from parking lots and roadways. No tree cutting or other disturbance would occur in areas with greater than 20 percent slope, except as periodically needed for wildland fire management purposes. Wildfire management planning is currently being developed in the *Los Alamos National Laboratory Wildland Fire Management Plan*, LA-UR-05-0286 (LANL 2005d). Management activities, such as tree thinning, could be put into effect at the proposed facilities. Tree thinning procedures would include incorporation of best management practices to prevent soil erosion and use of manual timber cutting on the steep slopes rather than mechanical methods.

National Pollutant Discharge Elimination System: No construction would be conducted within floodplains or wetlands. As appropriate, engineered best management practices for each building, parking structure, or roadway site would be implemented as part of a site stormwater pollution prevention plan executed under a National Pollutant Discharge Elimination System construction permit. Best management practices may include the use of hay bales, straw wattles, and silt fences. Prior to construction, topsoil from the site would be removed and stockpiled for later use in land restoration efforts at either this site or other sites. Soil stockpiles would be seeded and protected with silt fences to prevent erosion and impact on nearby drainages. Following construction, areas surrounding the buildings would be restored to enhance site drainage and stormwater capture for passive irrigation of landscaping. Recontoured areas would then be reseeded with a native grass mix to stabilize the site and planted with landscape vegetation closer to the buildings. Permanent site engineered controls for stormwater runoff may include stormwater retention ponds, curbing, permeable asphalt, or use of timber or stone as riprap to slow waterflow runoff. Vehicle fueling would not occur within drainages or floodplain areas.

Excavation and Dust Suppression: Dozers, backhoes, or graders may be used to remove tree stumps and rocks and to smooth the surface. Clearing or excavation activities during site construction would have the potential to generate dust. Standard dust suppression methods (such as water spraying or soil tackifiers) would be used to minimize dust generation during construction activities.

Cultural resources: If cultural remains were encountered during construction, activities would cease until their significance was determined and appropriate subsequent actions taken.

Ultimate disposition of the facilities constructed by the projects in this appendix would be considered at the end of their operations, usually several decades after construction. Facilities that would support missions involving radioactive and hazardous materials are required to be designed with consideration of the entire lifecycle of the facilities; this includes incorporating features into the design that would facilitate eventual facility DD&D. The impacts from the eventual disposition of the newly constructed facilities would be similar to or less than the impacts from the disposition of the facilities that they replace.

Purpose and Need

LANL's primary mission is to support national security. Nuclear technology and the associated radiological facilities at LANL are vital to this mission. The mission includes programs such as defense nuclear nonproliferation, emergency operations, domestic safeguards, and corresponding training operations and encompasses activities related to nuclear weapons, nuclear nonproliferation and arms control, homeland security, nuclear energy, radioactive waste management, environmental management, nuclear regulation, health and safety, nuclear medicine, and advanced materials science.

LANL has consistently applied state-of-the-art basic and applied scientific research in solving complex problems of national importance. The same attention to the state of infrastructure and facilities has not kept pace over the years. As a result, LANL's infrastructure is deteriorating to the point of jeopardizing its long-term ability to fulfill its stockpile stewardship mission. Many of the current structures in use at LANL are from 20 to 50 years old. A large percentage of the LANL workforce is located in facilities that are in marginal condition and frequently overcrowded. Buildings and structures built and occupied at LANL since the late 1940s are often incorrectly sized to effectively accommodate modern operations. The demands on the services, utilities, and communications were not anticipated when the buildings were designed. Current activities are conducted in scattered, old structures, many of which are obsolete and increasingly expensive to operate. Today, LANL has the oldest facilities and the greatest number of old facilities among the three national security laboratories and the Nevada Test Site. Approximately half of LANL's facilities are in poor or fair condition.

The liability and cost of aging infrastructure is an escalating problem throughout the U.S. Department of Energy (DOE) complex. Because the cost of operations and maintenance for aging LANL facilities is significant and growing, leaving this problem unaddressed would impact LANL's ability to carry out NNSA's stockpile stewardship mission. In the past, preventive facility maintenance has been deferred for higher priorities. The current DOE budgeting process allocates 5 to 8 percent less for infrastructure and repair than the industrial average. Over time, this practice has resulted in a backlog of repairs that threatens to overtake LANL's ability to effectively address these problems while pursuing research activities critical to NNSA's Defense Program mission. The majority of LANL facilities are reaching the end of their useful lives and would require major upgrade investments to meet future mission needs and ensure the health and safety of LANL employees. Even after such investment in upgrading aging facilities, the functionality of these buildings would remain marginal. These buildings and structures were neither built to current structural (including seismic), health, safety, and security standards, nor can they be easily or economically retrofitted to meet these standards or to accommodate present day office electronics, communications equipment, or heating and cooling systems. If these buildings are not replaced, they would eventually need to be shut down for safety reasons, and their missions would be compromised.

Employee safety would be improved by providing modern, well-designed workspaces. Current structures are poorly suited to today's demanding security needs. Many safety controls can be deployed by only new building design and construction. In addition, NNSA's purpose is to: (1) improve the quality of the facilities to carry out current and future anticipated research programs in support of NNSA's missions, (2) decrease and control operational and maintenance costs for LANL facilities, and (3) consolidate peer groups that need to interact frequently and provide a working environment that encourages collaboration, creative innovation, and efficiency.

Three of the projects proposed in this appendix are part of a TA-3 Revitalization Plan, which specifically addresses changes to one of LANL's most populated TAs; these include the Physical Science Research Complex in TA-3, construction and operation of Replacement Office Buildings in TA-3, and the Remote Warehouse and Truck Inspection Station in TA-72. Other projects address consolidation of LANL radiochemistry and nuclear nonproliferation capabilities in a new complex at TA-48, replacement of radioactive liquid waste treatment capabilities at TA-50, refurbishment of the LANSCE at TA-53, relocation of nondestructive examinations into a radiography facility at TA-55, refurbishment of the Plutonium Facility Complex in TA-55, and construction of a new Science Complex in either TA-62 or TA-3. Additional discussion of the purpose and need for the Radioactive Liquid Waste Treatment Facility Upgrade Project, TA-55 Radiography Facility Project, and Remote Warehouse and Truck Inspection Station Project are described below. The remaining projects are encompassed by the general purpose and need discussion above.

Purpose and Need for the Radioactive Liquid Waste Treatment Facility Upgrade Project

NNSA needs to provide reliable means for treating LANL-generated radioactive liquid wastes in compliance with DOE and other applicable regulatory requirements. Capability is needed for the treatment of liquid low-level radioactive waste, acidic transuranic waste, caustic transuranic waste, and small amounts of industrial wastewater that are generated in support of mission-critical and other work performed at LANL. Specifically, the ability to manage radioactive liquid waste is necessary for the continued performance of Stockpile Stewardship Program work in the Plutonium Complex and the Chemistry and Metallurgy Research Building. The current facility is over 40 years old and has liquid effluent discharges and air emissions resulting from liquid waste treatment that must meet current regulatory requirements. NNSA needs to provide for the ability to modify or expand treatment components as necessary to meet future regulatory requirements that may be more stringent than those currently in effect.

Purpose and Need for the Technical Area 55 Radiography Facility Project

Examination of nuclear items and components through radiography is a key process in U.S. nuclear weapons stockpile safety and reliability verification. Use of high-energy radiography capability formerly located at TA-8 required nuclear items and components to be temporarily moved out of TA-55 where the items and components are fabricated and stored. Transportation and examination at TA-8 required significant security resources. Movement of these nuclear items and components has become difficult. In addition, TA-8 facilities require extensive renovations to meet current requirements for a nuclear facility. High-energy radiography capability for nuclear materials is limited, affecting mission milestones and deadlines. NNSA needs to provide a more efficient high-energy radiography capability that eliminates the need for transporting nuclear items and components outside the security perimeter of TA-55.

Purpose and Need for the Remote Warehouse and Truck Station

The current warehouse facility is over 50 years old and has become cramped as LANL and NNSA have increased materials holding time requirements for materials in order to meet quality control inspection and chain-of-custody protocols. Additionally, LANL programs and activities have been expanding, resulting in increases in the amount of material processed at the current TA-3 warehouse facility. The current TA-3 warehouse facility is not properly equipped or constructed to meet current security requirements, including the need to segregate incoming vendor vehicles from government warehouse vehicles. Furthermore, the current location of the TA-3 warehouse facility requires offsite vehicles to travel through the densely populated TA-3 areas.

Overview of Projects

A brief introduction to each project is presented below, with detailed analysis of the environmental impacts associated with each project presented in the following sections. Chapter 4 of this SWEIS provides a detailed description of the affected environment at LANL. Therefore, the affected environment discussion is minimal in this appendix unless unique characteristics of the project or project area require further discussion.

Physical Science Research Complex (Technical Area 3)

Approximately 750 scientists from various divisions and disciplines located across LANL would be consolidated and collocated in this new facility, which would facilitate the science required for nuclear weapons stockpile stewardship and certification. The Physical Science Research Complex would be constructed in a developed area of TA-3 that currently has several existing structures in it; these structures would be demolished to accommodate the new facility.

Replacement Office Buildings (Technical Area 3)

The TA-3 Replacement Office Buildings would consolidate staff currently located in temporary structures or aging permanent buildings throughout TA-3 or from other parts of LANL. The complex would consist of 12 new buildings and related parking infrastructure. The replacement offices would include a Los Alamos Site Office Building. The number of staff housed in the overall Replacement Office Buildings would total approximately 900.

Radiological Sciences Institute, including Phase I – The Institute for Nuclear Nonproliferation Science and Technology (Technical Area 48)

NNSA proposes to build a new consolidated and integrated Radiological Sciences Institute. This project would serve two purposes: (1) modernization of LANL radiochemistry capabilities, and

(2) assumption of capabilities that could potentially be lost from LANL due to changes in other facilities (such as hot cell capabilities from the Chemistry and Metallurgy Research Building). The new institute would be constructed over 20 years, in a phased approach. Construction of the first phase, the Institute for Nuclear Nonproliferation for Science and Technology, is proposed to begin during the timeframe analyzed in this SWEIS. The Institute for Nuclear Nonproliferation Science and Technology would ultimately include a Security Category I and II training facility with a Security Category I vault, several Security Category III and IV laboratories, a field security test laboratory, a secure radiochemistry facility, and associated office support facilities. Further, Security Category III and IV material and capabilities from TA-18 that would remain at LANL would be relocated to the Institute for Nuclear Nonproliferation Science and Technology.

Radioactive Liquid Waste Treatment Facility Upgrade (Technical Area 50)

NNSA proposes to construct a new treatment facility adjacent to the existing Radioactive Liquid Waste Treatment Facility to ensure that LANL can maintain the capability to treat radioactive liquid waste safely, reliably, and effectively for the next 50 years with normal maintenance. The main building of the existing Radioactive Liquid Waste Treatment Facility would be retained; the three annexes that do not meet current seismic or wind-loading standards would undergo DD&D. The new structure would house equipment for treating liquid low-level radioactive waste and liquid transuranic waste and would provide flexibility to accommodate new technology that may be required in the upcoming years to meet more stringent discharge standards.

Los Alamos Neutron Science Center Refurbishment (Technical Area 53)

Since the LANSCE linear accelerator first accelerated protons in 1972, the facility mission has evolved considerably. However, investment in the physical infrastructure and technology has not been adequate to ensure long-term sustainable operation at high reliability. The LANSCE Refurbishment Project proposes to sustain reliable facility operations well into the next decade. The LANSCE Refurbishment Project would address the following priorities: (1) replacing facility equipment where necessary to address code compliance or end-of life issues that could severely impact facility operations; (2) enhancing cost-effectiveness by system refurbishments or improvements that stabilize decreasing facility reliability and maintainability; (3) stabilizing the overall beam availability and reliability in a manner that is sustainable over the longer term; and (4) accomplishing the above with minimal disruption to scheduled user programs.

Radiography Facility (Technical Area 55)

This project would enhance the safety and ease the logistics of LANL's stockpile management procedures. Nondestructive examinations using dye penetrant testing, ultrasonic testing, and x-ray radiography of nuclear items and weapons components are necessary elements of LANL's mission for stockpile management. Many steps of this process occur in TA-55, but final radiography was performed in TA-8. This required that the nuclear components and items be shipped between TA-55 and TA-8, a distance of 4.5 miles (7.2 kilometers), for this single step of the examination process. A rolling roadblock was required when the materials were transported, and a temporary material accountability area needed to be set up in TA-8 while the nondestructive examination procedures took place. These steps required significant security resources, making the process expensive, logistically difficult, and inefficient. NNSA proposes to construct a new high-energy nondestructive examination facility at TA-55 to eliminate the need for transporting these nuclear items to different locations at LANL during the examination process.

Plutonium Facility Complex Refurbishment (Technical Area 55)

The TA-55 Plutonium Facility Complex was constructed in the mid-1970s and has been in operation for approximately 30 years. Although systems in this complex function as designed, many are near the end of their design lives and have become increasingly difficult and expensive to maintain. NNSA has determined that an investment is needed in the near term to upgrade electrical, mechanical, safety, and other selected facility-related systems that are approaching the end of life. The proposed project comprises a number of subprojects considered for execution within the timeframe analyzed in this SWEIS.

Technical Area 62 (Technical Area 3) Science Complex

The Science Complex would consist of two buildings and one supporting parking structure that would be constructed in TA-3 or north of TA-3 in TA-62. This new complex would provide approximately 400,200 square feet (37,180 square meters) of office and light laboratory space in support of basic and applied scientific research and technology. One of the buildings would provide facilities for many of the bioscience activities currently conducted in the former Health Research Laboratory, now known as the Bioscience Facilities, located adjacent to the Los Alamos townsite.

Technical Area 72 Remote Warehouse and Truck Inspection Station

The current warehouse located at TA-3 provides centralized shipping, receiving, distribution, packaging, and transportation compliance and mail services for all LANL organizations. The facility is over 50 years old and has become cramped as LANL and NNSA have increased materials holding time requirements for purposes of quality control inspection and chain-of-custody protocols. The facility does not meet current security requirements. NNSA proposes construction of a consolidated warehouse facility and truck inspection complex in TA-72 to replace the current warehouse facility and LANL's temporary truck inspection station.

G.1 Physical Science Research Complex Construction and Operation Impact Assessment

This section provides an impact assessment for the construction and operation of a Physical Science Research Complex in TA-3 at LANL. Section G.1.1 provides background information on the construction project and a physical description of the Physical Science Research Complex. Section G.1.2 provides a description of the proposed project to construct and operate a Physical Science Research Complex in TA-3. Section G.1.3 provides an analysis of environmental consequences of the proposed project and the No Action Alternative.

G.1.1 Introduction

Over the past 3 years, a detailed analysis of the cost of operating and maintaining LANL facilities and a prioritization system to fund facilities and infrastructure upgrades have been developed. NNSA has been evaluating and implementing methods to reduce facility costs and has identified distinct areas that must be addressed to ensure future infrastructure sustainability. These areas include facility consolidation and cost reduction initiatives to reduce facility footprints and operating costs, as well as the improvement of safety, security, environmental protection, scientific interactions, and productivity. A TA-3 Revitalization Plan has been developed to address the upgrade of LANL's most populated area. The proposed construction and operation of the Physical Science Research Complex in TA-3 is one such consolidation and strategic planning effort being considered at LANL.

Theoretical and computational weapons physics research requires the use of delicate equipment and highly sensitive computers in carefully regulated laboratory environments. However, many such activities at LANL are currently conducted in scattered, 20- to 50-year-old facilities, many of which are obsolete and increasingly expensive to operate. The lack of adequate building infrastructure has resulted in experiments being conducted in spaces never intended to serve as laboratories. The space that has been made available to conduct this research is spread across TA-3, TA-35, and TA-53, rather than being consolidated in a single facility resulting in inefficiencies among the staff. Recent and ongoing construction actions have been undertaken to correct these deficiencies and address the modernization of several such facilities in TA-3, including the Nonproliferation and International Security Center, the Nicholas C. Metropolis Center for Simulation and Modeling, and the National Security Science Building. The Physical Science Research Complex would complete the theoretical and computational research core in TA-3. The project would consolidate and relocate critical operations necessary for continued support of the stockpile stewardship mission. The proposed Physical Science Research Complex would be located in TA-3, just west of the Nonproliferation and International Security Center.

G.1.2 Options Considered

The two options identified for the Physical Science Research Complex are the No Action Option and the proposed project option.

G.1.2.1 No Action Option

Under the No Action Option, LANL stockpile stewardship mission staff would continue to operate at current levels at existing geographically dispersed facilities at TA-3, TA-35, and TA-53. Corrective maintenance and actions would continue to be performed as facility infrastructure failures occur. Staff consolidation in a state-of-the-art research center would not occur, nor would the proposed DD&D of vacated older buildings and structures.

G.1.2.2 Proposed Project

The proposed project is the construction and operation of a new Physical Science Research Complex in a currently developed area of TA-3 (see **Figure G–2**). The Physical Science Research Complex would provide a new, modern facility and would consolidate staff currently located throughout TA-3, in TA-35, and in TA-53 in temporary structures or aging permanent buildings in failing and poor condition. Approximately 750 upper-level management, technical, and administrative staff whose work directly supports the Stockpile Stewardship Program would be consolidated in this facility. Currently, these individuals are located in outdated buildings or transportables (office trailers) in TA-3, TA-35, and TA-53 (LANL 2006a). The Physical Science

Research Complex would consist of up to four buildings, providing approximately 350,000 square feet (32,500 square meters) of space to house offices, light laboratories, computer rooms, analytical facilities, and support and common areas. Each building would be four stories tall; three of the four buildings would be designated as classified buildings and require security controls and fencing (LANL 2006a). In total, the facility would have a combined footprint of approximately 128,000 square feet (11,900 square meters). Approximately 30 percent of the total floor space would be composed of light-to-medium experimental laboratories, consisting primarily of laser laboratories (LANL 2006a). The Physical Science Research Complex would be sited south of the National Security Science Building where the Administration Building parking lot, guard station, Integrated Management Building and associated transportables, and part of the Administration Building A wing are located today.

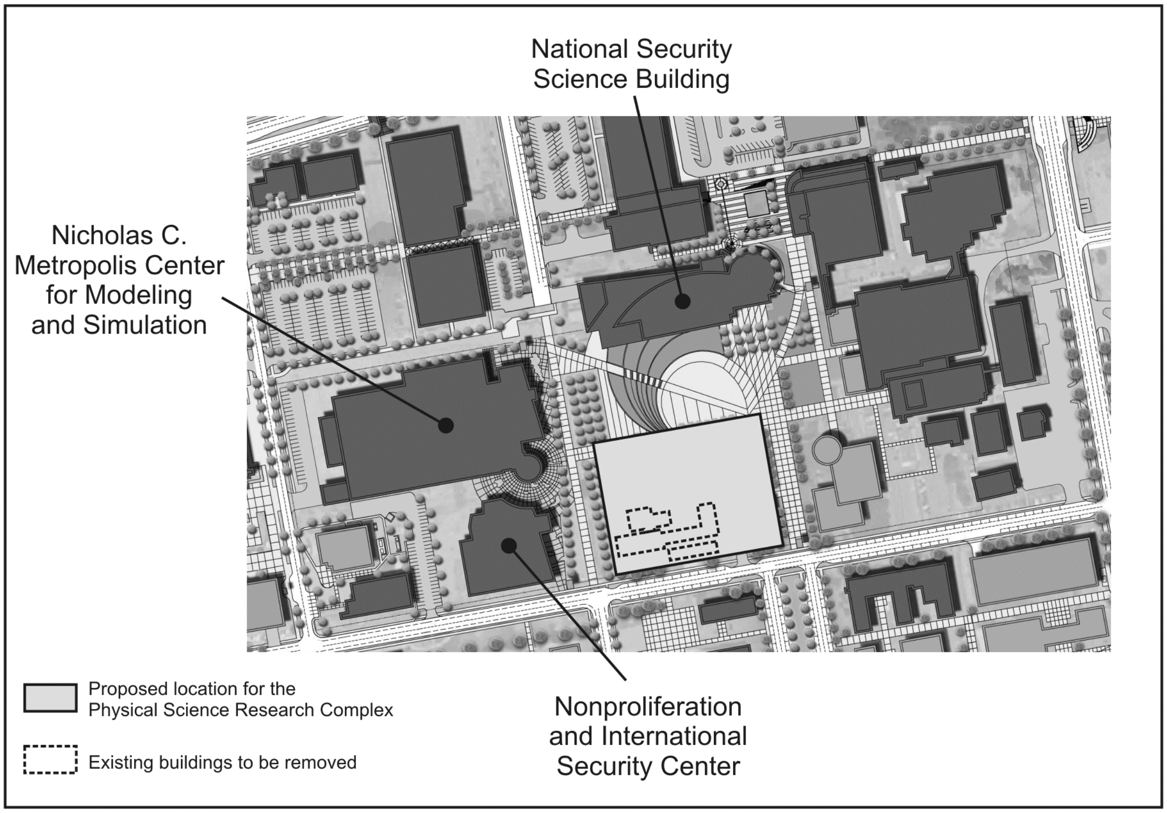


Figure G–2 Proposed Location for the Physical Science Research Complex

The light laboratories would have an efficient heating, ventilating, and air conditioning system with an ability to control temperature within 2 to 3 degrees; specialized flooring to limit vibration; extensive electrical grounding; and pressurized air, helium, and nitrogen gas available for use. No wet chemistry is expected to be conducted in the Physical Science Research Complex. The complex would include a clean room and vault space for classified weapons designers and would require a substantial amount of electricity (LANL 2006a). Common areas would include three auditoriums of different sizes, various-sized conference rooms, a 20,000-square-foot (1,900-square-meter) computer room with access floor, a computer equipment room, a vault-type room for offices, a computer machine room, a kitchen, and equipment storage rooms (LANL 2006a).

As shown in Figure G–2, construction and operation of the Physical Science Research Complex would occur at a location in TA-3 that includes approximately 74,000 square feet (6,900 square meters) of existing structures. These structures (TA-03-0028, -0142, -0510, -1559, -1566, and 1663) would undergo DD&D to accommodate construction of the proposed new facility. Once constructed, the Physical Science Research Complex would also house staff and capabilities from approximately 22 other LANL structures. In total, about 30 buildings and structures located across TA-3, TA-35, and TA-53 comprising about 867,000 square feet (80,550 square meters) would be removed under the proposed project. Physical Science Research Complex construction is scheduled to begin in 2010 and take approximately 2 years to complete. The associated DD&D of buildings within the proposed footprint of the Physical Science Research Complex would occur at the beginning of this timeframe, with subsequent DD&D of other buildings in TA-3, TA-35, and TA-53 occurring after their respective staff have relocated to the Physical Science Research Complex. At this time, project-specific work plans have not been prepared that would define the actual methods, timing, or workforce to be used for DD&D of these structures. Typical processes and methods for DD&D as discussed in Appendix H would be used for this proposed project.

G.1.3 Affected Environment and Environmental Consequences

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Land Resources* – The proposed site is in an already-developed area of TA-3 and the proposed land use is consistent with land use plans. Only the visual environment is included in the impacts discussion.

- *Water Resources* – The proposed site is located in an already-developed area of TA-3, and operations would not result in new discharges.

- *Ecological Resource*s – The proposed project is located in an already-developed area of TA-3; in general, wildlife is expected only around the periphery of TA-3.

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.

- *Environmental Justice* – The proposed project is confined to an already-developed area of TA-3, with no disproportionate human health impacts to low-income or minority populations expected.

- *Facility Accidents* – The proposed project would not implement new activities associated with radiological materials; only industrial accidents may occur.

This impact assessment focuses on those areas of the affected environment where potential impacts would occur: visual environment, geology and soils, air quality and noise, human health, cultural resources, site infrastructure, waste management, and transportation.

G.1.3.1 No Action Option

Under the No Action Option, NNSA would not construct the Physical Science Research Complex at TA-3 and LANL stockpile stewardship mission staff would continue to occupy existing structures spread among three TAs at the site. Benefits that would result from consolidating personnel in a modern facility would not occur. Outdated structures and temporary buildings that presently accommodate personnel would continue to contribute adversely to the visual character of TA-3 and other areas. Benefits in the areas of resource efficiency and conservation that would be realized by vacating currently occupied energy-inefficient structures would not take place. Expenses for repairs and replacement of aging heating, ventilation, and air conditioning systems and other building components would increase. As building systems and other components fail and cannot be replaced or repaired, affected buildings would be partially or completely closed and the staff relocated. No disturbance of existing TA-3 land or building sites would occur. The proposed vacating and DD&D of outdated facilities and temporary buildings would not occur, and no construction or DD&D waste requiring disposal would be generated.

G.1.3.2 Proposed Project

Land Resources—Visual Environment

Construction Impacts—Impacts on visual resources resulting from construction of the Physical Science Research Complex would be temporary in nature and could include increased levels of dust from heavy equipment.

Operations Impacts—The existing buildings are part of the "dense mixed development" within TA-3 that constitutes an adverse visual impact because it contains unusually discordant structures (NNSA 2001). The proposed Physical Science Research Complex would be visually compatible with nearby office and computing structures and would enhance the overall architectural character of the Core Development Area.

DD&D Impacts—Impacts on visual resources resulting from DD&D of vacated buildings under the proposed project would be temporary in nature and could include increased levels of dust from heavy equipment. Once these activities are completed, the general appearance of TA-3, TA-35, and TA-53 should benefit from the removal of outdated and vacated structures.

Geology and Soils

The site for the Physical Science Research Complex lies within a part of the Pajarito Fault system characterized by subsidiary or distributed fault ruptures; two small, closely spaced faults are located below TA-3. The annual probability of surface rupture in areas beyond the principal or main trace of the Pajarito Fault, such as at the Physical Science Research Complex site, is less than 1 in 10,000 (LANL 2004c). To account for seismic risk, the Physical Science Research Complex would be designed and constructed in accordance with current DOE seismic standards and applicable building codes.

Construction Impacts—Approximately 499,000 cubic yards (381,000 cubic meters) of soil would be disturbed during building excavation within areas already disturbed by previous facility construction; there would be no impact on undisturbed LANL soils. Construction of the new buildings would require removal of soils as well as new excavation of shallow bedrock in some areas. As a result, construction and DD&D activities would generate excess soil and excavated bedrock that may be suitable for use as backfill. This uncontaminated backfill material would be stockpiled at an approved material management area at LANL for future use. Best management practices would be implemented to prevent erosion and migration of disturbed materials from the site caused by stormwater or other water discharges or wind.

DD&D Impacts—DD&D activities associated with existing facilities would have a negligible additional impact on geologic and soil resources at LANL, as the affected facility areas are developed and adjacent soils are already disturbed. Additional ground disturbance would be necessary to establish laydown yards and waste management areas in the vicinity of the facilities to be razed. Available paved surfaces, such as parking lots in the vicinity of the facilities to be demolished, would be used to the extent possible.

The major indirect impact on geologic and soil resources at the DD&D locations would be associated with the need to excavate any contaminated tuff and soil from beneath and around facility foundations. Borrow material (such as crushed tuff and soil) would be required to fill the excavations to grade, but such resources would be available from onsite borrow areas (see Section 5.2) and in the vicinity of LANL. LANL staff would survey potentially affected areas to determine the extent and nature of any contamination and required remediation in accordance with established procedures. All excavated contaminated media would be characterized and managed according to waste type and all applicable LANL procedures and regulatory requirements.

Air Quality and Noise

Construction Impacts—Construction of new facilities at TA-3 would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the site work and erection construction phases of the TA-3 Physical Science Research Complex's largest new facilities and compared to the most stringent standards. Construction modeling considered particulate emissions from activity in the construction area and emissions from various earthmoving and material-handling equipment. The maximum ground-level pollutant concentrations off site and along the perimeter road to which the public has regular access would be below the ambient air quality standards, except for possible short-term concentrations of nitrogen oxides and carbon monoxide. Estimated concentrations for particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}) would be greatest for the site work phase. Estimated maximum PM_{10} concentrations are an annual average of 3.5 micrograms per cubic meter and a 24-hour average of 72.1 micrograms per cubic meter. The maximum annual and short-term concentrations for construction would occur at the site boundary or roadway north-to-northeast of TA-3. Soil disturbance during construction could result in small radiological air emissions, but would be controlled by best management practices, thereby resulting in no impacts on workers or the public.

Construction of the new Physical Science Research Complex at TA-3 would result in a temporary increase in noise levels from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of construction equipment operation. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employee vehicles and materials and debris shipments. Noise sources associated with construction at TA-3 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Criteria and toxic air pollutants could be generated from the operation and testing of an emergency generator, if an additional one is necessary. Also, the use of various chemicals in laboratories and other activities would result in criteria and toxic air pollutant emissions. Emissions from the diesel generator would occur during periodic testing and would result in little change in air pollutant concentrations, and expected air quality impacts on the public would be minor.

Little or no change in toxic pollutant emissions or air pollutant concentrations at LANL is expected under this option. Toxic pollutants released from laboratories would vary by year with the activities performed and are expected to be similar to the current combined emissions from the existing buildings and capabilities that would be consolidated at TA-3. The emissions would continue to be small and below Screening-Level Emission Values (see Appendix B). Therefore, the air quality impacts on the public would be minor. Additionally, operations would have no significant radiological air emissions.

Noise impacts of operating the new Physical Science Research Complex at TA-3 are expected to be similar to those of existing operations at TA-3. Although there would be small changes in traffic and equipment noise (for example, new heating and cooling systems) near the area, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of operating these new facilities.

DD&D Impacts—DD&D of buildings being replaced by the Physical Science Research Complex would result in temporary increases in air quality impacts of construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were not modeled for the DD&D of buildings at TA-3, but would be less than those from construction of the new facilities. DD&D of buildings at other TAs would be similar to DD&D activities taking place at various areas at LANL. Concentrations off site and along the roads to which the public has regular access would be below ambient air quality standards. Soil disturbance during demolition could result in small radiological air emissions, but would be controlled by best management practices, thereby resulting in no impacts on workers or the public.

DD&D of excessed buildings and structures in TA-3, TA-35, and TA-53 would result in some temporary increase in noise levels near the area from construction equipment and DD&D activities. Some disturbance of wildlife near the area may occur as a result of construction equipment operation. There would be no change in noise impacts on the public outside of LANL as a result of DD&D activities, except for a small increase in traffic noise levels from DD&D employee vehicles and materials and debris shipments.

Human Health

Construction Impacts—Potentially serious exposures to various hazards or injuries would be possible during the construction and DD&D phases of the proposed project. Adverse effects could range from relatively minor (such as lung irritation, cuts, or sprains) to major (such as lung damage, broken bones, or fatalities) (DOE 2004, BLS 2003). The potential for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 1.99 million person-hours to construct the new facilities, no fatal accidents are expected to occur. Nonfatal injuries are estimated to be between 23 (DOE 2004) and 84 (BLS 2003).

To prevent serious exposures and injuries, all site construction contractors would be required to submit and adhere to a Construction Safety and Health Plan and undergo site-specific hazard training. No potential offsite human health effects of construction hazards are expected.

Operations Impacts—Physical Science Research Complex operation is expected to have a beneficial effect on the LANL staff working environment, as working conditions would be improved by use of proper lighting, heating, ventilation, and air conditioning, and ergonomic equipment and furniture. Office, administrative, and light laboratory activities would constitute most of the Physical Science Research Complex operations, and applicable safety and health training and worksite criteria would be required for these workers.

DD&D Impacts—A potential source of impacts on noninvolved workers and members of the public would be associated with the release of radiological contaminants during the DD&D process. Any emissions of contaminated particulates would be reduced by the use of plastic draping and enclosures, coupled with high-efficiency particulate air (HEPA) filters. Construction and demolition workers would be actively involved in potentially hazardous activities such as heavy-equipment operations; soil excavations; and handling, assembly, or DD&D of various building materials. Potentially serious exposures to various hazards or injuries are possible during the DD&D phase of the proposed project. Adverse effects could range from relatively minor (such as lung irritation, cuts, or sprains) to major (such as lung damage, broken bones, or fatalities). The potential for industrial accidents is based on both DOE and the Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 286,000 person-hours to demolish the new facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be approximately 3 (DOE 2004) to 12 (BLS 2003).

To prevent serious exposures and injuries, all site construction contractors would be required to submit and adhere to a Construction Safety and Health Plan and undergo site-specific hazard training. Appropriate personal protection measures, such as personal protection device use (gloves, hardhats, steel-toed boots, eyeshields, and earplugs or ear covers) would be a routine part of construction activities. The proposed project is not expected to have an effect on the health of any demolition workers under normal operations conditions.

DD&D of certain buildings and structures in TA-3 would involve removal of some asbestos-contaminated material, which would be conducted according to existing asbestos management programs at LANL which are in compliance with strict asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls. As a result of the controls that would be established, no asbestos would be released that could be inhaled by members of the public.

Cultural Resources

DD&D Impacts—The proposed site of the Physical Science Research Complex is in an already-developed area of TA-3. However, TA-03-0028 is a potentially significant historic building that would be removed. Prior to its demolition it would be assessed for inclusion in the National Register of Historic Places. The current Administration Building (TA-03-0043) has been formally declared as eligible for the National Register of Historic Places and a Memorandum of Agreement has been signed regarding required documentation prior to its removal.

Socioeconomics and Infrastructure

Construction Impacts—Utility infrastructure resources would be required for Physical Science Research Complex construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection. Construction is estimated to require 2.6 million gallons (10 million liters) of liquid fuels and 14.4 million gallons (54 million liters) of water for the entire project.

The existing LANL infrastructure would be capable of supporting requirements for new facility construction without exceeding site capacities, resulting in a negligible impact on site utility infrastructure. Utility lines are located adjacent to the proposed building sites and would require minimal trenching to connect them to the new structures. Minor repairs to existing underground sewer or water lines may be necessary (NNSA 2001).

Operations Impacts— Physical Science Research Complex operations would result in estimated annual electrical and water requirements of 45,000 megawatt-hours and 9.6 million gallons (36 million liters), respectively (LANL 2006a). This power and water use would be similar to or less than the facilities that are being replaced. Although LANL does not meter water or electrical use at most buildings, nor does it track waste generated at individual buildings, the Physical Science Research Complex is expected to operate with more energy-efficient utility systems than the current structures. Water consumption is also expected to decrease with the DD&D of existing resource-inefficient structures currently in operation. As such, Physical Science Research Complex operation is expected to have no or negligible incremental impact on utility infrastructure capacities at LANL.

DD&D Impacts—Activities associated with DD&D of facilities to be replaced by the Physical Science Research Complex are projected to require 129,000 gallons (488,000 liters) of liquid fuels and 4.1 million gallons (16 million liters) of water. DD&D activities would be staggered over an extended period of time. As a result, impacts of these activities on LANL's utility infrastructure are expected to be very minor on an annualized basis. Standard practice dictates that utility systems serving individual facilities be shut down as they are no longer needed. As DD&D activities progress, interior spaces, including associated equipment, piping, and wiring, would be removed prior to final demolition. Thus, existing utility infrastructure would be used to the extent possible and would then be supplemented or replaced by portable equipment and facilities as DD&D activities proceed.

Waste Management

Construction Impacts—Physical Science Research Complex construction would result in approximately 1,600 cubic yards (1,200 cubic meters) of waste, consisting primarily of debris such as gypsum board, pallets, and wire generated in the course of normal construction. Waste types and quantities generated by removal of the structures would be within the capacity of the existing waste management system and would not result in a substantial impact on existing waste management disposal operations.

No known potential release sites are present within the proposed footprint of the Physical Science Research Complex site (LANL 2006a). Should any potential release site be disclosed during subsurface construction work, LANL's environmental restoration project staff would review the site, stipulate procedures for working within that site area, and perform remediation as needed consistent with DOE and the Compliance Order on Consent (Consent Order) (NMED 2005) requirements.

Operations Impacts—Solid waste generated during Physical Science Research Complex operations would be disposed of at the Los Alamos County Landfill or other appropriate solid waste landfill. The amount of waste generated during Physical Science Research Complex operations would not increase substantially from current volumes generated at the existing structures. Sanitary waste would be removed from the facility via sanitary wastewater lines to the Sanitary Wastewater Systems Plant.

DD&D Impacts—DD&D of associated buildings would produce approximately 195,000 cubic yards (149,000 cubic meters) of waste, including low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, sanitary waste, and nonhazardous solid waste. DD&D would also generate about 314,000 pounds (142,000 kilograms) of chemical waste and 311 cubic yards (238 cubic meters) of asbestos waste. This waste would be packaged according to applicable requirements and sent to the LANL asbestos transfer station for shipment off site to a permitted asbestos disposal facility along with other asbestos waste generated at LANL. The anticipated amount of waste would not be beyond the disposal capacity of existing on and offsite disposal facilities. **Table G–1** summarizes waste types and volumes expected to be generated during DD&D activities. Although excessed LANL transportables are usually donated to the public, it has been assumed for purposes of analysis that they would also be dispositioned as demolition debris. About 8.9 percent of waste produced during DD&D activities is bulk low-level radioactive wastes. For purposes of analysis, NNSA has evaluated both the on and offsite disposal of low-level radioactive waste to ensure that the environmental consequences of either waste management option were considered. Potential available offsite disposal sites include the Nevada Test Site near Mercury, Nevada, and a commercial facility.

Table G–1 Estimated Waste Volumes from Physical Science Research Complex Decontamination, Decommissioning, and Demolition Activities (cubic yards)

Low-Level Radioactive Waste	*Mixed Low-Level Radioactive Waste*	*Solid* [a]	*Hazardous*	*Asbestos*
17,400	< 1	177,000	3	311

[a] Includes demolition and sanitary waste.
Note: To convert cubic yards to cubic meters, multiply by 0.76455.

For disposal of generated low-level radioactive waste, two capability scenarios were evaluated. Low-level radioactive waste could be disposed of on site or shipped off site, with the selected disposal path determined based on TA-54 disposal capacity and disposal priorities.

Scenario 1. Under this scenario, NNSA would pursue offsite disposal of the low-level radioactive waste resulting from DD&D of the buildings and structures, including concrete, soil, steel, and personal protective equipment. Among other possible offsite disposal locations, both the Nevada Test Site, a DOE waste disposal facility, and a commercial facility have the capacity to accept these quantities of waste.

Scenario 2. Under this scenario, low-level radioactive waste would be disposed of on site in TA-54. The current disposal site footprint has limited waste capacity, although expansion into Zone 4 is planned. Onsite disposal capacity is expected to be adequate for the amount of low-level radioactive waste that would be generated by the DD&D activities.

All other wastes generated by the DD&D activities would be handled, managed, packaged, and disposed of in the same manner as the same wastes generated by other activities at LANL. Most mixed low-level radioactive waste generated at LANL is sent off site to other DOE or commercial facilities for treatment and disposal. The estimated volume of mixed low-level radioactive waste generated is small, and offsite disposal capacity is adequate.

Small amounts of hazardous waste would also be generated during DD&D activities. These wastes would be handled, packaged, and disposed of according to LANL's hazardous waste management program and are within its capacity.

Demolition debris and sanitary waste would be managed at the Los Alamos County Landfill or transported to an offsite landfill. For the purposes of analysis, it was assumed that these wastes would be disposed of at an offsite location. DD&D would generate nonradiological asbestos waste. This waste would be packaged according to applicable requirements and sent to the LANL asbestos transfer station for shipment off site to a permitted asbestos disposal facility along with other asbestos waste generated at LANL. Offsite disposal capacity would be adequate.

Transportation

Construction Impacts—Construction personnel would park on site and at remote designated parking areas. Truck traffic volumes carrying waste material to local or regional landfill sites would increase during these periods.

Operations Impacts—Once construction is completed, operation of the Physical Science Research Complex would account for the relocation of approximately 250 personnel from TAs other than TA-3. Using a ratio of 0.45 vehicles per employee, approximately 113 more vehicles may be added to TA-3 roadways and parking areas as a result of Physical Science Research Complex personnel relocation (DOE 1998).

DD&D Impacts—The generated DD&D wastes would need to be transported to storage or disposal sites using over-the-road truck transportation. These sites could be at LANL TA-54 or an offsite location. Transportation has potential risks to workers and the public from incident-free transport, such as radiation exposure as the waste packages are transported along the routes and highways. There is also increased risk from traffic accidents (without release of radioactive material) and radiological accidents (in which radioactive material is released).

The effects of incident-free transportation of construction and DD&D wastes on the worker population and general public are presented in **Table G–2**. Effects are presented in terms of the collective dose in person-rem resulting in excess latent cancer fatalities (LCFs) in Table G–1. Excess LCFs are the number of cancer fatalities that may be attributable to the proposed project and estimated to occur in the exposed population over the lifetimes of the individuals. If the number of LCFs is less than one, the subject population is not expected to incur any LCFs resulting from the actions being analyzed. The risk for development of excess LCFs is highest for workers under the offsite disposition option. This is because the dose is proportional to the duration of transport, which in turn is proportional to travel distance. As shown in Table G–2, disposal of low-level radioactive waste at Nevada Test Site, which is located farthest from LANL, would lead to the highest dose and risk, although the dose and risk are low for all disposal options.

Table G–2 Incident-Free Transportation Impacts – Physical Science Research Complex

Disposal Option	*Low-Level Radioactive Waste Disposal Location*	*Crew*		*Public*	
		Collective Dose (person-rem)	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite disposal	LANL TA-54	0.037	2.2×10^{-5}	0.01	6.0×10^{-6}
Offsite disposition	Nevada Test Site	4.65	0.0028	1.35	0.00081
	Commercial facility	4.51	0.0027	1.32	0.00079

LCF = latent cancer fatality, TA = technical area.

Table G–3 presents the impacts of traffic and radiological accidents. This table provides population risks in terms of fatalities due to traffic accidents from both the collisions themselves and from excess LCFs from exposure to releases of radioactivity. The analyses assumed that all nonradiological wastes would be transported to offsite disposal facilities.

The results in Tables G–2 and G–3 indicate that no traffic fatalities and no excess LCFs are expected from the transportation of generated waste derived from the DD&D of excessed buildings and structures at TA-3, TA-35, and TA-53.

Table G–3 Transportation Accident Impacts – Physical Science Research Complex

Low-Level Radioactive Waste Disposal Location [a]	*Number of Shipments* [b]	*Distance Traveled (10^6 kilometers)*	*Accident Risks*	
			Radiological (excess LCFs)	*Traffic (fatalities)*
LANL TA-54	10,897	4.16	Not analyzed [c]	0.0013
Nevada Test Site	10,897	6.76	1.2×10^{-8}	0.0036
Commercial facility	10,897	6.50	9.6×10^{-9}	0.0033

LCF = latent cancer fatality, TA = technical area.
[a] All nonradiological wastes would be transported off site.
[b] Approximately 10 percent of shipments are radioactive wastes. Others include 90 percent industrial and sanitary waste and about 0.1 percent asbestos and hazardous wastes.
[c] No traffic accident leading to releases of radioactivity for onsite transportation is hypothesized.
Note: To convert kilometers to miles, multiply by 0.6214.

G.2 Replacement Office Buildings Impact Assessment

This section provides an assessment of environmental impacts for the proposed Replacement Office Buildings at TA-3. Section G.2.1 provides background information on the proposed project to build a Replacement Office Building Complex and two parking structures and to DD&D two structures. Section G.2.2 provides a brief description of the proposed options for the replacement offices. Section G.2.3 presents the environmental consequences of the No Action Option and the proposed project (construction and operation of the proposed Replacement Office Buildings at TA–3).

G.2.1 Introduction

NNSA is working to reduce the number of substandard structures across LANL and to relocate staff and activities into more efficient and safe structures. Staff currently occupies trailers and other temporary structures that have exceeded their intended lifespan. NNSA has a congressional mandate to remove facilities at the same rate as new construction. NNSA is in the process of reducing non-office and inefficient office space, focusing on increased use and replacement of inefficient structures.

Over the past 3 years, a detailed analysis of the cost of operating and maintaining LANL facilities and a prioritization system to fund structural and infrastructure upgrades were developed. NNSA evaluated and implemented methods to reduce facility costs and identified distinct areas to be addressed to ensure infrastructure sustainability. These areas include structure consolidation and cost reduction initiatives to reduce structure footprints and operating costs as well as improve safety, security, environmental protection, scientific interactions, and productivity. A TA-3 Revitalization Plan, developed to address the upgrade of LANL's most populated areas and the construction of Replacement Office Buildings in TA-3, is one such consolidation and strategic planning effort being considered at LANL.

G.2.2 Options Considered

The two options identified for the Replacement Office Buildings are the No Action Option and proposed project option.

G.2.2.1 No Action Option

Under the No Action Option, no action would be taken. The site would not be changed and no Replacement Office Buildings or parking structures would be constructed. No DD&D activities would occur. Employees intended for the proposed office buildings would remain at their current locations throughout TA-3, and no consolidation would occur.

G.2.2.2 Proposed Project

The proposed project would be located partially on undeveloped land south of West Jemez Road and partially in the area of the existing Wellness Center and would consist of 12 new buildings (1 would be available to house NNSA's Los Alamos Site Office) and two new parking structures, one north of Mercury Road and one to the south of West Jemez Road. The Wellness Center and a warehouse would be demolished to accommodate this project. The current Los Alamos Site Office Building would also be demolished. Impacts of the Los Alamos Site Office Building DD&D were analyzed in the *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE 1999c). Three office buildings that were proposed before the larger project was envisioned were categorically excluded from further National Environmental Policy Act (NEPA) evaluation under DOE's NEPA implementing regulations. However, these three buildings are integral to this office complex and are included in the impacts analysis. The complex would provide new, modern structures and would consolidate staff located primarily throughout TA-3 in temporary structures or aging permanent buildings in failing and poor condition. LANL staff located in other TAs may also be housed in the new Replacement Office Buildings. The surface parking area near Mercury Road would become a parking structure in the distant future. **Figure G–3** shows the currently proposed layout of the Replacement Office Building complex.

The buildings would be sited partially on undeveloped land south of West Jemez Road and partially in the area of the existing Wellness Center. The Replacement Office Buildings would include construction of a 45,000-square-foot (4,200-square-meter) Los Alamos Site Office Building, which would house approximately 150 staff. Construction of the Los Alamos Site Office Building has begun. The remaining office buildings would consist of two-story structures, each with a footprint of 8,000 to 9,000 square feet (740 to 840 square meters). These new buildings would provide approximately 15,000 to 17,500 gross square feet (1,400 to 1,600 square meters) of office space and house approximately 50 to 70 staff each. The number of administrative staff housed in the overall Replacement Office Buildings would total approximately 900. This staff would migrate from other offices in various locations throughout LANL and would not constitute new hires.

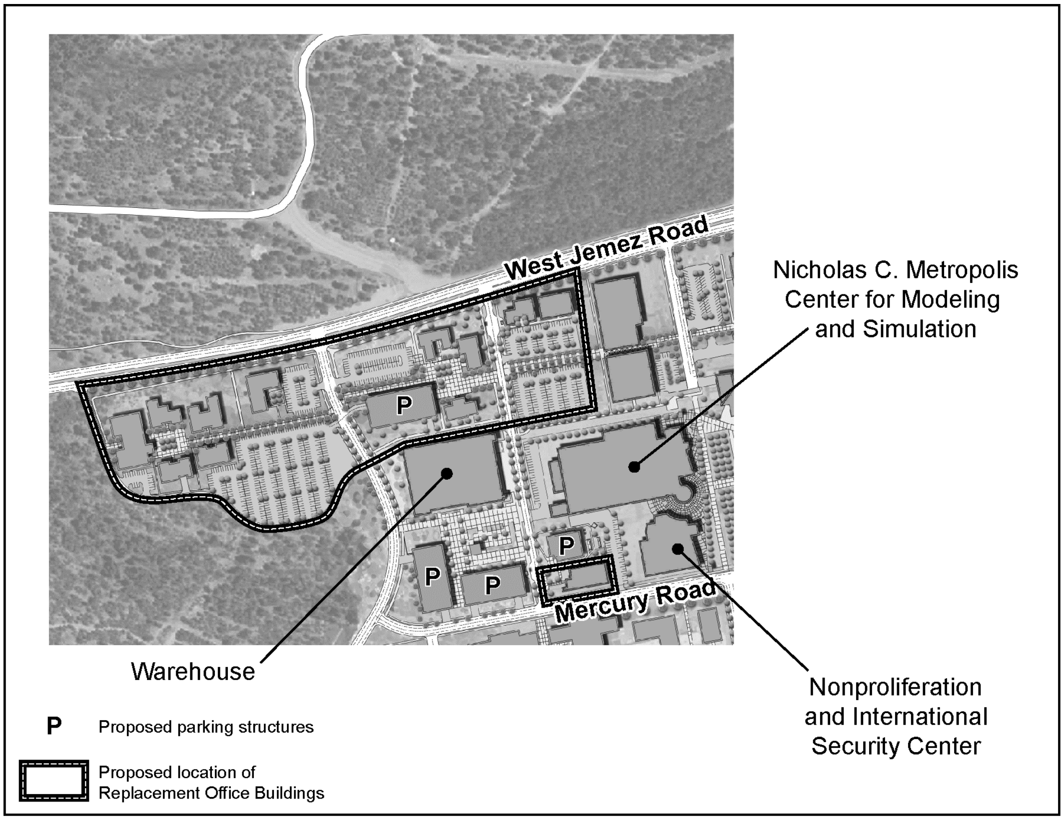


Figure G–3 Replacement Office Building Complex Proposed Layout

G.2.3 Affected Environment and Environmental Consequences

For the Replacement Office Buildings, the affected environment descriptions include only those resource areas that would be impacted. The analysis of environmental consequences relies on the affected environment descriptions in Chapter 4 of this SWEIS. Where information specific to the TA-3 affected environment is available and aids understanding potential impacts of constructing and operating the Replacement Office Buildings, it is included.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.

- *Environmental Justice* – The proposed project is mainly confined to already-developed areas of TA-3, with no disproportionate human health impacts to low-income or minority populations expected.

- *Facility Accidents* – The proposed project would not implement new activities associated with radiological materials; only industrial accidents may occur.

This impact assessment focuses on those areas of the affected environment where potential impacts would occur: land resources, geology and soils, water resources, air quality and noise, ecological resources, human health, cultural resources, site infrastructure, waste management, and transportation.

G.2.3.1 No Action Option

Under the No Action Option, LANL administrative staff would continue to operate at existing scattered LANL locations. The Replacement Office Buildings would not be constructed at TA-3, nor would the Wellness Center or the Warehouse undergo DD&D. Poor quality office space and the effectiveness of current staff to recruit and retain qualified employees would remain a problem. Current DOE seismic standards or applicable building codes would not be met, and use of the buildings would be phased out over time as commercial lease space or space within LANL became available or trailers could be brought on site. Outdated structures and temporary buildings that presently accommodate personnel would continue to contribute adversely to the visual character of the TA-3 area. No disturbance of existing TA-3 land or building sites would occur. There would be no construction or building removal debris to require disposal. Utility usage would remain the same as existing usage in the near future. Continued expenses for repairs and replacement of aging heating, ventilation, and air conditioning systems and other building components would increase. As building systems and other components fail and cannot be replaced or repaired, affected buildings would be partially or completely closed and the staff relocated. Benefits that would result from consolidating personnel in a modern facility that fosters better communication and collaboration between scientists and administrative personnel would not occur. Likewise, benefits would not result in the areas of resource efficiency and conservation by vacating currently occupied energy-inefficient structures.

G.2.3.2 Proposed Project

The Replacement Office Buildings Project also includes DD&D of the existing Wellness Center and warehouse located in the northwest section of TA-3. The following discussion summarizes potential impacts during construction, operations, and DD&D, as appropriate.

Land Resources—Land Use

Construction Impacts—Construction of the Replacement Office Building Complex, including parking lots and construction laydown areas, would require 13 acres (5.3 hectares) of previously undisturbed land within TA-3 that is presently designated as Reserve.

Operations Impacts—Additional acreage would be required within previously disturbed portions of the TA that are designated as Physical and Technical Support. Future land use plans have designated the proposed site area in the undeveloped portion of TA-3 as Physical and Technical Support. Thus, placement of the Replacement Office Buildings and a parking lot within the western part of TA-3 would be consistent with these plans.

Land Resources—Visual Resources

Construction Impacts—Impacts on visual resources resulting from construction of the Replacement Office Building Complex would result in short-term impacts on the visual environment, including increased dust generation due to construction activities.

Operations Impacts—Once complete, the project would result in a change in both near and distant views of TA-3. The project site is partially located within a forested area along West Jemez Road, which would be replaced with buildings and a parking lot. Although landscaping along West Jemez Road could help mitigate views, the new buildings and parking lot would be readily visible from the road and nearby areas. Views from Pajarito Road would also change; however, this would impact primarily employees, as the road is restricted from public use. Also, because the size of developed portions of TA-3 would increase and the area of woodland decrease, distant views of the TA would change as a result of construction of the Replacement Office Building Complex. However, the overall effect would be minimal due to the present highly developed nature of that part of LANL.

Geology and Soils

The Replacement Office Buildings site lies within a part of the Pajarito Fault system characterized by subsidiary or distributed fault ruptures; two small, closely spaced faults are located in TA-3. The annual probability of surface rupture in areas beyond the principal or main trace of the Pajarito Fault, such as at the Replacement Office Buildings site, is less than 1 in 10,000 (LANL 2004c). This probability is less than the required performance goal for the facility and in accordance with DOE standards. Additionally, the Replacement Office Buildings would be designed and constructed in accordance with current DOE seismic standards and applicable building codes.

The proposed area for the facility includes both disturbed and undisturbed soils. The undisturbed soils maintain the present vegetative cover. They are arid soils consisting largely of sandy loam material alluvially deposited from tuff units on higher slopes to the west and eroded from underlying geologic units. In general, the soils are poorly developed, with relatively little horizon differentiation and organic matter accumulation. These factors, combined with the dry moisture regime of the area, result in only a limited number of plant species being able to subsist on the soil medium, which, in turn, supports a very limited number of wildlife species.

Construction Impacts—Construction of the Replacement Office Buildings would include both areas already disturbed by previous facility construction and areas not previously disturbed. The impact on LANL undisturbed (native) soils would be proportional to the total area of new construction. Approximately 369,000 cubic yards (282,000 cubic meters) of soil and rock would be excavated for building construction. As a result, construction activities would generate excess soil and excavated bedrock that may be suitable for use as backfill. Uncontaminated backfill material would be stockpiled at an approved material management area at LANL for future use. Best management practices would be implemented to prevent erosion and migration of disturbed materials from the site caused by stormwater or other water discharges or wind.

Operations impacts—Office building operations would not result in additional impacts on geologic and soil resources at LANL.

DD&D Impacts—DD&D activities associated with existing facilities would have a negligible additional impact on geologic and native soil resources at LANL, as the affected facility areas are already developed and adjacent soils are already disturbed. Additional ground disturbance would be necessary to establish laydown yards and waste management areas in the vicinity of the facilities to be razed. Available paved surfaces, such as parking lots in the vicinity of the facilities to be demolished, would be used to the extent possible.

The major indirect impact on geologic and soil resources at the DD&D locations would be associated with the need to excavate any contaminated tuff and soil from beneath and around facility foundations. Borrow material (such as crushed tuff and soil) would be required to fill the excavations to grade, but such resources are available from onsite borrow areas (see Chapter 5, Section 5.2) and in the vicinity of LANL. LANL staff would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with LANL procedures. All excavated material would be characterized before removing it for disposal.

Water Resources

The proposed site is predominantly flat, with a slight slope toward the adjacent steep-sided canyon to the southwest. During storm events, unchanneled stormwater runoff from the mesa drains into the canyon.

Construction Impacts—Little or no effect on surface water resources is anticipated during construction of the Replacement Office Buildings. The proposed project would not result in disturbance of watercourses or generation of liquid effluents that would be released to the surrounding environment.

Under the current U.S. Environmental Protection Agency (EPA) Construction General Permit Program, permits are required for all LANL construction activities or other projects that disturb 1 or more acres (0.4 or more hectares) of land. Conditions of the permit require the development and implementation of a stormwater pollution prevention plan. Silt fences, hay bales, or other appropriate best management practices would be employed to minimize stormwater transport of fine particulates (disturbed during construction) into surface water in the vicinity of TA-3.

Operations Impacts—There would be an increase in stormwater runoff associated with the new office building because of the increase in impervious areas of buildings and parking lots. The replacement of buildings should not change the stormwater runoff from these TAs significantly.

Air Quality and Noise

Construction Impacts—Construction of new facilities at TA-3 would result in temporary increases in air quality impacts of construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the site work and erection construction phases of TA-3's largest new facilities and compared to the most stringent standards. The maximum ground-level concentrations off site and along the perimeter road to which the public has regular access would be below the ambient air quality standards, except for possible short-term concentrations of nitrogen oxides and carbon monoxide. Estimated concentrations for PM_{10} would be greatest for the site work phase. Estimated maximum PM_{10} concentrations are an annual average of 3.8 micrograms per cubic meter and a 24-hour average of 78.5 micrograms per cubic meter. The maximum annual and short-term concentrations for construction would occur at the site boundary or roadway north-to-northeast of TA-3. Modeling considered particulate emissions from activity in the construction area and emissions from various earthmoving and material-handling equipment.

Construction of new office facilities at TA-3 would result in some temporary increase in noise levels from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of construction equipment operation. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employees' vehicles and materials shipments. Noise sources associated with construction at TA-3 are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Operation of the Replacement Office Buildings at TA-3 would not result in an increase of criteria pollutant emissions above the existing level because the total number of employee trips to LANL would remain the same.

Noise impacts of operating the new office complex at TA-3 are expected to be similar to those from overall existing operations at TA-3. Although there would be a small change in traffic and equipment noise (for example, new heating and cooling systems) near the area, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of operating these new structures.

DD&D Impacts—DD&D of buildings being replaced by new facilities would result in temporary increases in air quality impacts of construction equipment, trucks, and employee vehicles. Maximum ground-level concentrations offsite and along the perimeter road to which the public has regular access would be below the ambient air quality standards, except for short-term concentrations of nitrogen oxides, carbon monoxide, and PM_{10}.

Demolition of the Wellness Center and warehouse would result in some temporary increase in noise levels from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of construction equipment operation. There would be no change in noise impacts on the public outside of LANL as a result of demolition activities, except for a small increase in traffic noise levels from construction employees' vehicles and materials shipments.

Ecological Resources

Construction Impacts—Construction of the Replacement Office Building Complex would involve clearing and grading 13 acres (5.3 hectares) of ponderosa pine and mixed conifer forest within TA-3. This would result in loss of less-mobile wildlife, such as reptiles and small mammals, and cause more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity of the area into which they moved. If the area were at its carrying capacity, displaced animals would not be likely to survive. Indirect impacts of construction, such as noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Such disturbance would span the construction period. These impacts could be mitigated by clearly marking the construction zone to prevent equipment and workers from disturbing adjacent habitat and by properly maintaining equipment. Construction of the new buildings and parking lot would not impact wetlands, as none are located in or near the construction zone.

The northern portion of TA-3 falls within the Los Alamos Canyon Mexican spotted owl (*Strix occidentalis lucida*) Area of Environmental Interest. Potential impacts to the Mexican spotted owl were evaluated in a biological assessment prepared by DOE. This assessment noted that although 11.2 acres (4.5 hectares) of buffer habitat would be disturbed, spotted owls have been not been detected in Los Alamos Canyon in recent years. The report concluded that if all reasonable and prudent alternatives are taken, actions associated with the construction of the Replacement Office Building Complex may affect, but are not likely to adversely affect, the Mexican spotted owl. Reasonable and prudent alternatives include ensuring that all lighting complies with the New Mexico Night Sky Protection Act, appropriate erosion and runoff controls be employed, unnecessary disturbance to vegetation be avoided, and all exposed soils be revegetated as soon as feasible (LANL 2006b). The U.S. Fish and Wildlife Service (USFWS) has concurred with this assessment (see Chapter 6, Section 6.5.2).

Areas of Environmental Interest for the bald eagle (*Haliaeetus leucocephalus*) and southwestern willow flycatcher (*Empidonax traillii extimus*) do not include any part of TA-3. However, recognizing that the bald eagle forages over all of LANL and that some habitat degradation is associated with the Replacement Office Building Complex project, the biological assessment concluded that provided appropriate reasonable and prudent alternatives are implemented to protect adjacent foraging habitat, the project may affect, but is not likely to adversely affect, the bald eagle. In addition to the reasonable and prudent alternatives noted above for the Mexican spotted owl, those for the bald eagle could include not disturbing winter roosting trees, monitoring the presence or absence of eagles during project activities, and keeping noise and disturbance to a minimum. Since the nearest southwestern willow flycatcher Area of Environmental Interest is more than 4.6 miles (7.4 kilometers) from the project site, the biological assessment concluded that the proposed project would have no effect on this species (LANL 2006b). The USFWS has concurred with the biological assessment as it relates to the bald eagle and southeastern willow flycatcher (see Chapter 6, Section 6.5.2).

Operations Impacts—Operation of the Replacement Office Building Complex would have minimal impact on terrestrial resources within or adjacent to TA-3. Because the wildlife residing in the area has already adapted to levels of noise and human activity associated with current operation, it is unlikely that it would be adversely affected by similar types of activity involved with operation of the new buildings. Areas not permanently disturbed (for example, construction laydown areas) would be landscaped; however, this would provide little habitat to native wildlife.

Human Health

Construction Impacts—During construction of the Replacement Office Buildings, some construction-related accidents would potentially occur. The potential for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities (DOE 2004, BLS 2003). Based on an estimated 1.35 million person-hours to construct the new facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be approximately 15 (DOE 2004) to 57 (BLS 2003).

DD&D Impacts—Health and safety impacts of demolition activities would be similar to those expected during construction activities. Based on an estimated 7,600 person-hours for DD&D of the existing facilities (including the current Los Alamos Site Office Building), no fatal accidents would occur, and nonfatal injuries are not expected (DOE 2004, BLS 2003).

Cultural Resources

A total of eight archaeological sites have been located within TA-3. Sites include lithic scatters, trails and stairs, and a wagon road. Two archaeological sites are eligible for listing on the National Register of Historic Places, four are of unknown eligibility, and two are not eligible. There are no National Register of Historic Places-eligible archaeological resources located in the vicinity of the proposed Replacement Office Building Complex; however, one site of undetermined status, a historical trail, is located to the south of the parking lot. Although three National Register of Historic Places-eligible buildings are located in TA-3, none are situated near the proposed new complex. One traditional cultural property is present within TA-3.

Construction Impacts—There are no cultural resource sites eligible for the National Register of Historic Places within the vicinity of the Replacement Office Buildings. However, the historic trail located to the south of the parking lot must be managed as a National Register of Historic Places-eligible site until formally determined otherwise. Due to its proximity to the proposed project, there could be potential adverse effects of construction. As noted above, one traditional cultural property is located within TA-3. However, it would not be affected by construction or operation of the Replacement Office Building Complex.

Operations Impacts—Operation of the Replacement Office Buildings and associated parking lots would not impact any cultural resources.

Socioeconomics and Infrastructure

Construction Impacts—Utility infrastructure resources would be required for Replacement Office Buildings construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection.

For Replacement Office Buildings construction, total liquid fuel consumption is estimated to be 1.8 million gallons (6.8 million liters). Total water consumption is estimated to be 9.6 million gallons (36 million liters). The existing LANL infrastructure would be capable of supporting the requirements for new facility construction without exceeding site capacities, resulting in negligible impact on site utility infrastructure.

Operations Impacts—In general, utility infrastructure requirements for operation of the new office structures would be limited to building connections, and no upgrades to existing utilities would be required. Usage in the proposed structures would be equivalent to or less than that of the replaced structures because contemporary building design includes water and energy conservation features. As such, Replacement Office Buildings operation is expected to have no or negligible incremental impact on utility infrastructure capacities at LANL.

DD&D Impacts—Activities associated with DD&D of facilities to be replaced by the Replacement Office Buildings are projected to require 356,000 gallons (1.35 million liters) of liquid fuels and 11.3 million gallons (43 million liters) of water. DD&D activities would be staggered over an extended period of time. As a result, impacts of these activities on LANL's utility infrastructure are expected to be very minor on an annualized basis. Standard practice dictates that utility systems serving individual facilities be shut down as they are no longer needed. As DD&D activities progress, interior spaces, including associated equipment, piping, and wiring, would be removed prior to final demolition. Thus, existing utility infrastructure would be used to the extent possible and would then be supplemented or replaced by portable equipment and facilities as DD&D activities proceed.

Waste Management

Construction Impacts—Replacement Office Building Complex construction would generate approximately 1,700 cubic yards (1,300 cubic meters) of construction waste, primarily construction debris and associated solid waste. Construction debris is not hazardous and may be disposed of in a solid waste landfill. A substantial portion of construction debris at LANL is routinely recycled; in 2003, approximately 89 percent of the uncontaminated construction and demolition waste was recycled, and those rates are expected to continue (LANL 2004d).

Operations Impacts—Operations at the new Replacement Office Building Complex would generate sanitary wastes. However, because the offices are a replacement for existing office space, no increase in waste is expected.

DD&D Impacts—Demolition activities would generate approximately 6,900 cubic yards (5,300 cubic meters) of demolition debris and sanitary waste. The demolition debris would be transferred to appropriate offsite recycling or disposal facilities. As with construction debris, as much as 89 percent of the demolition debris could potentially be recycled. Although no radiological waste is anticipated as a result of the demolition activities of the Wellness Center and warehouse, 31 cubic yards (24 cubic meters) of low-level radioactive waste was estimated in case contaminated materials were encountered during the demolition activities. This waste would be disposed of at TA-54. Because the estimated volume is small, no impacts on disposal capacity are expected.

Transportation

Construction Impacts—Construction personnel would park onsite and at remote designated parking areas. Truck traffic volume carrying construction materials to LANL and waste to local and regional landfill sites would increase. This increase in traffic would not have any significant impact on the adjacent road systems, including West Jemez Road. As stated earlier, a substantial portion of construction debris at LANL is routinely recycled.

DD&D Impacts—Demolition activities would generate a small amount of low-level radioactive wastes that would be disposed of onsite or shipped offsite. The demolition debris would be transported to offsite recycling or disposal facilities. As with construction debris, a majority of demotion debris could potentially be recycled.

G.3 Radiological Sciences Institute, Including Phase I – The Institute for Nuclear Nonproliferation Science and Technology Impact Assessment

This section provides an assessment of environmental impacts for the proposed Radiological Sciences Institute at LANL's TA-48. Section G.3.1 provides background information on the proposed project to replace deteriorated structures scattered over six TAs with the Radiological Sciences Institute. Section G.3.2 provides a description of the proposed options for the Radiological Sciences Institute. Section G.3.3 presents environmental consequences of the No Action Option and the proposed project (construction and operation of the proposed Radiological Sciences Institute at TA-48 and DD&D of the replaced facilities).

G.3.1 Introduction

The proposed project site is located in TA- 48, approximately 1 mile (1.6 kilometers) southeast of TA-3 along Pajarito Road and also includes a small portion of the western edge of TA-55. The Radiological Sciences Institute would provide state-of-the-art facilities for wet chemistry, metallurgy, safeguards (domestic and international), material protection control and accountability, machining and manufacturing, training schools, and underground storage of special nuclear material (LANL 2006a). This project would also involve DD&D of 52 deteriorating structures (80 percent of LANL's radiological facilities) (LANL 2006a). The project would consolidate radiological laboratories and working spaces to a significantly smaller footprint of modern, flexible facilities in up to 13 buildings located at TA-48.

The missions proposed for relocation to the Radiological Sciences Institute include (but are not limited to) support for weapons manufacturing, material property evaluations for stockpile stewardship, support for domestic and international safeguards, training for International Atomic Energy Agency inspectors, training and support for national emergency response to threats involving radioactive sources, biological research, detection and sensor technologies, various chemistry and chemical engineering missions, radioisotope production and distribution, and basic energy science. New and developing projects that require radiological facilities include missions such as homeland security, advanced fuel cycle initiatives, separation processes for commercial-reactor spent fuel, production capability for nuclear fuels for space missions, powder metallurgy for space and medical applications, nonproliferation, threat reduction, nuclear material control and accountability, alternative energy systems, advanced fusion, and nuclear-weapons-related research.

Much of the radiological infrastructure at LANL is 40 to 60 years old, and the ability to continue critical national missions is threatened. Current facilities are rapidly approaching obsolescence, with operation and maintenance costs associated with increased safety, security, regulatory, and operating requirements becoming prohibitive. Radiological competence and mission commitments need to be met at LANL (LANL 2006a). The existing radiological facilities were built in accordance with building codes and safety and security requirements that are now outdated (LANL 2006a). NNSA needs to replace aging structures with modern buildings designed to meet usage needs.

Table G–4 shows the types of buildings currently in use by different programs that would be replaced by the Radiological Sciences Institute Project, including their building numbers, approximate age, facility condition, and existing floor space. **Table G–5** lists the names and functions of the 30 permanent structures that would be replaced by the Radiological Sciences Institute.

Table G–4 Summary of Los Alamos National Laboratory Radiological Buildings Proposed for Decontamination, Decommissioning, and Demolition Radiological Sciences Institute Project

Program	*Structure*	*Building Numbers* [a]	*Area (gross square feet)*	*Predominant Condition*	*Predominant Building Age (years)*
Chemistry	10 permanent buildings	46-24, 46-31, 46-158, 46-200, 46-250, 48-1, 48-8, 48-17, 48-26, 59-1	167,409	Poor to failing	40-59
	8 transportable	48-27, 48-29, 48-33, 48-34, 48-46, 48-47, 48-208, 48-214			
	2 trailers	48-149, 48-154			
Materials Science and Technology	5 permanent buildings	3-29, 3-35, 3-169, 3-66, 3-451	258,922	Poor to failing	40-59
	2 trailers	3-1524, 3-1525			
Nuclear Nonproliferation	13 permanent buildings	18-1, 18-28, 18-30, 18-129, 18-141, 18-147, 18-227, 18-297, 3-66, 35-2, 35-27, 35-115, 35-347	180,099	Poor to failing	40-59
	1 transportable	35-253			
	8 trailers	18-288, 18-300, 18-301, 35-239, 35-261, 35-262, 35-263, 35-382			
	3 other	18-256, 18-257, 18-258			
Radiological Machining and Inspection	1 permanent building	3-102	29,365	Adequate	40-59
Totals	52 structures		635,795		

[a] 100 percent of most building functions would be moved to the Radiological Sciences Institute. Buildings whose functions would be only partially replaced by the Radiological Sciences Institute and the corresponding percentages are: 3-29, 7 percent (the hot cells); 35-2, 33 percent; 46-24, 50 percent; 46-31, 25 percent; 46-158, 15 percent; 46-200, 50 percent; 59-1, 25 percent.

Notes: Facilities associated with the Institute for Nuclear Nonproliferation Science and Technology Phase I DD&D include the International Atomic Energy Agency schoolhouse portion of 3-66; Buildings 35-2 (33 percent), 35-27, 35-115, 35-247; and all TA-18 buildings. DD&D of these facilities is not part of the Institute for Nuclear Nonproliferation Science and Technology and would be handled separately.

To convert square feet to square meters, multiply by 0.092903.

Source: LANL 2006a.

Table G–5 Name, Function, and Number of Employees of Permanent Buildings Proposed for Decontamination, Decommissioning, and Demolition by the Radiological Sciences Institute Project

Technical Area Building [a]	*Name*	*Current Use*	*Employees* [b]
46-24 (50%)	Laboratory and Office Building	Optics laboratories	24
46-31 (25%)	Test Building No. 2	Optics laboratories	3
46-158 (15%)	Laser-Induced Chemistry Laboratory	Optics laboratories	1
46-200 (50%)	Chemistry and Laser Laboratory	Chemistry laboratory	2
46-250	Analytical Chemistry	Chemistry laboratory	7
48-1	Radiochemistry Building	Chemical laboratory (nuclear)	149
48-8	Isotope Separator Building	Machine shops	2
48-17	Assembly Checkout Building	Assembly facilities	3
48-26	Office Building	Office	2
59-1 (25%)	Occupational Health Laboratory	Radiation effects laboratory	46
3-29 (7%)	Chemistry and Metallurgy Research Laboratory (Hot Cells)	Nuclear laboratory	24
3-169 [c]	Warehouse (Sigma)	General storage	125
3-66 [c]	Sigma Building	Laboratories (nuclear)	125
3-451	Micro Machining Facility	Physics laboratory	8
3-1524	Laboratory and Office Building	Laboratories (nuclear)	2
35-2 [c]	Laboratory and Office Building (Nuclear Safeguards Research)	Laboratories (nuclear)	93
35-27 [c]	Nuclear Safeguard Laboratory	Laboratories (nuclear)	72
35-115	Solvent Storage Shed	Hazardous and flammable storage	0
35-347	Garage	General storage	0
18-1 [d]	Staging Area	Fabrication facility	1
18-28	Warehouse	Programmatic general storage	1
18-30	Main Building	Office	222
18-129	Reactor Sub-Assay Building	Nuclear physics laboratory	10
18-141	Ultra-Sonic Cleaning Building	Nuclear physics laboratory	0
18-147	Office Building	Office	6
18-227	Accelerator Device Laboratory	Accelerator building	0
18-256	Butler Building	Applied physics laboratory	0
18-297	Storage Building	General storage	0
3-102 [c]	Technical Shops Addition (Radiological Machine Shop)	Nuclear contaminated storage	0
Total			1,074 [e]

[a] Unless noted by a percentage shown in parentheses, 100 percent of the floor space and building function would be moved to the Radiological Sciences Institute.
[b] One hundred percent of employees currently located at each building are listed, except for those buildings where only a portion of the function is to be transferred to the Radiological Sciences Institute. In those instances, the number of employees that would move to the Radiological Sciences Institute was assumed to be proportional to the percentage of floor space in the building that the Radiological Sciences Institute would replace.
[c] Identified as a radiological facility in the *SWEIS Yearbook – 2003* (LANL 2004d).
[d] All TA-18 functions from the Pajarito Site, except the Solution High-Energy Burst Assembly (SHEBA), would be moved to the Radiological Sciences Institute.
[e] Total includes permanent buildings listed in this table and 146 employees located in transportables and trailers not included in the table.
Source: LANL 2006a.

G.3.2 Options Considered

The two options identified for the Radiological Sciences Institute are the No Action Option and the proposed project option.

G.3.2.1 No Action Option

Under the No Action Option, the current use of existing radiological facilities throughout LANL would continue. At least two facilities are currently planned for DD&D under other actions: the TA-18 and Chemistry and Metallurgy Research Buildings. The facilities have exceeded their design life and are rapidly becoming obsolete and seriously deteriorating; corrective maintenance actions would continue as failures occur. Maintenance cost would continue to escalate to support the aging facilities until they must be shut down. Upgrade costs to meet currently applicable building codes and safety and security requirements are prohibitive and would provide only a limited lifespan to existing facilities. LANL would systematically lose radiological competence, and mission commitments would not be met. Failures of the existing facilities and equipment would delay programmatic work, possibly damage equipment, and possibly pose a risk to personnel safety, campaigns, critical experiments, and related activities. Because nearly 70 percent of all LANL radiological facilities are 40 to 60 years old, they would experience more and more severe failures over time, until corrective maintenance is no longer possible and the facilities would have to be shut down if unreliability adversely impacts safety or the environment.

G.3.2.2 Proposed Project

Under the proposed project, the Radiological Sciences Institute would be constructed and 52 obsolete structures scattered over six TAs would undergo DD&D. This analysis assumes the Radiological Sciences Institute would consist of up to 13 facilities. Phase I of the Radiological Sciences Institute Project would include 5 buildings associated with the Institute for Nuclear Nonproliferation Science and Technology, for which construction would begin in 2009, with an estimated occupancy in fiscal year 2012. New construction for the Institute for Nuclear Nonproliferation Science and Technology would include a Security Category I and II laboratory with a Security Category I vault, several Security Category III and IV laboratories, a field test laboratory, a secure radiochemistry facility, and associated office support facilities, further described below.

- *Security Category I and II Facility* – a small Nuclear Hazard Category 2 laboratory located within a security Isolation Zone and within the Perimeter Intrusion Detection and Assessment System (PIDAS) adjacent to TA-55 but physically isolated from the programmatic activities and personnel inside TA-55. The facility would provide the ability to utilize and store Security Category I and II quantities of materials (including rollup of various numbers of Security Category III and IV quantities).

- *Security Category III and IV Laboratories* – an independent radiological facility incorporating both open and secured laboratories, used for research and development, testing, and evaluation of technology directly applied to nuclear nonproliferation programs.

- *Secure Radiochemistry Facility* – a secure, low-background-dissolving and radiochemistry capability for the receipt and processing of classified samples to meet the requirements of current and future national security programs. The building would be a vault-type room.

- *Field Test Laboratory* – an outdoor vehicle portal and long-standoff nuclear material monitoring and detection field laboratory to be used to develop and demonstrate advanced nuclear detection technology suitable for deployment in border-protection situations and in other environments requiring long-distance monitoring.

- *Office Support Facility* – an office complex sized to accommodate the staff in the Institute for Nuclear Nonproliferation Science and Technology, to include both open and secured office space, and mechanical, electrical, and software design, fabrication, and assembly facilities for building prototype instruments and supporting research and development needs.

The Radiological Sciences Institute would consolidate radiological activities in an optimally designed, efficient, safe, and secure set of buildings. Facilities would be included for wet chemistry, metallurgy, safeguards (domestic and international), material protection control and accountability, machining and manufacturing, and nonproliferation training schools. The complex would also include a Security Category I underground vault for storage of special nuclear material, eliminating (through underground tunnels) routine material transport on public roads. Also, the complex would be designed to accommodate multiple concurrent radiological activities and Security Categories (III and IV) and temporary Security Category II International Atomic Energy Agency training schools. A Nuclear Hazard Category 3 operations building for specific co-located actinide chemistry operations and safeguards would also be included. In addition to the programs and functions listed above, others that would be moved to the Radiological Sciences Institute and have measurable quantities of emissions or waste include those of the Sigma Complex (Buildings TA-3-66, -35, and -169), the Pajarito Site (TA-18 buildings, except the Solution High-Energy Burst Assembly (SHEBA Project), the Radiological Machine Shop at TA-3 (TA-3-102), the Chemistry and Metallurgy Research hot cells (located at TA-3-29), and the Radiochemistry Facility currently located in TA-48.

This project would also involve DD&D of 52 obsolete structures (80 percent of LANL's radiological facilities), accounting for approximately 636,000 gross square feet (59,100 square meters) of building space located in six TAs (TA-3, TA-18, TA-35, TA-46, TA-48, and TA-59) (LANL 2006a). There are about 1,074 employees located in buildings that would be replaced by the Radiological Sciences Institute (see Table G–5). Of that total, 293 are in existing buildings at TA-48 slated for replacement (193 in permanent structures and 100 in transportables or trailers). Phase I of the Radiological Sciences Institute (the Institute for Nuclear Nonproliferation Science and Technology) would occupy approximately 145,000 net square feet (13,500 square meters), a reduction of about 50,000 net square feet (4,600 square meters) relative to the facilities to be replaced, and would house approximately 450 to 500 technical and support staff (LANL 2006a).

G.3.3 Affected Environment and Environmental Consequences

For Radiological Sciences Institute construction and operation, the affected environment is primarily TA-48, although the region of influence for each resource evaluated may extend beyond TA-48 and LANL. For DD&D of buildings replaced by the Radiological Sciences Institute, the affected environment is primarily TA-3, TA-35, TA-46, TA-48, and TA-59. DD&D of buildings in TA-18 is not part of the impacts evaluation for the Radiological Sciences Institute, but rather is included as part of the TA-18 Closure, Including Remaining Operations Relocation, and Structure DD&D Impacts Assessment (see Appendix H). Also, the DD&D impacts for the Chemistry and Metallurgy Research Building hot cells (Wing 9 of Building 3-29) are not part of the Radiological Sciences Institute evaluation, but are included as part of the proposed project analyzed in the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory* (DOE 2003). The impacts of TA-18 operations and the hot cells that would be moved to the Radiological Sciences Institute are included in the affected environment baseline for comparison with the impacts of the new Radiological Sciences Institute.

The analysis of environmental consequences relies on the affected environment descriptions in Chapter 4 of this SWEIS. Where information specific to TA-48 (or the TAs impacted by DD&D activities) is available and aids understanding the Radiological Sciences Institute affected environment, it is included here. An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.

- *Environmental Justice* – The proposed project is mainly confined to already-developed areas, with no disproportionate human health impacts to low-income or minority populations expected.

This impact assessment focuses on those areas of the affected environment where potential impacts would occur: land resources, geology and soils, water resources, air quality and noise, ecological resources, human health, cultural resources, site infrastructure, waste management, transportation, and facility accidents.

G.3.3.1 No Action Option

Under the No Action Option, LANL radiochemistry capabilities would not be modernized and would not take on capabilities that could potentially be lost from LANL due to changes in other facilities (the Chemistry and Metallurgy Research and Pajarito Site). No disturbance of existing land or building sites would occur. There would be no construction or building removal debris to require disposal. Utility use would remain essentially the same as the present use. Continued expenses for repairs and replacement of aging heating, ventilation, and air conditioning systems and other building components would increase. As building systems and other components fail and cannot be replaced or repaired, affected buildings would be partially or completely closed and the staff relocated. Personnel would remain scattered throughout LANL, and collaboration between scientists and administrative personnel would be hindered. Under the No Action Option, the inefficiencies of using outmoded and deteriorating buildings would continue.

No changes in emissions or air pollutant concentrations are expected under the No Action Option. Under this option, radiological air emissions would continue to be generated from operations at the Sigma Complex (TA-3-66), Machine Shops (TA-3-102), Radiochemistry (TA-48), and hot cells (Wing 9) at the Chemistry and Metallurgy Research Building. No increases in emissions or additional radionuclides are expected under the No Action Option.

Human Health

The consequences of continued operations at facilities that release radiological air emissions, and would be consolidated in the proposed Radiological Sciences Institute (Sigma Complex [TA-3-66], Machine Shops [TA-3-102], and Radiochemistry [TA-48]), on public and worker health under the No Action Option are presented below. A discussion of the terminology used in the human health evaluation and basic radiological health effects and the methodologies used to evaluate consequences can be found in Appendix C of this SWEIS.

Public Health—The collective dose to the public from all airborne radioactive emissions from these three facilities was estimated to a 50-mile (80-kilometer) radius from each facility. The total population dose from all three facilities, shown in **Table G–6**, is estimated to be 0.18 person-rem per year, which is a small part of the total population dose (30 person-rem) from all Key Facilities at LANL. This population dose would result in no additional fatalities in the 50-mile (80 kilometer) radius population of close to 300,000.

Table G–6 Annual Radiological Impacts on the Public from Operations under the Radiological Sciences Institute Project No Action Option

	Population Dose within 50 Miles (80 kilometers)	*Facility-Specific MEI Dose*	*MEI Location (feet)*
Sigma (TA-3-66)	0.16 person-rem	0.026 millirem	N 3,560 LANL boundary
Machine Shops (TA-3-102)	0.013 person-rem	0.0023 millirem	N 3,380 LANL boundary
Radiochemistry (TA-48)	0.0065 person-rem	0.0019 millirem	NNE 2,920 Royal Crest Trailer Park
Total dose	0.18 person-rem	Not applicable	
Cancer fatality risk	0.00011	1.6×10^{-8} (Sigma)	
Regulatory dose limit [a]	Not applicable	10 millirem	
Background radiation dose [b]	120,000 person-rem	400 millirem	

MEI = maximally exposed individual, TA = technical area.

[a] Title 40 of the *Code of Federal Regulations*, Part 61, establishes an annual limit of 10 millirem via the air pathway to any member of the public from DOE operations. There is no standard for a population dose.

[b] The annual individual dose from background radiation at LANL ranges from a low of about 300 millirem to a high of about 500 millirem (see this SWEIS, Appendix C). The population living within 50 miles (80 kilometers) of TA-48 was estimated to be 299,508 in 2000.

Note: To convert feet to meters, multiply by 0.3048.

Sources: Chapter 5 and Appendix C of this SWEIS.

A maximally exposed individual (MEI) is a hypothetical member of the public residing at the LANL site boundary who would receive the maximum dose from facility emissions. Each facility has a different location for its MEI, based on many factors, including the climate, distance, type and amount of radiological air emissions, and physical form of the radionuclides. The location and estimated dose for each of the three facilities that have radiological air emissions are listed in Table G–6; these doses do not include exposures from other sources at LANL. The highest of the three MEI doses is from emissions at the Sigma Complex. This MEI would receive an estimated annual dose of 0.026 millirem from operations as compared to the LANL site-wide MEI, who would receive 7.8 millirem per year from emissions from all LANL facilities. To put these doses into perspective, comparisons with doses from natural background radiation and the regulatory limit of 10 millirem established in Title 40 *Code of Federal Regulations* [CFR] Part 61 are included in the table.

In general, collective total effective dose equivalent by Key Facility or TA is difficult to determine because these data are assigned to the individual worker, not to a specific TA or building. In addition, members of many groups and organizations receive doses at several locations. Under the No Action Option, the average worker doses expected at the Sigma Complex, Machine Shops, and Radiochemistry would be similar to those in the 6-year period from 1999 through 2004.

Hazardous Chemical Impacts—No chemical-related health impacts would be associated with this option. As stated in Chapter 5, Section 5.6, of this SWEIS, the quantities of chemicals that could be released to the atmosphere during routine normal operations are minor and would be below screening levels used to determine the need for additional analysis. Under normal operating conditions, workers would be protected from hazardous chemicals by adherence to Occupational Safety and Health Administration and EPA occupational standards that limit concentrations of potentially hazardous chemicals in the workplace.

Waste Management

The impacts of managing waste from continued operations at the Radiochemistry Facility, Sigma Complex, Pajarito Site (TA-18), and Machine Shops (Building 03-102 only) would be the same as those currently experienced at these facilities because the same types and quantities of waste would be generated and subsequently managed.

Some gains in waste management efficiencies are expected over the next few years, and these gains would be realized under both the No Action Option and the proposed project (that is, whether or not the Radiological Sciences Institute is constructed and operated). Significant reductions in the volume of radioactive liquid discharges are expected over the next few years as improvements are made to the beryllium laundry operations, electroplate bath condensate system, and perchloric acid exhaust duct washdown process. Based on historical data and planned improvements, the projected discharge volume of radioactive liquids is 845,000 gallons (3.2 million liters) per year (LANL 2006a).

Chemical waste generation rates are expected to be 31,000 pounds (14,000 kilograms) per year. Low-level radioactive waste generation rates are estimated to be 157 cubic yards (120 cubic meters) per year. Mixed low-level radioactive waste and transuranic waste generation rates are expected to be very low, approximately 1.3 cubic yards (1 cubic meter) per year for each category. No mixed transuranic waste is expected to be generated (LANL 2006a).

Facility Accidents

Potential accidents under the No Action Option estimated to have the highest impacts would involve radiological operations and materials associated with Chemistry and Metallurgy Research Wing 9 hot cell operations. Five accident scenarios were selected to represent the bounding impacts of accidents. Information used to estimate the impacts of these accidents is shown in **Table G–7**. The material at risk in a hot cell is estimated to be 10.6 ounces (300 grams) of plutonium-238 equivalent and an additional 28.7 pounds (13 kilograms) of plutonium-238 equivalent in iridium cans inside two layers of textured graphite (general purpose heat source modules).

Table G–7 Bounding Radiological Accident Scenarios under the Radiological Sciences Institute Project No Action Option

Accident	*Source Term* [a] *(curies)*	*Release Energy (watts)*	*Annual Frequency*
Hot cell fire involving plutonium-238 in general purpose heat source modules	5.13 plutonium-238	2.04×10^{6}	1.0×10^{-4}
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	22.572 plutonium-238 1.386 plutonium-239	2.04×10^{6}	2.4×10^{-4}
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	5.13 plutonium-238 0.315 plutonium-239	0	2.4×10^{-3}
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	0.001283 plutonium-238	0	0.1
Hot cell plutonium-238 spill with no confinement	0.4104 plutonium-238	0	0.01

a. A release height of 4.9 feet (1.5 meters) is assumed for all accidents. Specific activity is 0.063 curies per gram for plutonium-239 and 17.1 curies per gram for plutonium-238.

Assuming that an accident occurred, estimated consequences for a noninvolved worker located 330 feet (100 meters) from the accident, the onsite worker population, the MEI located at West Jemez Road, and the offsite population are shown in **Tables G–8** through **G–10**. Estimated risks that take accident frequency into account to these same receptors are shown in Table G–10.

The hypothetical accidents with the highest radiological impacts would be the seismic-induced building collapse with no fire and the seismic-induced building collapse with a fire involving plutonium-238 in general purpose heat source modules. If either of these accidents were to occur, the consequences are estimated to be 2.9 or 8.6 increased LCFs for the offsite population, 0.047 or 0.052 increased risk of an LCF for the MEI, and 0.21 or 0.18 increased risk of an LCF for a noninvolved worker located at a distance of 330 feet (100 meters) from the accident, respectively. After taking into account the frequency (or probability) of each accident, the seismic-induced building collapse with no fire is estimated to have the highest risks. For this accident, the annual risks are estimated to be 0.0069 LCFs for the offsite population, 0.00011 increased risk of LCFs for the MEI, and 0.00049 increased risk of an LCF for a noninvolved worker located at a distance of 330 feet (100 meters) from the accident.

Table G–8 Radiological Accident Offsite Population Consequences under the Radiological Sciences Institute Project No Action Option

Accident	MEI		Population to 50 Miles (80 kilometers)	
	Dose (rem)	LCF [a]	Dose (person-rem)	LCF [b, c]
Hot cell fire involving plutonium-238 in general purpose heat source modules	9.18	0.0055	3,060	1.84
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	43	0.052	14,400	8.64
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	39	0.047	4,770	2.86
Spill of plutonium-238 residue from (0.5-gallon (2-liter) bottles outside of hot cell	0.012	7.4×10^{-6}	1.12	0.00067
Hot cell plutonium-238 spill with no confinement	3.96	0.0024	359	0.22

MEI = maximally exposed individual, LCF = latent cancer fatality.
[a] Increased risk of an LCF to an individual, assuming the accident occurs.
[b] Increased number of LCFs for the offsite population, assuming the accident occurs.
[c] Offsite population size is approximately 300,000 persons.

Table G–9 Radiological Incident Onsite Worker Consequences under the Radiological Sciences Institute Project No Action Option

Accident	Noninvolved Worker at 330 Feet (100 meters)	
	Dose (rem)	LCF [a]
Hot cell fire involving plutonium-238 in general purpose heat source modules	32.5	0.039
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	152	0.18
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	171	0.21
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	0.045	2.7×10^{-5}
Hot cell plutonium-238 spill with no confinement	14.3	0.0086

LCF = latent cancer fatality.
[a] Increased risk of an LCF to an individual, assuming the accident occurs.

The impacts of the other postulated accidents are shown in Tables G–8 through G–10. Comparing the seismic accident that includes a fire with one that does not include a fire, the former has higher offsite population and MEI impacts, while the latter has higher individual worker and worker population impacts. This is because the buoyant effects of a fire loft the radioactive plume over the onsite workers, while the greater releases associated with this scenario would impact the general population farther downwind. In contrast, the absence of a fire and its buoyant effects has a greater impact on close-in individuals like the noninvolved worker at 330 feet (100 meters) and the large worker population at the Chemistry and Metallurgy Research Building.

Table G–10 Radiological Accident Offsite Population and Worker Risks under the Radiological Sciences Institute Project No Action Option

Accident	Onsite Worker (LCFs)	Offsite Population (LCFs)	
	Noninvolved Worker (at 330 feet [100 meters]) [a]	MEI [a]	Population to 50 Miles (80 kilometers) [a, b]
Hot cell fire involving plutonium-238 in general purpose heat source modules	3.9×10^{-6}	5.5×10^{-7}	0.00018
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules [c]	4.4×10^{-5}	1.2×10^{-5}	0.0021
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules [c]	0.00049	1.1×10^{-4}	0.0069
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	2.7×10^{-6}	7.4×10^{-7}	6.7×10^{-5}
Hot cell plutonium-238 spill with no confinement	8.6×10^{-5}	2.4×10^{-5}	0.0022

LCF = latent cancer fatality, MEI = maximally exposed individual.
[a] Increased risk of an LCF to an individual per year.
[b] Offsite population size is approximately 300,000 persons.
[c] An updated probabilistic seismic hazard analysis has been completed for LANL (LANL 2007), which results in higher peak horizontal ground acceleration values for the same annual probability of exceedance. In the seismic accident analyses for the Chemistry and Metallurgy Research Building, the radioactive source term was conservatively based on the assumption that all structures, systems, and components failed, therefore, the updated probabilistic seismic hazard analysis is not expected to change the accident consequences or risks.

G.3.3.2 Proposed Project

Land Resources—Land Use

Construction Impacts—Construction of the Radiological Sciences Institute, including parking lots and construction laydown areas, would require 33.6 acres (13.6 hectares) of land. Of the land area required for the Radiological Sciences Institute, approximately 12.6 acres (5.1 hectares) are undeveloped (LANL 2006a).

Operations Impacts—Upon project completion, 32 acres (13 hectares) would be occupied by permanent facilities. While the land use designation of much of the site would remain Reserve, some Reserve areas and the currently designated Experimental Science area would be redesignated in the future as Nuclear Materials Research and Development (LANL 2003b).

The Radiological Sciences Institute would be constructed in TA-48 and a small portion of TA-55 located within the Pajarito Corridor West Development Area. Construction of the Radiological Sciences Institute within TA-48 would take place in areas designated within that plan as available for Primary Development and Proposed Parking, as well as within the currently developed portion of the site which is identified as Potential Infill. Although the Radiological Sciences Institute would result in the use of previously undeveloped land and involve a change in land use designation in TA-48, its construction would be compatible with future land use plans. The small portion of the western edge of TA-55 that would be affected by the Radiological Sciences Institute is classified as Nuclear Materials and Research. Under this option, land use within this area would not change from its current land use designation of Nuclear Materials Research and Development.

DD&D Impacts—DD&D of buildings proposed for replacement is not expected to result in a change in land use at the respective TAs. These structures are within built-up areas that would continue to be used for other purposes. Once removed, the land upon which these buildings stood would be available for future development.

Land Resources—Visual Resources

The buildings that would be replaced by the Radiological Sciences Institute are all in currently developed areas consisting of industrial and office buildings, transportables, and trailers. The buildings are primarily located in TAs along Pajarito Road, except buildings in TA-3. As with TA-48, the views are industrial in nature and are viewed primarily by site personnel.

Construction Impacts—Construction of the Radiological Sciences Institute would result in a change in both near and distant views of TA-48 and the western edge of TA-55. Short-term impacts would include the construction activity itself as well as increased dust generation. Although landscaping is planned along Pajarito Road following construction, new buildings and parking lots would be more visible from the road than current facilities due to their increased number and size. Additionally, a number of buildings, as well as parking lots, would be located closer to the road than are the current Advanced Radiochemistry Diagnostics Building and associated facilities. These changes in the visual environment would mainly impact LANL employees. Additionally, new development of TA-48 would be visible at the entrance to the controlled access along Pajarito Road and to viewers in the southeast quadrant of TA-3.

Distant views from the higher elevations to the west of TA-48 (as well as the western edge of TA-55) would also change as a result of construction of the Radiological Sciences Institute, as the size of the developed area would increase as well as the number of buildings and parking lots. However, the overall effect on the view would be minimal due to the present nature of development on the mesa.

DD&D Impacts—Although removal of buildings that the Radiological Sciences Institute would replace would positively affect visual resources, the level of improvement would be small. Near views of LANL facilities along the mesa are seen mostly by LANL employees. From higher elevations to the west, the Pajarito Mesa presents the appearance of a mosaic of industrial buildings within a ponderosa pine forest. Removal of a limited number of buildings would not appreciably change the view.

Geology and Soils

The 9-mile-long (14-kilometer-long) Rendija Canyon Fault is located approximately 0.5 miles (0.8 kilometers) east of the Radiochemistry Laboratory at TA-48. Geologic mapping shows that there is no faulting in the near surface directly beneath TA-48. The closest fault is located about 300 feet (90 meters) southwest of the Radiochemistry Laboratory (LANL 2004c). This small fault trace exhibits only about 2 feet (0.6 meters) of offset. Most of these small faults have been inferred to represent ruptures subsidiary to the major faults, and, as such, their potential rupture hazard is very small (Gardner et al. 1999). Additionally, all buildings in the Radiological Sciences Institute would be designed in accordance with current DOE seismic standards and applicable building codes.

The proposed area for the facility includes undisturbed soils that maintain the present vegetative cover. They are arid soils consisting largely of sandy loam material alluvially deposited from tuff units on higher slopes to the west and eroded from underlying geologic units. In general, the soils are poorly developed with relatively little horizon differentiation and organic matter accumulation. These factors, combined with the dry moisture regime of the area, result in only a limited number of plant species being able to subsist on the soil medium, which, in turn, supports a very limited number of wildlife species.

Construction Impacts—Approximately 802,000 cubic yards (613,000 cubic meters) of soil would be disturbed during building excavation. These estimates are based on building footprints and do not include the impact of short-term construction support activities such as the use of equipment laydown yards. The impact of such support areas would be minimized by locating these facilities in developed areas such as parking lots.

Adherence to standard best management practices for soil erosion and sediment control, including watering, during construction would serve to minimize soil erosion. After construction, disturbed areas would lie within the footprint of the new buildings and roadway, with temporarily disturbed areas stabilized and revegetated, so they would not be subject to long-term soil erosion.

For construction of the Security Category I underground vault for special nuclear material storage and the associated tunnel, excavation depths of up to 45 feet (14 meters) into the mesa may be necessary. Excavation of welded tuff could necessitate blasting to speed construction. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. In addition, prior to commencing ground disturbance, NNSA would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with LANL procedures.

Aggregate (sand, gravel, crushed stone) and other geologic resources would be required to support Radiological Sciences Institute construction activities at TA-48, but such resources are readily available from onsite borrow areas and otherwise abundant in the vicinity of Los Alamos County.

Operations Impacts—Radiological Sciences Institute operations would not result in additional impacts on geologic and soil resources at LANL. Any new facilities and uses within TA-48 would be evaluated, designed, and constructed in accordance with DOE Order 420.1B and sited to minimize risk from geologic hazards, including earthquakes.

DD&D Impacts—DD&D activities associated with existing radiological facilities would have a negligible additional impact on geologic and soil resources at LANL, as the affected facility areas are already developed and adjacent soils are already disturbed. Additional ground disturbance would be necessary to establish laydown yards and waste management areas in the vicinity of the facilities to be razed. Available paved surfaces, such as parking lots in the vicinity of the facilities to be demolished, would be used to the extent possible.

The major indirect impact on geologic and soil resources at DD&D locations would be associated with the need to excavate any contaminated tuff and soil from beneath and around facility foundations. Borrow material (such as crushed tuff and soil) would be required to fill the excavations to grade, but such resources are readily available from onsite borrow areas and otherwise abundant in the vicinity of Los Alamos County. LANL staff would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with LANL procedures and the Consent Order. All excavated material would be characterized before removing it for disposal.

Water Resources

All radioactive liquid effluents are directed to the Radioactive Liquid Waste Treatment Facility in TA-50 and sanitary liquid effluents to the Sanitary Wastewater Systems Plant in TA-46. Any potential contamination sources, such as aboveground storage tanks, are controlled through a Spill Prevention Control and Countermeasures Plan.

For TAs that would be impacted by DD&D activities, there are currently two National Pollutant Discharge Elimination System (NPDES) outfalls (which discharged 3.81 million gallons [14.4 million liters] in 2005) associated with the Sigma Complex at TA-3 (LANL 2006f). There is also one NPDES outfall (which discharged 0.92 million gallons [3.48 million liters] in 2005) associated with the Chemistry and Metallurgy Research Building at TA-3, but it is not associated with the Wing 9 hot cells.

Construction Impacts—Little or no effect on surface water resources is anticipated during construction of the Radiological Sciences Institute. The proposed project would not result in disturbance of watercourses or generation of liquid effluents that would be released to the surrounding environment. Silt fences, hay bales, or other appropriate best management practices would be employed and specified in a stormwater pollution prevention plan to ensure that fine particulates created during construction would not be transported by stormwater into surface water features in the vicinity of TA-48.

Operations Impacts—The proposed project should produce minimal effects on surface water resources during operations. There are three NPDES outfalls associated with facilities moving to the Radiological Sciences Institute. The Sigma Complex currently has two NPDES outfalls (03A-022 and 03A-024) (LANL 2006a), and the Chemistry and Metallurgy Research Building has one NPDES outfall (03A-021) (LANL 2006a), but it is not associated with the Chemistry and Metallurgy Research Building hot cell operations that would be moved into the Radiological Sciences Institute.

There would be more stormwater runoff from the new facility because of the increase in impervious areas of buildings and parking lots. This may be offset by the decreased stormwater runoff from the demolished facilities.

Aboveground storage tanks may be added to the Radiological Sciences Institute, but the number would not exceed the current number of aboveground storage tanks associated with the operations slated to be moved to the Radiological Sciences Institute. Radioactive and sanitary liquid effluents from the Radiological Sciences Institute would continue to be discharged to the Radioactive Liquid Waste Treatment Facility and Sanitary Wastewater Systems Plant, respectively.

The proposed project should produce minimal effects on groundwater resources during operations. Potable and industrial water use during operation of the Radiological Sciences Institute would not vary significantly from current volumes used for operations at the various radiological facilities that would be incorporated at the Radiological Sciences Institute. The cooling tower at Building 48-1 and the Sigma Building 3-66 would be incorporated into a new cooling tower system for the Radiological Sciences Institute. The cooling tower cycle increase program would reduce the amount of water used by this new system. Groundwater quality should not be affected by the operation of the Radiological Sciences Institute, as no new potential contamination sources would be added.

DD&D Impacts—Although several of the NPDES outfalls at the facilities to be demolished have already been blocked off and no longer discharge industrial effluent to the environment, the possibility of accidental discharges through these drains would be eliminated when the buildings at TA-3-66, TA-18, and TA-35 are demolished (LANL 2006a). Elimination of the 14 buildings at TA-18 that would be replaced by the Radiological Sciences Institute also would eliminate a potential source of contamination in the Pajarito Canyon 100-year floodplain. As noted above, increased impervious areas at the Radiological Sciences Institute that would create more stormwater runoff may be offset by the decreased stormwater runoff from demolished buildings and parking lots.

Air Quality and Noise

Nonradiological air pollutant emission sources at TA-48 include three natural-gas-fired boilers and emissions from various toxic chemicals. Emissions from boilers for 2003 are reported in **Table G–11**. **Table G–12** shows emissions of other pollutants from the Machine Shop at TA-3 and activities at TA-18 that could be transferred to TA-48.

Table G–11 Nonradiological Air Pollutant Emissions at Technical Area 48 – 2003 (tons per year)

Pollutant	*Boiler BS-1*	*Boiler BS-2*	*Boiler BS-6*
Criteria Pollutants			
Carbon monoxide	0.455	0.455	0.609
Nitrogen oxides	0.542	0.542	0.725
Particulate matter	0.041	0.041	0.055
PM_{10}	0.041	0.041	0.055
$PM_{2.5}$	0.041	0.041	0.055
Sulfur oxides	0.003	0.003	0.004
Volatile organic compounds	0.030	0.030	0.040

PM_{10} and $PM_{2.5}$ = particulate matter with aerodynamic diameters of 10 and 2.5 micrometers, respectively, or less.
Source: LANL 2006e.

Table G–12 Nonradiological Air Pollutant Emissions at Technical Area 3 Machine Shops and Technical Area 18 – 2005 (tons per year)

Pollutant	*Machine Shop (TA-3)*	*TA-18 Pajarito Site*
Ethanol	0.012	0.0035
Kerosene	0.0012	0
Zinc chloride fume	0	0.00013

TA = technical area.
Source: LANL 2006f.

Radiological air emissions for 1999 – 2005 are presented in Chapter 4, Section 4.4.3.1. Doses associated with radiological emissions at LANL are discussed in the section on human health. Emissions from three facilities that are projected to be consolidated in the proposed Radiological Sciences Institute are, or have been, monitored for radiological air emissions. Both the Machine Shops at TA-3 and Radiochemistry Complex at TA-48 have monitored point sources. Monitoring at the Sigma Complex (TA-3) was discontinued in 2000; it was determined that because of sufficiently low emissions, stack monitoring was no longer necessary for compliance. There are radiological air emissions from TA-18, but because the source of those emissions, SHEBA, would not be moved to the Radiological Sciences Institute, those data are not included here.

Estimated emission rates for toxic air pollutants emitted at TA-48 were compared to screening-level emission values for the *Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (1999 SWEIS)* (DOE 1999a). A screening-level emission value was developed for each chemical. A screening level emission value is a theoretical maximum emission rate that, if emitted at that TA over a short-term (8-hour) or long-term (1-year) period, would not exceed a health-based guideline value. This screening-level emission value was compared to the emission rate that would result if all the chemicals purchased for use in the facilities at a TA over the course of 1 year were available to become airborne. At TA-48, chemicals have been emitted at levels below the screening levels identified.

Construction Impacts—Construction of new facilities at TA-48 would result in temporary increases in air quality impacts of construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the site work and erection construction phases of the TA-48 Radiological Sciences Institute's largest new facilities. Maximum ground-level concentrations off site and along the perimeter road to which the public has regular access would be below ambient air quality standards, and the air quality impacts on the public would be minimal. Estimated concentrations for PM_{10} would be greatest for the site work phase. Estimated maximum PM_{10} concentrations are an annual average of 2.3 micrograms per cubic meter and a 24-hour average of 31.9 micrograms per cubic meter. The maximum annual and short-term concentrations for construction would occur at the site boundary north of TA-48. Construction modeling considered particulate emissions from activity in the construction area and emissions from various earthmoving and material-handling equipment.

Although no radiological releases to the environment are expected in association with construction activities at TA-48, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. A large potential release site encircles all of TA-48-1 and TA-48-45 (LANL 2006a). To determine the extent and nature of any contamination, an assessment of the affected areas would be performed prior to commencing ground disturbance. As needed, any contamination found would be remediated before continuing, and appropriate personal protection equipment would be required for working in this area.

In addition, there are other potential release sites within TA-48 (LANL 2006a). These sites and others at LANL are being investigated and assessed consistent with DOE requirements and the Consent Order. If it is determined that the potential release sites pose an unacceptable risk to the public or to LANL workers, the sites would be cleaned up before proceeding.

Construction of the new Radiological Sciences Institute at TA-48 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of construction equipment operation. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employees' vehicles and materials shipments. Noise sources associated with construction at TA-48 may include loud impulsive sources such as blasting.

Operations Impacts—Under the proposed project, criteria and toxic air pollutants would be generated from the operation and testing of an emergency generator, use of various chemicals in laboratories, and other activities. Emissions from the diesel generator would occur during periodic testing resulting in little change in air pollutant concentrations. Air quality impacts on the public would be minor.

Little or no change in toxic pollutant emissions or air pollutant concentrations at LANL is expected under this option. For facilities that would be combined at TA-48, toxic pollutants released from laboratories would be similar to those from current uses as shown under the No Action Option and would vary by year with the activities performed. Emissions would continue to be below screening-level emission values, and air quality impacts on the public would be minor.

Projected annual radiological air emissions from the Radiological Sciences Institute were estimated to be the combined total of the projected emissions from the individual facilities whose functions would be moved to the Radiological Sciences Institute. The projected emissions are shown in **Table G–13**. The individual facility air emissions combined together in the Radiological Sciences Institute at TA-48 are described in detail in this SWEIS, Appendix C (Human Health). Impacts of radiological air emissions released during normal operations are discussed under Human Health.

Noise impacts of operation of the new Radiological Sciences Institute at TA-48 are expected to be similar to those from existing operations at TA-48. Although there would be a slight increase in traffic and equipment noise near the area (for example, new heating and cooling systems), there would be minimal change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of operating these new facilities.

Table G–13 Radiological Air Emissions from the Radiological Sciences Institute

Radionuclide	*Emission Rate (curies per year)*
Arsenic-72	1.21×10^{-4}
Arsenic-73	2.55×10^{-3}
Arsenic-74	1.33×10^{-3}
Beryllium-7	1.65×10^{-5}
Bromine-77	9.35×10^{-4}
Germanium-68	8.97×10^{-3}
Krypton-85	1.00×10^{2}
Rubidium-86	3.08×10^{-7}
Selenium-75	3.85×10^{-4}
Xenon-131m	4.50×10^{1}
Xenon-133	1.50×10^{3}
Other activation products [a]	5.58×10^{-6}
Plutonium-239	1.21×10^{-5}
Uranium-234	6.60×10^{-5}
Uranium-235	4.84×10^{-7}
Uranium-238	1.95×10^{-3}
Mixed fission products [b]	1.54×10^{-4}

[a] Other activation products are a mixed group of activation products represented by strontium-90 and yttrium-90 in equilibrium.
[b] Mixed fission products are rep resented by strontium-90 and yttrium-90 in equilibrium.
Source: Appendix C of this SWEIS.

DD&D Impacts—DD&D of buildings at TA-3, TA-18, TA-35, TA-46, TA-48, and TA-59 would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Maximum ground-level concentrations at the site boundary would be below the ambient air quality standards, except for possible short-term concentrations of carbon monoxide. Concentrations off site and along the perimeter road to which the public has regular access would be below ambient air quality standards, and it is expected that air quality impacts on the public would be minor.

DD&D of buildings at TA-3, TA-35, and TA-48 would result in some release of radionuclides. The potential exists for contaminated soils, building debris, and possibly other media to be disturbed during demolition of these facilities. The release of radionuclides would be minimized by proper decontamination of buildings prior to demolition and the use of appropriate containment devices. Radiological air emissions would be comparable to or less than those emitted during normal operations. Impacts of these radiological air emissions released during DD&D of the buildings under the proposed project are discussed under Human Health.

DD&D of buildings at TA-3, TA-18, TA-35, TA-46, TA-48, and TA-59 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area may occur as a result of demolition activity. There would be no change in noise impacts on the public outside of LANL as a result of these activities, except for a small increase in traffic noise levels from employee vehicles and debris shipments.

Ecological Resources

Effects of the Cerro Grande Fire within TA-48 varied from a burn severity of medium to low or unburned. Those portions of the TA in the vicinity of the Radiochemistry Building (Building 48-1) were categorized as being burned at the low or unburned severity level (DOE 2000). The buildings that would be replaced by the Radiological Sciences Institute are all located in currently developed industrial and office areas. While buildings situated in TA-3, TA-35, TA-46, TA-48, and TA-59 are located within the ponderosa pine forest vegetation zone and those in TA-18 are in the pinyon (*Pinus edulis* Engelm.)- juniper (*Juniperus monosperma* [Engelm.] Sarg.) woodland vegetation zone, wildlife use of the areas in the immediate vicinity of the buildings would be limited. Due to the presence of people, activity, and security fencing, no large animals are usually found within developed areas.

Four wetlands occur in TA-48, three of which are located within Mortandad Canyon between TA-48 and TA-60. These wetlands, which total about 1.1 acres (0.4 hectares), are characterized by coyote willow (*Salix exigua* Nutt.), Baltic rush (*Juncus balticus* Willd.), cattail (*Typha* spp.), and wooly sedge (*Carex lanuginose* Michx.). The fourth wetland is located between TA-48 and TA-55; cattail is the dominant plant. This wetland is less than 0.1 acre (0.04 hectares) in size (ACE 2005).

Surface water flow within that portion of Mortandad Canyon on the northern boundary of TA-48 is ephemeral. Thus, there are no fish or other permanent aquatic resources present within TA-48. Further, there are no permanent water bodies in any of the TAs within which buildings are to be removed.

Although there are no threatened or endangered species in the TA-48 area (LANL 2006a), portions of the TA are located within both the core habitat and buffer zone of the Mexican spotted owl for the Sandia-Mortandad Canyon Area of Environmental Interest. However, the buffer and core areas encompass only the eastern portion of the TA. They do not include developed areas (or areas adjacent to developed areas) on the mesa. Additionally, a small portion of the southeast corner of TA-48 and the western edge of TA-55 fall within the buffer zone of the Pajarito Canyon Mexican spotted owl Area of Environmental Interest. Areas of Environmental Interest are established under the *LANL Threatened and Endangered Species Habitat Management Plan* to protect important breeding or wintering habitat for certain sensitive species. Areas of Environmental Interest for the bald eagle and southwestern willow flycatcher do not include any part of TA-48 (LANL 1998).

Of those TAs where buildings are to be demolished in connection with the new Radiological Sciences Institute (TA-3, TA-18, TA-35, TA-46, and TA-59), only TA-3 and TA-35 fall within the core areas of the Los Alamos Canyon and Sandia-Mortandad Canyon Areas of Environmental Interest, respectively, of the Mexican spotted owl. However, only those buildings to be removed at TA-35 are within developed core habitat. None of these TAs falls within Areas of Environmental Interest for the bald eagle or southwestern willow flycatcher (LANL 1998).

Construction Impacts—Although construction of some of the new facilities associated with the Radiological Sciences Institute would involve previously disturbed land, about 12.6 acres (5.1 hectares) of ponderosa pine forest at TA-48 and within the small area of TA-55 would be cleared (LANL 2006a). This would result in decreased less-mobile wildlife such as reptiles and small mammals, and cause more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity of the area into which they move. If the area were at its carrying capacity, displaced animals would not likely survive. Indirect impacts of construction, such as noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Such disturbance would span the construction period. The work area would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Construction of the Radiological Sciences Institute would not directly impact wetlands located in Mortandad Canyon or the small wetland situated between TA-48 and TA-55. Best management practices would reduce the potential for indirect impacts to wetlands at TA-48.

While there are no threatened or endangered species in the TA-48 area, portions of the TA are located within both the core and buffer zones of the Sandia-Mortandad Canyon and Pajarito Canyon Mexican spotted owl Areas of Environmental Interest. However, only a small portion of the Radiological Sciences Institute may be built within buffer habitat; most new structures would not be in core or buffer zones. Thus, the biological assessment prepared by DOE concluded that with the application of reasonable and prudent alternatives such as reseeding and erosion protection, the project may affect, but is not likely to adversely affect, the Mexican spotted owl (LANL 2006b). The USFWS has concurred with this assessment (see Chapter 6, Section 6.5.2).

Areas of Environmental Interest for the bald eagle and southwestern willow flycatcher do not include any part of TA-48 or TA 55. Recognizing that the bald eagle forages over all of LANL and that some habitat degradation is associated with construction of the Radiological Sciences Institute, the DOE biological assessment concluded that with appropriate reasonable and prudent alternatives (see Section G.2.3.2) the project may affect, but is not likely to adversely affect, the bald eagle. Since the nearest southwestern willow flycatcher Area of Environmental Interest is over 3 miles (4.8 kilometers) from the project site it was determined that there would be no effect on this species (LANL 2006b). The USFWS has concurred with the biological assessment as it relates to bald eagle and southeastern willow flycatcher (see Chapter 6, Section 6.5.2).

Operations Impacts—Operation of the Radiological Sciences Institute would have minimal impact on terrestrial resources within or adjacent to TA-48. Because the wildlife residing in the area has already adjusted to current levels of noise and human activity associated with current operation, it would not likely be adversely affected by similar types of activity involved with operation of the new facility. Areas not permanently disturbed by the new facility (for example, construction laydown areas) would be landscaped. While these areas would provide some habitat for wildlife, species composition and density would differ from preconstruction conditions.

DD&D Impacts—Removal of existing structures that the Radiological Sciences Institute is to replace would generate increased noise and levels of human disturbance. However, impacts would be temporary and would have minimal effect on wildlife, as these structures exist within disturbed areas and wildlife in adjacent areas is accustomed to human activity. Upon demolition of the buildings, the land would be revegetated and could be available for other uses. Because revegetation would primarily be for purposes of soil stabilization, there would be little benefit for wildlife. Also, if the land were redeveloped, there would be little change in its value as wildlife habitat; however, if development did not take place and native species were used in the revegetation effort, wildlife could benefit. Specific effects would depend on the nearness of existing development and natural habitat.

Since wetlands do not exist in the immediate area of any of the buildings to be removed in association with the new Radiological Sciences Institute, there would be no direct impacts on this resource. The use of best management practices would prevent erosion and subsequent sedimentation of any wetlands located in the canyons.

As noted above, of the buildings to be demolished in connection with the Radiological Sciences Institute, only those located in TA-35 occur within developed core habitat for the Mexican spotted owl. The removal of these buildings could produce noise greater than 6 decibels A-weighted (dB[A]) above background levels in undeveloped core habitat to the north in Mortandad Canyon. However, provided that reasonable and prudent alternatives are followed, the biological assessment concluded that demolition may affect, but is not likely to adversely affect, the Mexican spotted owl. Reasonable and prudent alternatives include muted back-up indicators on heavy equipment and reseeding and erosion protection. Also, activities involving heavy equipment would not be permitted to take place between March 1 and May 15, or until the completion of surveys for spotted owls. If owls were determined to be present, work restrictions would be extended until August 31. Potential impacts from DD&D activities to the bald eagle and southwestern willow flycatcher would not be expected (LANL 2006b). The USFWS has concurred with the biological assessment as it relates to impacts to the Mexican spotted owl, bald eagle and southeastern willow flycatcher from building demolition (see Chapter 6, Section 6.5.2).

Human Health

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers would be at a small risk for construction-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. Any contamination that might be present in the soil would have been determined during site characterization and cleaned up accordingly. Workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses were kept as low as reasonably achievable (ALARA).

The potential for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 3.12 million person-hours to construct the new facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be 35 (DOE 2004) to 132 (BLS 2003).

Operations Impacts—Radiological Sciences Institute operations would not exceed the combined current operational limits. **Table G–14** shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the new Radiological Sciences Institute at TA-48 would be 0.26 person-rem, far less than the total population dose (30 person-rem) from all Key Facilities at LANL. This population dose would result in no additional fatalities in the population.

Table G–14 Annual Radiological Impacts on the Public from Radiological Sciences Institute Operations [a]

	Population Dose within 50 Miles (80 kilometers)	*MEI Dose*	*MEI Location (feet)*
Dose	0.26 person-rem	0.077 millirem	NNE 2,920 Royal Crest Trailer Park
Cancer fatality risk [b]	0.00016	4.6×10^{-8}	–
Regulatory dose limit [c]	Not applicable	10 millirem	–
Background radiation dose [d]	120,000 person-rem	400 millirem	–

MEI = maximally exposed individual.

[a] The stack parameters were conservative estimates used for the purpose of calculating a dose. A stack height of 10 meters, diameter of 1 meter, and exit velocity of 1 meter per second were used.

[b] Based on a risk estimate of 0.0006 LCFs per person-rem (see Appendix C of this SWEIS).

[c] 40 CFR Part 61 establishes an annual dose limit of 10 millirem via the air pathway to any member of the public from DOE operations. There is no standard for a population dose.

[d] The annual individual dose from background radiation at LANL ranges from a low of about 300 millirem to a high of about 500 millirem (see Appendix C of this SWEIS). The population living within 50 miles (80 kilometers) of TA-48 was estimated to be 299,508 in 2000.

Note: To convert feet to meters, multiply by 0.3048.

An MEI is a hypothetical member of the public residing at the LANL site boundary who would receive the maximum dose. The MEI, located at the Royal Crest Trailer Park, would receive an estimated annual dose of 0.077 millirem from Radiological Sciences Institute operations, as shown in Table G–14. This dose corresponds to an increased annual risk of developing a fatal cancer of 4.6×10^{-8}, or about 1 chance in 22 million for each year of operation.

Depending on the new facility layouts and consolidation of activities, the worker doses may vary from those at the existing facilities. Worker doses would be similar to those under the No Action Option or potentially less due to the improved facility design.

Neither additional chemicals nor an increase in chemical inventories is expected over those associated with current operating levels at the proposed new facility. Therefore, there would be no chemical-related health impacts on workers or the public expected under this option. The quantities of most chemicals that could be released to the atmosphere during routine normal operations are minor and would be below screening levels used to determine the need for additional analysis.

DD&D Impacts—Nonradiological DD&D health impacts could include construction-type injuries and possible fatalities. Based on an estimated 1 million person-hours for DD&D of the existing facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be 12 (DOE 2004) to 45 (BLS 2003).

Demolition of the buildings might also involve removal of some asbestos-contaminated material. Removal of this 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 be released that could be inhaled by members of the public.

Potential radiological DD&D health impacts were evaluated for members of the public and workers. The main radiological impacts would result from DD&D of the Sigma Complex (TA-3-66), Machine Shop (Building TA-3-102), and Radiochemistry site (TA-48). Quantitative information has not been presented, as project-specific work plans have not been prepared nor have the buildings in question been completely characterized with regard to types and locations of contamination. The Chemistry and Metallurgy Research Building Wing 9 was not included in the DD&D analysis, as it has previously been considered in a prior NEPA compliance document (DOE 2003). In addition, DD&D impacts of other partial buildings were not included. In addition to those listed above, several other buildings were reviewed with regard to health impacts because they were monitored for radiological air emissions in the past, currently house radiological sources, or have potential for radiological air emissions based on past functions. The review indicated that there would be no health impacts of their DD&D on members of the public or workers.

During early DD&D stages, when interior equipment is being removed from the buildings in question, doses to the public would be comparable to or less than those estimated for normal operation (see Table G–6). The building structures would be intact, with operating filtering systems for the stacks, while the decontamination and decommissioning were taking place. No additional nuclides would be introduced during these stages. Worker doses during decontamination and equipment removal may be higher than during normal operations but would be managed to remain under the DOE Administrative Control Level of 2,000 millirem per year and ALARA (DOE 1999b).

The primary source of potential consequences to workers and members of the public would be associated with the release of radiological air emissions during the demolition stage. Any radiological air emissions would be reduced by plastic draping and an enclosure, coupled with HEPA filters. Potential releases of radioactive particulates from disposition activities are expected to be lower than releases from past normal operations.

Cultural Resources

Surveys have identified two archaeological resource sites within TA-48, both of which are eligible for the National Register of Historic Places. The prehistoric site is a one- to three-room structure, whereas the historic site is a rock and wood enclosure. Additionally, the Radiochemistry Building and a number of other buildings have been determined to be potentially significant historic buildings. However, none of the buildings or structures have been formally evaluated for National Register of Historic Places eligibility status, and are, therefore, considered eligible and managed as such until a formal assessment determination has been made. There are no cultural resource sites in the small area of TA-55 that could be affected by the proposed Radiological Sciences Complex.

Four of the five TAs where structures would be removed as a part of the proposed project contain cultural resource sites. These are briefly summarized in **Table G–15**.

Table G–15 Affected Cultural Resource Sites – Radiological Sciences Institute

Technical Area	*Number of Cultural Resource Sites*	*Types of Resources Present*	*National Register of Historic Places Eligibility* [a]
3	8	Lithic scatter; trail and stairs; wagon road	3/2
18	3	Cavates; historic structure; rock shelter	3/0
35	0		
46	19	Pueblo roomblocks; lithic and ceramic scatters, one- to three-room structures, wagon road, cavates	9/2
59	1	Wagon road	0/0

[a] Number of sites that are eligible (the first number) or undetermined eligibility (the second number).

Traditional cultural properties are properties that are eligible for the National Register of Historic Places because of their association with cultural practices or beliefs of a living community that are (1) rooted in that community's history, and (2) important in maintaining its cultural identity. Consultations to identify traditional cultural properties were conducted with 19 American Indian tribes and 2 Hispanic communities in connection with the preparation of the *1999 SWEIS* (DOE 1999a). As noted in Section 4.7.3 of this SWEIS, traditional cultural properties are present throughout LANL and adjacent lands; however, to protect such sites specific features or locations are not identified (Knight and Masse 2001). Traditional cultural properties are not expected in developed areas of any TA involved in the Radiological Sciences Institute Project.

Construction Impacts—New construction in the area of the prehistoric or historic sites would require that the site boundaries be marked and fenced. Fencing would prevent accidental intrusion and disturbance to the site(s). If either of the two National Register of Historic Places-eligible prehistoric or historic sites could not be avoided by the proposed construction activities and protected by fencing, then a data recovery plan would need to be prepared and site excavation conducted prior to construction.

Radiological Sciences Institute construction and operation impacts on traditional cultural properties are unlikely, as most development would take place within previously disturbed portions of TA-48. Also, because the site would remain developed, potential views of TA-48 from any traditional cultural properties located in the vicinity would remain largely unchanged.

DD&D Impacts—Before demolition could begin on parts of the Radiochemistry Building or structures within TA-3, TA-18, TA-35, TA-46, and TA-59, a cultural resources assessment would be performed, as well as any subsequent compliance requiring documentation. NNSA, in conjunction with the State Historic Preservation Office, would implement documentation measures such as preparing a detailed report containing the history and description of the affected properties. These measures would be incorporated into a formal memorandum of agreement between NNSA and the New Mexico Historic Preservation Division to resolve adverse effects on eligible properties. The Advisory Council on Historic Preservation would be notified of the memorandum of agreement and would have an opportunity to comment. DD&D of buildings to be replaced by the new Radiological Sciences Institute would not impact traditional cultural properties, as all are located within developed portions of LANL.

Socioeconomics and Infrastructure

Construction Impacts—Utility infrastructure resources would be required for construction of the new Radiological Sciences Institute. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be a limited resource. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would be trucked to the point of use, rather than provided by a temporary service connection.

For construction of all 13 buildings, total liquid fuel consumption is estimated to be 4.2 million gallons (16 million liters). Total water consumption is estimated to be 22.4 million gallons (85 million liters). The existing LANL infrastructure would be capable of supporting requirements for new facility construction without exceeding site capacities, resulting in a negligible impact on site utility infrastructure.

Operations Impacts—No net increase in utility infrastructure demands for operation of the new Radiological Sciences Institute is expected, as its operational demands with more resource-efficient utility systems would be equal to or less than those of the facilities that the new Radiological Sciences Institute would replace. As such, operation of the Radiological Sciences Institute is expected to have no or negligible incremental impact on utility infrastructure capacities at LANL.

DD&D Impacts—Activities associated with DD&D of facilities to be replaced by the Radiological Sciences Institute are projected to require 101,000 gallons (384,000 liters) of liquid fuels and 3.1 million gallons (12 million liters) of water. DD&D activities would be staggered over an extended period of time. As a result, annual impacts of these activities on LANL's utility infrastructure would be minimal. Standard practice dictates that utility systems serving individual facilities be shut down as they are no longer needed. As DD&D activities progress, interior spaces, including associated equipment, piping, and wiring, would be removed prior to final demolition. Thus, existing utility infrastructure would be used to the extent possible and would then be supplemented or replaced by portable equipment and facilities as DD&D activities proceed, as previously discussed for construction activities.

Waste Management

The Radiochemistry Facility at TA-48 currently generates sanitary wastes, liquid radioactive wastes, and solid radioactive (low-level and transuranic) and chemical wastes, including mixed wastes. Sanitary wastes are delivered by a dedicated pipeline to the sanitary wastewater systems plant at TA-46. Radioactive liquid wastes are transported via dedicated piping to the Radioactive Liquid Waste Treatment Facility at TA-50. Low-level radioactive wastes are disposed of at

TA-54; all other radioactive, chemical, and mixed wastes are sent off site for treatment or disposal. Historical chemical and radioactive waste generation information is provided in **Table G–16** for TA-48. Table G–16 also includes historical waste generation information for the Sigma Complex, the Machine Shops, and those activities at the Pajarito Site that may be transferred to TA-48.

Table G–16 Waste Generation for the Radiochemistry Facility, Pajarito Site, Sigma Complex, and Machine Shops at Technical Area 3 (1998 to 2003)

		Radiochemistry Facility TA-48	*Pajarito Site TA-18* [a]	*Sigma Complex TA-3*	*Machine Shops TA-3* [b]
Transuranic waste (cubic yards)	Range	0 to 2	0 to 0	0 to 0	0 to 0
	Average	less than 1	0	0	0
Low-level radioactive waste (cubic yards)	Range	23 to 102	0 to 41	less than 1 to 264	20 to 535
	Average	58	13	94	127
Mixed low-level radioactive waste (cubic yards)	Range	less than 1 to 8	0 to 10	0 to 7	0 to less than 1
	Average	3	1	1	less than 1
Chemical waste (pounds)	Range	3,340 to 410,350	0 to 3,760	1,940 to 71,420	340 to 58,370
	Average	80,020	650	26,120	10,800

TA = technical area.
[a] TA-18 waste data include data for SHEBA which would not be moved to the Radiological Sciences Institute. Therefore, data presented for TA-18 are conservative (high) estimates of waste quantities.
[b] The Machine Shops data were compiled jointly for two buildings, the Nonhazardous Materials Machine Shop (Building 03-39) and the Radiological Hazardous Materials Machine Shop (Building 03-102). Only activities from Building 03-102 would be transferred to the Radiological Sciences Institute. Therefore, the values shown are conservative estimates of waste management impacts on the affected environment.
Note: To convert cubic yards to cubic meters, multiply by 0.76455; pounds to kilograms, by 0.4536.
Sources: LANL 2003b, 2004d, 2005c, 2006f.

Construction Impacts—Radiological Sciences Institute construction would generate approximately 2,800 cubic yards (2,100 cubic meters) of waste, primarily construction debris and associated solid waste. Construction debris is not hazardous and may be disposed of in a solid waste landfill. Recent LANL tracking and projection efforts have identified construction and demolition debris as a separate category of nonroutine sanitary (solid) waste. A substantial portion of construction debris at LANL is routinely recycled; in 2003, approximately 89 percent of the uncontaminated construction and demolition debris was recycled, and those rates are expected to continue (LANL 2004d).

Operations Impacts—Radiological Sciences Institute operations are expected to generate sanitary wastes, liquid radioactive wastes, and solid radioactive (low-level and transuranic) and chemical wastes, including mixed wastes. Because the Radiological Sciences Institute would be a new facility, design features would minimize wastes through enhanced processing, avoidance of cross-contamination, and nonhazardous product substitutions. Sanitary wastes would be delivered by dedicated pipeline to the Sanitary Wastewater Systems Plant at TA-46. Radioactive liquid wastes would be transported via dedicated piping to the Radioactive Liquid Waste Treatment Facility at TA-50. Other radioactive and chemical wastes would be managed at the waste management facilities or to a centralized waste storage facility within the Radiological Sciences Institute, where wastes may be stored for less than 90 days. Low-level radioactive wastes would be disposed of at TA-54 or at an offsite facility; all other radioactive and chemical wastes would be sent off site for treatment or disposal.

Because the Radiological Sciences Institute would consolidate operations already under way at the Radiochemistry Facility, Sigma Complex, Pajarito Site (TA-18), and Machine Shops (Building 03-102 only), the same general level of waste generation is expected to continue. Estimates of future waste generation rates were calculated based on historical rates and planned process improvements.

Projected discharge volumes of radioactive liquids are 845,000 gallons (3.2 million liters) per year (LANL 2006a). Chemical waste generation rates are expected to be 31,000 pounds (14,000 kilograms) per year. Low-level radioactive waste generation rates are estimated to be 157 cubic yards (120 cubic meters) per year. Mixed low-level and transuranic waste, including mixed transuranic waste; generation rates are expected to be very low, approximately 1.3 cubic yards (1 cubic meter) per year for each category (LANL 2006a).

DD&D Impacts—DD&D activities are expected to generate significant quantities of debris, including some radioactively contaminated debris. With the exception of low-level radioactive waste, most DD&D waste would be transferred to appropriate offsite treatment, recycling, or disposal facilities. **Table G–17** lists potential DD&D waste volumes from facilities that would be replaced by the Radiological Sciences Institute. Uncontaminated demolition debris may be recycled at on or offsite facilities. Chemical and radioactive wastes generated through decontamination processes would be managed at the waste management facilities. The large quantity of low-level radioactive waste may be disposed of on site or sent to an offsite facility. Solid wastes would be transferred to a permitted municipal landfill.

Table G–17 Decontamination, Decommissioning, and Demolition Waste Volumes for Buildings to be Replaced by the Radiological Sciences Institute

DD&D Waste Type	*Cubic Yards*
Low-level radioactive waste [a]	95,700
Mixed low-level radioactive waste	1,020
Remote-handled low-level radioactive waste	479
Contact-handled transuranic waste	1,130
Remote-handled transuranic waste	11
Demolition debris [b]	76,800
Hazardous waste with asbestos	605
Solid hazardous waste with organics	9
Solid hazardous waste with metals	373

DD&D = decontamination, decommissioning, and demolition.
[a] Consists of 71,800 cubic yards (54,900 cubic meters) of bulk waste, 23,500 cubic yards (18,000 cubic meters) of packaged waste, and 479 cubic yards (366 cubic meters) of remote-handled waste.
[b] Demolition waste includes solid and sanitary wastes.
Note: To convert cubic yards to cubic meters, multiply by 0.76455.

Transportation

Pajarito Road would provide access to the Radiological Sciences Institute.

Construction Impacts—Traffic on Pajarito Road could be disrupted due to temporary increases during construction.

Operations Impacts—Under the proposed project, interstate waste transportation would decrease over the long term. However, local traffic would increase.

DD&D Impacts—The large amounts of waste generated by Radiological Sciences Institute DD&D activities would have to be transported to storage or disposal sites using over-the-road truck transportation. These sites could be LANL TA-54 or an offsite location. Transportation has potential risks to workers and the public from incident-free transport, such as radiation exposure as the waste packages are transported along the routes and highways. Traffic accidents could result both in injuries or deaths from collisions and in an additional radiological dose to the public from radioactivity that may be released during the accident.

The effects of incident-free transportation of construction and DD&D wastes on the worker population and general public are presented in **Table G–18**. Effects are presented in terms of the collective dose in person-rem resulting in excess LCFs. Excess LCFs are the number of cancer fatalities that may be attributable to the proposed project, estimated to occur in the exposed population over the lifetimes of the individuals. If the number of LCFs is less than one, the subject population is not expected to incur any LCFs resulting from the actions being analyzed.

Table G–18 Incident-Free Transportation Impacts – Radiological Sciences Institute

Disposal Option	Low-Level Radioactive Waste Disposal Location [a]	Crew		Public	
		Collective Dose (person-rem)	Risk (LCF)	Collective Dose (person-rem)	Risk (LCF)
Onsite disposal	LANL TA-54	3.56	0.0021	1.06	0.00064
Offsite disposition	Nevada Test Site	31.34	0.0188	8.90	0.0053
	Commercial Facility	30.0	0.018	8.62	0.0052

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic wastes would be disposed of at the Waste Isolation Pilot Plant (WIPP).

The risk of development of excess LCFs is highest for the workers under the offsite disposition option. This is because the dose is proportional to the duration of transport, which in turn is proportional to travel distance. As shown in Table G–18, disposal of low-level radioactive waste at the Nevada Test Site, which is located farthest from LANL, would lead to the highest dose and risk, although the dose and risk are low for all disposal options. **Table G–19** presents the impacts of traffic and radiological accidents. This table provides population risks in terms of fatalities due to traffic accidents from both the collisions themselves and from excess LCFs from exposure to releases of radioactivity. The analyses assumed that all transuranic and nonradioactive wastes would be transported to offsite disposal facilities.

Because all estimated LCFs and traffic fatalities, as shown in Tables G–18 and G–19, are much less than 1.0, the analysis indicates that no excess fatal cancers would result from this activity, either from dose received from packaged waste on trucks or potentially received from traffic collisions and accidental release.

Table G–19 Transportation Accident Impacts – Radiological Sciences Institute

Low-Level Radioactive Waste Disposal Location [a, b]	*Number of Shipments* [c]	*Distance Traveled (million kilometers)*	*Accident Risks*	
			Radiological (excess LCFs)	*Traffic (fatalities)*
LANL TA-54	10,469	2.20	4.2×10^{-9}	0.027
Nevada Test Site	10,469	17.03	5.1×10^{-6}	0.174
Commercial facility	10,469	15.54	4.9×10^{-6}	0.158

LCF = latent cancer fatality, TA = technical area.
[a] All nonradiological wastes would be transported offsite.
[b] Transuranic wastes would be disposed of at WIPP.
[c] Approximately 58.7 percent of shipments are radioactive wastes. Others include 41 percent industrial and sanitary waste and about 0.6 percent asbestos and hazardous wastes.
Note: To convert kilometers to miles, multiply by 0.6214.

Facility Accidents

Operations Impacts—Potential accidents that might occur at the proposed Radiological Sciences Institute that are estimated to have the highest impacts would involve radiological operations and materials that were transferred from Chemistry and Metallurgy Research Wing 9 hot cell operations. Six accident scenarios were selected to represent the bounding impacts of accidents at the Radiological Sciences Institute. Information used to estimate the impacts of these accidents is shown in **Table G–20**. The material at risk in a hot cell is estimated to be 10.6 ounces (300 grams) of plutonium-238 equivalent and an additional 2.2 pounds (1 kilogram) of plutonium-239. The new Radiological Sciences Institute vault is assumed to contain this same entire inventory.

Table G–20 Bounding Radiological Accident Scenarios – Radiological Sciences Institute

Accident	*Source Term* [a] *(plutonium-238 curies)*	*Release Energy (watts)*	*Annual Frequency*
Hot cell fire involving plutonium-238 in general purpose heat source modules	5.13 plutonium-238	2.04×10^{6}	0.0001
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	22.572 plutonium-238 1.386 plutonium-239	2.04×10^{6}	2.4×10^{-5}
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	5.13 plutonium-238 0.315 plutonium-239	0	0.00024
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	0.001283 plutonium-238	0	0.1
Hot cell plutonium-238 spill with no confinement	0.4104	0	0.01
Main vault fire	10.26 plutonium-238 0.126 plutonium-239	2.04×10^{6}	$<1 \times 10^{-6}$

[a.] A release height of 4.9 feet (1.5 meters) is assumed for all accidents. Specific activity is 0.063 curies per gram for plutonium-239 and 17.1 curies per gram for plutonium-238.

Assuming that an accident occurred, estimated consequences for a noninvolved worker located 330 feet (100 meters) from the accident, the MEI located at the trailer park, and the offsite population are shown in **Tables G–21** and **G–22**. Estimated risks that take accident frequency into account to these same receptors are shown in **Table G–23**.

Table G–21 Radiological Accident Offsite Consequences – Radiological Sciences Institute

Accident	*MEI*		*Population to 50 Miles (80 kilometers)* [b, c]	
	Dose (rem)	*LCF* [a]	*Dose (person-rem)*	*LCF*
Hot cell fire involving plutonium-238 in general purpose heat source modules	6.31	0.0038	2,770	1.7
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	29.6	0.036	13,000	7.8
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	19.4	0.012	4,650	2.8
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	0.0066	4.0×10^{-6}	1.1	0.00065
Hot cell plutonium-238 spill with no confinement	2.12	0.0013	350	0.21
Main vault fire	12.8	0.0077	5,620	3.4

MEI = maximally exposed individual, LCF = latent cancer fatality.
[a] Increased risk of an LCF to an individual per year.
[b] Increased number of LCFs for the offsite population per year.
[c] Offsite population size is approximately 300,000 persons located within a 50-mile (80-kilometer) radius.

Table G–22 Radiological Accident Onsite Worker Consequences – Radiological Sciences Institute

Accident	*Noninvolved Worker at 330 Feet (100 meters)*	
	Dose (rem)	*LCF* [a]
Hot cell fire involving plutonium-238 in general purpose heat source modules	32.5	0.039
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules	152	0.18
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules	171	0.21
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	0.045	2.7×10^{-5}
Hot cell plutonium-238 spill with no confinement	14.3	0.0086
Main vault fire	65.9	0.079

LCF = latent cancer fatality.
[a] Increased risk of an LCF to an individual, assuming the accident occurs.

The accident scenarios with the potential for the highest radiological impacts to the MEI are the seismic-induced building collapse with no fire and the seismic-induced building collapse with a fire involving plutonium-238 in general purpose heat source modules. If either of these accidents were to occur, the consequences are estimated to be 2.8 or 7.8 increased LCFs for the offsite population, 0.012 or 0.036 increased risk of LCFs for the MEI, and 0.21 or 0.18 increased risk of an LCF for a noninvolved worker located at a distance of 330 feet (100 meters) from the accident, respectively. After taking into account the frequency (or probability) of each accident, the hot cell plutonium-238 spill with no confinement is estimated to have the highest risks. For this accident, the annual risks are estimated to be 0.0021 LCFs (1 chance in 480) for the offsite population, 1.3×10^{-5} increased risk (1 chance in 77,000) of LCFs for the MEI, and 8.6×10^{-5} increased risk (1 chance in 12,000) of an LCF for a noninvolved worker located at a distance of 330 feet (100 meters) from the accident.

Table G–23 Radiological Accident Offsite Population and Worker Risks – Radiological Sciences Institute

Accident	*Onsite Worker (LCFs)*	*Offsite Population (LCFs)*	
	Noninvolved Worker at 330 Feet (100 meters) [a]	*MEI* [a]	*Population to 50 Miles (80 kilometers)* [b, c]
Hot cell fire involving plutonium-238 in general purpose heat source modules	3.9×10^{-6}	3.8×10^{-7}	0.00017
Seismic-induced building collapse and fire involving plutonium-238 in general purpose heat source modules [d]	4.4×10^{-6}	8.5×10^{-7}	0.00019
Seismic-induced building collapse with no fire involving plutonium-238 in general purpose heat source modules [d]	4.9×10^{-5}	2.8×10^{-6}	0.00067
Spill of plutonium-238 residue from 0.5-gallon (2-liter) bottles outside of hot cell	2.7×10^{-6}	4.0×10^{-7}	6.5×10^{-5}
Hot cell plutonium-238 spill with no confinement	8.6×10^{-5}	1.3×10^{-5}	0.0021
Main vault fire	$< 7.9 \times 10^{-8}$	$< 7.7 \times 10^{-9}$	$< 3.4 \times 10^{-6}$

LCF = latent cancer fatality, MEI = maximally exposed individual.
[a] Increased risk of an LCF to an individual per year.
[b] Increased number of LCFs for the offsite population per year.
[c] Offsite population size is approximately 300,000 persons located within a 50-mile (80-kilometer) radius.
[c] An updated probabilistic seismic hazard analysis has been completed for LANL (LANL 2007), which results in higher peak horizontal ground acceleration values for the same annual probability of exceedance. In the seismic accident analyses for the Radiological Sciences Institute, the radioactive source term was conservatively based on the assumption that all structures, systems, and components failed, therefore, the updated probabilistic seismic hazard analysis is not expected to change the accident consequences or risks.

Seismic accidents considered for the proposed Radiological Sciences Institute are estimated to have a probability of release of 0.1 (the same as at the Chemistry and Metallurgy Research Building); the Radiological Sciences Institute would be designed to withstand the evaluation-basis earthquake. In comparing a seismic accident scenario that includes a fire with one that does not include a fire, both located within the Radiological Sciences Institute, the former has higher potential for causing offsite population and MEI impacts, while the latter has higher individual worker impacts. This is because the buoyant effects of a fire loft the radioactive plume over the onsite workers, while the greater releases associated with this scenario would impact the general population farther downwind. In contrast, the absence of a fire and its buoyant effects has a greater impact on close-in individuals like the noninvolved worker at 330 feet (100 meters) and the nearby worker population.

G.4 Radioactive Liquid Waste Treatment Facility Upgrade Impact Assessment

This section provides an assessment of environmental impacts for the proposed Radioactive Liquid Waste Treatment Facility Upgrade. Section G.4.1 provides background information on the proposed project. Section G.4.2 provides a description of the proposed options for the Radioactive Liquid Waste Treatment Facility Upgrade. Section G.4.3 presents environmental consequences of the No Action Option and project options for the Radioactive Liquid Waste Treatment Facility Upgrade. The main volume of this SWEIS contains information about the general environmental setting of LANL and environmental impacts associated with continued operations of the site.

G.4.1 Introduction

The Radioactive Liquid Waste Treatment Facility treats radioactive liquid wastes generated at other LANL facilities and houses analytical laboratories supporting waste treatment operations. The principal capabilities and activities conducted at the Radioactive Liquid Waste Treatment Facility include: (1) waste characterization and packaging, including identification and quantification of constituents of concern in waste streams and packaging and labeling waste according to U.S. Department of Transportation regulations; (2) waste transportation including inspection and cross-checking for acceptance; (3) liquid and solid chemical materials and radioactive waste storage; (4) waste pretreatment; (5) radiological liquid waste treatment using a number of treatment processes, including ultrafiltration and reverse osmosis; and (6) secondary waste treatment.

The original Radioactive Liquid Waste Treatment Facility (Building 50-1) as shown in **Figure G–4** was constructed in 1963. Between 1963 and 1986, three annexes were attached to the north, south, and east sides of the original building. With the addition of these annexes, the current facility has a total floor area of approximately 42,300 square feet (3,900 square meters). The North Annex has a footprint of about 5,000 square feet (450 square meters); the East Annex has a footprint of about 7,000 square feet (630 square meters); and the South Annex has a footprint of about 7,500 (700 square meters).

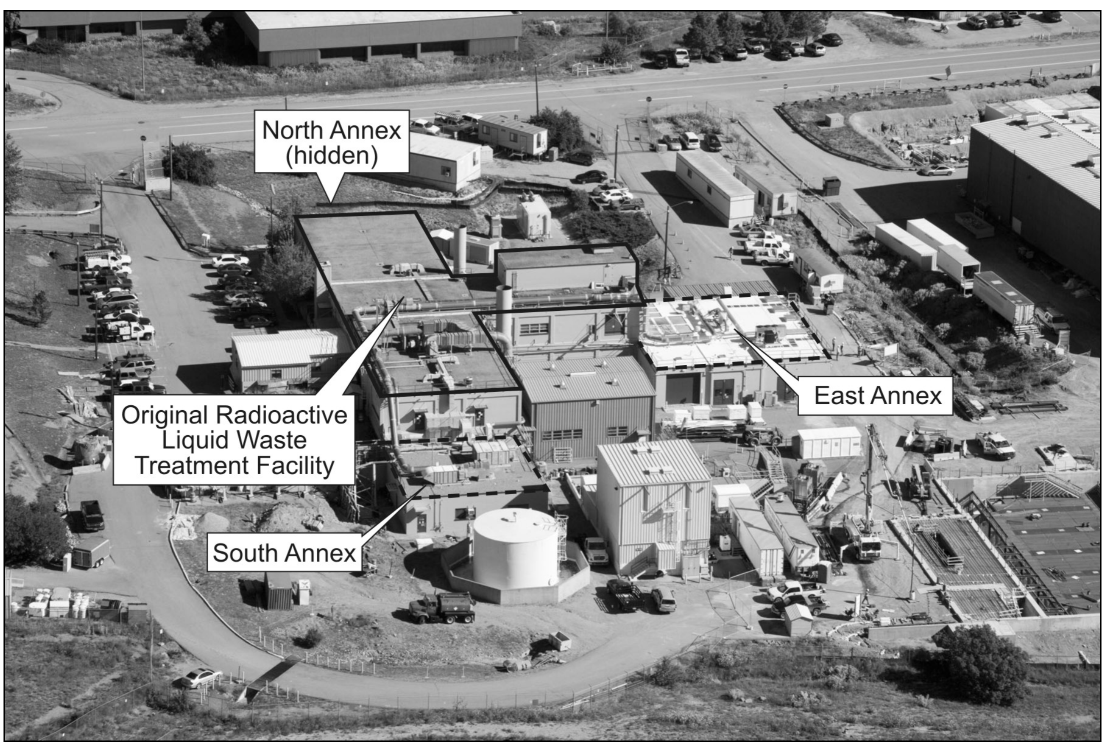


Figure G–4 Existing Radioactive Liquid Waste Treatment Facility

The Radioactive Liquid Waste Treatment Facility is the only facility available at LANL to treat a broad range of transuranic liquid wastes and low-level radioactive liquid waste. However, the ability of this facility to operate reliably is becoming increasingly uncertain. The original building is over 40 years old and has exceeded its design life. Similarly, the clarifiers, rotary vacuum filter, and heating, ventilation, and air conditioning systems, installed in 1963, are also over 40 years old. The infrastructure and treatment equipment require increasing maintenance attention to keep them operational, and replacement parts are increasingly difficult to acquire; replacement components for some older systems are no longer commercially produced. Corrosion of pipes and tanks has resulted in leaks. Radioactive Liquid Waste Treatment Facility materials and components are failing with increased frequency, and key systems could potentially fail within the next 5 to 10 years.

The current Radioactive Liquid Waste Treatment Facility treats all liquid radioactive waste generated at LANL except for that generated at TA-53 and occasionally that from TA-21. A system of pipes collects radioactive wastewater from various facilities, such as the Plutonium Facility at TA-55 and the Chemistry and Metallurgy Research Facility at TA-3, and transfers the wastewater to influent tanks at the Radioactive Liquid Waste Treatment Facility. In a few cases, trucks bring radioactive wastewater from other facilities to the Radioactive Liquid Waste Treatment Facility.

The influent waste stream contains two types of radioactive components: (1) tritiated water, and (2) radioactive solids that are either dissolved or suspended in the liquid. The existing and the proposed Radioactive Liquid Waste Treatment Facility treatment processes are designed to treat the dissolved or suspended solids, but are not able to extract tritiated water. Tritiated wastewater is discharged via a permitted outfall if it meets discharge criteria or is trucked to TA-53's evaporation ponds if it exceeds discharge criteria. Tritiated wastewater has not been trucked to the TA-53 evaporation ponds since 2003.

Although the treatment processes cannot remove tritiated water, they do extract suspended and dissolved radioactive solids from the liquid waste and concentrate the solids by removing additional liquid. The treated liquid is either returned to the low-level radioactive waste influent tank or released to a permitted outfall in Mortandad Canyon. Solid radioactive waste is placed in 55-gallon (208-liter) drums. Drums of solids that meet the waste acceptance criterion regarding liquid content are trucked to TA-54 for storage or disposal. Concentrated liquids resulting from the evaporator portion of the treatment process are sent by truck to a permitted commercial treatment facility in Tennessee for drying, a trip of about 1,400 miles (2,700 kilometers). Typically, about six shipments are made each year. The treatment facility returns the dried solids to TA-54. Drums of solidified transuranic waste from liquid treatment are stored at TA-54 pending preparation for shipment to WIPP near Carlsbad, New Mexico; low-level radioactive waste is disposed of in TA-54.

Future preparation of transuranic waste for shipment is expected to occur in a new TRU (Transuranic) Waste Facility in TA-54 (Appendix H, Section H.3.2.2.2). Some of the functions needed for preparation of transuranic waste from the Radioactive Liquid Waste Treatment Facility may be optionally duplicated in a separate structure co-located with the Radioactive Liquid Waste Treatment Facility. The environmental analysis conducted for the TRU Waste Facility bounds this possibility.

Because many treatment processes work best with water that contains certain ranges of minerals and chemicals and with certain quantities of water, design of the new facility would consider historical usage and future mission requirements. The lower-bound waste volumes assume the generators of radioactive wastewater implement various waste minimization and pollution prevention projects. Calculations of the upper-bound waste volumes assume these waste minimization and pollution prevention projects do not occur and changes in LANL's mission (in particular an increase in pit production up to 80 pits per year) would result in generation of more radioactive wastewater. **Table G–24** shows the quantities of wastewater that the new facilities would be designed to process annually. Upper-bound quantities would be about twice as large.

Table G–24 Design Basis Influent Volumes – Radioactive Liquid Waste Treatment Facility Upgrade

Influent	*Lower Bound (gallons per year)*
Low-level radioactive waste	2,507,000
Acidic transuranic waste	3,700
Caustic transuranic waste	2,600

Note: To convert gallons to liters, multiply by 3.7854.

G.4.2 Options Considered

For the Radioactive Liquid Waste Treatment Facility Upgrade, one No Action Option (see Section G.4.2.1) and three action options (see Sections G.4.2.2, G.4.2.3, and G.4.2.4) are proposed to address facility needs. Additionally, two auxiliary actions to reduce or eliminate the discharge are also proposed (see Section G.4.2.5). The auxiliary actions (evaporation tanks or mechanical evaporation) may be incorporated as part of the No Action Option or any of the three action options. Section G.4.2.6 presents options considered, but dismissed.

G.4.2.1 No Action Option

Under the No Action Option, the Radioactive Liquid Waste Treatment Facility would continue to process transuranic and low-level radioactive wastewater in the existing building. No new construction would occur. The annexes to the original Radioactive Liquid Waste Treatment Facility, which do not meet seismic and wind-loading standards, would not be removed. No existing contaminated materials would be removed. Existing processes would continue to treat liquid transuranic waste and liquid low-level radioactive wastes separately. Treatment processes would result in generation of transuranic sludge, low-level radioactive waste sludge, solid low-level radioactive waste, secondary liquid low-level radioactive wastes (evaporator bottoms), and treated effluent. The transuranic sludge would be solidified (cemented), then transported to TA-54 for storage, characterization, and shipment to WIPP for disposal. The low-level radioactive waste sludge would be dewatered, packaged, and shipped to TA-54 for disposal. Solid low-level radioactive wastes would be packaged and shipped to TA-54 for disposal. Secondary liquid low-level radioactive wastes would be transported by truck to an offsite treatment plant where it would be dried, and the resultant solids would be returned to LANL for disposal at TA-54 as solid low-level radioactive wastes, if it meets waste acceptance criteria. Optionally, effluent from the existing facility could be evaporated as discussed in Section G.4.2.5. The existing treatment processes for transuranic waste are shown in **Figure G–5**.

Under the No Action Option, LANL staff would continue to perform routine repairs, safety improvements, and replacement-in-kind of equipment on an as-needed basis. LANL would continue to meet current discharge standards, but may not be able to meet future discharge standards if they become more stringent and the auxiliary actions are not implemented. The existing Radioactive Liquid Waste Treatment Facility would continue to process radioactive liquid wastes until key systems irreparably fail or until the facility can no longer meet discharge standards. System failure or failure to meet discharge standards is estimated to occur sometime within the next 10 years. Therefore, this No Action Option does not meet NNSA's purpose and need to maintain treatment capability at LANL for 50 years.

G.4.2.2 Option 1: Single Liquid Waste Treatment Building Option – Proposed Project

Under the proposed project, NNSA would construct new low-level radioactive waste and transuranic liquid waste treatment facilities to achieve greater reliability, redundancy, and flexibility. A new waste treatment building would have a footprint of about 10,800 square feet (1,000 square meters). The building would consist of a partially below-grade basement, a main floor, and a mezzanine for a total area of 20,700 square feet (1,923 square meters), and would be accompanied by a new central utilities building. NNSA would also modify low-level radioactive and transuranic waste processes to become more effective and better able to incorporate future technology. Portions of the existing Radioactive Liquid Waste Treatment Facility, as described below, would be demolished. The existing facility would not be renovated but would continue to be used for offices and chemical analyses. New equipment would be purchased; some existing equipment may be used to supplement the new equipment and to provide redundancy. Additionally, either one of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

The proposed location of the single new low-level radioactive waste and transuranic facility is west of the existing Radioactive Liquid Waste Treatment Facility in an existing parking area (see **Figure G–6**). The building would be sited near the point where transuranic waste lines enter TA-50 to minimize the distance this wastewater must flow to reach the treatment facility. NNSA would conduct DD&D of the East Annex. The existing transuranic storage tank vault (TA-50-66) and the transformer on the north side of the existing Radioactive Liquid Waste Treatment Facility would also be demolished. Some wastewater collection pipes and utilities in the immediate vicinity of the Radioactive Liquid Waste Treatment Facility may be rerouted. Some remediation of contaminated soils would be required.

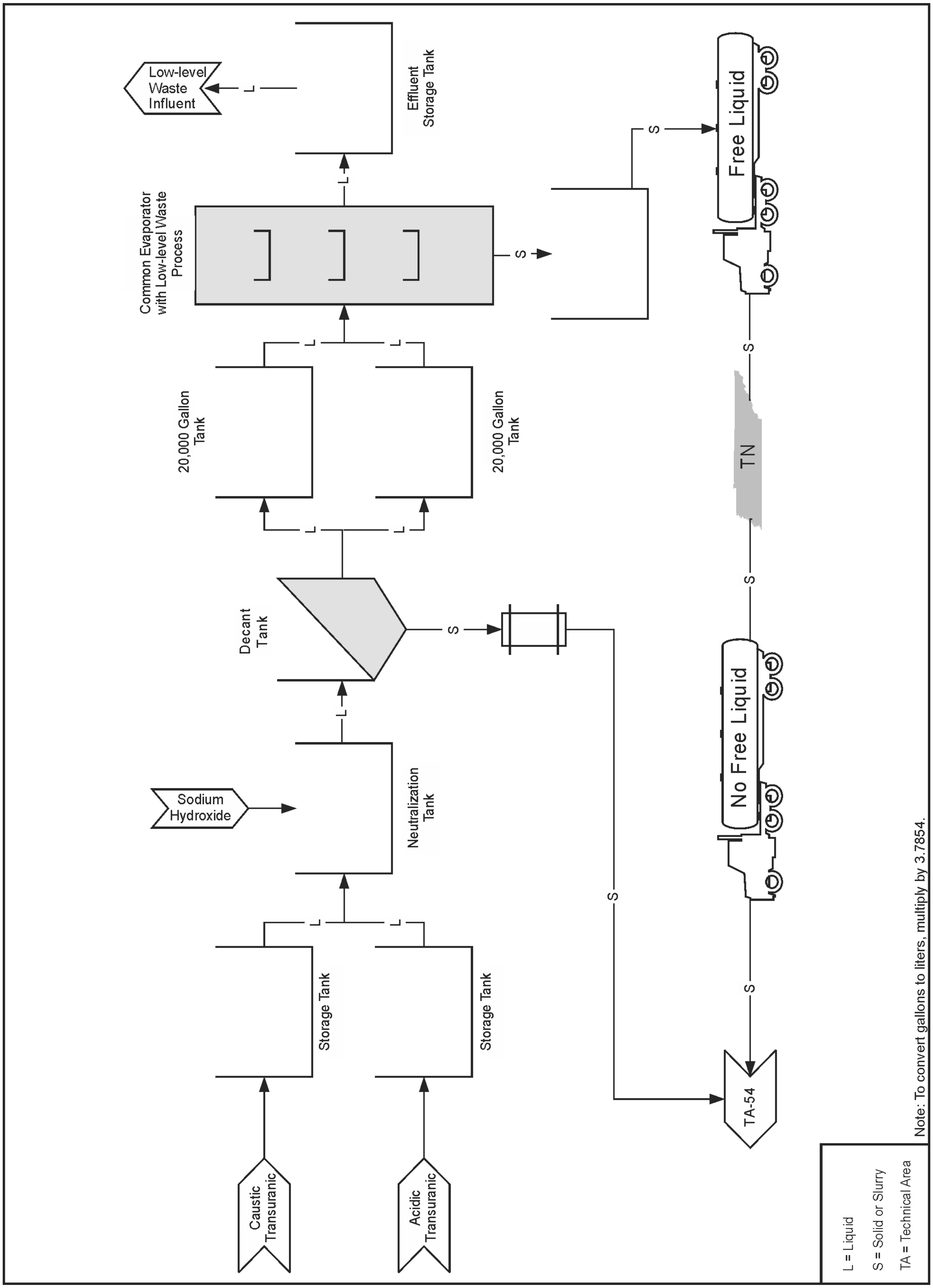


Figure G–5 Existing Treatment Processes for Transuranic Waste

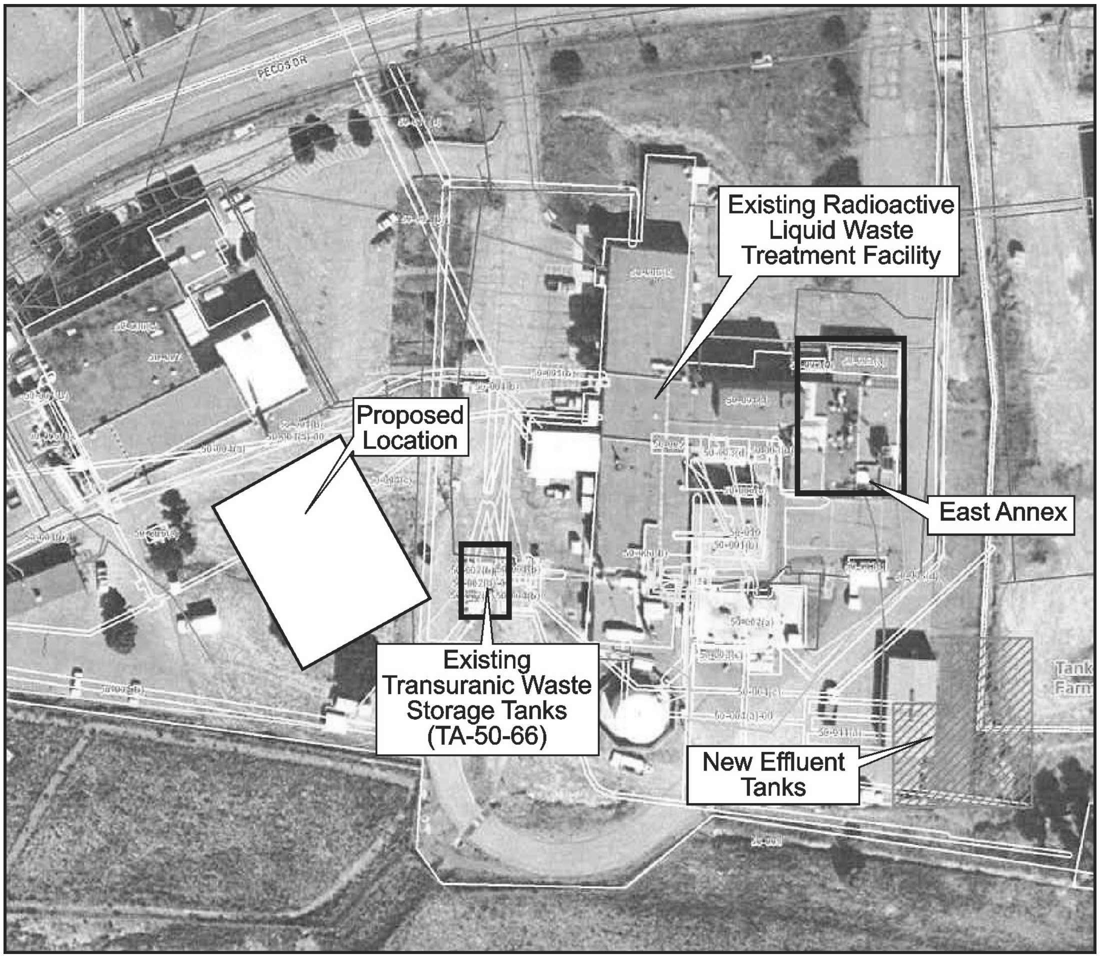
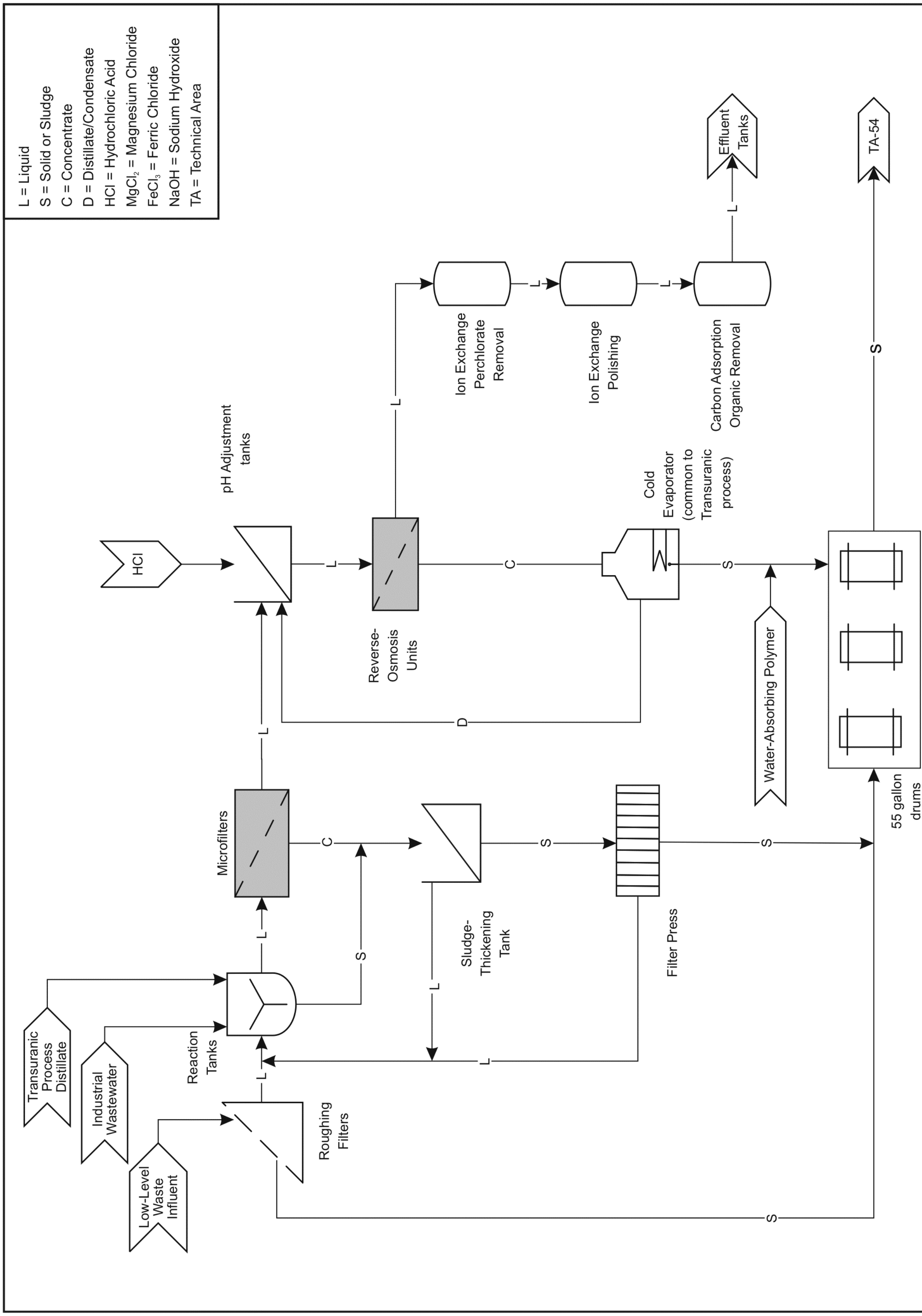


Figure G–6 Proposed Project Location

The proposed low-level radioactive waste treatment process consists of removing suspended and dissolved solids from the liquid waste stream, concentrating the solid waste stream by removing additional liquid, packaging the resulting solid radioactive waste, and ultimately releasing the remaining liquids to a permitted outfall or to evaporative processes. **Figure G–7** shows the proposed low-level radioactive waste treatment process. This process would receive waste via pipeline from the low-level radioactive waste influent tanks and distillate from the transuranic waste treatment process. Some industrial wastewater that cannot be treated by other LANL wastewater treatment systems may also be treated (LANL 2005e). In a typical year, the system could receive approximately 2.5 million gallons (9.5 million liters) of liquid low-level radioactive waste, although the upper bound influent volume may be up to 5 million gallons (20 million liters). The proposed transuranic waste treatment process is shown in **Figure G–8**. The transuranic influent tanks can store approximately 25,000 gallons (96,000 liters) per year of transuranic acid wastewater and 9,000 gallons (34,000 liters) per year of transuranic caustic wastewater. Redundant tanks would handle overflows and drainage.



Note: To convert gallons to liters, multiply by 3.7854.

Figure G–7 Proposed Low-Level Radioactive Waste Treatment Process

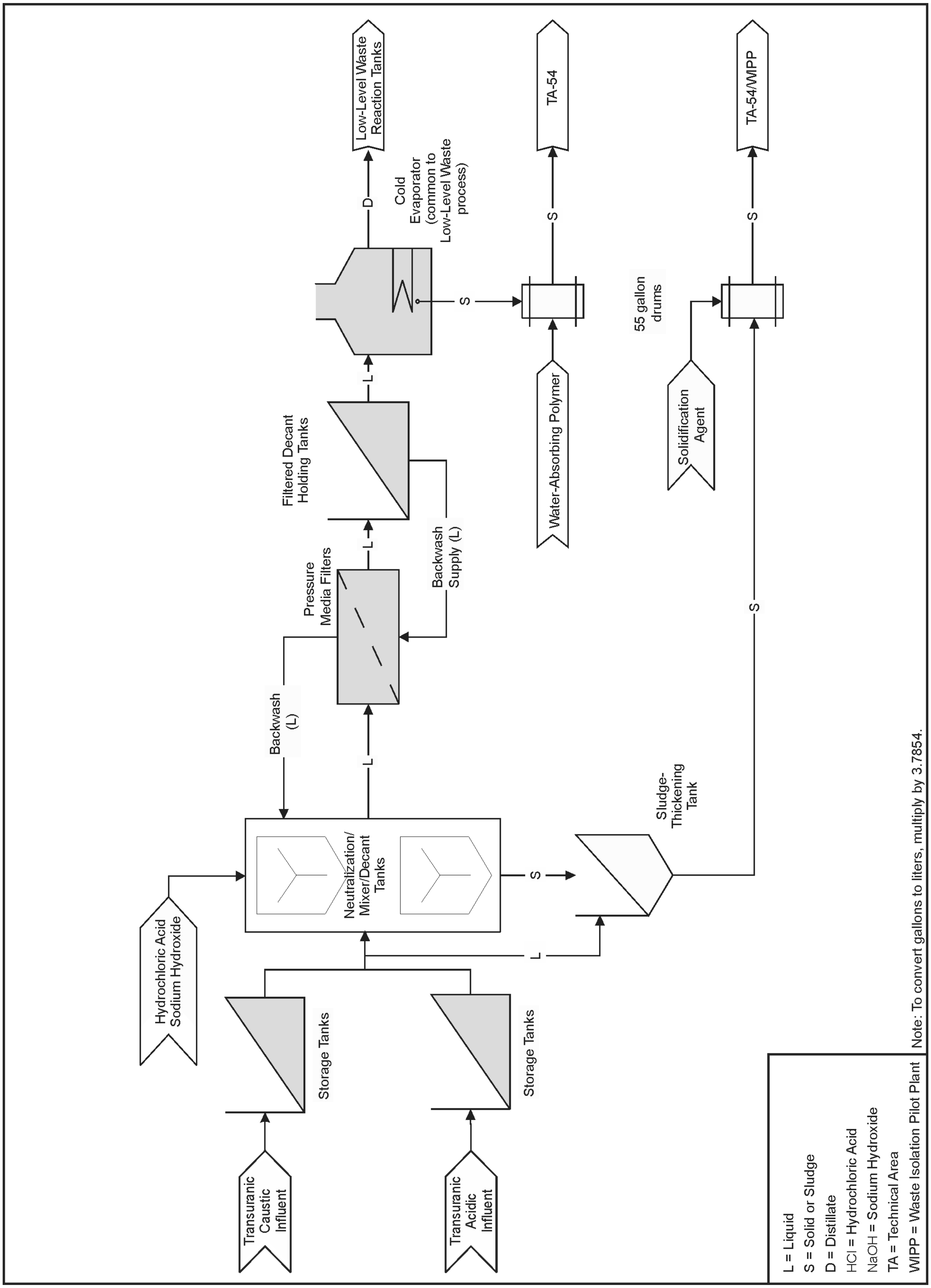


Figure G–8 Proposed Transuranic Waste Treatment Process

G.4.2.3 Option 2: Two Liquid Waste Treatment Buildings Option

This option would involve construction and operation of two new treatment facilities: one for low-level radioactive waste and one for transuranic waste (see **Figure G–9**). A central utilities building would also be constructed. The new low-level radioactive waste facility would have a footprint between 25,000 and 35,000 square feet (2,323 to 3,150 square meters) and would be located on the north side of the Radioactive Liquid Waste Treatment Facility. The transuranic waste facility would be located close to the point where transuranic waste lines enter TA-50, southwest of the existing Radioactive Liquid Waste Treatment Facility, to minimize the distance this wastewater must flow to reach the treatment facility. The transuranic waste facility would require approximately 15,000 square feet (1,350 square meters) of floor space. Like the low-level radioactive waste facility, it would contain processing areas, mechanical rooms, a control room, and access control areas. Additionally, either one of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

Locating the new low-level radioactive waste facility north of the existing Radioactive Liquid Waste Treatment Facility would necessitate demolition of the North Annex, in addition to the East Annex, as well as a transformer located on the north side of the existing facility. The existing transuranic waste storage tank vault (TA-50-66) would be demolished. Some remediation of contaminated soils would be required. The new facilities would use the same treatment process as that described for the proposed project. All other aspects of this option are the same as those of the proposed project (Option 1).

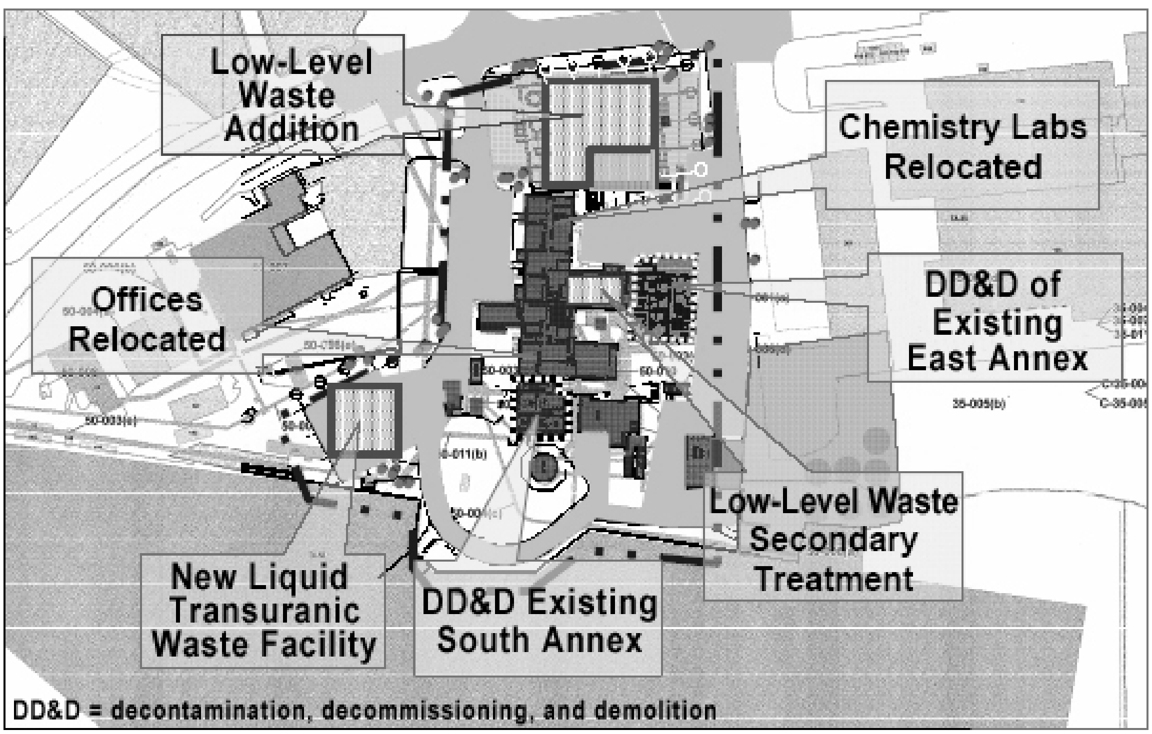


Figure G–9 Proposed Layout under the Two Liquid Waste Treatment Buildings Option

As a variation on this option, treatment functions to be housed in two facilities may be housed in multiple facilities in addition to the central utilities building. For example, separate structures may be constructed for portions of the transuranic waste treatment train rather than being consolidated into one structure.

G.4.2.4 Option 3: Two Liquid Waste Treatment Buildings and Renovation Option

Under Option 3, new buildings would be constructed to house the low-level radioactive waste and transuranic waste treatment processes, as in Option 2. As for Option 2, two new treatment buildings are envisioned, in addition to a central utilities building, although separate functions of the liquid waste treatment trains may be optionally housed in separate structures. In addition, the existing Radioactive Liquid Waste Treatment Facility would be renovated and reused for offices, chemistry laboratories, and drying of various solid residues (secondary waste) from the low-level radioactive waste treatment system.

Upon completion of the new facilities, the low-level radioactive waste and transuranic waste processes would be established in the new facilities and renovation of the existing facility would begin. When renovation is completed, equipment needed to dry the solid residues would be installed and operated in the renovated facility. In the interim, solid wastes would continue to be shipped off site for dewatering. The wastewater streams would be treated in the same way as under the proposed project (Option 1), and the treated effluent would similarly be discharged into Mortandad Canyon, reused, or evaporated. One of the auxiliary actions (evaporation tanks or mechanical evaporation) described in Section G.4.2.5 may be added to this option.

This Two Liquid Waste Treatment Buildings and Renovation Option (Option 3) would entail major structural and infrastructure changes to the existing Radioactive Liquid Waste Treatment Facility. Existing external walls would be removed and replaced with seismically appropriate materials and construction as required to meet LANL engineering standards for Hazard Category 2 facilities. Electrical and plumbing systems that do not meet current building codes would be replaced. Piping that does not conform to spill control requirements would also be replaced. The North, South, and East Annexes would be demolished, as they do not meet seismic requirements; failure of these structures could have a detrimental effect on existing and new construction. Under this option, the process of characterizing, demolishing, and removing contaminated materials would be the same as that under the proposed project (Option 1).

G.4.2.5 Auxiliary Actions

For the Radioactive Liquid Waste Treatment Facility Upgrade, two auxiliary actions are proposed to reduce or eliminate this discharge. The auxiliary actions could be applied to the No Action Option or any of the action options.

The first auxiliary action consists of constructing evaporation tanks and allowing the wastewater to evaporate using passive solar energy. The tanks would consist of up to three individual tanks constructed of lined, self-supporting concrete structures having walls approximately 4 feet high. Each tank would be open on top and have a surface area for evaporation of about an acre, with a total surface tank area of about 3 acres (1.2 hectares). The tanks would be surrounded by a security fence slatted with inserts to provide a wind screen. Except for periodic cleaning to eliminate the buildup of dissolved solids in the water, the tanks would be managed to always retain a minimum level of water. During cleaning, salt (and blown-in dirt) on the floor and sidewalls of the tanks would be flushed to a sump for solids removal, and the filtrate from solids removal returned to the evaporation tanks. The evaporation tanks could be constructed at a site in TA-52, located about a mile east of the Radioactive Liquid Waste Treatment Facility. A pipeline would be constructed to transport effluent from the Radioactive Liquid Waste Treatment Facility to the evaporation tanks.

The second auxiliary action option consists of the use of mechanical evaporation. Evaporative equipment would be purchased and installed at or near the proposed low-level radioactive waste treatment building.

G.4.2.6 Options Considered but Dismissed

Two additional action options were considered but dismissed from further evaluation. The first of these would be to construct the new radioactive liquid waste treatment facilities in another location. This site option was dismissed because the collection system, which is already in place to deliver wastewater to the current Radioactive Liquid Waste Treatment Facility, would need to be rebuilt in new locations. Constructing a new collection system has the potential for negative impacts on a number of resources without a benefit over the options being considered. The existing facility is in reasonable proximity to the source of most of the transuranic wastewater. Any other location would entail additional collection infrastructure and a longer distance over which wastewater would be transferred. In addition, the current facility has an existing NPDES permit to discharge at its current location.

The second option considered but dismissed from further evaluation would be to renovate the existing Radioactive Liquid Waste Treatment Facility to house the new transuranic waste and low-level radioactive waste treatment processes. This option is not feasible, as the capability to treat radioactive liquid wastewater must be maintained so that LANL missions are not impacted. Engineering and process reviews have determined that it is not feasible to install additional treatment equipment in the existing facility while the current treatment process is operating due to lack of space. The existing treatment processes must be maintained with no more than 10 days of downtime to ensure that mission-critical activities in facilities that generate liquid radioactive waste can be maintained. The time required to renovate the existing facility would far exceed 10 days.

G.4.3 Affected Environment and Environmental Consequences

This section presents an analysis of environmental consequences for each of the four options presented in Section G.4.2. Affected environment descriptions are also included where information is available that is specific to the project site and has not been included in Chapter 4 of this SWEIS. Detailed information about the LANL environment is presented in the main volume of this SWEIS. The auxiliary actions (see Section G.4.2.5) are not evaluated separately, but are largely evaluated as part of each of the action options (Options 1, 2, and 3). These auxiliary action evaluations would be also applicable to the No Action Option.

Proposed sites for the new transuranic and low-level radioactive waste buildings are within the developed area of TA-50, adjacent to the existing Radioactive Liquid Waste Treatment Facility. The area has been designated as an industrial area focused on Nuclear Materials Research and Development in *LANL's Comprehensive Site Plan*. Mortandad Canyon, which lies north of the proposed project, is largely undeveloped.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary.

- *Noise* – Would be managed with standard worker protective measures; no impact on the public due to location.
- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.
- *Environmental Justice* – The proposed project is mainly confined to already-developed areas of TA-50, with no disproportionate human health impacts to low-income or minority populations expected.
- *Facility Accidents* – Potential facility accidents associated with this proposed project are addressed as part of the No Action Alternative of this SWEIS.

Resource areas examined in this analysis include: land resources, geology and soils, water resources, air quality, ecological resources, human health, cultural resources, site infrastructure, waste management, and transportation.

G.4.3.1 No Action Option

No changes in air emissions or biological resources are expected under the No Action Option. Although the Radioactive Liquid Waste Treatment Facility is currently able to meet existing discharge standards, the facility may not meet more stringent discharge standards in the future. Implementation of the auxiliary action options would greatly reduce or eliminate liquid effluent discharges and therefore beneficially effect water quality. Construction impacts from particulate or radioactive emissions would not occur. There would be no effects on land resources, cultural resources, human health, transportation, traffic, or infrastructure under the No Action Option.

Between 1998 and 2004, the Radioactive Liquid Waste Treatment Facility received a range of about 2.2 million to 5.9 million gallons (8.4 million to 22.3 million liters) of low-level radioactive waste influent per year (LANL 2005e). During that same period, solid low-level radioactive waste volumes ranged from 173 to 510 cubic yards (132 to 390 cubic meters) per year (LANL 2003b, 2004d, 2006a).

During 2005, the facility treated and discharged about 1.8 million gallons (6.8 million liters) of effluent to a permitted outfall. Also during 2005, 339 cubic yards (259 cubic meters) of solid low-level radioactive waste, very small quantities of mixed low-level radioactive waste, and

15.9 pounds (7.2 kilograms) of chemical waste were generated. About 75 cubic yards (57.5 cubic meters) of the low-level radioactive waste was construction soil and debris from installing influent storage tanks for the Cerro Grande Rehabilitation Project (LANL 2006f).

Under the No Action Option, low-level radioactive waste volumes are expected to be similar to the past few years of Radioactive Liquid Waste Treatment Facility operation, when more-efficient treatment equipment was brought online and radioactive solids were more effectively removed than in previous years. Because the treatment process would not be improved under the No Action Option, the amount of solid low-level radioactive waste to be generated would be largely a product of the influent volume and contamination concentrations. The average influent volume for 2003–2004 was 2.7 million gallons (10.3 million liters), while average low-level radioactive waste generation was 488 cubic yards (373 cubic meters) (LANL 2003b, 2004d, 2006a). Influent and waste generation levels were smaller than those averages in 2005 (LANL 2006f). If all pollution prevention measures and mission changes are implemented as scheduled, low-level radioactive waste influent volumes are expected to decrease slightly from current levels by about the year 2014 (LANL 2005e). Solid low-level radioactive waste volumes are expected to decrease slightly as well.

Similarly, because the treatment process would not be improved under the No Action Option, transuranic waste quantities would be a function of the influent volume and influent contamination concentrations. For the years 1998-2002, the Radioactive Liquid Waste Treatment Facility received on average 1,412 gallons (5,346 liters) of caustic transuranic and 8,792 gallons (33,276 liters) of acid transuranic influent per year. In that same period, the Radioactive Liquid Waste Treatment Facility produced approximately about 6.5 to 7.8 cubic yards (5 to 6 cubic meters) of solid transuranic and mixed transuranic waste annually. Under the No Action Option, the transuranic waste influent would approximately double if mission changes and pollution prevention measures are implemented. The amount of transuranic solid waste generated by treatment of the influent is likely to increase in a similar way.

Construction and operation of the evaporation tanks would have the same impacts as those detailed for Options 1, 2, and 3 in Section G.4.3.2.

G.4.3.2 Option 1: Single Liquid Waste Treatment Building Option – Proposed Project

Land Resources—Land Use

Land in TA-50 where the new building would be constructed is in the immediate vicinity of the Radioactive Liquid Waste Treatment Facility, a highly developed area with a land use designation of Waste Management (see Section 4.1 for a land use map and description). If evaporation tanks were constructed, the pipeline to them would be routed east through TA-63 and TA-52 in areas with current land use designations of Physical and Technical Support, Experimental Science, and Reserve. The proposed location of the evaporation tanks near the border of TA-52 and TA-5 is designated Reserve (LANL 2003b).

Construction Impacts—Construction of the new liquid waste management building would occur in a developed area and result in no changes to current or future land use designations. If the option to construct evaporation tanks is implemented, the land use designation for the tank areas and along a portion of the pipeline would likely change from Reserve to Waste Management. The tanks themselves could occupy approximately 3 acres (1.2 hectares), but a somewhat larger area (up to 4 acres [1.6 hectares]) would undergo a change in land use designation. Removing this land from the Reserve designation was not previously accounted for in land use plans (LANL 2004d).

Land Resources—Visual Resources

As noted previously in the land use discussion, the area in which the treatment buildings would be constructed is a highly developed area. This area currently has an industrial look, with a mix of buildings of different design. The area proposed for construction of the tanks is currently undeveloped and wooded.

Construction Impacts—There would be temporary local visual impacts associated with construction of the new treatment building, and during excavation from the use of construction equipment. The current natural setting in the area of the evaporation tanks, and a portion of the pipeline, would be disrupted by removal of vegetation, establishment of a construction staging area, and construction activities. Construction would entail excavation of soils to construct the tanks and pipeline, and possibly the temporary establishment of a soil pile. Excess soils would be removed and used or stockpiled elsewhere.

Operations Impacts—The new treatment building would not result in a change to the overall visual character of the area within TA-50. The facility would be a maximum of two stories and constructed in accordance with site guidelines, which establish acceptable color schemes for building exteriors. Establishment of evaporation tanks would result in a permanent change to the visual environment in the area near the border of TA-52 and TA-5. Although this change would result in a noticeable break in the forest cover when seen from higher elevations to the west of LANL, due to their low profile and the presence of nearby forest vegetation, the tanks would not likely be visible from the east. Additionally, the tanks would be surrounded by a fence that would be colored to blend with the surrounding environment. Following regrowth of vegetation, the area disturbed for pipeline construction would not be noticeable.

DD&D Impacts—Removal of the East Annex and TA-50-66 would result in temporary local visual impacts in the form of construction equipment and the presence of partially demolished buildings. Long-term effects would be a slightly improved local visual environment, once the annex and TA-50-66 are removed.

Geology and Soils

The existing Radioactive Liquid Waste Treatment Facility is categorized as a potential release site; other potential release sites representing possible historic spills, polychlorinated biphenyls, or leakage of radioactive wastewater are present in the vicinity of the proposed construction at TA-50. A large radioactive waste material disposal area (MDA), designated MDA C, is immediately south of the existing Radioactive Liquid Waste Treatment Facility. NNSA is implementing environmental investigation and remediation measures for MDA C and other potential release sites at TA-50 in accordance with DOE requirements and the Consent Order.

TA-50 is approximately 0.8 miles (1.25 kilometers) east of the nearest mapped fault, a subsidiary of the Rendija Canyon Fault (see Section 4.2 of this SWEIS). However, previous study indicates that the level of seismic risk is low and is manageable through facility design. Any new facilities would be designed in accordance with current DOE seismic standards and applicable building codes.

Because building construction would occur within areas already disturbed by previous facility construction, there would be no impact on native soils. Construction of the new facilities would require removal of facility soils as well as new excavation of shallow bedrock in some areas. As a result, construction activities would generate excess soil and excavated bedrock that may be suitable for use as backfill. Uncontaminated backfill would be stockpiled at an approved material management area at LANL for future use. Best management practices would be implemented to prevent erosion and migration of disturbed materials from the site caused by stormwater, other water discharges, or wind.

Construction Impacts—Approximately 36,000 cubic yards (28,000 cubic meters) of soil and rock would be disturbed during building excavation. If construction of the evaporation tanks and associated pipeline also occurs, an additional 69,000 cubic yards (53,000 cubic meters) of excavation work would be required. Nevertheless, the proposed project would initiate removal of contaminated areas adjacent to the Radioactive Liquid Waste Treatment Facility and would have a positive effect. The East Annex and TA-50-66 would also be demolished, and remediation of associated potential release sites would be initiated.

Operations Impacts—There would be minimal operations impacts on geology and soils. Evaporation of liquid effluent would eliminate addition of contaminants to soil and sediment below the existing permitted outfall. As noted above, construction activities may remove contaminated media, resulting in a reduced potential for contamination spread from past releases.

DD&D Impacts—Contaminated material would be removed from the areas affected by demolition and construction, and would be managed according to waste type and LANL procedures.

Water Resources

The Radioactive Liquid Waste Treatment Facility currently releases treated effluent to Mortandad Canyon at a permitted outfall. Other industrial outfalls and stormwater also discharge into Mortandad Canyon, both upstream and downstream from the Radioactive Liquid Waste Treatment Facility. Mortandad Canyon crosses lands belonging to the Pueblo of San Ildefonso before discharging into the Rio Grande. Existing contaminants are known to be present in Mortandad Canyon. A permeable reactive membrane barrier designed to trap contaminants and to prevent their movement downstream toward the Pueblo of San Ildefonso is located downstream from TA-50.

Construction Impacts—Construction could result in movement of contaminated and uncontaminated materials. The effects of construction would be mitigated by implementation of a stormwater pollution prevention plan to contain sediments and prevent erosion.

Operations Impacts—The overall effect of implementing the proposed project is expected to be positive. This option would ensure that both current and projected future discharge requirements could be met. During operations, effluent water quality is expected to improve due to improved processing and potentially more-stringent discharge requirements. If discharges are eliminated or greatly decreased through recycling or evaporation, movement of contaminants in groundwater and surface water in Mortandad Canyon is expected to decrease. If liquid discharge is not reduced or completely eliminated by recycling or evaporation, the permeable reactive membrane barrier is expected to mitigate the downstream movement of contaminants. The potential for spills of contaminated water would be greatly reduced by replacing single-walled piping with double-walled pipes and by use of secondary containment structures.

DD&D Impacts—Demolition could result in mobilization of particulates that could be entrained in offsite sediments. However, erosion control measures specified in a stormwater pollution prevention plan would be implemented. Movement of contaminated or uncontaminated materials is, therefore, expected to be negligible.

Air Quality

The Radioactive Liquid Waste Treatment Facility contributes less than 1 microcurie of radioactive emissions to LANL's total radioactive emissions. Likewise, Radioactive Liquid Waste Treatment Facility emissions of criteria air pollutants (nitrogen oxides, sulfur oxides, particulate matter, carbon monoxide, and volatile organic compounds) and other hazardous air pollutants are small relative to LANL's overall emissions.

Construction Impacts—Construction and demolition would result in temporary increases in particulate emissions.

Operations Impacts—Sufficient information to assess emissions and doses from a new treatment building is not yet available. The effect of the proposed project on air quality is expected to be minimal. During operations, radioactive air emissions are expected to be within an order of magnitude of current air emissions. Because current radioactive air emissions are very low, radioactive emissions from the processes to be implemented under any of the new construction options would likely not be major contributors to the total LANL radioactive emissions. Stack monitoring requirements would be adjusted as necessary based on the final design. New combustion equipment installed as part of any of the new construction options would be low-nitrogen-oxide emitters compared to existing equipment. Radiological and nonradiological emissions associated with solar evaporation of effluent are expected to be small, and dominated by evaporation of water containing tritium.

DD&D Impacts—Demolition of the East Annex and the transuranic waste influent storage tanks (TA-50-66) would likely produce radioactive or hazardous emissions. These emissions would be temporary, but released particulates could be dispersed to other areas. Because of the presence of contaminated soils and structural materials, there is potential to release radioactive or other hazardous constituents. Standard measures for controlling fugitive emissions would be employed.

Ecological Resources

The Radioactive Liquid Waste Treatment Facility is located within a highly developed industrial area of TA-50 and contains no important biological resources. However, the evaporation ponds would be located in an open field containing scattered trees. Mortandad Canyon contains breeding and foraging habitat for the Mexican spotted owl. The industrial area where the Radioactive Liquid Waste Treatment Facility is located is within developed Mexican spotted owl core habitat and its developed buffer zone. The area where the evaporation tanks would be located is also within the buffer and cores zones of the Sandia and Mortandad Canyon Area of Environmental Interest (LANL 2000).

Construction Impacts – Construction of the new Radioactive Liquid Waste Treatment Facility would not disturb any natural habitat. The biological assessment prepared by DOE, however, determined that constructing the evaporation tanks and pipeline would remove about 5.4 acres (2.2 hectares) of undeveloped core and buffer habitat of the Mexican spotted owl (LANL 2006b). It was also determined that construction of the Radioactive Liquid Waste Treatment Facility would likely result in noise levels greater than 6 dB(A) above background levels in the core zone; however, these levels should attenuate to below this level within 0.25 miles (0.4 kilometers) of the construction site. The biological assessment concluded that with the application of reasonable and prudent alternatives the project may affect, but is not likely to adversely affect, the Mexican spotted owl. Reasonable and prudent alternatives would include not permitting work to start between March 1 and the completion of surveys aimed at determining if owls were present in order to avoid a sudden increase in noise levels during the breeding season (LANL 2006b). Additional reasonable and prudent alternatives would be similar to those addressed in Section G.3.3.2. The USFWS has concurred with this assessment (see Chapter 6, Section 6.5.2).

The bald eagle Area of Environmental Interest is not located near the proposed project site. However, because the entire LANL site is considered potential bald eagle foraging area, there may be some habitat degradation associated with the project. Provided reasonable and prudent alternatives are implemented to protect adjacent foraging habitat from detrimental cumulative effects (see Section G.2.3.2), the DOE biological assessment concluded that construction of the Radioactive Liquid Waste Treatment Facility may affect, but is not likely to adversely affect, the bald eagle. Because the proposed project is not within or upstream of the southwestern willow flycatcher Area of Environmental Interest, the biological assessment determined that the project would not affect this species (LANL 2006b). The USFWS has concurred with the DOE biological assessment as it relates to the bald eagle and southeastern willow flycatcher (see Chapter 6, Section 6.5.2).

Operations and DD&D Impacts – No direct effects on sensitive species are expected from Radioactive Liquid Waste Treatment Facility Operations. However, a biological assessment prepared by DOE predicted that if water is evaporated and not discharged to Mortandad Canyon the reduction in flow would decrease the extent of perennial and intermittent stream reaches and associated wetland and riparian habitat. This could in turn reduce the abundance and diversity of prey species for the Mexican spotted owl. Thus, the biological assessment concluded that zero discharge may adversely affect the Mexican spotted owl (LANL 2006b). But after reviewing the assessment, the USFWS determined that the affects to the Mexican spotted owl would be insignificant and discountable, and would not result in adverse affects (see Chapter 6, Section 6.5.2).

DD&D effects are expected to be temporary and to have no direct impact on sensitive species.

Human Health

The Radioactive Liquid Waste Treatment Facility has very low radioactive emissions. These emissions do not have a distinguishable effect on the projected dose to the public. Current Radioactive Liquid Waste Treatment Facility operations are conducted with a commitment to maintaining radiological doses to workers at ALARA levels.

Construction Impacts—Construction would have potential for affecting only worker health. Based on an estimated 141,000 projected person-hours and accident rates for construction at DOE sites and for the general construction industry, 2 to 6 recordable injuries and no fatalities could be expected from construction of the new treatment buildings and associated structures. If the evaporation tanks and pipeline were built, an additional 420,000 person-hours would be required, with a possibility of 5 (DOE 2004) to 18 (BLS 2003) recordable injuries.

Operations Impacts—Emissions from operating the new treatment processes would remain very low, so there would be no distinguishable contribution to the dose to the public from all LANL activities. Emissions from effluent evaporation would be small and dominated by tritium, assuming operation of the evaporation tanks as described in Section G.4.2.5. The potential quantity of evaporated tritium would be minimal compared to the quantity of tritium emitted from other Key Facilities (for example, the Tritium Facility and the Plutonium Facility). The associated radiation dose would be small and enveloped by the impacts to the public discussed in Chapter 5, Section 5.6.1.

Worker health and safety at the facility would improve during operations under this option for two reasons: (1) the new buildings, equipment, and infrastructure would be more reliable and require less maintenance; and (2) because the buildings and process are being designed together (rather than retrofitting new equipment into an old building), when maintenance is needed, prolonged periods of time in zones with potential for radiation doses would be less than those in the current Radioactive Liquid Waste Treatment Facility. Maintenance of the evaporation tanks including periodic cleaning may cause occupational exposures to workers. However, radiation doses would be maintained to levels as low as reasonably achievable below DOE occupational dose limits in 10 CFR Part 835, and exposures to non-radioactive materials would be maintained well below established occupational exposure limits.

DD&D Impacts—Under this option, workers could be exposed to radiologically or chemically contaminated materials during demolition activities. Worker risks would be mitigated by use of personal protective equipment and pre-established safety procedures. Based on an estimated 56,000 person-hours and construction accident rates, 1 to 2 recordable injuries could be expected to occur from DD&D (DOE 2004, BLS 2003).

Cultural Resources

There are no archaeological remains within the developed area of TA-50. Archaeological sites in the vicinity of the proposed evaporation tanks and pipeline would be avoided. The existing Radioactive Liquid Waste Treatment Facility qualifies as a historic building. Any removal of process equipment or demolition of portions of the structure requires historic building documentation to mitigate any adverse effects.

Construction Impacts—Under Option 1, construction would not affect cultural resources. Changes in the Radioactive Liquid Waste Treatment Facility process area would require historic documentation before any equipment is removed from the building. Any mitigation plans would have to be implemented before or during project implementation.

The pipeline and tanks would be sited to avoid impacts on nearby archaeological sites to the extent practical. However, if the pipeline alignment or the tanks encroached on cultural sites, the sites would be fenced for avoidance or excavated.

Operations Impacts—Operations conducted under the proposed project would not affect historic buildings.

DD&D Impacts—Effects on historic buildings under this option are expected to be minimal. Removal of the East Annex is not likely to affect the original historic fabric of the Radioactive Liquid Waste Treatment Facility. Removal of both the East Annex and the transuranic waste influent storage vault (TA-50-66) would require historic documentation before the demolition process began.

Socioeconomics and Infrastructure

Major infrastructure (potable water, sewage, natural gas, and electricity) is available at TA-50. As necessary, utility infrastructure and capacity will be evaluated under a separate action to determine upgrade requirements due to demand from proposed new projects, including the Radioactive Liquid Waste Treatment Facility. Recently installed natural gas infrastructure would adequately accommodate the Radioactive Liquid Waste Treatment Facility. The radioactive liquid waste collection system, which pipes radioactive liquid waste to the Radioactive Liquid Waste Treatment Facility, requires improvements such as replacing manholes and installing monitoring equipment. Within the Radioactive Liquid Waste Treatment Facility, the piping is largely single-walled and has inadequate leak and spill protection. The electrical system within the existing facility does not meet current codes.

Construction—Utility infrastructure resources would be needed for Radioactive Liquid Waste Treatment Facility construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection. Construction is estimated to require 190,000 gallons (720,000 liters) of liquid fuels and 1.0 million gallons (3.8 million liters) of water.

If evaporation tanks and pipeline were constructed, an additional 850,000 gallons (3.2 million liters) of liquid fuels and 6.5 million gallons (25 million liters) of water would be required.

The existing LANL infrastructure would be capable of supporting requirements for new facility construction without exceeding site capacities, resulting in a negligible impact on site utility infrastructure.

Operations Impacts—Utility demands in TA-50 are expected to increase. Operations at both the new Chemistry and Metallurgy Research Building Replacement and the Radioactive Liquid Waste Treatment Facility would potentially require more natural gas and electric power over time. As stated previously, utility infrastructure needs are being separately evaluated. Nevertheless, the proposed project would be subject to an energy efficiency study as it reaches detailed design phases. The preliminary facility design limits energy use to some extent by the use of cold evaporators instead of more energy-consumptive driers or other evaporative equipment.

DD&D Impacts—Activities associated with DD&D of facilities to be replaced by the new facility would be staggered over an extended period of time. As a result, impacts of these activities on LANL's utility infrastructure are expected to be very minor on an annualized basis. Standard practice dictates that utility systems serving individual facilities are shut down as they are no longer needed. As DD&D activities progress, interior spaces, including associated equipment, piping, and wiring, would be removed prior to final demolition. Thus, existing utility infrastructure would be used to the extent possible and would then be supplemented or replaced by portable equipment and facilities as DD&D activities proceed, as previously discussed for construction activities. DD&D is estimated to require 1,700 gallons (6,500 liters) of liquid fuel and 52,000 gallons (197,000 liters) of water.

Waste Management

The existing Radioactive Liquid Waste Treatment Facility does not contain RCRA regulated treatment, storage, and disposal facilities. All RCRA-regulated waste is managed in less-than-90-day storage areas before being packaged and trucked to TA-54 for offsite treatment and disposal. In 2005, the Radioactive Liquid Waste Treatment Facility produced approximately 16 pounds (7.2 kilograms) (LANL 2006f) of chemical waste compared to about 4,850 pounds (2,200 kilograms) of chemical waste projected by the *1999 SWEIS* (DOE 1999a).

The Radioactive Liquid Waste Treatment Facility typically generated about 170 to 262 cubic yards (130 to 200 cubic meters) of solid low-level radioactive waste annually between 1998 and 2002 (LANL 2003b). In 2003, 510 cubic yards (390 cubic meters) of low-level radioactive waste were generated, in 2004, 464 cubic yards (355 cubic meters) were generated (LANL 2004d, 2005c), and in 2005, 339 cubic yards (259 cubic meters) were generated (LANL 2006f). Less than 4 percent of the low-level radioactive waste volume was mixed low-level radioactive waste (LANL 2003b, 2004d). Between 1998 and 2002, the Radioactive Liquid Waste Treatment Facility generated about 39 cubic yards (30 cubic meters) of transuranic or mixed transuranic solid waste, of which about one-third was mixed transuranic waste (LANL 2003b). Due to operational interruptions in 2003 and 2004, the Radioactive Liquid Waste Treatment Facility generated no transuranic waste and only 4 cubic yards (2.7 cubic meters) of mixed transuranic waste during those 2 years (LANL 2004d, 2005c). No transuranic or mixed transuranic waste was generated during 2005 (LANL 2006f).

Construction and DD&D Impacts – **Table G–25** lists the types and volumes of waste expected to be generated during construction and demolition of buildings under Option 1. Nearly 4,900 cubic yards (3,700 cubic meters) of low-level radioactive waste is projected to be soil and debris containing so little radioactive or hazardous material that it can be disposed in bulk using lift liners or similar disposal containers that are transported in reusable transport packages such as Intermodals. Packaged low-level radioactive waste would include small quantities of low-level radioactive waste from one-time transitioning from the existing Radioactive Liquid Waste Treatment Facility, and additional one-time waste from facility stand-down. This waste would include low-level radioactive waste sludges that would be drummed, solidified, and disposed of at TA-54 or any other authorized facility, as well as small quantities of used filters, membranes, and expendable supplies. A small amount of mixed low-level radioactive waste is expected to be generated from DD&D activities.

Table G–25 Construction and Decontamination, Decommissioning, and Demolition Waste Volumes – Single Waste Liquid Treatment Building Option

Waste Type	***Cubic Yards***
Low-level radioactive waste (bulk)	4,860
Low-level radioactive waste (packaged)	1,620
Mixed low-level radioactive waste	44
Transuranic waste (contact-handled)	94
Demolition debris [a]	820
Construction waste [b]	980
Hazardous waste with asbestos	200
Solid hazardous waste with organics	< 1
Solid hazardous waste with metals	< 1

[a] Includes solid sanitary wastes.
[b] Includes 427 tons (387 metric tons) of solid waste from constructing evaporation tanks with associated pipeline. Construction waste density is 2 cubic yards per ton.
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Contact-handled transuranic waste would include small quantities of transuranic sludge that would be drummed, solidified, and transferred to TA-54 for eventual disposal at WIPP. DD&D may also generate waste from roofing materials that may contain asbestos and would require disposal at a permitted offsite facility, as well as possibly small quantities (less than 1 cubic yard [0.8 cubic meter]) of other wastes containing organics or metals. Otherwise, all potentially recyclable materials from construction or DD&D would be characterized; if contaminated with radioactive materials or chemicals, they would be disposed of at an appropriate permitted facility (LANL 2005f).

Facility construction, transitioning, and DD&D are expected to also generate small quantities of liquids that would be processed and disposed of in accordance with LANL requirements. Construction liquids are expected to include wash water from concrete trucks (less than 100 gallons [380 liters]). Transitioning liquids are expected to include 2,640 gallons (10,000 liters) of clean water used for testing the new process that would be processed through the existing Radioactive Liquid Waste Treatment Facility treatment system. Rinsing and flushing of the piping at the existing Radioactive Liquid Waste Treatment Facility would be treated at the new or the existing facility. Any remaining treated effluent would be evaporated assuming the auxiliary action options discussed in Section G.4.2.5 are implemented; otherwise the effluent would be released to the outfall in Mortandad Canyon.

Operations Impacts—Operations would generate liquid effluent, transuranic waste, and low-level radioactive waste. The volumes of waste generated would be a function of the level of operations occurring at LANL; these volumes are presented in Chapter 5, Section 5.9 of this SWEIS.

Transportation

Pecos Drive, a secondary road that intersects Pajarito Road, provides access to TA-55, TA-50, and TA-35. Traffic is restricted to the LANL workforce and official visitors. Sufficient parking is available to accommodate the existing workforce on the site.

Construction Impacts—Construction would result in some local adverse transportation effects. Construction traffic would increase temporarily. Parking would be eliminated by construction of the new facility.

Operations Impacts—Implementation of this option would eliminate the need to ship radioactive waste to Tennessee, thus reducing the risks of waste transportation off site.

DD&D Impacts—As with construction, traffic on Pecos Road and employee parking would be disrupted during demolition. Demolition traffic would increase temporarily.

The generated construction and DD&D wastes would be transported to disposal sites, either at LANL TA-54 or an offsite location. Transportation has potential risks to workers and the public from incident-free transport, such as radiation exposure as the waste packages are transported long the routes and highways. Traffic accidents could result both in injuries or deaths from collisions and in an additional radiological dose to the public from radioactivity that may be released during the accident.

The effects of incident-free transportation of construction and DD&D wastes on the worker population and general public is presented in **Table G–26**. Effects are presented in terms of the collective dose in person-rem resulting in excess LCFs. Excess LCFs are the number of cancer fatalities that may be attributable to the proposed project, estimated to occur in the exposed population over the lifetimes of the individuals. If the number of LCFs is smaller than one, the subject population is not expected to incur any LCFs resulting from the actions being analyzed.

The risk for development of excess LCFs is highest for the workers under the offsite disposition option. This is because the dose is proportional to the duration of transport, which in turn is proportional to travel distance. As shown in Table G–26, disposal of low-level radioactive waste at the Nevada Test Site, which is located farthest from LANL, would lead to the highest dose and risk, although the dose and risk are low for all disposal options.

Table G–26 Incident-Free Transportation – for Single Liquid Waste Treatment Building Option Impacts

Disposal Option	Low-Level Radioactive Waste Disposal Location [a]	Crew		Public	
		Collective Dose (person-rem)	Risk (LCF)	Collective Dose (person-rem)	Risk (LCF)
Onsite disposal	LANL TA-54	0.26	0.000155	0.082	0.000049
Offsite disposition	Nevada Test Site	2.02	0.0012	0.59	0.00036
	Commercial facility	1.96	0.0012	0.58	0.00035

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic wastes would be disposed of at WIPP.

Table G–27 presents the impacts of traffic and radiological accidents. This table provides population risks in terms of fatalities due to traffic accidents from both the collisions themselves and from excess LCFs from exposure to releases of radioactivity. The analyses assumed that all transuranic and nonradioactive wastes would be transported to offsite disposal facilities.

Table G–27 Transportation Accident Impacts – for Single Liquid Waste Treatment Building Option

Low-Level Radioactive Waste Disposal Location [a, b]	Number of Shipments [c]	Distance Traveled (million kilometers)	Accident Risks	
			Radiological (excess LCFs)	Traffic (fatalities)
LANL TA-54	462	0.057	3.6×10^{-10}	0.00089
Nevada Test Site	462	1.04	5.2×10^{-8}	0.0106
Commercial facility	462	0.94	3.9×10^{-9}	0.0095

LCF = latent cancer fatality, TA = technical area.
[a] All nonradiological wastes would be transported off site.
[b] Transuranic wastes would be disposed of at WIPP.
[c] Approximately 87.7 percent of shipments are radioactive wastes. Others include 10 percent industrial and sanitary wastes and about 2.4 percent asbestos and hazardous wastes.
Note: To convert kilometers to miles, multiply by 0.6214.

Because all estimated LCFs and traffic fatalities, as shown in Tables G–26 and G–27, are much less than 1.0, the analysis indicates that no excess fatal cancers would result from this activity, either from dose received from packaged waste on trucks or potentially received from traffic collisions and accidental release.

G.4.3.3 Option 2: Two Liquid Waste Treatment Buildings Option

The overall effect of implementing this option would be positive. Effects on land use, cultural resources, ecological resources, human health, and infrastructure are expected to be similar to those under the proposed project (Option 1). Resource area impacts that would differ from the proposed project are discussed in detail below.

Land Resources—Visual Resources

As noted previously in the land use discussion, the area in which the treatment buildings would be constructed is highly developed. This area currently has an industrial look, with a mix of buildings of different design. The area proposed for construction of the tanks is currently undeveloped and wooded.

Construction Impacts—There would be temporary local visual impacts associated with construction of the new treatment buildings and during excavation from the use of construction equipment. The current natural setting, in the area of the evaporation tanks and a portion of the pipeline, would be disrupted by removal of vegetation, establishment of a construction staging area, and construction activities. Construction would entail excavation of soils to construct the tanks and pipeline, and possibly the temporary establishment of a soil pile. Excess soils would be removed and used or stockpiled elsewhere.

Operations Impacts—The new treatment buildings would not result in a change to the overall visual character of the area within TA-50. Buildings would be a maximum of two stories and constructed in accordance with site guidelines, which establish acceptable color schemes for building exteriors. Establishment of evaporation tanks would result in a permanent change to the visual environment in the area near the border of TA-52 and TA-5. Impacts would be similar to those described for Option 1 (see Section G.4.3.2). Following regrowth of vegetation, the area disturbed for pipeline construction would not be noticeable.

DD&D Impacts—Removal of the North and East Annexes and TA-50-66 would result in temporary local visual impacts in the form of construction equipment and the presence of partially demolished buildings. Long-term effects would be a slightly improved local visual environment, once the annexes and TA-50-66 are gone.

Geology and Soils

Construction Impacts—About 80,000 cubic yards (61,000 cubic meters) of soil and rock would be disturbed during building construction; installation of the evaporation tanks and pipeline would disturb the same quantities of soil and rock as those given for Option 1.

This option would initiate removal of some potential release sites and would have a positive effect. This option would be likely to affect more potential release sites than would the proposed project because of its larger footprint.

DD&D Impacts—The major indirect impact on geologic and soil resources at DD&D locations would be associated with the need to excavate any contaminated soil and tuff from beneath and around facility foundations. Under this option, the North and East Annexes and TA-50-66 would be demolished and remediation of associated potential release sites would be required. Borrow material such as crushed tuff and soil would be required to fill the excavations to grade, but such resources would be available from onsite borrow areas (see Chapter 5, Section 5.2 of this SWEIS). Potentially affected contaminated areas would be surveyed to determine the extent and nature of any contamination. All excavated contaminated media would be characterized and managed according to waste type and all LANL procedures and regulatory requirements.

Water Resources

DD&D Impacts—Effects on water quality could be larger under this option because more demolition is proposed under this option. However, erosion control measures specified in a stormwater pollution prevention plan would be implemented to mitigate impacts of sediment movement by stormwater. Water quality effects would be similar to those under Option 1.

Air Quality

DD&D Impacts—Nonradioactive emissions would be slightly larger under this option because the amount of demolition is greater. Other air quality impacts would be similar to those under Option 1.

Ecological Resources

Possible impacts would be the same as those for Option 1.

Human Health

Construction Impacts—Option 2 would result in somewhat larger worker hours and risks than would Option 1. Based on 317,000 worker hours, 4 to 13 recordable injuries could occur during construction (DOE 2004, BLS 2003). If the evaporation tanks and pipeline were built, an additional 420,000 person-hours would be required, with a possibility of 5 (DOE 2004) to 18 (BLS 2003) recordable injuries.

DD&D Impacts—Under this option, workers could potentially be exposed to radiologically or chemically contaminated materials during demolition activities. Worker risks would be mitigated by use of personal protective equipment and pre-established safety procedures. Based on an estimated 59,800 worker hours and construction accident rates, one to three recordable injuries could occur from DD&D (DOE 2004, BLS 2003).

Operations Impacts—Impacts would be the same as those for Option 1.

Cultural Resources

Construction Impacts—Under this option, effects of construction on cultural resources would be the same as those for Option 1.

Operations Impacts—This option would result in minimal effects on historic buildings. The original portion of the Radioactive Liquid Waste Treatment Facility would remain, but would undergo internal changes such as process equipment removal. As required by mitigation plans, documentation would occur before any equipment is removed from the building. Mitigation plans would have to be implemented before or during project implementation.

DD&D Impacts—Removal of the North and East Annexes to the Radioactive Liquid Waste Treatment Facility and TA-50-66 under this option should not affect the original historic fabric of the building, but would require historic documentation before the demolition process began.

Socioeconomics and Infrastructure

Construction Impacts—Construction of the new buildings would require more infrastructure resources than Option 1. Construction is estimated to require 420,000 gallons (1.6 million liters) of liquid fuels and 2.3 million gallons (8.7 million liters) of water. If the evaporation tanks and pipeline were constructed, then similar impacts to those described in Option 1 would occur. The existing LANL infrastructure would be capable of supporting Option 2 without exceeding site capacities.

Operations Impacts—Electricity and natural gas requirements would be slightly more than Option 1 since additional new buildings would be operating. This would increase the use of utilities for lighting and heating as compared to Option 1.

DD&D Impacts—Activities associated with facilities to be replaced by the new facilities in Option 2 would be similar to those described in Option 1. However, the infrastructure needs for Option 2 would be somewhat higher than for Option 1 because one additional annex would be removed. DD&D is estimated to require quantities of liquid fuel and water similar to those in Option 1.

Waste Management

Waste types are expected to be similar to those under the proposed project. **Table G–28** provides the types and volumes of wastes generated during construction, transition, and demolition of buildings. Uncontaminated construction waste volumes would be larger than those under the proposed project because two or more new treatment facilities would be built. Transition and standdown wastes would be identical to those under the proposed project (Option 1). Volumes of demolition wastes would be greater than those under the proposed project because of the additional demolition of the North Annex. Operational waste is expected to be similar to that under the proposed project. Chemical and radioactive wastes generated through decontamination processes would be managed within the LANL waste management system. The low-level radioactive waste may be disposed of onsite or sent to an offsite facility, depending upon onsite capacities and waste acceptance priorities at TA-54 Area G. Solid wastes would be transferred to a permitted municipal landfill.

Operations Impacts—Operations would generate liquid effluent, transuranic waste, and low-level radioactive waste. The volumes of waste generated would be a function of the level of operations occurring at LANL; these volumes are presented in Chapter 5, Section 5.9, of this SWEIS.

Transportation

Pecos Drive, a secondary road that intersects Pajarito Road, provides access to TA-55, TA-50, and TA-35. Traffic is currently restricted to the LANL workforce and official visitors along Pecos Drive. Sufficient parking is available to accommodate the existing workforce in the area.

Construction Impacts—Traffic on Pecos Road and employee parking would be disrupted during construction. Pecos Road would be realigned slightly near the new low-level radioactive waste treatment buildings, but would not alter traffic flow over the long term. Traffic associated with construction would cause a temporary increase in local traffic.

Table G–28 Construction and Decontamination, Decommissioning, and Demolition Waste Volumes – Two Liquid Waste Treatment Buildings Option

DD&D Waste Type	*Cubic Yards*
Low-level radioactive waste (bulk)	5,250
Low-level radioactive waste (packaged)	1,750
Mixed low-level radioactive waste	44
Transuranic waste (contact-handled)	94
Demolition debris [a]	1,650
Construction waste [b]	1,110
Hazardous waste with asbestos	210
Solid hazardous waste with organics	< 1
Solid hazardous waste with metals	< 1

DD&D = decontamination, decommissioning, and demolition.
[a] Includes solid sanitary wastes.
[b] Includes 427 tons (387 metric tons) of solid waste from constructing evaporation tanks. Construction waste density is 2 cubic yards per ton (1.4 cubic meters per metric ton).
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Operations Impacts—Under this option, there would be no change in local traffic. Implementation of the proposed treatment technologies would eliminate the need to ship radioactive waste to and receive residues back from Tennessee, thus reducing the risks of offsite waste transportation.

The waste generated by construction and DD&D activities would have to be moved to a different location for disposal, mostly using over-the-road truck transportation. Effects of incident-free and accident conditions of transporting construction and DD&D wastes to disposal locations on or off site are presented in **Tables G–29** and **G–30**. All nonradiological and transuranic wastes would be transported to offsite facilities. The results in these two tables indicate that no traffic fatalities or excess LCFs are expected from transportation of generated wastes.

Table G–29 Incident-Free Transportation Impacts – Two Liquid Waste Treatment Buildings Option

Disposal Option	*Low-Level Radioactive Waste Disposal Location* [a]	*Crew*		*Public*	
		Collective Dose (person-rem)	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite disposal	LANL TA-54	0.26	0.000156	0.082	0.000049
Offsite disposal	Nevada Test Site	2.16	0.0013	0.63	0.00038
	Commercial facility	2.10	0.00126	0.62	0.00037

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic waste would be disposed of at WIPP.

Table G–30 Transportation Incident Impacts – Two Liquid Waste Treatment Building Option

Low-Level Radioactive Waste Disposal Location [a, b]	Number of Shipments [c]	Distance Traveled (10^6 kilometers)	Accident Risks	
			Radiological (excess LCFs)	Traffic (fatalities)
LANL [b]	540	0.076	3.6×10^{-10}	0.0011
Nevada Test Site	540	1.14	5.6×10^{-8}	0.0117
Commercial facility	540	1.03	4.2×10^{-9}	0.0105

LCF = latent cancer fatality.
[a] All nonradiological wastes would be transported offsite.
[b] Transuranic waste would be disposed of at WIPP.
[c] Approximately 81 percent of these are radioactive. Others include 17 percent industrial and sanitary waste and about 2 percent asbestos and hazardous waste.
Note: To convert kilometers to miles, multiply by 0.6214.

G.4.3.4 Option 3: Two Liquid Waste Treatment Buildings and Renovation Option

Under this option, the effects on ecological resources would be similar to those under the proposed project (Option 1). Resource area impacts that would differ from the proposed project are discussed in detail below.

Land Resources – Visual Resources

Activities in this option would be the same as those conducted in Option 2, with the additional renovation of a portion of the existing facilities. The renovated structure would have new external walls that would have color schemes that would match the new structures built as part of Option 2. Local visual impacts would therefore be similar to those described for Option 2.

Geology and Soils

About 95,000 cubic yards (73,000 cubic meters) of soil would be disturbed during building construction. Installation of the evaporation tanks and pipeline would disturb the same quantities of soil and rock as those given for Option 1.

This option would have a long-term positive effect by removing contaminated materials. More demolition would occur under this option than under Options 1 or 2, and a larger area of the associated potential release sites could be disturbed. More contaminated materials would be removed under this option. Contaminated material from demolition and construction would be managed according to waste type and LANL procedures. The long-term potential for spread of air- and waterborne contamination would be reduced.

Water Resources

Effects on water quality could be larger than those under Option 1 because more demolition is proposed under this option. However, implementing sediment and erosion control measures is expected to control possible consequences. Other water quality effects would be similar to those under Option 1.

Air Quality

Radioactive and nonradioactive emissions would be slightly greater under this option than under the proposed project because the amount of demolition would be greater. Other air quality impacts would be similar to those under Option 1.

Ecological Resources

Possible impacts on ecological resources would be the same as those for Option 1.

Human Health

Construction Impacts—Option 3 would result in somewhat larger worker hours and risks than would Option 2. Based on 377,000 worker hours, 4 to 16 recordable injuries could occur from construction (DOE 2004, BLS 2003). If the evaporation tanks and pipeline were built, an additional 420,000 person-hours would be required, with a possibility of 5 (DOE 2004) to 18 (BLS 2003) recordable injuries.

DD&D Impacts—Potential for worker exposure to radiological and hazardous material (such as asbestos) contamination would be greater under this option than under Option 2 due to the increased amount of demolition and the renovation in the existing facility. This greater potential exposure would result in very small increases in worker risk. DD&D activities would require 108,000 person-hours resulting in the possibility of 1 to 5 recordable injuries (DOE 2004, BLS 2003).

Operation Impacts—Impacts would be the same as those under Option 1.

Cultural Resources

Under this option, additional adverse effects on cultural resources are expected. In addition to impacts addressed under Option 2, changes to the structure of the existing Radioactive Liquid Waste Treatment Facility would alter the original appearance of the historic building. Removal of equipment, modification to the building, and demolition of the annexes would require documentation and consultation with the New Mexico Historic Preservation Office. Any mitigation plans would be implemented before DD&D began.

Socioeconomics and Infrastructure

Construction Impacts—Option 3 would require more infrastructure resources than Options 1 and 2 because Option 3 includes Option 2 plus renovating the existing facilities. Construction is estimated to require 500,000 gallons (1.9 million liters) of liquid fuels and 2.7 million gallons (10 million liters) of water. If the evaporation tanks and pipeline were constructed, then similar impacts to those described in Option 1 would occur. The existing LANL infrastructure would be capable of supporting Option 3 without exceeding site capacities.

Operations Impacts—Electricity and natural gas requirements would be slightly more than Options 1 and 2 since two new buildings would be constructed and existing facilities would be reused.

DD&D Impacts—Activities associated with facilities to be replaced by the new facilities in Option 3 would be similar to those described for Options 2. As in Option 2, a second annex would be removed. Option 3 would require quantities of liquid fuel and water similar to those for Option 1.

Waste Management

Construction, transition, and standdown waste volumes would be similar to those under Option 2. Under this option, contaminated wastes from demolition and renovation would exceed those of Options 1 and 2, as the South Annex would be demolished in addition to the East and North annexes. Existing external walls would be removed and replaced with seismically appropriate materials and construction as required to meet the LANL's standard for Hazard Category 2 facilities. In addition, electrical and plumbing systems that do not meet the current building codes would be replaced. Operational waste would be similar to that of the proposed project. All wastes would be managed in accordance with LANL procedures and the project's waste management plan. **Table G–31** provides the types and volumes of wastes generated during construction (contaminated soil and rubble volumes), transition, and demolition of buildings.

Table G–31 Construction and Decontamination, Decommissioning, and Demolition Waste Volumes – Two Liquid Waste Treatment Buildings and Renovation Option

DD&D Waste Type	*Cubic Yards*
Low-level radioactive waste (bulk)	7,720
Low-level radioactive waste (packaged)	2,570
Mixed low-level radioactive waste	153
Transuranic waste (contact-handled)	228
Demolition debris [a]	1,810
Construction waste [b]	1,150
Hazardous waste with asbestos	211
Solid hazardous with organics	< 1
Solid hazardous with metals	1

DD&D = decontamination, decommissioning, and demolition.
[a] Includes solid sanitary waste.
[b] Includes 427 tons (387 metric tons) of solid waste from constructing evaporation tanks. Construction waste density is 2 cubic yards per ton (1.4 cubic meters per metric ton).
Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Transportation

Traffic effects would be the same as those for Option 1, except that the disruption would be longer in duration due to the extended renovation and demolition activities.

The large amounts of waste generated by construction and DD&D activities would have to be moved to a different location for disposal, mostly using over-the-road truck transportation. The effects from incident-free transportation and accident conditions of transporting the construction and DD&D wastes to disposal locations on or off site are presented in **Tables G–32** and **G–33**. All nonradiological and transuranic wastes would be transported to offsite facilities.

Table G–32 Incident-Free Transportation Impacts – Two Liquid Waste Treatment Buildings and Renovation Option

Disposal Option	*Low-Level Radioactive Waste Disposal Location* [a]	*Crew*		*Public*	
		Collective Dose (person-rem)	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite	LANL TA-54	0.58	0.00035	0.185	0.00011
Offsite	Nevada Test Site	3.46	0.0021	1.02	0.00061
	Commercial facility	3.35	0.0020	1.00	0.00060

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic waste would be disposed of at WIPP.

Table G–33 Transportation Incident Impacts – Two Liquid Waste Treatment Building and Renovation Option

Low-Level Radioactive Waste Disposal Location [a, b]	*Number of Shipments* [c]	*Distance Traveled (10^6 kilometers)*	*Accident Risks*	
			Radiological (excess LCF)	*Traffic (fatalities)*
LANL [b]	771	0.100	8.3×10^{-10}	0.0014
Nevada Test Site	771	1.68	8.3×10^{-8}	0.017
Commercial facility	771	1.52	6.2×10^{-9}	0.015

LCF = latent cancer fatality.
[a] All nonradiological wastes would be transported offsite.
[b] Transuranic waste is disposed of at WIPP.
[c] Approximately 85 percent of these are radioactive. Others include 13 percent industrial and sanitary wastes, and about 2 percent asbestos and hazardous wastes.

The results in these two tables indicate that no traffic fatalities or excess LCFs would be expected from transportation of generated wastes.

G.5 Los Alamos Neutron Science Center (LANSCE) Refurbishment Impacts Assessment

This section provides an impact assessment for activities to be taken to refurbish LANSCE. Section G.5.1 provides background information on the proposed project. Section G.5.2 provides a brief description of the proposed options for LANSCE. Section G.5.3 presents the environmental consequences of the No Action Option and the proposed project.

G.5.1 Introduction

In the late 1960s and early 1970s, the Los Alamos Meson Physics Facility was constructed as a world-class medium-energy physics machine with the primary mission of studying production of subatomic particles called pions and their interaction with nuclei. At that time, the nuclear weapons program needed an intense source of neutrons that the new machine could provide. As a result, an accelerator was designed and constructed to have an extraordinarily flexible beam structure capable of accelerating both positive and negative hydrogen ions and delivering those beams to multiple experimental areas simultaneously. In 1996, the Los Alamos Meson Physics Facility was renamed the Los Alamos Neutron Science Center (LANSCE) (LANL 2004a).

Since the LANSCE linear accelerator first accelerated protons in 1972, the facility mission has evolved considerably. However, investment in the physical infrastructure has not kept pace with that required for long-term sustainable operation at high reliability. NNSA now needs to make repairs to the facility and its operating systems and equipment to address its continued use. In addition, the refurbishment would eliminate the following sources of operational inefficiencies that could improve operational effectiveness: single-point failures with an estimated time to repair of greater than 30 days; equipment beyond its predicted end of life that could severely impact facility operations; obsolete equipment with no available spare parts; and environmental, safety, and health or code compliance issues necessary to continue safe operation.

G.5.2 Options Considered

Two options identified for LANSCE Refurbishment are the No Action Option and proposed project option.

G.5.2.1 No Action Option

Under the No Action Option, no action to refurbish the facility would be taken. The existing programs would be operated as they are today, and there would be limitations on the full expanded use of the facility; corrective maintenance and actions would continue to be performed as failures occur or certain activities would cease. If systems proposed for replacement on this project are neither modified nor upgraded, they are expected to fail. Based on currently available information, the nature, timing, or type of all failures cannot be predicted. However, many failures would delay programmatic work, campaigns, critical experiments, and their activities. All of this would result in higher program costs and lengthier schedules. Because the facility is over 30 years old, it would experience more and more severe failures over time, until either equipment would have to be replaced on a piecemeal basis through corrective maintenance (resulting in increased operating costs) or the facility would have to be shut down if unreliability adversely impacts safety. If this No Action Option is selected, there is a high probability that the research and development for the Stockpile Stewardship Program and radioactive isotope production would be shut down in 4 to 5 years.

G.5.2.2 Proposed Project

NNSA has identified a series of refurbishment activities that would ensure reliable facility operations well into the next decade. Refurbishment would prevent long nonoperational periods and costly emergency expenditures. This proposed project would entail replacing facility equipment, enhancing cost-effectiveness, and stabilizing the overall beam availability reliability, while imposing minimal disruption to user programs.

NNSA proposes to: (1) replace facility equipment where necessary to address code compliance or end-of-life issues that could severely impact facility operations, (2) enhance cost-effectiveness by system refurbishments or improvements that stabilize decreasing facility reliability and maintainability, (3) stabilize the overall beam availability and reliability in a manner that is sustainable over the longer term, and (4) accomplish the above with minimal disruption to scheduled user programs.

Achieving the above requires undertaking the following activities (LANL 2005b):

- Replacing a minimum set of klystrons, transmitters, high-voltage power systems, and ancillary hardware with new and modern equivalents to achieve high reliability of the 805-megahertz radiofrequency system
- Replacing the power amplifier, intermediate power amplifier, and ancillary hardware with a modern system to maintain and improve reliability of the 201-megahertz radiofrequency system
- Replacing antiquated hardware and software in the accelerator control, data acquisition, and timing systems that have become virtually nonmaintainable because of obsolescence
- Refurbishing and replacing vacuum and cooling systems and magnet power supplies for the accelerator and beam-transfer lines to substantially reduce the increasing amount of beam downtime due to these systems
- Refurbishing and improving beam-diagnostics systems to provide much-needed efficient beam-tuning capabilities to maintain reliability
- Replacing injector components to increase the negative-hydrogen beam intensity by a factor of two (LANL 2005b).

There is substantial evidence that many components needed to sustain reliable operation are near the end of life, are so obsolete that replacement parts can no longer be found, need replacement to comply with Federal law, or could have single-point failures with long lead time replacements (LANL 2004a).

All refurbishment and upgrade work for the LANSCE Refurbishment Project would be performed within the existing complex at TA-53. The activities proposed constitute a refurbishment of existing, operating facilities that would provide the same basic operational conditions that currently exist. The proposed project would be limited to the Accelerator Complex and experimental facilities. The proposed schedule has overall design beginning in fiscal year 2007, with refurbishment activities completed in fiscal year 2014. Under this schedule, an extended outage in the 2010 to 2012 timeframe may be required; however, work would be performed during these outages to minimize disruption to operations and would be conducted over the course of about 7 years (LANL 2005b). The project is not expected to result in material changes to the permitting basis (for example, air and water emissions), and the subprojects would fall within the bounds of existing permits.

Specifically, LANSCE Refurbishment would enhance cost-effectiveness by system refurbishments or improvements that reduce operating costs, improve decreasing facility reliability by replacing systems that have an impact of 15 percent or greater on reliability for those systems, and increase the negative-hydrogen beam intensity for improved proton radiography data (LANL 2005b).

G.5.2.3 Options Considered but Dismissed

Move the mission to another facility

Moving the mission from LANL to another location would reduce the amount of capital that must be invested at LANL; however, LANSCE continues to be the major LANL experimental-science facility and is a critical feature of LANL's science-based mission. The LANSCE facility is unique to LANL, and there is no foreseeable future substitute for this capability. A list of other DOE facilities that could be possible sites for portions of the mission need was identified by capability type. Technical capabilities for evaluation included: proton radiography, fast-burst neutron sources, neutron irradiation of weapons components, fast-neutron nuclear science, low-energy neutron nuclear science, and neutron scattering in support of weapons materials science. No one DOE facility was identified that could fulfill the entire mission of LANSCE, and no combination of facilities was identified that could complete the required missions without a new investment several times the cost of LANSCE refurbishment (LANL 2005b). Therefore, this action was dismissed from further consideration.

Construct a new facility and demolish the existing TA-53 facility at the end of its life

Construction of a new LANSCE facility at LANL or elsewhere would require more resources and is not a viable fiscal option at this time. Therefore, this option was dismissed from further consideration.

G.5.3 Affected Environment and Environmental Consequences

The LANSCE complex is located in TA-53 (see **Figure G–10**). NNSA proposes activities that constitute a refurbishment of an existing, operating facility that would provide the same basic operational conditions that currently exist (LANL 2006a). Therefore, the affected environment is TA-53, although the region of influence for each resource evaluated may extend beyond TA-53 and LANL.

The analysis of environmental consequences relies heavily on the affected environment descriptions in Chapter 4 of the main volume of this SWEIS, and care has been taken not to repeat this information. Resource areas or disciplines not expected to be affected by the LANSCE Refurbishment Project or that would not directly or indirectly affect project implementation have not been included. Otherwise, where information specific to TA-53 and LANSCE is available and aids understanding the TA-53 affected environment and potential environmental consequences, it has been included.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Land Resources* – Refurbishment takes place within existing structures and would not change land use designations or visual resources.

- *Geology and Soils* – Refurbishment takes place within existing structures.

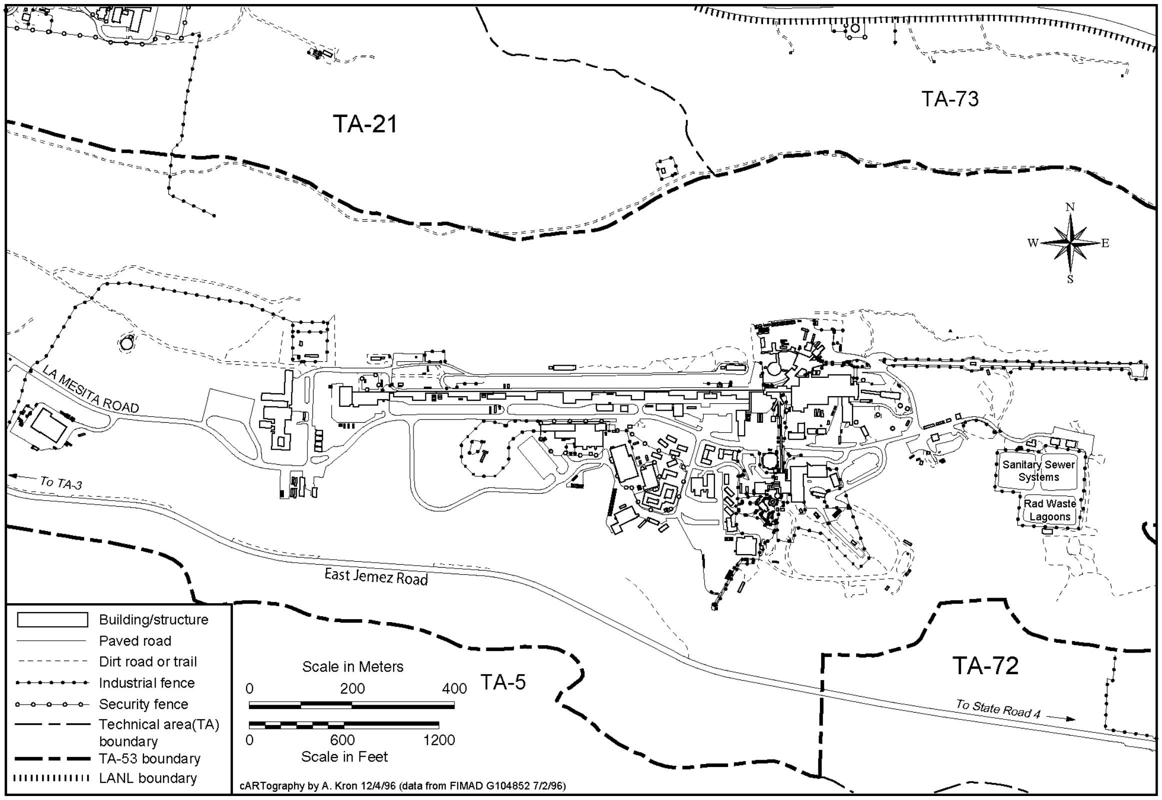


Figure G–10 Location of Los Alamos Neutron Science Center at Technical Area 53

- *Ecological Resources* – Refurbishment takes place within existing structures with no new land disturbed.

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and refurbishment workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.

- *Transportation* – Refurbishment takes place within existing structures with no additional traffic effects.

- *Environmental Justice* – The proposed project is confined to already-developed areas of TA-53, with no disproportionate human health impacts to low-income or minority populations expected.

- *Facility Accidents* – The proposed project would not implement new activities associated with radiological materials; only industrial accidents may occur.

This impact assessment focuses on those areas of the affected environment where potential impacts would occur: water resources, air quality and noise, human health, cultural resources, site infrastructure, and waste management.

G.5.3.1 No Action Option

Lack of investment in critical structural upgrades and replacements would delay programmatic work, campaigns, critical experiments, and their activities. Over time, this would result in higher program costs and lengthier schedules. Because no new buildings or facilities would be built under the No Action Option and operations would not change, there would be no impact on land use, water resources, human health, or transportation. Impacts of the No Action Option are included in the impacts of the No Action Alternative discussed in Chapter 5 of this SWEIS.

G.5.3.2 Proposed Project

All the refurbishment and upgrade work for the LANSCE Refurbishment Project would be performed inside the existing LANSCE complex at TA-53. The project is not expected to result in material changes to the permitting basis (air and water emissions), and the subprojects are assumed to fall within the bounds of existing permits.

Water Resources

Operations Impacts—While LANSCE Refurbishment Project activities are not intended to materially change LANSCE complex operations, project implementation may indirectly increase annual discharge of nonradiological cooling water effluent due to potential increased use of the accelerator facilities. However, discharge levels are still expected to remain below those that were forecast for the *1999 SWEIS* (DOE 1999a).

Air Quality and Noise

LANSCE operations have historically accounted for more than 90 percent of all radioactive air emissions and 95 percent of the total offsite dose from LANL (LANL 2005a, 2006a). These emissions have historically come predominantly from stacks ES-3 and ES-2. Stack ES-3 ventilates Building 53-003, the linear accelerator and adjacent experimental stations. Stack ES-2 exhausts the proton storage ring and experimental stations at the Manuel Lujan Neutron-Scattering Center and Weapons Neutron Research Facility buildings. However, the shutdown of beam operations in Area A in the 1998 timeframe resulted in decreased radiological air emissions from the ES-3 emission point. Air activation products from the LANSCE stacks contributed over 95 percent of the total LANL radiological air emissions during 2005 (LANL 2006d).

Construction Impacts—As LANSCE Refurbishment Project activities would primarily involve upgrades and repairs or replacements of existing structures, systems, and components, including electrical, electronic, and mechanical systems; most work would be performed using portable equipment and hand tools. There would be some emissions of criteria and toxic pollutants from fuels, solvents, acids, and epoxies associated with project activities. Because implementation of individual subprojects would be spread out over a period of 7 years and emissions would be small, any impacts on ambient air quality would be negligible to minor and of short duration. Minor impacts of vehicle emissions from transport of materials and construction workers would occur off site. No radiological releases to the environment are expected in association with LANSCE Refurbishment Project activities.

Project activities could result in a temporary increase in noise levels near the TA-53 complex and near specific work areas. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from project workers' vehicles and materials shipments. Noise sources would not include loud impulsive sources such as blasting.

Operations Impacts—While LANSCE Refurbishment Project activities are not intended to materially change LANSCE complex operations, project implementation may indirectly increase air emissions due to increased use of the accelerator facilities as described in Chapter 5, Section 5.4.2, of this SWEIS. The dose to the MEI from these emissions would be limited by operational controls to 7.5 millirem per year.

The acoustic environment of the more intensely developed TAs such as TA-53, in which administrative, research and development, and various industrial processes are collocated, includes noise from mechanical equipment (such as cooling systems, vents, motors, and material-handling equipment), in addition to employee motor vehicle and truck traffic. This level of noise at LANSCE would not change from existing levels and does not generally pose a hazard to workers. In situations requiring workers to enter high-noise environments, appropriate hearing protection is provided. LANSCE operations do not result in impulse noises that would be distinguishable by the public.

Human Health

During LANSCE operations, short-lived positron emitters, and activation products such as carbon-11, nitrogen-13, and oxygen-15, are released from the stacks and diffuse from the buildings. These products would release photon radiation as they decay, producing a potential radiation dose. Based on atmospheric modeling of actual releases and dose calculations, the dose to the MEI (at East Gate) from LANSCE in 2005 was 6.31 millirem. The total dose from all LANL operations to an individual at East Gate was approximately 6.46 millirem. This dose is under the EPA limit of 10 millirem per year, and approximately 1 percent of the naturally occurring background radiation dose (LANL 2006d).

Construction Impacts—No radiological risks would be incurred by members of the public from proposed LANSCE Refurbishment Project activities. Project workers would be at a small risk for work-related accidents and radiological exposures. However, as the majority of the scoped work would be performed in areas outside of the beam line, doses to workers performing these tasks would be minimal (LANL 2006a). These workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses were kept ALARA.

Operations Impacts—While LANSCE Refurbishment Project activities are not intended to materially change LANSCE complex operations, project implementation may indirectly increase air emissions, including radiological emissions and consequential dose, due to increased use of the accelerator facilities. However, the dose would be limited by operational controls to 7.5 millirem per year.

Cultural Resources

The LANSCE Accelerator Building has been determined to be eligible for listing on the National Register of Historic Places. Although project-related modifications would not affect the external appearance of the structure, it would be necessary to make a determination of potential adverse effects and document existing conditions, as appropriate. Such documentation could include production of archival photographs and drawings. Additionally, any other significant historic buildings at TA-53 that could experience internal modifications would have to be evaluated for National Register of Historic Places eligibility status; these buildings must be considered potentially eligible until formally assessed.

Socioeconomics and Infrastructure

Utility infrastructure at the LANSCE complex encompasses the electrical power, natural gas, and water supply systems needed to support mission requirements. LANL's total electrical energy consumption was 421,413 megawatt-hours in fiscal year 2005, with LANSCE using 93,042 megawatt-hours. These values are well below the *1999 SWEIS* annual forecasts of 782,000 and 437,000 megawatt-hours, respectively. LANL's total electric peak demand was about 69.4 megawatts in fiscal year 2005 with LANSCE accounting for 21.9 megawatts of the total. Again, these values are well below the *1999 SWEIS* forecasts of 113 and 63 megawatts, respectively (LANL 2006f). Full-power operation of the 800-million electron volt linear accelerator alone requires 21 megawatts of power from the LANL electric grid. Natural gas is also consumed by boilers within TA-53 for space heating and also to operate and maintain the cooling water system (LANL 2003a, 2006a). LANSCE's boilers consumed approximately 65,283 decatherms (equivalent to about 65.3 million cubic feet [1.85 million cubic meters]) of natural gas in fiscal year 2005 (LANL 2006a). LANL's total natural gas consumption was 1,187,855 decatherms (equivalent to about 1.19 billion cubic feet [33.7 million cubic meters]) in fiscal year 2005. Site-wide natural gas consumption remained below the *1999 SWEIS* annual forecast of 1,840,000 decatherms (equivalent to about 1.84 billion cubic feet [52.1 million cubic meters]) (LANL 2006f). LANSCE's natural gas consumption was not individually forecast in the *1999 SWEIS*.

Cooling water requirements for accelerator operations drive total water demand at LANSCE. Operations have historically required about 77 million gallons (291 million liters) of water annually, or about 15 percent of the water consumption for all of LANL (LANL 2006a). LANL used about 359 million gallons (1.36 billion liters) of water in fiscal year 2005 (LANL 2006f); LANSCE's metered water use was approximately 54.8 million gallons (207 million liters) in 2005 (LANL 2006a). Nevertheless, recent LANL site-wide and historic LANSCE usages are well below the *1999 SWEIS* annual forecasts of 759 million gallons (2.87 billion liters) and 265 million gallons (1.0 billion liters), respectively (LANL 2006a, 2006f).

Overall, LANSCE demands for electric power and water have trended well below those forecast in the *1999 SWEIS* in part because those projections included operation of the Low-Energy Demonstration Accelerator. Operation of this facility was forecast to more than double LANSCE's electric peak load demand and its water demand for cooling tower operation (LANL 2006a). Nonetheless, this facility only operated from late 1998, and at lower power than originally proposed, until it was shut down in December 2001. The facility has been decommissioned and is being dismantled (LANL 2006f).

Construction Impacts—Requirements for utility infrastructure resources are expected to be negligible and well within the capacities of existing TA-53 utility systems (LANL 2006a). Although small quantities of gasoline and diesel fuel would be required for such uses as operation of vehicles associated with project activities and possibly for portable generators to power hand tools, spotlighting, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource.

Operations Impacts—While LANSCE Refurbishment Project activities are not intended to materially change LANSCE complex operations, project implementation would likely indirectly increase utility demands over more recent levels due to increased use of the accelerator facilities as analyzed and described in Chapter 5, Section 5.8.2.3, of this SWEIS. However, levels are still expected to remain below those forecast in the *1999 SWEIS* (DOE 1999a).

Waste Management

LANL generates chemical and radioactive wastes as a result of research, production, maintenance, construction, and remediation service activities. For 2005, waste quantities generated from operations at the key facilities were below *1999 SWEIS* projections for all waste types (LANL 2006f). At LANSCE, low-level radioactive liquid waste is collected and allowed to decay in three process tanks, located in Building 53-945, prior to discharge to two lined evaporation tanks. Sanitary wastewater is collected and sent to the Sanitary Wastewater Systems Plant at TA-46. Chemical wastes include hazardous, toxic, and special wastes. Small quantities of hazardous wastes such as liquid solvents, solvents on wipes, lead, and solder are produced from accelerator maintenance and development (LANL 2006a). **Table G–34** presents the latest available waste generation data for LANSCE operations.

Table G–34 Waste Generation from Existing Los Alamos Neutron Science Center Operations at Technical Area 53

Waste Type	*1999 SWEIS ROD Projection*	*2005 Generation*
Low-level radioactive waste (cubic yards per year)	1,420	67
Mixed low-level radioactive waste (cubic yards per year)	1	< 1
Chemical (pounds per year)	36,600	1,980

ROD = Record of Decision.
Note: To convert pounds to kilograms, multiply by 0.45359; cubic yards to cubic meters, multiply by 0.76456.
Source: LANL 2006f.

Construction Impacts—LANSCE Refurbishment Project activities are expected to generate small quantities of low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous solid wastes. In particular, low-level and mixed low-level radioactive wastes would be generated from refurbishment of beam-line components, but operating experience would be combined with recognized waste minimization techniques to eliminate or reduce all waste streams (LANL 2004a). All wastes would be managed and disposed of in a fully compliant method that minimizes volume while minimizing exposure to workers. Liquid low-level radioactive waste would be processed directly through LANSCE's Radioactive Liquid

Waste Treatment Facility. Greater than 75 percent of all nonhazardous solid waste generated, including steel, wire and piping, and packing materials (such as pallets and packing crates), would be recycled (LANL 2006a).

Operations Impacts—While LANSCE Refurbishment Project activities are not intended to materially change LANSCE complex operations, project implementation may indirectly increase air emissions, including radiological emissions and consequential dose, due to enhanced operational availability of the accelerator facilities. However, levels are still expected to remain below applicable standards and levels that were forecast in the *1999 SWEIS*. In addition, an increase in LANSCE operations may result in generation of additional volumes of wastes, but quantities are expected to remain within the *1999 SWEIS* projections.

G.6 Technical Area 55 Radiography Facility Impacts Assessment

This section provides an assessment of environmental impacts for the proposed TA-55 Radiography Facility. Section G.6.1 provides background information on radiography facilities throughout LANL. Section G.6.2 provides a description of the TA-55 Radiography Facility proposed options. Section G.6.3 presents environmental consequences of the No Action Option and the new Radiography Building Option.

G.6.1 Introduction

The NNSA proposes to relocate high-energy x-ray radiography[1] (radiography) of nuclear items and components from the former location at TA-8 to facilities within restricted access areas of TA-55. This would involve an incremental development of the capability within TA-55.

In the ROD (61 *Federal Register* [FR] 68014) for the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996), LANL was assigned responsibility for ensuring the safety and reliability of weapons systems in the stockpile for the foreseeable future, in the absence of underground testing. LANL was also assigned responsibility for stockpile management, which addresses NNSA's production and maintenance of nuclear weapons, including component production and weapon disassembly, as well as stockpile surveillance and process development. Nondestructive examination of nuclear weapons components using dye penetrant testing, ultrasonic testing, and radiography of nuclear items and weapons components is a necessary piece of these responsibilities.

Many of the facilities for carrying out stockpile stewardship and management are located within the PIDAS at TA-55. Access to this area is highly restricted by physical barriers and security personnel. Research and development of nuclear weapons items and components are carried out in the Plutonium Facility, Building 55-4.

Radiography on nuclear items and components has been performed at Building 8-23 within TA-8 at LANL. This radiography facility has several types of radiographic equipment that provide extensive and flexible capabilities for nondestructively examining a wide range of materials and assembly configurations. Nuclear components and items were shipped by truck from TA-55 to

[1] *X-ray radiography is a nondestructive test method that uses penetrating radiation to probe the volume of an item or component. Different materials and thicknesses of the item or component require x-rays of different energies.*

radiography facilities at TA-8, a distance of approximately 4.5 miles (7.2 kilometers). A rolling roadblock was used when the materials were transported, and a temporary material accountability area was set up at TA-8 while the nondestructive examination procedures took place. These procedures required that security personnel accompany the transportation vehicles and be in place for the duration of the examinations; thus, significant security resources were required. This process was expensive, inconvenient, and logistically difficult. Since the events of September 11, 2001, there have been increased demands on security personnel, and adequate resources were not always readily available to safeguard the transportation and examinations. In addition, Building 8-23 required extensive renovation to continue to function as a nuclear facility. LANL ceased the movement of nuclear items and components out of TA-55 to TA-8, and radiography at LANL for these materials was stopped. This has prevented NNSA from effectively carrying out part of its mission for stockpile stewardship and management.

NNSA has developed a strategy for incremental development of the capability within the TA-55 PIDAS from low to high energy over a period of years. Under this strategy, NNSA has ceased radiography of nuclear items and components at TA-8, although radiography capability to support high-explosives operations remains at that location. The nuclear radiography capability is being relocated to TA-55 from TA-8 using near-term, interim, and long-term phases. The near-term phase utilizes low-energy radiography for nuclear items and components and uses destructive testing and other nondestructive examination information in lieu of high-energy radiography. This low-energy radiography capability is being developed in Building 55-4. The interim phase locates a mid-energy range capability (two 6 million electron volt machines) in a previously unused tunnel between Buildings 55-4 and the old 55-41. The long-term phase (the proposed project) would be to install a high-energy (up to 20 million electron volt) pit radiography capability. This document addresses the environmental impacts of locating the high-energy radiography capability at TA-55.

G.6.2 Options Considered

The two options identified for the TA-55 Radiography Facility are the No Action Option and the construction of a new facility within TA-55. Under the No Action Option, LANL would no longer be able to perform high-energy radiography. The new facility option would implement the strategy for developing high-energy radiography capability within the PIDAS at TA-55. NNSA would construct a new radiography facility at TA-55 to accommodate high-energy radiography and other nondestructive examination activities. Under both options, demolition activities within the TA-55 PIDAS that have no impact to the public, workers, or environment, and that have been categorically excluded, would continue.

G.6.2.1 No Action Option

Under the No Action Option, there would be no high-energy radiography capability for nuclear items and components at LANL. Some low-energy radiography would continue at Building 55-4, and the mid-energy radiography would take place in the tunnel adjacent to Building 55-4. No new structure would be built at TA-55 for high-energy radiography.

G.6.2.2 New Radiography Building Option

Under the New Radiography Building Option, NNSA would construct and operate a new facility within TA-55 in the area of Building PF-41; Building PF-41 is scheduled for demolition (see **Figure G–11**). The new facility would have 5,000 square feet (460 square meters) of available floor space. The New Radiography Building Option would include construction of a 400-square-foot (37-square-meter) accessory structure, which would contain the boiler for the facility. The new radiography building would be no more than two stories high, with one floor below ground level.

Figure G–11 Location of Building 55-41 Relative to Building 55-4 at Technical Area 55

G.6.2.3 Options Considered but Dismissed

A series of options for locating radiography capability were evaluated. The following sections describe options that were not further analyzed in this document because they do not meet the need for a more-efficient capability of nondestructive radiography of nuclear components and items as described in Section G.6.1.

Use of the TA-18 Radiography Facilities

Certain radiography capabilities exist at TA-18. However, use of these radiography facilities would require that nuclear items and components be transported approximately 2.5 miles (4 kilometers) to TA-18. Conducting the full suite of proposed radiography examinations at TA-18 would require installation of additional shielding materials and would conflict with existing space requirements for current TA-18 operations. In the *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the*

Los Alamos National Laboratory (DOE 2002c) and ROD (67 FR 79906), NNSA stated its decision that many of the TA-18 capabilities would be relocated to the Nevada Test Site. Relocation of materials from TA-18 has taken place, and TA-18 no longer meets the requirements of a Security Category I nuclear facility. This option does not meet NNSA's purpose and need for a permanent, secure, and cost-effective radiography capability at TA-55.

Construct New Radiography Facility within Tunnels at TA-55

Another option was to construct a new high-energy radiography facility within or adjacent to the underground tunnel between Buildings 55-4 and 54-41. However, space within the tunnels is not large enough to accommodate high-energy radiography, access to and from the tunnels is restricted, and costs for conversion of tunnel space into a radiography facility would be excessive. Due to these limitations, this option was dismissed from further consideration.

Establish a Radiography Capability at the Chemistry and Metallurgy Research Building

The possibility of establishing a radiography capability at the Chemistry and Metallurgy Research Building was also investigated. This option would require transportation of nuclear items and components to and from the Chemistry and Metallurgy Research Building. In addition, the amount of nuclear material that can be located within the Chemistry and Metallurgy Research Building is highly restricted and the process of radiographic examination of nuclear items would exceed these limits (DOE 2003). In the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2003) and ROD (69 FR 6967), NNSA stated its decision to relocate the analytical chemistry and materials characterization capabilities to a new facility at TA-55; however, the new facility does not include radiography capabilities or space to establish these capabilities. Due to these limitations, this option does not meet the purpose and need and was dismissed from further consideration.

Use of Building TA-55-41

Two options originally considered for a Radiography Facility would have used parts of Building TA-55-41, which was originally designed and constructed for storage of nuclear material. The options were to renovate the building or to demolish part of the building and construct a new radiography facility within the original high bay. However, the decision was made to totally demolish Building TA-55-41 and these options are not further considered.

G.6.3 Affected Environment and Environmental Consequences

Chapter 4 of this SWEIS describes the natural and human environment that could be affected by the options described. TA-55 is located on Pajarito Road, which is restricted to LANL-badged personnel. Building 55-4 is located within the PIDAS. Nuclear components are manufactured and nuclear research and development is conducted in Building 55-4.

Based on the option descriptions, environmental resources that may potentially be affected as a result of implementing the action options have been considered. An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Land Resources* – Land use and visual resources would not be affected, as construction would take place within an existing and previously disturbed industrial area.
- *Water Resources* – There would be no effect on water quality. Operation of the radiography facility would not result in any effluent discharges.
- *Ecological Resources* – The action option would be located within previously disturbed and developed land or adjacent to disturbed areas within an industrialized area of LANL. Facilities under the action options would not be located in a floodplain or wetland.
- *Socioeconomics and Infrastructure* – No new employment is expected. Construction workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.
- *Cultural Resources* – Because the proposed New Radiography Building Option would be constructed on previously disturbed land, no impacts to cultural resources are expected.
- *Environmental Justice* – The proposed project is confined to already-developed areas of TA-55, with no disproportionate human health impacts to low-income or minority populations expected.

Resource areas examined in detail in this analysis include: geology and soils, air quality and noise, human health, site infrastructure, waste management, transportation, and facility accidents.

G.6.3.1 No Action Option

Under the No Action Option, the high-energy radiography capability would not be located in a new building at TA-55. Facilities at TA-8 and TA-55 could continue to be used in their current fashion. Under this option, there would be no construction activities.

There would be no change in ambient air quality effects associated with implementing the No Action Option. Ambient noise levels would remain unchanged in the vicinity of TA-55. Potential noise from construction and operational activities associated with the New Radiography Building Option would not occur.

There would be no potential for injuries to construction workers from activities planned under the action option. Potential radiation doses to radiography and nuclear material handlers would diminish because high-energy radiography of nuclear items and components would be discontinued.

The No Action Option would require no modification of existing utilities and infrastructure in TA-55. There would be no construction wastes generated and shipment of construction waste to landfills or recycling centers would not occur. There would be no additional effects to consider.

G.6.3.2 New Radiography Building Option

Geology and Soils

The 9-mile-long (14-kilometer-long) Rendija Canyon Fault is located approximately 0.8 miles (1.3 kilometers) west of Building 55-41 (see Section 4.2 of this SWEIS). Most of the small faults observed in the area have been inferred to represent ruptures subsidiary to the major faults, and as such their potential rupture hazard is very small (Gardner et al. 1999). Any new facilities would be designed in accordance with current DOE seismic standards and applicable building codes.

Construction Impacts—Construction of the new buildings would require excavation of up to 8,000 cubic yards (6,100 cubic meters) of soils as well as shallow bedrock in some areas. As a result, construction would generate excess soil and excavated bedrock that may be suitable for use as backfill. Uncontaminated backfill would be stockpiled at an approved material management area at LANL for future use. Best management practices would be implemented to prevent erosion and migration of disturbed materials from the site caused by stormwater, other water discharges, or wind.

Operations Impacts—Facility operations would not result in additional impacts on geologic and soil resources at LANL.

Air Quality and Noise

Construction Impacts—Construction activities as a result of implementing the new Radiography Building Option could result in temporary, localized emissions associated with vehicle and equipment exhaust as well as particulate (dust) emissions from excavation and construction activities. Effects on air quality would be temporary and localized. There would be no long-term degradation of regional air quality. Air emissions are not expected to exceed either National Ambient Air Quality Standards or New Mexico Ambient Air Quality Standards. Effects of the proposed project on air quality would be negligible compared to potential annual air pollutant emissions from LANL as a whole.

Implementing appropriate control measures would mitigate fugitive dust. Frequent watering with watering trucks would be used to control fugitive dust emissions. Emissions from diesel engine combustion products could result from construction activities involving heavy equipment. Air pollutant emissions associated with construction equipment operation would not result in exceedances of ambient air quality standards.

Implementation of the New Radiography Building Option would result in limited short-term increases in noise levels associated with various construction activities. Following completion of these activities, noise levels would return to preexisting levels. Noise generated by the New Radiography Building Option is not expected to have an adverse effect on LANL workers, members of the public, or the environment. New construction would require the use of heavy equipment for moving materials and for removal of debris and soil. Truck traffic would occur infrequently but would generally produce noise levels below that of the heavy equipment. Personal protective equipment would be required to protect workers' hearing if site-specific work produced noise levels above the LANL action level of 82 dB(A) on average. Noise from these construction activities should not be noticeable to most members of the public and should not disturb most local wildlife.

Operations Impacts—In general, radiography operations do not require hearing protection. When actual radiography work is being conducted, x-ray machines or devices are used to generate radiographs (or pictures) of objects. Cooling water circulators for x-ray machines can generate elevated noise levels, but employees are not located in the direct vicinity of these machines when they are in operation.

The proposed new radiography capability at TA-55 would include equipment that generates noise at levels well below the LANL action level of 82 dB(A) on average. Noise levels that exceed the action level would typically trigger implementation of a hearing conservation program for workers. However, this is not expected to be required for workers under the New Radiography Building Option.

Traffic noise from commuting workers is not expected to noticeably increase over present traffic noise level on roads at LANL. Worker vehicles would remain parked during the day and would not contribute to background noise levels except during rush hour. Therefore, noise levels from commuter traffic are not expected to change.

Human Health

The health of construction workers and LANL project staff is considered in this analysis because they would be involved in either facility construction or high-energy radiography equipment operation under the New Radiography Building Option. The radiography operations would take place in rooms protected by shielding, so that there would be no offsite radiation doses to the public under normal operations. Members of the general public are not affected because access to Pajarito Road, and thence to buildings within TA-55, is restricted. Unescorted, untrained members of the public are not routinely admitted to TA-55.

The health of LANL workers is routinely monitored depending upon the type of work they perform. Health monitoring programs for LANL workers consider a wide range of potential concerns, including exposure to radioactive materials, hazardous chemicals, physical or environmental hazards, and routine workplace hazards. In addition, LANL workers involved in hazardous operations are protected by various engineering or process controls and are required to wear appropriate personal protective equipment. Training is also required to identify and avoid or correct potential hazards typically found in the work environment and to respond to emergency situations. Workers with the potential to be exposed to radiation, such as radiography workers or nuclear material handlers, are monitored through the use of personnel radiation dosimeters. Because of the various health monitoring programs, requirements for personal protective equipment, and routine health and safety training, LANL workers are generally considered a healthy workforce, with a below-average incidence of work-related injuries and illnesses.

Construction Impacts—The most common hazards associated with construction activities are falls, heavy-equipment hazards, being struck or caught by objects or equipment, and transportation incidents. Potential fatalities can be considered by comparing national statistics on construction with project worker information for the New Radiography Building Option. Potentially serious exposures to various hazards or injuries are possible during the construction phases of the proposed project. Adverse effects could range from relatively minor (such as lung irritation, cuts, or sprains) to major (such as lung damage, broken bones, or fatalities). The potential for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 32,400 person-hours to construct the new facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be none (DOE 2004) to less than two (BLS 2003).

The New Radiography Building Option is not expected to result in adverse long-term effects on the health of construction workers; however, construction workers would be actively involved in potentially hazardous activities under this option. Construction activities would involve the use of heavy equipment (such as bulldozers and front-end loaders). Potentially serious exposures to various physical hazards or injuries are possible during the construction phases. To prevent serious injuries, all construction workers would be required to adhere to a contractor safety plan for construction activities. Adherence to an approved plan, use of personal protective equipment and engineered controls, and completion of appropriate hazards training would aid in prevention of adverse long-term health effects on construction workers.

Operations Impacts—Routine operation and maintenance of the proposed new radiography capability would be performed in accordance with standard practices used at LANL for conducting work with radiation-generating machines, such as Laboratory Implementation Requirement 402-700, *Occupational Radiation Protection Requirements*. Operation of the proposed new facility would pose potentially serious worker health hazards, such as high-radiation fields, when operating. To avoid potentially serious worker doses, radiography operations would be designed and constructed so that workers would not be exposed to high-radiation fields. This would be accomplished by use of warning alarms, mandatory evacuation of certain work areas or establishment of exclusion areas in and around the building, closed-circuit television monitors of high-radiation areas, and interlocks on all doors that would prevent inadvertent entry by staff but would allow workers to exit an area if they failed to respond to warning alarms. Occupied work areas, such as the control room, would be shielded, and radiation alarm monitors would be appropriately located to alert workers to high-radiation fields produced during routine operations. Workers would also be issued personnel radiation dosimeters and would utilize ALARA principles in their work.

Radiation levels at the target can cause injury or death; no workers would be in the vicinity of the target when x-ray machines are operating. Radiation dose levels would be greatly reduced in adjacent rooms and throughout the rest of the building. Work areas would be designed to shield workers in adjacent rooms to ensure that exposures are kept to less than 20 millirem per week, and routine radiography operations would result in worker radiation doses much less than 20 millirem per week for all site workers.

In addition to potential radiation doses from radiography operations, workers could also be exposed to radiation from handling, transporting, and testing various items containing nuclear materials. Engineering and administrative controls would be developed to keep worker doses as low as reasonably achievable. In addition, the amount of nuclear material allowed in the radiography room and adjacent test areas would be kept to a minimum, and no materials would be stored in the building.

Radiography workers and nuclear material handlers supporting the proposed project would be drawn from workers that currently perform these duties at LANL. Therefore, the dose to workers from the nondestructive examination operations would not be additive to doses typically received by these workers, nor would operations expose a new population of workers to radiological doses. The dose to individual workers and to the pool of workers that perform these tasks is not expected to change if the New Radiography Building Option is implemented.

Socioeconomics and Infrastructure

Utility infrastructure at the TA-55 Complex encompasses the electrical power, natural gas, steam, and water supply systems needed to support mission requirements. TA-55 used approximately 15,715 megawatt-hours of electricity in fiscal year 2005. TA-55 also uses natural gas to fire boilers for facility heating and other uses that are housed in Building 55-6. Natural gas consumption totaled 20,427 decatherms (equivalent to about 20.4 million cubic feet [0.58 million cubic meters]) in fiscal year 2005. TA-55 water usage is not metered (LANL 2006a). TA-55's electric power and natural gas consumption represented about 4 percent and 2 percent, respectively, of LANL's site-wide consumption in fiscal year 2005.

Construction—Utility infrastructure resources would be needed for construction of the new facility. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection. Construction is estimated to require 42,000 gallons (159,000 liters) of liquid fuels and 234,000 gallons (886,000 liters) of water.

Operations Impacts—Utility infrastructure requirements for operation of the new Radiography Building would be limited to building connections, and no upgrades to existing utilities would be required. Usage in the new facility would be equivalent to or less than that of the former radiography facilities because contemporary building design includes water and energy conservation features. As such, operation of the new facility is expected to have no or negligible incremental impact on utility infrastructure capacities at LANL.

Waste Management

About 24 cubic yards (18 cubic meters) of solid waste would be generated during construction of the new building. Construction and installation of the radiography facility would incorporate, to the extent practical, recommendations that would be provided in the pollution prevention design assessment for this project. Construction debris would be minimized through recycling, reuse, or reselling, if the cost benefits, resources, and available technologies permit. Material that cannot be recycled would be disposed of at the Los Alamos County Landfill or other New Mexico solid waste landfills. Recyclable material would be transported directly to an appropriate recycling facility or would be staged at the Los Alamos County Landfill for recycling. No potential release sites are known to be present at the proposed construction sites. The radiography project, in consultation with the environmental restoration activities, would perform characterization and confirmatory sampling to determine the soil disposition.

Transportation

Operations Impacts—Under the New Radiography Building Option, nuclear items and components would be transported within the PIDAS at TA-55. Radioactive materials and items would not be transported for radiography on LANL or public roads, and traffic would not be affected by road closures. Under the New Radiography Building Option, there would be reduced trips of nuclear components to TA-8. Fewer trips would result in less traffic and fewer potential roadway accidents.

Facility Accidents

Operations Impacts—In preparing this SWEIS, a large suite of accident scenarios was identified and grouped by material at risk. Accident types and initiators that could produce an accident with a frequency in excess of 10^{-7} (1 in 10 million) per year when realistically estimated or in excess of 10^{-6} (1 in a million) per year when conservatively estimated were treated as “credible” and “reasonably foreseeable.” Rigorous evaluations were performed for the potentially risk-dominant scenarios, meaning those that were credible and led to offsite consequences beyond insignificant.

Under the New Radiography Building Option, radiographic capability would be moved from the High-Energy Processing Key Facility at TA-8 to TA-55. These radiographic procedures were evaluated for potential accidents for this SWEIS, and any potential accident is bounded by other accidents.

The New Radiography Building Option would not result in additional nuclear material at TA-55. Under the current procedure, nuclear items and components are stored and worked on at Building 55-4 and moved to TA-8 on a temporary basis for nondestructive examination. Thus, these nuclear items and components are part of the inventory at TA-55 that was used in the accident screening analysis.

G.7 Plutonium Facility Complex Refurbishment Project Impact Assessment

This section provides an impact assessment for the Plutonium Facility Complex Refurbishment Project in TA-55. Section G.7.1 provides background information on the refurbishment project and the proposed project to modernize and upgrade facility and infrastructure portions of the TA-55 Complex. Section G.7.2 provides a description of the proposed options for modernizing and upgrading the facility infrastructure at TA-55. Section G.7.3 presents the environmental consequences of the proposed infrastructure modernization and upgrade activities at TA-55.

G.7.1 Introduction

The TA-55 Plutonium Facility Complex (TA-55 Complex) encompasses about 40 acres (16 hectares) and is located about 1 mile (1.6 kilometers) southeast of TA-3. Most of TA-55 is situated inside a restricted area surrounded by a double security fence. The main complex has five connected buildings: the Administration Building, Support Office Building, Support Building, Plutonium Facility, and Warehouse. The Nuclear Materials Storage Facility (Building 55-41, discussed in the previous section) is separate from the main complex. Various other support, storage, security, and training structures are located throughout the complex.

To address the threats of the 21st century, the U.S. nuclear deterrent strategy requires a safe, secure, and reliable capability to design and manufacture replacement plutonium weapons components. This capability is provided through the Stockpile Stewardship Program. The TA-55 Complex is needed to support the Stockpile Stewardship Program and other nuclear programs. It must continue to operate to achieve its programmatic milestones, safely and cost-effectively, for at least the next 25 years. The Plutonium Facility Complex Refurbishment Project would enable an extension of the facility's lifetime by recapitalizing selected major facility systems to help ensure the facility's continuing capability and reliability to support NNSA's missions. In this project, major (also referred to as "critical") systems are defined as those facility and infrastructure systems whose loss of functionality or reliability due to an emergent disability could disrupt TA-55 Complex operations for an unacceptably long duration pending repair.

The TA-55 Complex, constructed in the mid-1970s, is the primary nuclear facility in the Nation for plutonium research and development. It consists of a Security Category I special nuclear materials laboratory and processing facility as well as support systems and structures. It is the most modern and well-equipped nuclear facility at LANL; however, it is aging, and critical systems are beginning to require excessive maintenance. The goal of this project is to support the Stockpile Stewardship Program and other efforts delineated in DOE and NNSA strategic plans for the next 25 years. An investment is necessary in the near term (the next 10 years or so) to upgrade electrical, mechanical, safety, security, facility control, and other selected facility-related systems.

The scope of the overall project is to modernize and upgrade facility and infrastructure portions of the TA-55 Complex that are approaching the end of life. This project is part of a comprehensive, long-term strategy to extend the life of TA-55 so that it can operate safely, securely, and effectively for at least another 25 years (LANL 2006a).

The project would be executed through a series of subprojects. The subprojects focus on priority facility systems and components that would improve overall facility reliability and that are critical to facility and program operations. Subproject sequencing would minimize disruptions to operations. The process of subproject sequencing requires consideration of a number of factors that have direct bearing on the way this project would be accomplished. Factors considered in prioritization of subprojects include:

- *Regulatory Requirements*: Is there a regulatory mandate or driver, law, policy, or order that would be satisfied by completion of the subproject?
- *Environmental Impact and Minimize Waste*: Will completion of the subproject reduce the possibility of an adverse environmental impact or reduce current waste generation?
- *Personnel Safety*: Will completion of the subproject result in improvement of personnel safety?
- *Mission*: Will completion of the subproject improve the facility's ability to support mission requirements?
- *Security*: Will completion of the subproject lead to an improvement in security?
- *Maintainability*: Will completion of the subproject lead to an improvement in maintainability?
- *Reliability*: Will the equipment or system be more reliable after completion of the subproject?
- *Availability*: Will completion of the subproject lead to an improvement in facility availability?
- *Maintain Authorization Basis*: Is the item classified as Safety, Structures, Systems and Components and will completion of the subproject strengthen the Facility Authorization Basis?
- *Condition Assessment System Status*: If the system is listed in the Condition Assessment System, will completion of the subproject improve its condition assessment?

G.7.2 Options Considered

The two options identified for the Plutonium Facility Complex Refurbishment are the No Action Option and the proposed project option.

G.7.2.1 No Action Option

Under the No Action Option, operations at TA-55 would continue at the level they are today. There would be no renovations or remodeling to improve reliability of pit production or actinide processing. Corrective maintenance and actions would continue to be performed as failures occur. However, maintenance cost would increase to support the aging systems until the systems must be shut down or replaced. If systems proposed for replacement on this project are neither modified nor upgraded, they are expected to fail in the next 10 to 15 years. Based on available information, it is not possible to predict the nature, timing, or type of failures. However, many failures would delay programmatic work, possibly damage equipment, and possibly pose a risk to personnel safety, campaigns, critical experiments, and other activities where plutonium analysis and capabilities are required. Because the facilities are over 25 years old, they would experience more and more severe system failures over time, until either the systems would have to be replaced on a piecemeal basis through corrective maintenance (resulting in increased operating costs) or the facility would have to be shut down.

G.7.2.2 Proposed Project

Existing facilities would be renovated for purposes of life extension rather than just maintenance. This option would entail renovating building systems in the Plutonium Facility or systems supporting the Plutonium Facility. The approach of this project is to renovate or refurbish only systems most in need of upgrading. However, renovations would have to be conducted in an operating nuclear facility, with the attendant programmatic impact and reduction of construction efficiency. Contamination control and safeguards and security issues would not be trivial and would have to be addressed.

All work would be performed inside the existing TA-55 Complex. Most of the work would be inside existing structures or would entail modifications to existing structures that are relatively minor in scope. The proposed project would be limited to the TA-55 Complex and is organized as follows:

- Inside the Plutonium Facility
- Exterior to the Plutonium Facility, including closely related support work (for example, the Plutonium Facility roof)

This section lists a series of upgrades that would compose Phase 1 of the TA-55 Refurbishment Project based on current planning assumptions. Although the list may change based on future planning decisions, and subprojects currently scheduled for a later phase may be moved up in priority, the impacts of the current Phase I upgrades would be similar.

- Heating and cooling systems (preheat coils in intake stacks)
- Heating, ventilation, and air conditioning plenums and associated Zone 1 plenums
- Roof (membrane) for the Plutonium Facility
- Confinement doors in the Plutonium Facility
- Heating, ventilation, and air conditioning ductwork Zone 1
- Criticality alarm system
- Fire water sprinkler piping
- Vault water tanks
- Air dryers
- Stack upgrade and replacement
- Fire alarm panel and wiring
- Fire alarm devices – buildings
- Fire alarm devices – gloveboxes
- Heating, ventilation, and air conditioning plenums (non-safety class portions)

- Glovebox stands
- Chiller replacement
- Replacement of cooling towers
- Elevator
- Waste transfer system
- Uninterruptible power supply replacement

This section lists the types of upgrades that are scheduled for later phases of the Plutonium Facility Complex Refurbishment Project, based on current planning assumptions. Depending on mission requirements and funding availability, any of the following subprojects could be reprioritized for earlier completion.

- Heating and cooling systems (except preheat coils in intake stacks)
- Non-plutonium-facility heating, ventilation, and air conditioning
- Heating, ventilation, and air conditioning plenums
- Heating, ventilation, and air conditioning ductwork intakes, bleed-off, exhaust
- Heating, ventilation, and air conditioning fans and motors
- Facility control system
- Nonprocess cooling water system
- Fire suppression system
- Fire suppression – halon system
- Fire doors electrical distribution system
- 13.2-kilovolt distribution
- Paging system
- Process air
- Continuous air monitoring systems
- Fixed-head air sampler blower system
- Steam system
- Positive pressure chilled water
- Bubbler bypass features
- Chlorine gas delivery system
- Remove selected gloveboxes from throughout the building
- Hot water system
- Utility gas systems
- Industrial gas systems (trailers)

- Radiation protection systems
- Wet vacuum
- Acid distribution
- Water storage tank exteriors
- Sanitary waste
- Site drainage
- Material control and accounting systems
- Tie in Facility Improvement Technical Support (FITS) Building (TA-55) and Manufacturing Technology Support Facility (protocol) to classified local area network
- Communications capacity
- Roofs
- Structure (confinement system)
- Lockers and change facilities
- Operations Center
- Attic
- Laboratories – doors
- Vault racks and shelving, Kardex Unit, and special nuclear material storage drawers
- Trolley systems
- Perimeter road and site paving
- Upgrade tunnel – Plutonium Facility to Building 55-41
- Facilities for site support service contractor
- Warehouse capability
- Cafeteria
- Training Center and mockup for TA-55
- Equipment and glovebox mockup and assembly area

The subprojects would be designed and installed so that any changes in operation would be consistent with approved environmental permits issued by the EPA and the State of New Mexico. The subprojects would not materially change any aspect of LANL's ability to comply with permits. While the new structures, systems, or components may not function in precisely the same way as the existing ones and may be constructed, fabricated, and operated in a different manner, they would fulfill the same function and provide at least the same level of protection and monitoring as the existing ones. One exception is the stack upgrade and replacement subproject for the Plutonium Facility. The proposed modifications are in part in anticipation of more stringent stack release requirements. These modifications would result in stacks that are different in size and would have better performance parameters than the existing stacks.

All proposed work would be performed inside or adjacent to the existing TA-55 Complex. Most of the work would be inside existing structures or would entail modifications to existing structures, systems, or components that would result in relatively minor changes to their operational performance.

G.7.2.3 Options Considered but Dismissed

Move the Stockpile Stewardship Program to another location

DOE prepared the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996) to analyze mission assignments. In its ROD (61 FR 68014), DOE assigned pit production and associated activities to support stockpile stewardship and management to LANL. Thus, the option of moving the Stockpile Stewardship Program to another location within the nuclear weapons complex was already considered and dismissed from further consideration.

G.7.3 Affected Environment and Environmental Consequences

In the case of the proposed project, it is difficult to upgrade an operating nuclear facility with high levels of security because of the organizational, programmatic, safety, and security constraints involved. The constraints and requirements are necessarily much more formal and detailed than those for an office building, for example. The proposed project involves existing, required assets. As such, it must be constructed at TA-55 within the existing systems and infrastructure; there are no other options as to location. Therefore, the affected environment is TA-55, although the region of influence for each resource evaluated may extend beyond TA-55 and LANL.

The analysis of environmental consequences relies heavily on the affected environment descriptions in Chapter 4 of this SWEIS, and care has been taken not to repeat this information. Resource areas or disciplines not expected to be affected by the Plutonium Facility Complex Refurbishment Project, or that would not directly or indirectly affect project implementation, have not been included. Otherwise, where information specific to TA-55 is available and aids understanding the TA-55 affected environment and potential environmental consequences, it has been included.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Land Resources-Visual* – Visual resources would not be affected because subprojects would occur indoors or in a previously disturbed industrial area.
- *Ecological Resources* – The project would occur in an already-developed area of TA-55. No parts of the project would be located in a floodplain or wetland.
- *Cultural Resources* – The proposed upgrades to the main TA-55 Plutonium Facility Complex buildings are likely exempt under the Programmatic Agreement between the

State Historic Preservation Office and NNSA and, therefore, would not require any formal compliance consultation.

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D (refurbishment) workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussion.

- *Environmental Justice* – The proposed project is confined to already-developed areas of TA-55, with no disproportionate human health impacts to low-income or minority populations expected.

- *Facility Accidents* – Potential facility accidents associated with this proposed project are addressed as part of the No Action Alternative of this SWEIS.

This impact assessment focuses on those areas of the affected environment where potential impacts would occur: land use, geology and soils, water resources, air quality and noise, human health, site infrastructure, waste management, and transportation.

G.7.3.1 No Action Option

Under the No Action Option, the project to refurbish systems in the Plutonium Facility Complex would not be implemented, necessitating a continued high level of maintenance activity to keep the facility operating safely. The overall environmental impacts of the Plutonium Facility Complex would be as described under the No Action Alternative in Chapter 5 of this SWEIS. However, as systems continue to require replacement and maintenance, there would be collateral impacts. The two Plutonium Facility stacks are corroded, and surveillance and sampling is becoming problematic, which could degrade regulatory compliance. In addition, the stacks no longer meet American National Standards Institute stack requirements or New Mexico State requirements. Although utility demand would reflect continuation of current activities, as existing radiological facilities age and associated utility systems deteriorate, utility usage would increase as utility system efficiency decreases over time. No changes in waste types are expected in the short term under the No Action Option. As systems and equipment age and the level of required maintenance increases, there could be a commensurate increase in the amount of waste generated. Waste generation rates are expected to remain within LANL waste management infrastructure capabilities.

G.7.3.2 Proposed Project

Under the Plutonium Facility Complex Refurbishment Project, work related to the subprojects would be performed primarily within or around existing structures at TA-55.

Land Resources – Land Use

TA-55 is situated in the west-central portion of LANL along Pajarito Road between Twomile and Pajarito Canyons approximately 1.1 miles (1.8 kilometers) south of the Los Alamos townsite. The Plutonium Facility Complex within TA-55 encompasses 40 acres (16.2 hectares) of land, 43 percent of which is developed (DOE 2003). Existing land uses within TA-55 are designated

Nuclear Materials Research and Development and Reserve (LANL 2003c). TA-55 falls within the Pajarito Corridor West Development Area. In general, the plan designates land use north of Pajarito Road as Infill (the area around existing structures), Primary Development (to the west and south of developed areas), or Parking (to the southeast of developed areas) (LANL 2001).

Construction Impacts—Implementation of several subprojects to the existing project scope would involve varying degrees of land-disturbing activities ranging from grading work and roadway replacement to construction of accessory structures or additions to existing structures within the TA-55 Complex. These subprojects would collectively have a negligible-to-minor incremental impact on land resources at LANL and would be consistent with prevailing land uses of the TA-55 Complex.

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, facility operations would not result in additional impacts on land resources at LANL.

Geology and Soils

The 9-mile-long (14-kilometer-long) Rendija Canyon Fault is located approximately 0.8 miles (1.3 kilometers) west of the Plutonium Facility at TA-55 (see Section 4.2 of this SWEIS). Most of the small faults observed in the area have been inferred to represent ruptures subsidiary to the major faults, and as such their potential rupture hazard is very small (Gardner et al. 1999). Proposed new and upgraded structures, systems, or components would be designed, constructed, and operated in compliance with applicable DOE orders, requirements, and governing standards established to protect public and worker health and the environment.

Construction Impacts—Refurbishment project activities at TA-55 would have no or negligible direct impact on geologic and soil resources, as all work would be performed inside and adjacent to existing TA-55 facilities. Potential release sites that could be impacted by refurbishment project activities at TA-55 would be addressed in accordance with DOE requirements and the Consent Order. That is, prior to commencing ground disturbance, potentially affected contaminated areas would be surveyed to determine the extent and nature of any contamination and required remediation in accordance with procedures established for environmental remediation. Other buried objects would be surveyed and removed as appropriate.

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, facility operations would not result in any additional impacts on geologic and soil resources at LANL. The structural integrity and seismic safety basis of TA-55 facilities would be improved because a number of the proposed project subprojects would involve structural upgrades that specifically include installation of seismic bracing to meet current performance category standards.

Water Resources

TA-55 is located on a narrow mesa (Mesita del Buey). The mesa is flanked by Mortandad Canyon to the north and Twomile Canyon to the south. TA-55 is primarily a heavily developed facility complex, with surface drainage occurring primarily as sheet-flow runoff from the impervious surfaces within the complex. No developed portions of the complex are located within a delineated floodplain. One TA-55 facility discharges cooling-tower blowdown directly to Mortandad Canyon (via National Pollutant Discharge Elimination System Outfall 03A-181) (DOE 2003). In 2005, discharges through this outfall totaled 2.40 million gallons (9.08 million liters) (LANL 2006f).

Construction Impacts—Impacts on water resources would be negligible under this option, as there are no natural surface water drainages in the TA-55 Complex vicinity and ground-disturbing activities would be minor. Appropriate soil erosion and sediment control measures (sediment fences, stacked hay bales, and mulching disturbed areas) and spill prevention practices would be employed to minimize suspended sediment and material transport and potential water quality impacts. No onsite discharge of sanitary wastewater is planned, nor impact on surface water expected.

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, facility operations would result in no additional impacts on water resources at LANL. The proposed refurbishment activities are not intended to materially change TA-55 operations, and no measurable increase in effluent discharge is expected (LANL 2006a).

Air Quality and Noise

Estimates for selected toxic and hazardous air pollutant emissions from key LANL facilities were made in the *1999 SWEIS* (DOE 1999a) based on chemical use at LANL and assumed stack and building parameters. Chemical purchasing records for these key facilities have been reviewed each year and estimated emissions reported in the annual *SWEIS Yearbooks* (LANL 2003b, 2004d, 2005c, 2006f). **Table G–35** presents estimated toxic and hazardous air pollutant emissions for 2005 based on chemical usage at TA-55.

Table G–35 Toxic and Hazardous Pollutant Air Emissions from Existing Operations at Technical Area 55

Chemical and Form	*2005 Air Emissions (kilograms)*
Acetone	4.56
Acetylene	0.00
Ammonium Chloride (Fume)	0.28
Ethanol	82.07
Hydrogen Chloride	9.14
Hydrogen Peroxide	0.18
Magnesium Oxide Fume	0.35
Methyl Alcohol	0.28
Nitric Acid	9.35
Oxalic Acid	0.53
Potassium Hydroxide	0.18
Propane	0.00
Tributyl Phosphate	1.36

Note: To convert kilograms to pounds, multiply by 2.2046.
Source: LANL 2006f.

Radiological air emissions from operations at TA-55 in 2005 are described in Chapter 4, Section 4.4.3.1, Radiological Monitoring. TA-55 typically produces a minimal amount (less than 3 percent) of the total LANL air emissions.

Construction Impacts—As execution of the higher-priority subprojects would primarily involve upgrades to and repairs or replacements of existing structures, systems, and components, including electrical, electronic, plumbing, and mechanical systems, most work would be performed using portable equipment and hand tools. There would be some criteria and toxic pollutant emissions from fuels, solvents, acids, and epoxies associated with subproject work. Because implementation of individual subprojects would be spread out over a number of years rather than performed concurrently, any impacts on ambient air quality would be negligible to minor and of short duration.

Construction activities would result in a temporary increase in emissions from construction equipment, trucks, and, to a lesser degree, employee vehicles. Incremental increases in toxic air pollutants would be small and would have a negligible-to-minor short-term impact on local ambient air quality.

Although no radiological releases to the environment are expected in association with construction activities at TA-55, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Potential release sites at TA-55 that could be impacted during site activities would be addressed in accordance with DOE requirements and the Consent Order. To determine the extent and nature of any contamination, an assessment of the affected areas would be performed prior to commencing ground disturbance. If the contamination poses an unacceptable risk to the public or LANL workers, the sites would be cleaned up before proceeding.

Refurbishment project activities and new facility construction would result in some temporary increase in noise levels near the TA-55 Complex and near specific subproject work areas. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from project workers' vehicles and materials shipments. Noise sources associated with the proposed subprojects are not expected to include loud impulsive sources such as blasting.

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, facility operations would not result in any measurable increase in air emissions. Implementation of the stack upgrade and replacement subproject would provide for improved in-stack mixing and emissions monitoring.

Further, implementation of the chiller replacement subproject would have a positive impact on environmental quality by removing ozone-depleting substances, and one subproject (steam system) would directly reduce emissions of criteria pollutants by replacing natural-gas-fired boilers with electric units.

Following completion of Plutonium Facility Complex Refurbishment Project activities, facility operations would not result in any measurable increase in noise levels.

Human Health

LANL workers receive the same dose as the general public from background radiation, but they also receive an additional radiation dose from working in facilities with nuclear materials, such as at TA-55. However, occupational radiation exposures for workers at LANL remain well below those projected for the *1999 SWEIS* ROD. The majority of the LANL offsite maximum exposed individual dose in 2005 (6.46 millirem) resulted from emissions from LANSCE stacks. The portion of that dose attributed to operations at TA-55 is minimal (less than 1 percent) (LANL 2005a). All worker doses in 2005 were below the 5-rem-per-year standard set by DOE (LANL 2006f). Further details can be found in Section 4.6.2.1 of this SWEIS.

No radiological risks would be incurred by members of the public from proposed project activities. Project workers would be at a small risk for work-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site as well as from work in contaminated areas and encountering contaminated materials during subproject execution. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses were kept ALARA. The individual dose to involved workers would be less than 500 millirem per year for any subproject (LANL 2006a).

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, there would be no increase in radiological releases to the atmosphere from normal operations, as the proposed upgrades are not intended to materially change TA-55 Complex operations. Similarly, there would be no change in the basis for postulated accidents and resulting consequences from implementation of this option, as upgrades would not materially change facility operations and materials at risk would not be affected. A number of the higher-priority subprojects involve upgrades that would substantially improve the safety basis of the TA-55 Complex and the Plutonium Facility in particular. In addition, implementation of the stack upgrade and replacement subproject, as previously discussed, would provide for improved in-stack mixing and emissions monitoring in support of improved regulatory compliance.

Socioeconomics and Infrastructure

Utility infrastructure at the TA-55 Complex encompasses the electrical power, natural gas, steam, and water supply systems needed to support mission requirements. TA-55 used approximately 15,715 megawatt-hours of electricity in fiscal year 2005. TA-55 also uses natural gas to fire boilers for facility heating and other uses that are housed in Building 55-6. Natural gas consumption totaled 20,427 decatherms (equivalent to about 20.4 million cubic feet [0.58 million cubic meters]) in fiscal year 2005. TA-55 water usage is not metered (LANL 2006a). TA-55's electric power and natural gas consumption represented about 4 percent and 2 percent, respectively, of LANL's site-wide consumption in fiscal year 2005.

Construction Impacts—Requirements for utility infrastructure resources, including electricity, fuels, and water, are expected to be negligible for most subprojects and activities would be staggered over an extended period of time. Existing TA-55 utility systems would easily be capable of supporting project activities (LANL 2006a). Small quantities of gasoline and diesel fuel would be required for such uses as operation of construction vehicles and possibly for portable generators to power hand tools, spotlighting, and other construction equipment. This fuel would be procured from offsite sources and, therefore, would not be a limited resource.

Operations Impacts—The proposed refurbishment activities are not intended to materially change TA-55 operations. No net increase in utility infrastructure demands is expected that would be directly related to implementation of the proposed project.

Waste Management

LANL generates chemical and radioactive wastes as a result of research, production, maintenance, construction, and remediation service activities. For 2005, waste quantities generated from operations at the key facilities were generally below *1999 SWEIS* ROD projections for nearly all waste types (LANL 2006f). **Table G–36** presents the latest available waste generation data for TA-55 operations.

Table G–36 Waste Generation from Existing Operations at Technical Area 55

Waste Type	*1999 SWEIS ROD Projection*	*2005 Generation*
Low-level radioactive waste (cubic yards per year)	986	380
Mixed low-level radioactive waste (cubic yards per year)	17	17
Transuranic waste (cubic yards per year)	310	62
Mixed transuranic waste (cubic yards per year)	133	125
Chemical (pounds per year)	18,500	2,840

ROD = Record of Decision.
Note: To convert cubic yards to cubic meters, multiply by 0.76455; pounds to kilograms, by 0.4536.
Source: LANL 2006f.

The Plutonium Facility has capabilities to treat, package, store, and transport the radioactive waste produced by TA-55 operations. Liquid wastes are converted to solids or are piped to the TA-50 Radioactive Liquid Waste Treatment Facility. Some transuranic wastes are immobilized with cement in 55-gallon (208-liter) drums. Other transuranic waste is consolidated in 55-gallon (108-liter) drums or is packaged in waste boxes. Low-level radioactive wastes also are packaged in the Plutonium Facility, where care is taken to avoid combining hazardous waste with radioactive waste to form mixed waste. Solid wastes of all types are stored temporarily at TA-55 until they are shipped to onsite waste storage or disposal locations, primarily in TA-54 (LANL 2006a).

Construction Impacts—Refurbishment project activities are expected to generate transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous solid and sanitary wastes from removal of equipment being replaced and construction activities. Projected waste volumes, for those wastes where estimates have been made, are provided in **Table G–37**.

Table G–37 Total Waste Generation from Implementation of the Plutonium Facility Complex Refurbishment Project at Technical Area 55

Waste Type	*Projected Generation*
Low-level radioactive waste (cubic yards)	1,290 [a]
Mixed low-level radioactive waste (cubic yards)	216
Transuranic waste (cubic yards)	196
Mixed transuranic waste (cubic yards)	144
Chemical waste (pounds)	2,000
Nonhazardous solid waste (cubic yards)	2,740 [b]

[a] Includes 970 cubic yards (740 cubic meters) of bulk low-level radioactive waste and 320 cubic yards (240 cubic meters) of packaged low-level radioactive waste.

[b] Includes about 2,060 cubic yards (1,570 cubic meters) of demolition debris and 685 cubic yards (524 cubic meters) of construction waste.

Note: To convert cubic yards to cubic meters, multiply by 0.7644; pounds to kilograms, multiply by 0.4536.

Source: LANL 2006a.

Low-level radioactive waste would consist mainly of construction debris removed from radiological control areas. Chemical waste could include various materials removed from inside TA-55 facilities as part of the upgrades, including electronic components, wiring, batteries, and other materials (LANL 2006a). Chemical wastes may also include spent chemical wastes or leftover materials that could not otherwise be recycled, such as solvents or acids. Construction debris and miscellaneous removed equipment (water tanks, pumping units, heating and ventilating equipment, and roofing material) would be characterized to determine the appropriate waste classification. All wastes would be managed and disposed of in a fully compliant method that minimizes volume while minimizing exposure to workers. Subprojects would be designed and constructed to incorporate pollution prevention and waste minimization features. For some subprojects, DD&D would be performed after the new systems are in place; for others, DD&D would be part of the critical path. Waste volume estimates would be refined through conceptual design report activities. A waste management plan would be developed by the project as part of the conceptual design report. The existing LANL waste management infrastructure is adequate for management of the waste types and quantities generated by the Plutonium Facility Complex Refurbishment activities.

Operations Impacts—Following completion of Plutonium Facility Complex Refurbishment Project activities, there would be no increase in TA-55 waste generation rates, as the proposed upgrades are not intended to materially change TA-55 Complex operations.

Transportation

Construction Impacts—Traffic on Pajarito Road could be disrupted due to temporary increases during construction.

Operations Impacts—Under the proposed project, interstate waste transportation would decrease over the long term. However, local traffic would increase.

Waste generated during refurbishment activities would have to be transported for disposal at either LANL TA-54 or an offsite location, using over-the-road truck transportation. Transportation has potential risks to workers and the public from incident-free transport, such as radiation exposure as the waste packages are transported along the highways. There is also increased risk from traffic accidents (without release of radioactive material) and radiological accidents (in which radioactive material is released).

The effects of accident-free transportation of wastes on the worker population and general public are presented in **Table G–38**. The effects are presented in terms of the collective dose in person-rem resulting in excess LCFs. Excess LCFs are the number of cancer fatalities that may be attributable to the proposed project and estimated to occur in the exposed population over the lifetimes of the individuals. If the number of LCFs is less than one, the subject population is not expected to incur any LCFs resulting from the actions being analyzed. The risks of developing excess LCFs are highest for workers under the offsite disposition option because the dose is proportional to the duration of transport, which in turn is proportional to travel distance. As shown in Table G–38, disposal of low-level radioactive waste at Nevada Test Site, which is farthest from LANL, would lead to the highest dose and risk, although the dose and risk are low under all disposal options.

Table G–38 Incident-Free Transportation Impacts – Plutonium Facility Complex Refurbishment

Disposal Option	*Low-Level Radioactive Waste Disposal Location* [a]	*Crew*		*Public*	
		Collective Dose (person-rem)	*Risk (LCF)*	*Collective Dose (person-rem)*	*Risk (LCF)*
Onsite disposal	LANL TA-54	0.85	0.00051	0.27	0.00016
Offsite disposal	Nevada Test Site	1.38	0.00083	0.43	0.00026
	Commercial Facility	1.34	0.00081	0.42	0.00025

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic waste would be disposed of at WIPP.

Table G–39 presents the impacts of traffic and radiological accidents. This table provides population risks from traffic accidents in terms of LCFs caused by exposure to releases of radioactivity, and of fatalities caused by the collisions themselves. The analyses assumed that, all transuranic and nonradioactive wastes generated by refurbishment activities would be transported to offsite disposal facilities.

Table G–39 Transportation Incident Impacts – Plutonium Facility Complex Refurbishment

Low-Level Radioactive Waste Disposal Location [a, b]	*Number of Shipments* [c]	*Distance Traveled (10^6 kilometers)*	*Accident Risks*	
			Radiological (excess LCFs)	*Traffic (fatalities)*
LANL TA-54	285	0.11	1.2×10^{-9}	0.0013
Nevada Test Site	285	0.34	1.2×10^{-8}	0.0036
Commercial facility	285	0.32	9.1×10^{-9}	0.0034

LCF = latent cancer fatality, TA = technical area.
[a] Transuranic waste would be disposed of at WIPP.
[b] All nonradiological wastes would be transported off site.
[c] Approximately 46 percent of these are radioactive. Others include 54 percent industrial and sanitary and about 0.4 percent asbestos and hazardous.
Note: To convert kilometers to miles, multiply by 0.6214.

The results in these two tables indicate that no traffic fatalities or excess LCFs are expected from transportation of generated wastes.

Because all of the LCFs estimated, as shown in Tables G–37 and Table G–38, are much less than 1.0, the analysis indicates that no excess fatal cancers would result from this activity, either from dose received from packaged waste on trucks or potentially received from accidental release. Likewise, no fatalities are expected from traffic accidents.

G.8 Science Complex Impact Assessment

This section provides an assessment of environmental impacts for the proposed project consisting of the construction and operation of the Science Complex at several alternate LANL sites. The Science Complex would be constructed within the timeframe under consideration in this SWEIS. More general descriptions of the affected environment at LANL are located in Chapter 4 of this SWEIS, while this appendix focuses on project-specific analyses of those resources that would be impacted by the Science Complex Project. The proposed Science Complex Project is categorized as one that would relocate existing operations to a completely new facility, and then conduct DD&D of an equivalent square footage of existing LANL facilities. Section G.8.1 provides background information and rationale for the proposed project to build the Science Complex, while Section G.8.2 provides descriptions of the location options for the Science Complex. Section G.8.3 describes the affected environment and impacts of the No Action Option and the proposed project (construction and operation of the proposed Science Complex) at all of the location options.

G.8.1 Introduction

NNSA and DOE are proposing to construct two buildings and one supporting parking structure. This facility, collectively referred to as the Science Complex, would aid NNSA in fulfilling its primary Defense Program Stockpile Stewardship mission, while supporting basic and applied scientific research and technology to be conducted on DOE-administered land that could be custodially transferred from one Federal agency to another or by long-term ground lease or government-approved land transfer. The Science Complex would replace 402,000 gross square feet (37,300 square meters) of LANL's 5,800,000-square-foot (538,800-square-meter) of outdated and inefficient occupied space.

The Science Complex would be used for light laboratories and offices. It would be a state-of-the-art, multi-disciplinary facility that would enable the performance of mission-related scientific research. Low hazard work would be conducted in the laboratories. Work would be nonradiological except for the use of ionizing radiation producing equipment (such as x-ray machines) and sealed sources (radioactive sources engineered to meet Department of Transportation special form testing at 49 CFR 173.469 or the American National Standards Institute N45.6 testing for Sealed Radioactive Sources, Categorization). Biological research laboratories would be designed and operated in accordance with applicable standards for work with Biosafety Level 1 agents (see Appendix C for a discussion of Biosafety Levels).

G.8.2 Options Considered

The four options identified for the Science Complex Project are the No Action Option and three action options. Option 1, the Northwest Technical Area 62 Site Option, has been identified as the Preferred Option for the Science Complex Project.

G.8.2.1 No Action Option

Under the No Action Option, the Science Complex would not be constructed. Operations and activities proposed for the Science Complex would continue at dispersed locations across LANL in aging facilities that are reaching the end of their useful lives and require major upgrades to meet future mission objectives.

G.8.2.2 Option 1: Northwest Technical Area 62 Site Option (Preferred Option)

The Science Complex would be constructed on a site in Northwest TA-62, located west of the Research Park area. The Northwest TA-62 site is bounded to the south by West Jemez Road, to the east by West Road, to the west by forested land, and to the north by a utility corridor unpaved access road with forested land beyond. Note that the "Northwest" name is a historical site name that has since been combined with the TA nomenclature and does not refer to the northwest portion of TA-62. The utility corridor access road may be paved in the future to provide all-weather access to areas of the Santa Fe National Forest and a local recreational ski facility.

The relatively undeveloped site is situated on slightly sloping terrain above the south rim of Los Alamos Canyon and is vegetated primarily with native grass, ponderosa pine, and some pinyon-juniper. The Science Complex would consist of two buildings: a four-story secured building of approximately 110,000 gross square feet (10,200 square meters), and a four-story unclassified work building, including an auditorium, of approximately 292,000 gross square feet (27,100 square meters) (LANL 2006a). In addition to these two buildings, a new six-story, 504,000-gross-square-foot (47,000-square-meters) parking structure would be constructed on site. A maximum area of 15.6 acres (6.3 hectares) would be required for the project, which includes an area of about 5 acres (2 hectares) for new construction and staging. General roadway improvements would include construction of a site access road to the Science Complex and a parking structure. Also, to mitigate non-construction-related traffic increases, east- and westbound right- and left-turn deceleration lanes could be constructed on West Jemez Road approaching the site access. **Figure G–12** illustrates the conceptual layout of the Science Complex at the Northwest TA-62 site.

G.8.2.3 Option 2: Research Park Site Option

Under the Research Park Site Option, the Science Complex would be constructed at the Los Alamos Research Park site, located in the northwest portion of TA-3. The Research Park site is bounded to the west by West Road, to the south by West Jemez Road, to the east by the existing Research Park Buildings, and to the north by Los Alamos Canyon. Approximately 100 feet (30.5 meters) to the east lie the existing Los Alamos County Research Park Buildings and Los Alamos County Fire Station. The Los Alamos community access road may be developed in the future to provide all-weather access to areas in the Santa Fe National Forest and a local recreational ski facility. To mitigate non-construction-related traffic increases, the four-lane cross section of West Jemez Road east of the proposed site access could be extended to the site access. Also, east- and westbound right- and left-turn deceleration lanes could be constructed on West Jemez Road approaching the site access.

The relatively undeveloped site is situated on slightly sloping terrain above the south rim of Los Alamos Canyon and is vegetated primarily with native grass, ponderosa pine, and some pinyon-juniper.

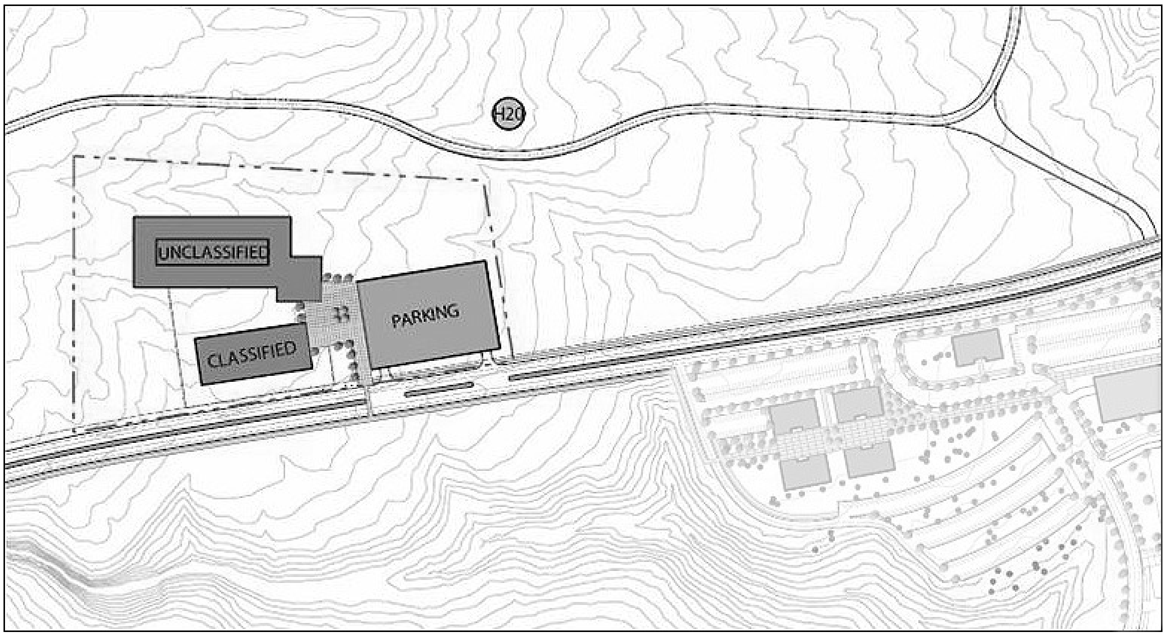


Figure G–12 Conceptual Layout of the Science Complex at the Northwest Technical Area 62 Site

G.8.2.4 Option 3: South Technical Area 3 Site Option

Under the South TA-3 Site Option, the Science Complex would be constructed on a site in the southeast portion of TA-3. The South TA-3 site is bounded to the south by Pajarito Road and to the west by Diamond Drive. The site is partially developed, with an existing parking lot situated in the center of the site, which is accessed from Diamond Drive. The eastern edge of the parking lot is constructed on fill material, which slopes downward to the east. At the toe of the slope lies a poorly defined drainage. South of the parking lot, between Pajarito Road and the parking lot, the area is relatively undeveloped. The undeveloped areas to the east and south of the parking lot are characterized by slightly sloping terrain and vegetated primarily with native grass, ponderosa pine, and some pinyon-juniper. To mitigate non-construction-related traffic, it would be necessary to construct south- and northbound left- and right-turn deceleration lanes on Diamond Drive approaching the site access.

G.8.2.5 Options Considered but Dismissed

Consistent with the Council on Environmental Quality and DOE NEPA regulations (40 CFR Part 1500 and 10 CFR Part 1021, respectively), several options were analyzed for comparison of potential effects with those options listed above. Two options were analyzed from a land use planning perspective, primarily based on location, which considered land use, traffic circulation, infrastructure, environmental compliance, security, safety, space consolidation opportunities and proximities, and work environment quality. The site options were located at the Gateway site, on the southeast corner of West Jemez Road and Diamond Drive, and on Twomile Mesa in TA-58. As a consequence of the planned Security Perimeter Road, access to both of these sites was made impractical. Therefore, both of these previously considered sites were eliminated from further consideration.

G.8.3 Affected Environment and Environmental Consequences

For construction and operation of the Science Complex at either the Northwest TA-62 or the Research Park sites, the affected environment would primarily be TA-62 and TA-3. For construction and operation of the Science Complex at the South TA-3 Site Option, the affected environment would primarily be TA-3.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction and DD&D workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussions.

- *Environmental Justice* – The proposed project would entail no disproportionate human health impacts to low-income or minority populations.

Resource areas examined in this analysis include: land resources, geology and soils, water resources, air quality and noise, ecological resources, human health, cultural resources, site infrastructure, waste management, transportation, and facility accidents.

G.8.3.1 No Action Option

Under the No Action Option, the Science Complex would not be constructed at any of the location options. Under the No Action Option, new land tracts would not be developed at this time. The tracts could remain undeveloped or could be developed sometime in the future by NNSA for some as-yet-undetermined use. Potential effects associated with development and use of this land would not occur. No construction waste would be generated. However, the potential for increased efficiency due to more-modern construction and collocation would also not occur. Open space from DD&D of old, less-efficient structures would not be created.

G.8.3.2 Option 1: Northwest Technical Area 62 Site Option (Preferred Option)

Land Resources—Land Use

Under the Northwest TA-62 Site option a site located to the west of TA-3 would be used for construction of the Science Complex. Current land use within the entire 245-acre (99-hectare)

TA is classified as Reserve and land use should not change in the future (LANL 2003b). The Science Complex would disturb 5 acres (2 hectares) of undeveloped land and would result in a change in future land use from Reserve to Experimental Science.

Land Resources—Visual Resources

The southern rim of Los Alamos Canyon is relatively undeveloped, and the area possesses desirable aesthetic qualities that contribute to the natural viewshed. From West Jemez Road, the view north to the forest canopy at the site is unobstructed. From the site, the views west, north, and east, to Los Alamos Canyon below and to the mountains and valleys beyond Los Alamos, are relatively unobstructed. The principal manmade features that contrast with the existing natural environment are West Jemez Road and the TA-3 facilities to the south and the Los Alamos Canyon bridge and community buildings to the east and north, these being at a lower elevation than the site.

The Science Complex would encompass 5 acres (2 hectares) on the site and would consist of two four-story buildings and a six-story parking structure, as well as related supporting structures and utilities. Buildings of this size would be visible from neighboring properties and roadways. Although the Science Complex at this site would be near existing industrial compounds at TA-3, and the area of existing development at TA-3 has already impacted the landscape, the addition of the Science Complex would result in an impact on visual resources in this area because views from the site, or from West Jemez Road, to the west, north, and east would be obstructed. Currently, LANL structures are largely contained on the south side of West Jemez Road. However, with the Science Complex construction on the north side of this road, the natural forested buffer area between LANL and Los Alamos Canyon at this site would be lost.

Because there is little nighttime activity at LANL, nighttime light sources would generally be security lighting. The sodium vapor lights used for this purpose can be distinguished from the lights of the nearby Los Alamos community by their slightly yellow color. At a distance across the viewshed, however, the color variation in light sources becomes negligible, and any nighttime distinction between LANL and the community is not apparent to the observer. Light sources for the proposed Science Complex would be associated primarily with security lighting. However, the security lighting near the north edge of the site may illuminate some portion of the south and north canyon walls of Los Alamos Canyon adjacent to the site. This increased illumination may impact nighttime movement of wildlife in the area, including the Mexican spotted owl, and Mexican spotted owl habitat.

Construction of new facilities would affect this viewshed. Preservation of existing vegetation and use of building design sand colors that complement the natural environment would mitigate viewshed degradation. In addition, limiting use of bright security lights on the north edge of the site and using directed lighting and shielded fixtures would limit illumination to the adjacent Los Alamos Canyon walls. To mitigate the visual impact of lighting, the project would conform to the New Mexico Night Sky Protection Act per architectural and design guidelines.

Geology and Soils

Data from geological studies indicate that TA-62 is located in a fault zone. In general, the density of seismic features increases to the west at LANL, and a number of faults are mapped in the TA-62 area (see Section 4.2 of this SWEIS). A probabilistic analysis of potential surface rupture was performed to evaluate the Chemistry and Metallurgy Research Building site in TA-3. TA-3 is located adjacent to and east of TA-62 (DOE 2003). The analysis indicates that the annual probability of surface rupture in TA-3 is less than 1 in 10,000, which is less than the required performance goal for the Chemistry and Metallurgy Research Building and is in accordance with DOE standards. If located in TA-62, an estimate of the seismic hazard at the site would be conducted, and the Science Complex would be designed in accordance with current DOE seismic standards and applicable building codes.

Soil resources in the area of the proposed location for the Science Complex are undisturbed and maintain natural vegetative cover. The arid soils in this area are largely sandy loam material alluvially deposited from tuff units on the slopes to the west and eroded from underlying geologic units. Soils in the proposed construction area are primarily classified as Typic Eutroboralfs, while there are smaller areas at the site where soils are classified as Typic Ustorthents. Both of these soil types are poorly developed with relatively little horizon differentiation and organic matter accumulation. These factors, combined with the dry moisture regime of the area, result in only a limited number of plant species able to subsist on the soil medium, which, in turn, supports a very limited number of wildlife species.

Construction Impacts—Construction of the Science Complex at the Northwest TA-62 site is expected to impact soil resources over several acres. Soil resources in this area, as well as the habitat it supports, would be irretrievably lost as a result of the construction. To mitigate this loss, valuable surface soil in this area would be scraped off of the building sites and stockpiled prior to beginning construction activities. In addition, some underlying rock (consisting of Bandelier tuff) would be excavated for building foundations. An estimated 840,000 cubic yards (640,000 cubic meters) of soil and rock would be excavated and stockpiled. The stockpiled soil and rock could then be used at other locations at LANL for site restoration following remediation. If soil and rock stockpiles were to be stored for longer than a few weeks, the stockpiles would be seeded or managed as appropriate to prevent stockpile erosion and impact on nearby drainages. In addition, care would be taken to employ all necessary erosion control best management practices during and following construction to limit impact on soil resources adjacent to the construction and building sites.

Water Resources

There are no natural surface water resources at the Northwest TA-62 Project site. An existing water tank is currently located on the site, approximately 50 feet (15 meters) north of one of the proposed structures. Regional groundwater occurs approximately 6,150 feet (1,875 meters) below ground surface at the site, and no groundwater pumping or monitoring wells exist at the site. Two existing, natural drainage swales transect the western half of the site.

Construction Impacts—No long-term effects on surface water quality would be likely. Vegetation reduction could expose soils due to excavation and heavy construction equipment.

Best management practices for runoff control, such as silt barriers and straw bales, would be used. The potential for downstream siltation would be minor and temporary in nature. A stormwater pollution prevention plan would be developed and implemented, including placement of best management practices to prevent erosion of disturbed soil by stormwater runoff or other water discharges.

Under the current conceptual site layout plan (see Figure G–12) some modification of the site's natural drainage patterns would be necessary. This would involve a consultation with the U.S. Army Corps of Engineers to determine if a Clean Water Act Section 404 Dredge and Fill Permit, and a State of New Mexico Section 401 Water Quality Certification are required.

Operations Impacts—The addition of new impermeable surfaces would increase stormwater runoff and would decrease surface water infiltration. While decreased infiltration is not expected to have an adverse effect on groundwater quality, the increased amount of runoff from impervious surfaces may have a slight effect on surface water quality and on residual contaminant transport within canyon sediments. Best management practices integrated as part of the site design would minimize the potential for sediment and residual contaminant transport.

Air Quality and Noise

Construction Impacts—Construction of the proposed Science Complex would result in temporary, localized emissions associated with vehicle and equipment exhaust as well as particulate (dust) emissions from excavation and construction activities. Emissions from gasoline and diesel engines would result from excavation and construction activities. Air emissions associated with excavation and construction equipment operation would not result in exceedances of ambient air quality standards, except for possible short-term concentrations of carbon monoxide and nitrogen oxides. Estimated concentrations for PM_{10} would be greatest for the site work phase. The maximum estimated ground-level concentration for PM_{10} would be an annual average of 4.5 micrograms per cubic meter and a 24-hour average of 92.2 micrograms per cubic meter offsite or along the perimeter road to which the public has regular access.

Soil disturbance during construction would result in small air emissions, but would be controlled by best management practices and would not exceed ambient air quality standards, thereby resulting in no impacts on workers or the public.

The proposed project would result in limited short-term increases in noise levels associated with construction activities and increased long-term noise levels associated with operation of the proposed Science Complex. Noise generated by the proposed project is not expected to have an adverse effect on either construction workers or workers at the new facility once it is operating.

Sound levels would dissipate to background levels before reaching publicly accessible areas or undisturbed wildlife habitats, and they would not be noticeable to nearby workers or members of the public, nor would they disturb local wildlife. Traffic noise from construction workers or operations would not increase the present traffic noise level on West Jemez Road.

Operations Impacts—In terms of Science Complex operation, as existing LANL capabilities and organizations are consolidated at the Science Complex, there could be fewer emissions resulting from individuals driving to various points at LANL throughout the day for meetings and other purposes.

Ecological Resources

Areas in the region of TA-62 burned in the Cerro Grande Fire, including a portion of the area contained within the Northwest TA-62 Option. There are no wetlands or aquatic resources within the Northwest TA-62 Option area, although wetlands are located to the north in Los Alamos Canyon. A portion of the project area falls within the core and buffer zone of the Los Alamos Canyon Area of Environmental Interest for the Mexican spotted owl. Areas of environmental interest for the bald eagle and southwestern willow flycatcher are not located near the project site (LANL 2006b).

Construction Impacts—Science Complex construction would involve clearing and grading approximately 5 acres (2 hectares) of ponderosa pine forest within TA-62. This would result in loss of less-mobile wildlife, such as reptiles and small mammals, and cause more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity of the area into which they moved. If the area were at its carrying capacity, displaced animals would not likely survive. Indirect impacts of construction, such as noise, light, or human disturbance, could also impact wildlife living adjacent to the construction zone. Such disturbance would span the construction period. These impacts could be mitigated by clearly marking the construction zone to prevent equipment and workers from disturbing adjacent habitat, including the Mexican spotted owl habitat, and properly maintaining equipment. Construction of the new buildings and parking structure would not impact wetlands, as none are located in or near the construction zone.

The Science Complex would remove areas of undeveloped core and buffer habitat within the Los Alamos Canyon Mexican spotted owl Area of Environmental Interest. Further, noise from the project would potentially exceed 6 dB(A) above background in the core zone; however, this level would drop below that level within 450 feet (135 meters) from the construction zone. The biological assessment prepared by DOE noted that it is unlikely that the Mexican spotted owl would be denied access to adequate nesting and foraging habitat as a result of the project. Thus, provided all reasonable and prudent alternatives are implemented (see Section G.2.3.2), the project may affect, but is not likely to adversely affect, the Mexican spotted owl (LANL 2006b). The USFWS has concurred with this assessment (see Chapter 6, Section 6.5.2).

Areas of Environmental Interest for the bald eagle and southwestern willow flycatcher are not located near the proposed Science Complex. However, recognizing that the bald eagle forages over all of LANL and that some habitat degradation would be associated with the project, the DOE biological assessment concluded that with appropriate reasonable and prudent alternatives (see Section G.2.3.2), the project may affect, but is not likely to adversely affect, the bald eagle. Since the nearest southwestern willow flycatcher Area of Environmental Interest is not within or downstream of the project site there would be no effect on this species (LANL 2006b). The USFWS has concurred with the biological assessment as it relates to the bald eagle and southwestern willow flycatcher (see Chapter 6, Section 6.5.2).

Operations Impacts—Science Complex operation would have minimal impact on terrestrial resources within or adjacent to TA-62. Because the wildlife residing in the area has already adapted to levels of noise and human activity associated with development in the area surrounding the project area, it would not likely be adversely affected by similar types of activity involved with operation of the new buildings.

Human Health

Construction Impacts—During Science Complex construction, some construction-related accidents would potentially occur. The potential for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 3.2 million person-hours to construct the new facilities, no fatal accidents would occur. Nonfatal injuries are estimated to be approximately 36 (DOE 2004) to 135 (BLS 2003).

Cultural Resources

Three archaeological sites are situated in the vicinity of the proposed Northwest TA-62 location, and each site has been determined to be eligible for the National Register of Historic Places. Two of these prehistoric sites are listed as nonstructural, and both traverse the proposed project area. One site is a 1-acre (0.4-hectare) prehistoric artifact scatter. The second site is about 0.6 acres (0.2 hectares) in size and is a prehistoric artifact site comprised of a dense lithic scatter. The third site is a cavate.

Construction Impacts—The three prehistoric archaeological sites are at risk of either direct or indirect impact by the proposed construction of Northwest TA-62. Construction activity, traffic, and ground disturbance could damage portions of these sites. If buried cultural deposits are encountered during construction, activities would cease and procedures as set forth in *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* (LANL 2006c) would be implemented. Those buildings to be replaced by the two Science Complex Buildings have not been evaluated for their historic importance; thus, an eligibility assessment would have to be conducted prior to their demolition.

Socioeconomics and Infrastructure

The site is currently developed with aboveground electrical distribution lines, a water tower, underground water transmission lines with valves and pumps, and communication lines. Electrical and communication lines are located in a utility corridor along the water tower access road near the north boundary of the proposed site. A gas line is located approximately 250 feet (76 meters) from the southeast corner of the site. There are no sanitary sewer lines within 300 feet (91 meters) of the site boundary.

Construction Impacts—Utility infrastructure resources would be required for Science Complex construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used, requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection.

For Science Complex construction, total liquid fuel consumption is estimated to be 4.3 million gallons (16 million liters) and total water consumption is estimated to be 23 million gallons (86 million liters) over the 2-year construction phase. Development of the proposed Science Complex Project would require addition of a natural gas line. The conceptual plan includes extending a new gas line approximately 500 feet (150 meters) east along the utility corridor to connect with existing lines. Local electrical and data or communication lines would be accessed through the utility corridor. In addition, the Science Complex Building must be connected to existing sewer lines. Primary vehicle access to the site would be from a signalized intersection along West Jemez Road. However, the existing LANL infrastructure would be capable of supporting requirements for new facility construction without exceeding site capacities, resulting in negligible impact on site utility infrastructure.

Operations Impacts—Utility resource usage in the proposed structures would be equivalent to or less than the usage of the replaced structures. This is due to contemporary building design, which includes water and energy conservation features. As such, Science Complex operation is expected to have no or negligible incremental impact on utility infrastructure capacities at LANL.

Waste Management

There are currently no LANL operations located at the site, and therefore no waste volumes are produced. However, the activities that would be relocated to the Science Complex currently produce waste at other LANL locations. There would be no change to overall waste types or volumes.

Construction Impacts—The proposed project would generate solid waste from construction that would be disposed of at the Los Alamos County Landfill or other New Mexico solid waste landfills. Based on the total gross square footage of newly constructed office and light laboratory space for the Science Complex, approximately 3,320 cubic yards (2,540 cubic meters) of waste would be generated during construction. This estimate would be refined as additional information becomes available during project design development.

Operations Impacts—Regulated wastes from site development, facility operations, and DD&D of other structures as a result of the new Science Complex would be handled through existing waste management programs at LANL and carried out in accordance with applicable laws, regulations, and DOE orders.

Transportation

Site development would primarily affect traffic on West Jemez Road. Level of service is a quantitative measurement indicating the level of delay and congestion at an intersection, ranging from A to F (where level of service A indicates very little congestion or delay, and level of service F indicates a high level of congestion or delay). West Jemez Road currently operates at level of service A during morning and afternoon peak hours.

Construction Impacts—Traffic generated by Science Complex construction would have only minor impacts on the adjacent roadway system, including West Jemez Road. No mitigation measures would be necessary to accommodate construction-related traffic.

Operations Impacts—To evaluate Science Complex impacts on traffic at LANL and in Los Alamos, a traffic analysis was conducted for the Science Complex at the Northwest TA-62 site. The analysis evaluated short- and long-term impacts on traffic resulting from an estimated 1,600 employees at the Science Complex. Short-term background traffic volumes are the sum of existing traffic volumes (counted in the fall of 2004) plus the traffic volumes estimated to be generated by the Wellness Center and adjacent development. Long-term background traffic volumes assumed a 20 percent increase in traffic volumes on West Jemez Road. The study estimated that the Science Complex would generate about 5,790 vehicle trips on the average weekday (2,895 vehicles entering and exiting in a 24-hour period) (LSC 2005b). To mitigate non-construction related traffic increases, the four-lane cross section of West Jemez Road east of the proposed site access could be extended to the site access. Also, east- and westbound right- and left-turn deceleration lanes could be constructed on West Jemez Road approaching the site access.

Facility Accidents

Operations Impacts—As an office building and light laboratory, the Science Complex is not considered a credible threat to the health and safety of personnel outside of the complex in the event of an accident. If the Science Complex is not fully used by LANL site employees, it is possible that some or all of this space could be occupied by a commercial company. Therefore, an analysis of the potential risk to an occupant of this building from an accident in another LANL facility was evaluated. From the list of accidents analyzed in the Appendix D of this SWEIS, the accident at the Chemistry and Metallurgy Research Building in TA-3 would be the most likely to impact the occupants at the Science Complex. The accident is identified as a HEPA filter fire with a likelihood of occurrence of one in 100 years (see Appendix D). If such an accident were to occur, the dose to an occupant of the Science Complex, which is about 6,600 feet (2,000 meters) northwest of the Chemistry and Metallurgy Research Building, would be 0.30 rem or less, with a risk of less than 1.8×10^{-4} (1 in 5,600) that an exposed individual would develop an LCF. Taking into account the likelihood of occurrence of such an accident, the risk of an LCF would be 1.8×10^{-6} (1 chance in 560,000) per year of occupancy. DD&D of the Chemistry and Metallurgy Research Building would reduce this radiological risk.

G.8.3.3 Option 2: Research Park Site Option

The effects on air quality and noise, human health, and waste management are expected to be similar to those of the proposed project (Option 1). Resource area impacts or conditions that would differ from the proposed project are discussed below.

Land Resources—Land Use

Under the Research Park Site option, the Science Complex would be built in TA-3 just to the west of the Los Alamos County Research Park. TA-3, which is located in the northwestern portion of LANL, encompasses 359 acres (145 hectares), most of which is occupied by buildings and other structures. It contains the director's office, administrative offices, support facilities, and a number of laboratories (DOE 1999a). As with the Northwest TA-62 Site option, the new Science Complex would occupy 5 acres (2 hectares) of undeveloped land. Currently land use in this area is classified as Reserve and future land use was predicted to remain unchanged (LANL 2003b). However, if this option is selected, future land use would change from Reserve to Experimental Science.

Land Resources—Visual Resources

The principal manmade features that contrast with the existing natural environment are West Jemez Road and the TA-3 facilities to the south, the existing Research Park Building to the east, and the Los Alamos Canyon bridge and community buildings to the east and north, these being at a lower elevation than the site.

Operations Impacts—The Science Complex would consist of two four-story buildings and a six-story parking structure, as well as related supporting structures and utilities. Buildings of this size would be visible from neighboring properties and roadways. Although the Science Complex at this site would be near and adjacent to existing industrial compounds at the Research Park and TA-3, and the area of existing development at TA-3 has already impacted the landscape, the addition of the Science Complex would result in a significant impact on visual resources in this area because views from the site, or from West Jemez Road, to the west, north, and east would be obstructed. With the Science Complex construction on the north side of West Jemez Road, the natural forested buffer area between LANL and Los Alamos Canyon would be further reduced. Impacts of the Research Park Site Option would be similar to those of the proposed project.

Construction of new facilities would further affect this viewshed. Impacts of the Research Park Site Option would be similar to those of the proposed project (Option 1). In addition, limiting use of bright security lights on the north edge of the site and using directed lighting and shielded fixtures would limit illumination to the adjacent Los Alamos Canyon walls. To mitigate the visual impact of lighting, the project would conform to the New Mexico Night Sky Protection Act architectural and design guidelines.

Geology and Soils

The site for the Science Complex at TA-3 lies within a part of the Pajarito Fault system characterized by subsidiary or distributed fault ruptures. Probabilistic analysis of potential surface rupture indicates that the annual probability of surface rupture in areas beyond the principal or main trace of the Pajarito Fault, such as at the Science Complex TA-3 site, is less than 1 in 10,000 (LANL 2004c). This probability is a less than the required performance goal for the facility and in accordance with DOE standards. Additionally, the Science Complex would be designed in accordance with current DOE seismic standards and applicable building codes.

Construction Impacts—Impacts on geology and soils associated with Science Complex construction at the Research Park Site in TA-3 would be similar to those discussed under the Northwest TA-62 Site Option (Option 1).

DD&D Impacts—The Research Park Site Option includes DD&D activities of unspecified facilities with a footprint equivalent to new facility construction. The impacts associated with DD&D of existing facilities would be the same as those discussed under the Northwest TA-62 Site Option (Option 1).

Water Resources

There are no surface water resources at the Research Park site, nor are there any significant surface water drainage features at the proposed project site, though the site does drain toward Los Alamos Canyon to the north. Regional groundwater occurs approximately 6,100 feet (1,859 meters) below ground surface at the site, and no groundwater pumping or monitoring wells exist at the site.

Construction Impacts—Because no watercourses would be directly impacted by construction, a Clean Water Act Section 404 Dredge and Fill Permit and a State of New Mexico Section 401 Water Quality Certification would not be required. All vehicles and equipment used for construction purposes would be inspected for leaks before arrival at the construction site to avoid inadvertent surface contamination from hydrocarbon fuel products.

Operations Impacts—Research Park Site Option operations impacts would be the same as those discussed under the Northwest TA-62 Site Option (Option 1).

Ecological Resources

The project area for the Research Park Site Option is not within an Area of Environmental Interest delineated for protection of the Mexican spotted owl, southwestern willow flycatcher, or the bald eagle. Other state-listed special status species would have a low probability of occurrence within the project area. The Research Park Site Option is situated within ponderosa pine forest and is adjacent to Los Alamos Canyon located to the north. Industrial development from LANL facilities is located to the south. There are no wetlands or aquatic resources within the proposed project area for this option, although wetlands are located beyond TA-62 to the north in Los Alamos Canyon (LANL 2006b).

Construction Impacts—The Research Park Site Option would result in clearing and grading approximately 5 acres (2 hectares) of ponderosa pine forest to construct the Science Complex. The area to the south and east is either already heavily developed or is planned for development. Impacts of construction on wildlife would be similar to those described for the proposed project (Option 1).

Operations Impacts—Under the Research Park Site Option, operation of the proposed Science Complex would not be likely to pose significant adverse effects on most wildlife. Activities would be restricted to within the facility grounds; therefore, most area wildlife would likely continue to use the area around the facility for foraging and migration after construction was complete. In addition, the site currently experiences human impact of the surrounding development; therefore, increased activity from the Science Complex under the Research Park Site Option is expected to cause minimal effects on area wildlife.

Human Health

Human health impacts would be the same as those for Option 1.

Cultural Resources

No archaeological sites are located within the boundaries of the leased Research Park tract. However, there is one National Register of Historic Places-eligible site located in the vicinity of the proposed Science Complex. It is situated to the immediate north of the Research Park on nonleased land.

Construction Impacts—Construction of the planned Research Park Site Option, including the access road, would not affect any recorded prehistoric or historic archaeological sites. If any buried material or cultural remains are encountered during construction, activities would cease until appropriate local authorities or a qualified professional is consulted. The buildings to be replaced by the new Science Complex have not been evaluated for their historic significance; thus, an eligibility assessment would be completed prior to demolition activities.

Socioeconomics and Infrastructure

Existing aboveground electrical distribution and communications lines, underground water transmission lines, storm drains, and buried gas lines transect portions of the proposed Research Park site. There are no identified sanitary sewer lines within 400 feet (120 meters) of the site. Roads in the vicinity of the proposed Research Park location include West Jemez Road and West Road.

Construction Impacts—Utility infrastructure resources required for Science Complex construction at the Research Park site location would be similar to those described for the Northwest TA-62 Site Option (Option 1).

Operations Impacts—Development of the proposed Science Complex at the Research Park location would likely require rerouting of many utilities currently located on the site, and rerouting may also be necessary outside the project area. A sanitary sewer trunk line would need to be extended from buildings to the south or from the existing building in the eastern portion of the Research Park. Primary vehicle access to the site would be from a signalized intersection along West Jemez Road.

Waste Management

Waste management impacts would be the same as those for Option 1.

Transportation

Site development would primarily affect traffic on West Jemez Road. West Jemez Road currently operates at level of service A during morning and afternoon peak hours.

Construction Impacts—Traffic generated by Science Complex construction would not have any significant impacts on the adjacent roadway system, including West Jemez Road. No mitigation measures would be necessary to accommodate construction-related traffic volumes.

Operations Impacts—To evaluate Science Complex impacts on traffic at LANL and in Los Alamos, a traffic analysis was conducted for the Science Complex at the Northwest TA-62 site (LSC 2005b). The proposed Research Park site is located adjacent to the Northwest TA-62 site and would also have primary access along West Jemez Road. Therefore, a signalized intersection would likely be used for access to West Jemez Road, and traffic impacts would be similar to those resulting from development at the Northwest TA-62 site. To mitigate non-construction-related traffic increases, the four-lane cross section of West Jemez Road east of the proposed site access could be extended to the site access. Also, east- and westbound right- and left-turn deceleration lanes could be constructed on West Jemez Road approaching the site access.

Facility Accidents

Operations Impacts—Under this option, Science Complex would be located about 3,400 feet (1,000 meters) meters to the north of the Chemistry and Metallurgy Research Building. Similar to the situation discussed under Option 1, the HEPA filter fire accident at the Chemistry and Metallurgy Research Building would be the most likely event to impact the occupants at the Science Complex. This accident would lead to an occupant dose of about 0.7 rem, or a risk of 4.2×10^{-4} (1 in 2,400) of developing an LCF. Taking into account the likelihood of the accident occurring, the risk of an LCF would be 4.2×10^{-6} (1 chance in 240,000) per year of occupancy. Again, DD&D of the Chemistry and Metallurgy Research Building would reduce this radiological risk.

G.8.3.4 Option 3: South TA-3 Site Option

The effects on air quality and noise, human health, and waste management are expected to be similar to those of the proposed project (Option 1). Resource area impacts or conditions that would differ from the proposed project are discussed below.

Land Resources—Land Use

Under this option, the Science Complex would be constructed in the southern part of TA-3 and would require 5 acres (2 hectares) of land. TA-3, which is located in the northwestern portion of LANL, encompasses 359 acres (145 hectares), most of which is occupied by buildings and other structures. It contains the Director's office, administrative offices, support facilities, and a number of laboratories (DOE 1999a). The portion of the TA within which the Science Complex would be located is presently classified as Experimental Science. This area is predicted to remain Experimental Science in the future; thus, construction of the new complex would not result in a change in land use (LANL 2003b).

Land Resources—Visual Resources

The South TA-3 site is located at the northeast corner of Diamond Drive and Pajarito Road, near the top of Mortandad Canyon within TA-3. The viewshed at this site is relatively developed, as it is located at the southeastern corner of heavily developed TA-3 and is adjacent to nearby TA's with parking lots and structures. The view from the South TA-3 site to the west is of Chemistry and Metallurgy Research Building parking lots, of multistory buildings to the north, buildings and parking lots across Pajarito Road to the south, and of a forested drainage, which lies at a lower elevation from the site to the east and leads down to Mortandad Canyon. The South TA-3 site is partially covered with a 1.5-acre (0.6-hectare) parking lot currently used by LANL employees. Currently, the viewshed from this site is impacted due to existing LANL structures.

Operations Impacts—The Science Complex would encompass the majority of the site and would consist of two four-story buildings and a six-story parking structure, as well as related supporting structures and utilities. Buildings of this size would be visible from neighboring properties and roadways. The Science Complex at this site would be near existing industrial buildings at TA-3, and the area of existing development at TA-3 has already impacted the landscape. If the existing small parcels of forested land to the south and east of the South TA-3 site remain undisturbed, Science Complex development at this site would retain the landscape's primary aesthetic attributes.

As there is little nighttime activity at LANL, nighttime light sources would generally be security lighting. Because this site is located in an area already developed with other LANL facilities and structures, the presence of lights at the Science Complex would not likely adversely impact visual resources of the surrounding area, nor are lights expected to impact nighttime movement of wildlife in the area.

Construction Impacts—Construction of new facilities at this site would not significantly affect the viewshed. Preservation of existing vegetation and use of building design sand colors that complement the natural environment would mitigate potential viewshed degradation. Because of the level of LANL development surrounding the site, Science Complex lighting at the site is not expected to adversely impact the surrounding area visual resources.

Geology and Soils

The probability of surface rupture for the South TA-3 site is the same as that for the other options. Soil resources in the area of the proposed location for the Science Complex are relatively disturbed, and only adjacent undisturbed areas maintain vegetative cover. The South TA-3 site is partially occupied by a parking lot that is partially built up on fill material. The fill material came from the site in the process of grading or was brought in from another area. The arid soils in this area, and presumably underlying the parking lot, are largely sandy loam material alluvially deposited from tuff units on the higher slopes to the west and eroded from underlying geologic units. Soils in the proposed Science Complex area at this site are classified as Typic Eutroboralfs. This soil type is poorly developed with relatively little horizon differentiation and organic matter accumulation. These factors, combined with the dry moisture regime of the area, result in only a limited number of plant species able to subsist on the soil medium, which, in turn, supports a very limited number of wildlife species.

Construction Impacts—Science Complex construction at the South TA-3 site would result in the same construction impacts as those discussed under the Northwest TA-62 Site Option (Option 1).

DD&D Impacts—Activities and impacts associated with DD&D of existing facilities would be the same as those discussed under the Northwest TA-62 Site Option (Option 1).

Water Resources

Because the South TA-3 site is located at the headwaters of Mortandad Canyon, there would be surface water considerations with Science Complex development. Regional groundwater occurs approximately 6,050 feet (1,844 meters) below ground surface at the site, and no regional groundwater pumping or monitoring wells exist at the site.

Construction Impacts—Science Complex construction at the South TA-3 site would have similar impacts as those discussed under the Northwest TA-62 Site Option. Additionally, if the adjacent drainage leading to Mortandad Canyon were affected by fill material or excavation during construction, a Clean Water Act Section 404 Dredge and Fill Permit and a State of New Mexico Section 401 Water Quality Certification would be required.

Operations Impacts—Science Complex operation at the South TA-3 site would have the same impacts as those discussed under the Northwest TA-62 Site Option.

Ecological Resources

The project area for the South TA-3 Site Option is partially developed and is not within an Area of Environmental Interest delineated for protection of the Mexican spotted owl, southwestern willow flycatcher, or the bald eagle. Other state-listed special status species would have a low probability of occurrence within the project area (LANL 2006a).

The South TA-3 site is generally located in a developed part of TA-3 but does contain areas of native grass, ponderosa pine, and some pinyon-juniper. There are no wetlands or aquatic resources within the proposed project area for this option. There are however, wetlands in upper Mortandad Canyon. The area is not within any areas of environmental interest for any federally listed threatened or endangered species (LANL 2006a).

Construction Impacts—Science Complex construction under the South TA-3 Site Option would result in impacts generally similar to those addressed in Section G.8.3.2. The proposed project would result in clearing and grading less than 5 acres (2 hectares) of land to construct the Science Complex. Much of the area around the buildings would be paved. A biological assessment would be needed if tree removal affects more than 5 acres (2 hectares) (LANL 2006b).

Operations Impacts—Operation of the proposed the Science Complex would not pose significant adverse affects on most wildlife under this option. Activities would be restricted to within the facility grounds, therefore, most area wildlife would likely continue to use the area around the facility for foraging and migration after construction was complete.

Human Health

Human health impacts would be the same as those for Option 1.

Cultural Resources

No archaeological sites are located in the vicinity of the proposed South TA-3 location for the Science Complex. The entire proposed project area was previously surveyed for cultural resources.

Construction Impacts—Construction planned for South TA-3, including roads and areas for construction traffic and staging, would not affect any recorded prehistoric or historic archaeological sites. If any buried material or cultural remains are encountered during construction, activities would cease until appropriate local authorities or a qualified professional is consulted before work resumes. The buildings to be replaced by the new Science Complex have not been evaluated for historical significance; thus, an eligibility assessment would be completed prior to demolition activities.

Socioeconomics and Infrastructure

Existing aboveground electrical distribution lines, belowground communications lines, underground water transmission lines, storm drains, and buried gas lines run parallel to both Diamond Drive and Pajarito Road adjacent to the site. In addition, a new buried steam line is planned near the center of the site for construction of the Information Management Division Operations Facility. Existing sanitary sewer lines are located somewhat farther from the site, and sewer service could be brought to the site from the same side of Diamond Drive. Roads in the vicinity of the proposed South TA-3 alternate site include Diamond Drive and Pajarito Road.

Construction Impacts—Utility infrastructure resources required for Science Complex construction at the South TA-3 Site Option location would be similar to those described for the Northwest TA-62 Site Option (Option 1).

Operations Impacts—Development of the proposed Science Complex Project at the South TA-3 alternate site would require addition of a natural gas line, connected from either the west side of Diamond Drive or the north side of Pajarito Road. In addition, the Science Complex Building must be connected to existing sewer lines that lie both north of the site, serving the Biosafety Level 3 Facility, and southwest of the Diamond Drive-Pajarito Road intersection. Any trenching associated with bringing utility service to the site that could potentially impact adjacent drainages would be done using erosion control best management practices.

Waste Management

Waste management impacts would be the same as those for Option 1.

Transportation

According to the 2002 environmental assessment for the proposed construction and operation of the Biosafety Level 3 Facility at LANL, which is north of the South TA-3 alternate site, Pajarito Road had approximately 8,000 average vehicle trips, while West Jemez Road had approximately 6,000 per day (DOE 2002b). The environmental assessment also noted that the intersection of Diamond Drive and West Jemez Road exhibited considerable congestion during peak traffic periods. Pajarito Road traffic levels have decreased slightly since access to the road has been limited to LANL badge holders, resulting in an increase in traffic on West Jemez Road.

Construction Impacts—Though traffic generated by Science Complex construction at Northwest TA-62 was not projected to have any significant impacts on the adjacent roadway system, including West Jemez Road, in the 2005 study, there would be additional impacts on traffic resulting from Science Complex construction at the South TA-3 site.

Operations Impacts—To evaluate Science Complex impacts on traffic at LANL and in Los Alamos, a traffic analysis was conducted for the Science Complex at the Northwest TA-62 site in 2005 (LSC 2005b). The analysis evaluated short- and long-term impacts on traffic resulting from the 1,600-employee Science Complex at this site. Results of this traffic study for the Northwest TA-62 Site Option are applicable for traffic evaluation at the South TA-3 site because the proposed Science Complex is unchanged. However, because the South TA-3 site would be within the planned Security Perimeter Road and not as easily accessible due in part to proximity and higher traffic flows on Diamond Drive relative to those on West Jemez Road, traffic impacts of the Science Complex at the South TA-3 site would be greater than the study determined for the Northwest TA-62 site. In the study, short-term background traffic volumes are the sum of existing traffic volumes (counted in the fall of 2004) plus the traffic volumes estimated to be generated by the Wellness Center and adjacent development. Long-term background traffic volumes assumed a 20 percent increase in traffic volumes on West Jemez Road. The study estimated that the Science Complex would generate about 5,790 vehicle trips on the average weekday (2,895 vehicles entering and exiting in a 24-hour period). To mitigate non-construction-related traffic, it may be necessary to construct south- and northbound left- and right-turn deceleration lanes on Diamond Drive approaching the site access.

Facility Accidents

Operations Impacts—Under this option, the Science Complex would be located about 800 feet (240 meters) to the southeast of the Chemistry and Metallurgy Research Building. Similar to the situation discussed under Option 1, the HEPA filter fire accident at the Chemistry and Metallurgy Research Building would be the most likely event to impact the occupants at the Science Complex. This accident would lead to an occupant dose of 2.8 rem or less, or a risk of 1.7×10^{-3} (1 in 600) of developing an LCF. Taking into account the likelihood of the accident occurring, the risk of an LCF would be 1.7×10^{-5} (1 chance in 60,000) per year of occupancy. The DD&D of the Chemistry and Metallurgy Research Building would reduce this radiological risk.

G.9 Remote Warehouse and Truck Inspection Station Impact Assessment

This section presents an assessment of environmental impacts for the proposed construction and operation of the Remote Warehouse and Truck Inspection Station at TA-72. Under the proposed project, existing operations would be relocated to a completely new facility. The existing warehouse in TA-3 would be demolished or reused for some other purpose; the existing temporary truck inspection station on East Jemez Road would be demolished. Section G.9.1 provides background information on the proposed project to build the Remote Warehouse and Truck Inspection Station. Section G.9.2 provides a description of the options for the proposed project. Section G.9.3 provides information supplementing the affected environment description presented in Chapter 4 and describes the environmental impacts of the No Action Option and the proposed project to construct and operate the Remote Warehouse and Truck Inspection Station at TA-72.

G.9.1 Introduction

The current warehouse located at TA-3 provides centralized shipping, receiving, distribution, packaging and transportation compliance, and mail services for all LANL organizations. Personnel at the current warehouse facility are responsible for part of the institutional physical handling, identification, acceptance of goods or materials, and distribution of these materials for LANL. Over 500,000 packages and shipments are received, processed, inspected, and delivered annually to 500 drop points at LANL. Nearly 4,000 radioactive or hazardous and classified shipments are received and delivered annually. The mail distribution function currently delivers 14,000,000 pieces annually to 620 LANL mail stops and processes over 500,000 pieces for external mailing. Approximately 18,000 outbound classified documents are handled annually. The volume of material received and shipped and the Federal administrative requirements for handling these shipments continue to increase. There are also approximately 80 daily commercial deliveries to the TA-3 warehouse location. Trucks accessing the TA-3 warehouse currently represent approximately 50 to 60 percent of the truck traffic volume for TA-3. The current TA-3 warehouse facility location requires offsite vehicles to travel through densely populated TA-3 areas (LANL 2006a).

G.9.2 Options Considered

The two options identified for the Remote Warehouse and Truck Inspection Station are the No Action Option and the proposed project option.

G.9.2.1 No Action Option

Under the No Action Option, the Remote Warehouse and Truck Inspection Station would not be constructed. Incoming commercial trucks would continue to be inspected at the temporary inspection station on East Jemez Road prior to continuing farther onto the LANL site. Receiving, warehousing, and mailing activities would continue to be conducted at the current TA-3 warehouse facility. Under the No Action Option, operational and security issues associated with operating the current TA-3 warehouse facility would not be resolved.

G.9.2.2 Proposed Project

The Remote Warehouse and Truck Inspection Station Project would relocate shipment receiving, warehousing, and distribution functions from TA-3 to a site in TA-72. In addition, the truck inspection station would be relocated from its current location on the northwest corner of New Mexico State Route 4 (NM 4) and East Jemez Road to the new Remote Warehouse and Truck Inspection Station site. The proposed site is located in Santa Fe County on the south side of East Jemez Road, about 1 mile (1.6 kilometers) west of NM 4 and 0.5 miles (0.8 kilometers) east of the Protective Technology Los Alamos shooting range, which is located north of East Jemez Road. The proposed location is not far from lands belonging to San Ildefonso Pueblo and is about 1 mile (1.6 kilometers) from the Tsankawi Unit of Bandelier National Monument. The proposed site is situated on gently sloping terrain in Sandia Canyon that is covered with pinyon-juniper and some ponderosa pine.

There would be an 85,000-square-foot (7,900-square-meter) warehouse, a 12,000-square-foot (1,100-square-meter) office building, a 400-square-foot (37-square-meter) truckers' rest lounge, a dog kennel, and a 600-square-foot (55-square-meter) guardhouse. In addition to the building footprints, the truck inspection station would comprise approximately 50,000 square feet (4,600 square meters) of paved area. Upon completion of the proposed project, the location of the current truck inspection station on the north side of East Jemez Road would be returned to a natural condition. **Figure G–13** illustrates the conceptual layout of the Remote Warehouse and Truck Inspection Station at the TA-72 site.

The area affected by Remote Warehouse and Truck Inspection Station Project construction would be about 4 acres (1.6 hectares) and would include the actual facilities, parking, staging areas, and perimeter fencing. There would also be modifications made along East Jemez Road to accommodate safety and access improvements.

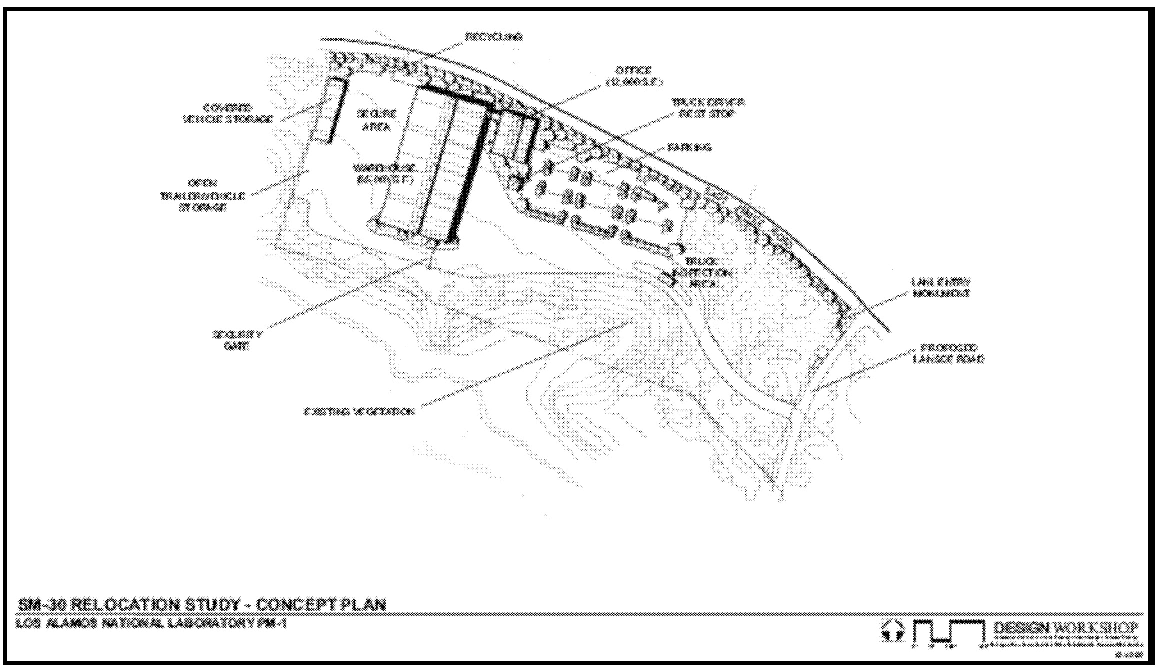


Figure G–13 Technical Area 72 Remote Warehouse and Truck Inspection Station Conceptual Layout

The warehouse facility would include loading docks, leveling ramps, conveyor belts, and a security vault. The facility would have areas for mail sorting, packaging, and storage of general mail, as well as shipments of hazardous chemicals and radioactive materials. There would also be a customer service desk and offices for shipping and receiving, postage, classified documents, mail room supervision, dispatcher, large-freight receiving, and warehouse supervision. The office building would house approximately 125 people involved with activities supporting consolidated warehouse and truck inspection functions.

The Remote Warehouse and Truck Inspection Station would accommodate the projected growth and changes in LANL materials management and provide adequate quality inspection and holding areas (cages) for chain-of-custody materials. The warehouse would enhance and support safety and security requirements by providing for greater separation between radioactive and hazardous materials and the majority of other materials shipping and receiving operations. The current plan is to have uncleared commercial trucks enter the warehouse area to unload and, after inspection, have smaller government trucks and vans with cleared drivers distribute the goods throughout LANL. At the Remote Warehouse and Truck Inspection Station, vendor vehicles and personnel would be separated from government vehicles and personnel. Materials being sent to secure areas and those being sent to the rest of LANL would also be segregated.

G.9.2.3 Options Considered but Dismissed

Ten location options for the Remote Warehouse and Truck Inspection Station were analyzed in a February 2004 siting study (Booth 2004). Many of these sites were not acceptable because of operational or environmental considerations, while other sites were eliminated due to security considerations. Specifically, one of the primary security objectives for the Remote Warehouse and Truck Inspection Station Project is to restrict large private trucks from TA-3 and adjacent areas. Therefore, options that did not achieve this objective were eliminated based on security and efficiency of operations. The TA-72 site (identified as the East Jemez and NM 4 site in the study) ranked highest for development of the Remote Warehouse and Truck Inspection Station, according to results of a model that accounted for all pertinent selection criteria, including environmental and physical, social and political, safety, operations, and economic factors. As a result of the siting study, all other sites previously identified were eliminated from further consideration.

G.9.3 Affected Environment and Environmental Consequences

The affected environment descriptions in this section provide the context for understanding the environmental consequences discussed in the impact assessments. They serve as a baseline from which any environmental changes brought about by implementing the proposed project can be evaluated; the baseline conditions are the currently existing conditions. For construction and operation of the Remote Warehouse and Truck Inspection Station at the proposed location on East Jemez Road, the affected environment would primarily be TA-72.

An initial assessment of the potential impacts of the proposed project identified resource areas for which there would be no or only negligible environmental impacts. Consequently, for the following resource areas, a determination was made that no further analysis was necessary:

- *Socioeconomics and Infrastructure* – No new employment is expected. Construction workers would be drawn from the pool of construction workers employed on various projects at LANL. Only infrastructure impacts are included in the impacts discussions.
- *Environmental Justice* – The proposed Remote Warehouse and Truck Inspection Station would entail no disproportionate impacts to low-income or minority populations.

Resource areas examined in this analysis include: land resources, geology and soils, water resources, air quality and noise, ecological resources, human health, cultural resources, site infrastructure, waste management, transportation, and facility accidents.

G.9.3.1 No Action Option

Under the No Action Option, the Remote Warehouse and Truck Inspection Station would not be constructed at the East Jemez Road site, and LANL would continue to operate its warehouse and distribution operations from outdated facilities. As a result, there would not be any land disturbances or additional impacts on environmental resources at TA-72. Under the No Action Option, the objective of removing private commercial vehicles from TA-3 would not be met.

G.9.3.2 Proposed Project

Land Resources—Land Use

TA-72 is 1,189 acres (481 hectares) in size and is located in the northeastern portion of LANL. Current land designation within most of the TA is Reserve, except for a small area north of East Jemez Road categorized as Physical and Technical Support. Future land use was not projected to change prior to this project being proposed (LANL 2003b).

Construction Impacts—Remote Warehouse and Truck Inspection Station construction along the south side of East Jemez Road would require clearing about 4 acres (1.6 hectares) of land. Site development would represent a change in both current and projected land use from Reserve to Physical and Technical Support.

Land Resources—Visual Resources

Along East Jemez Road between NM 4 and the shooting range, Sandia Canyon is relatively undeveloped, and the area possesses desirable aesthetic qualities. There is a forest canopy, and certain spots along East Jemez Road afford views of the surrounding mesas and more distant mountains. The principal manmade features that contrast with the existing natural environment are East Jemez Road, the existing truck inspection station, and the shooting range.

Construction Impacts—During the construction phase, heavy equipment, hauling operations, staging areas, and site preparation activities would create local temporary adverse visual effects through disturbance of soil resources and subsequent release of airborne dust locally.

Operations Impacts—Impacts of site development, which would involve clearing approximately 4 acres (1.6 hectares), would be visible to passing travelers on East Jemez Road. The area proposed for the Remote Warehouse and Truck Inspection Station would be visible to motorists along East Jemez Road because the project would require clearing trees, and the resulting buildings would be taller than most remaining trees. Some screening would be possible by selectively cutting trees closest to East Jemez Road and by placement of buildings on the site with regard to its topographic features. Nighttime lighting would be required in a location that was previously unlit. Although the Remote Warehouse and Truck Inspection Station would not be visible from the trails or parking lot at the Tsankawi Unit of Bandelier National Monument, the nighttime sky glow from Remote Warehouse and Truck Inspection Station lighting could be visible from Tsankawi under normal conditions. However, the trails at Tsankawi are closed to the public after dusk. Installed lighting would comply with the New Mexico Night Sky Protection Act to the extent it does not compromise security.

Geology and Soils

Only small faults at the western periphery of the area have been identified in TA-72, so the seismic hazard would be minimal. Soil resources in the area of the Remote Warehouse and Truck Inspection Station proposed location are undisturbed and maintain the present vegetative cover.

Construction Impacts—Construction of the Remote Warehouse and Truck Inspection Station in TA-72 is expected to require excavation of approximately 90,000 cubic yards (69,000 cubic meters) of soil and underlying Bandelier tuff. Soil resources that are excess to project needs would be stockpiled in approved areas. These soil and rock stockpiles could then be used at other locations at LANL for site restoration following remediation. If soil and rock stockpiles are to be stored for longer than a few weeks, the stockpiles would be seeded or managed as appropriate to prevent erosion and loss of the resource. In addition, care would be taken to employ all necessary erosion control best management practices during and following construction to limit impact on soil resources adjacent to the construction site.

Water Resources

The proposed Remote Warehouse and Truck Inspection Station location is approximately 1,500 feet (460 meters) east (downgradient) of Los Alamos County water supply well PM-3, and 3,100 feet (950 meters) west of water supply well PM-1. Both wells are located on the north side of East Jemez Road, along with the ephemeral streambed in Sandia Canyon. Both wells tap the regional aquifer. Regional groundwater occurs at approximately 900 feet (270 meters) below ground surface. Intermediate, perched groundwater occurs in portions of Sandia Canyon at a depth of approximately 450 feet (140 meters) below ground surface, but is not used as a resource.

Construction Impacts—No long-term effects on surface water quality would be likely. Best management practices for runoff control, such as silt barriers and straw bales, would be used during construction. The potential for downstream siltation would be minor and temporary in nature. A stormwater pollution prevention plan would be developed and implemented, including best management practices to prevent erosion of disturbed soil by stormwater runoff or other water discharges. All Remote Warehouse and Truck Inspection Station construction would occur on the south side of East Jemez Road. Therefore, there would be no impact on the Sandia Canyon floodplain and ephemeral watercourse, located on the north side of the road.

Operations Impacts—The addition of new impermeable surfaces would increase stormwater runoff and would decrease surface water infiltration. While decreased infiltration is not expected to have an adverse effect on groundwater quality, the increased amount of runoff from paved surfaces may have a slight effect on surface water quality and on residual contaminant transport within canyon sediments. Best management practices integrated as part of the site design would minimize the potential for sediment and residual contaminant transport. Removal of paved surfaces at the existing truck inspection station would help offset potential increases in runoff in Sandia Canyon due to proposed Remote Warehouse and Truck Inspection Station development.

Air Quality and Noise

Construction Impacts—Construction of the proposed Remote Warehouse and Truck Inspection Station would result in temporary, localized emissions associated with vehicle and equipment exhaust, as well as particulate (dust) emissions from excavation and construction activities. Total emissions of criteria pollutants and other air emissions associated with heavy-equipment operation for excavation and construction activities would be greater than for other vehicles due to the types of engines and their respective emission factors. Air emissions associated with excavation and construction equipment operation would not exceed ambient air quality standards. Emissions resulting from soil disturbance during construction would be controlled by best management practices, thereby causing no impacts on workers or the public.

The proposed project would result in limited short-term increases in noise levels associated with construction activities. Noise generated would not have an adverse effect on construction workers. Sound levels are expected to dissipate to background levels before reaching the Tsankawi parking lot at the intersection of NM 4 and East Jemez Road.

Operations Impacts—Effects of Remote Warehouse and Truck Inspection Station operations on air quality would be negligible compared to potential annual air pollutant emissions from LANL as a whole. Remote Warehouse and Truck Inspection Station operation could result in fewer emissions by consolidating delivery trucks and trips going to various points at LANL throughout the day. Operations would not cause any radiological air emissions.

The project would result in increased long-term noise levels associated with the proposed Remote Warehouse and Truck Inspection Station operation. Noise generated by the proposed project would not have an adverse effect on workers at the new facility once it is operating. Operational sound levels are expected to dissipate to background levels before reaching the Tsankawi parking lot at the intersection of NM 4 and East Jemez Road. Noise from the facility may be noticeable to the public on East Jemez Road; however, undisturbed wildlife habitats in the surrounding area would not be adversely impacted by the increased noise.

Ecological Resources

The proposed project site is situated within a mixed pinyon-juniper woodland and ponderosa pine forest due to its elevation and orientation that includes north-facing slopes. The area is not within an Area of Environmental Interest delineated for protection of the Mexican spotted owl, southwestern willow flycatcher, or the bald eagle. Other state-listed special status species would have a low probability of occurrence within the project area (LANL 2006a). Furthermore, there are no wetlands or aquatic resources within the project area (ACE 2005).

Construction Impacts—The proposed project would result in clearing and grading approximately 4 acres (1.6 hectares) of ponderosa pine forest and pinyon-juniper woodland. Much of the area around buildings would be paved, and an industrial security fence would be installed at the perimeter. The project area contains large-diameter trees (greater than 8 inches

[20 centimeters]), primarily ponderosa pines, that would potentially require removal for the proposed project construction.

Remote Warehouse and Truck Inspection Station construction would also result in loss of less-mobile wildlife, such as reptiles and small mammals, and cause more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity of the area into which they moved. If the area were at its carrying capacity, displaced animals would not likely survive. Indirect impacts of construction, such as noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Such disturbance would span the construction period. These impacts would be mitigated by clearly marking the construction zone to prevent equipment and workers from disturbing adjacent habitat.

As noted above, the site of the Remote Warehouse and Truck Inspection Station would not be located within Areas of Environmental Interest for the Mexican spotted owl, bald eagle, or southwestern willow flycatcher. However, recognizing that the bald eagle forages over all of LANL and that some habitat degradation is associated with the proposed project, the biological assessment prepared by DOE concluded that if appropriate reasonable and prudent alternatives are followed to protect adjacent foraging habitat (see Section G.2.3.2), the project may affect, but is not likely to adversely affect, the bald eagle. The biological assessment further concluded that the project would not effect the Mexican spotted owl or southwestern willow flycatcher (LANL 2006b). The USFWS has concurred with this assessment (see Chapter 6, Section 6.5.2).

Operations Impacts—Operation of the proposed Remote Warehouse and Truck Inspection Station would not likely pose significant adverse effects on most wildlife in this portion of Sandia Canyon. Activities would be restricted to within the facility grounds; therefore, most area wildlife would likely continue to use the area around the facility for foraging and migration after construction was complete.

Human Health

Construction Impacts—During Remote Warehouse and Truck Inspection Station construction, some construction-related accidents could potentially occur. The rate of occurrence for industrial accidents is based on both DOE and Bureau of Labor Statistics data on construction injuries and fatalities. Based on an estimated 281,000 person-hours to construct the new facilities, no fatal accidents would occur. The number of nonfatal injuries would be between 3 and 12 (DOE 2004, BLS 2003).

Cultural Resources

Three archaeological sites are situated in the vicinity of the proposed Remote Warehouse and Truck Inspection Station location. These sites include two rock rings and a lithic scatter. Each site was recommended by LANL for a determination of eligibility for the National Register of Historic Places.

In addition to the above-mentioned sites, two nearby National Historic Landmarks are located outside of the proposed project boundary. They include the Mortandad Cave Kiva National

Historic Landmark, accessed by the Mortandad Trail, and the Sandia Canyon Cave Kiva National Historic Landmark. There are no historic structures in the project area.

Construction Impacts—The planned East Jemez Road Remote Warehouse and Truck Inspection Station could impact the recorded prehistoric archaeological sites at the proposed location. Additional consultation would be required to ensure the sites are clearly marked such that the sites are avoided and that construction activity, traffic, and ground disturbances would not result in damage to the sites. If buried cultural deposits are encountered during construction, activities would cease, and procedures as set forth in *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* would be implemented (LANL 2006c).

The Mortandad Trail, located east of the proposed project site, leads to the Mortandad Cave Kiva National Historic Landmark and is closed to public access except for organized tours. Although the proposed project would not affect normal access to the trail, it would incorporate fencing around the perimeter of the Remote Warehouse and Truck Inspection Station to protect sensitive areas, including the Mortandad Cave Kiva National Historic Landmark, from unauthorized increased visitation.

Socioeconomics and Infrastructure

Currently, there are no NNSA facilities at the site. In the vicinity of the proposed project area, there are no utilities on the north side of East Jemez Road. However, there are existing aboveground electrical distribution lines, underground water transmission lines (and water pumping wells), and underground telecommunications along the north side of East Jemez Road in the vicinity of the proposed Remote Warehouse and Truck Inspection Station.

Construction—Utility infrastructure resources would be needed for Remote Warehouse and Truck Inspection Station construction. Standard construction practice dictates that electric power needed to operate portable construction and supporting equipment be supplied by portable diesel-fired generators. Therefore, no electrical energy consumption would be directly associated with construction. A variety of heavy equipment, motor vehicles, and trucks would be used requiring diesel fuel, gasoline, and propane for operation. Liquid fuels would be brought to the site as needed from offsite sources and, therefore, would not be limited resources. Water would be needed primarily to provide dust control, aid in soil compaction at the construction site, and possibly for equipment washdown. Water would not be required for concrete mixing, as ready-mix concrete is typically procured from offsite resources. Portable sanitary facilities would be provided to meet the workday sanitary needs of project personnel on the site. Water needed for construction would typically be trucked to the point of use, rather than provided by a temporary service connection. Construction is estimated to require 420,000 gallons (1.6 million liters) of liquid fuels and approximately 2 million gallons (7.6 million liters) of water.

The existing LANL infrastructure would be capable of supporting the requirements for new facility construction without exceeding site capacities, resulting in a negligible impact on site utility infrastructure.

Operations Impacts—Development of the proposed Remote Warehouse and Truck Inspection Station Project would require addition of a natural gas line, extended from the intersection of

East Jemez Road and NM 4, east of the proposed site. In addition, a means of sanitary sewer treatment, conveyance, and disposal would be required for the proposed facility. Onsite disposal of sanitary wastes in this area would be intensive if a conventional leach field is used. Onsite disposal would require an New Mexico Environment Department groundwater discharge permit to ensure local groundwater resources are not adversely impacted. An option of local treatment with surface discharge to the Sandia Canyon watercourse would require modification to the LANL NPDES permit.

Waste Management

There are currently no LANL operations located at the site, and therefore no waste volumes are produced. However, the activities that would be relocated to the Remote Warehouse and Truck Inspection Station currently produce waste at other LANL locations. There would be no change to overall waste types or volumes.

Construction Impacts—Based on the scope of the proposed project and historical projects at LANL, it is estimated that approximately 610 cubic yards (470 cubic meters) of solid waste would be generated during construction. The solid waste from construction would be recycled or disposed of at a permitted solid waste landfill.

Operations Impacts—Wastes from operations that would be moved to the new warehouse site under the proposed project would generally be of the same types and quantities as those generated at the current warehouse, TA-3-30. No new radioactive or other wastewater or hazardous waste streams would be generated.

Under the proposed project, sanitary waste from the existing warehouse site (SM-30) would no longer be discharged to the Sanitary Wastewater System Plant (TA-46). Due to the Remote Warehouse and Truck Inspection Station location, sanitary sewage from the facility may require onsite treatment, which could result in permitted discharges from a new treatment system. The total volume of sanitary waste generated, treated, and disposed of at LANL would remain unchanged.

Transportation

The TA-3 area where the warehouse functions are presently located is accessed from Pajarito Road, East and West Jemez Roads, and Diamond Drive. Trucks going to LANL must use East Jemez Road and stop at the current truck inspection station at the NM 4 intersection.
Los Alamos County peak period traffic volumes and resulting congestion are greatly influenced by LANL (as it is the main employer in Los Alamos County), existing roadway network constraints, the Pajarito Plateau topography, and operational access restrictions. A traffic study was conducted in support of the proposed Remote Warehouse and Truck Inspection Station (LSC 2005a). The study reports existing average weekday peak-hour traffic along East Jemez Road in the proposed project area to be about 175 eastbound and 995 westbound vehicle trips in the morning and about 1,260 eastbound and 205 westbound vehicle trips in the afternoon.

East Jemez Road lies within the LANL site boundary and is under NNSA control. It serves as the primary public access road between LANL and White Rock and to locations west of

Los Alamos County. An access control station would be built on East Jemez Road close to Diamond Drive to screen all vehicles entering LANL from these roads. The only access to TA-53 (LANSCE) is along East Jemez Road. The Los Alamos County Landfill and proposed future waste transfer station and Royal Crest Trailer Park are also accessed by East Jemez Road. There are no sidewalks or improved bicycle lanes along East Jemez Road. Long-range transportation plans for TA-53 propose a secondary access road descending from the mesa, with an intersection across from the general proposed project area.

Operations Impacts—The traffic study evaluated the impact of the 125-employee Remote Warehouse and Truck Inspection Station on traffic along East Jemez Road for two different scenarios: a two-lane and a four-lane East Jemez Road (LSC 2005a). Traffic impact was evaluated in terms of level of service, a quantitative measurement indicative of the level of delay and congestion at an intersection, ranging from A to F (level of service A being very little congestion or delay, while level of service F is a high level of congestion or delay). The Remote Warehouse and Truck Inspection Station is projected to generate nearly 540 vehicle trips on the average weekday, with about 270 vehicles entering and 270 exiting in a 24-hour period. These vehicle trips would be moved from the existing access (to the east) to the proposed Remote Warehouse and Truck Inspection Station access. The shooting range is expected to generate about 100 vehicle trips on the average weekday, with about 50 vehicles entering and 50 exiting in a 24-hour period.

Under the two-lane East Jemez Road scenario, with shooting-range-site-generated traffic and the addition of the Remote Warehouse and Truck Inspection Station, the East Jemez Road and site access intersection (without a traffic signal) is projected to operate at a failing level of service (level of service F) for east- and westbound traffic during the afternoon peak hour. The entrance to the shooting range would also potentially become a part of the intersection, with the warehouse entrance and the estimated number of vehicles entering and exiting taken into account in estimating potential traffic impacts. Under the four-lane East Jemez Road scenario, with the addition of the distribution center to existing shooting-range-site-generated traffic, the East Jemez Road and site access intersection (without a traffic signal) would operate at an acceptable level of service during short-term peak hours (LSC 2005a).

The traffic study concluded that changes to roadway geometry, to include left-turn lanes and acceleration lanes for east- and westbound traffic on East Jemez Road, would be required to achieve an acceptable level of service for vehicles on East Jemez Road and vehicles entering the road from the proposed combined access intersection. Although truck and other traffic would increase at TA-72 relative to current levels, the proposed project could result in reduced traffic in and around TA-3 because deliveries would be consolidated for specific sites at LANL.

Facility Accidents

Operations Impacts—The Remote Warehouse and Truck Inspection Station would process and distribute all types of deliveries to LANL, including conventional mail and packages and some hazardous, biological, and radioactive materials. Locating the facilities along East Jemez Road in Sandia Canyon would isolate them from any residential or work areas in the event of an accidental release. East Jemez Road is the designated truck route for Los Alamos County and LANL.

The operational hazards of the proposed project have been previously assessed in the *1999 SWEIS* (DOE 1999a) at the current locations of those operations. Most operations proposed for the Remote Warehouse and Truck Inspection Station were eliminated from further analysis in the SWEIS on the basis of hazard categorization; it was determined that no hazards existed beyond those routinely encountered in an office or standard industrial laboratory environment. Because there would be no substantial changes (such as in quantities of hazardous materials at risk) in operations from implementing the proposed project, potential outcomes of accidents involving operations-related hazards would be bounded by the operational hazard analyses in the SWEIS.

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