APPENDIX J
IMPACTS ANALYSES OF PROJECTS ASSOCIATED WITH NEW INFRASTRUCTURE OR LEVELS OF OPERATION

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Appendix J presents the project-specific analyses for three proposed projects that would result in either new infrastructure or increased levels of operation at Los Alamos National Laboratory (LANL) within the timeframe under consideration in the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (SWEIS). These three proposed projects are:

- Security-Driven Transportation Modifications;
- Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center) Increase in Levels of Operation; and
- Increase in the Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project.

These projects are part of the Expanded Operations Alternative, and their implementation could entail changes in the use of resources (such as water and electric power) or new accident types (such as the introduction or movement of new materials at risk [MAR]) not fully addressed in existing National Environmental Policy Act (NEPA) analyses. The proposed timeframes associated with construction and operation of these facilities are depicted in **Figure J–1.**

Facility or Project Name New Infrastructure or Levels of Operations	Fiscal Year 2007	2008	2009	2010	2011	2012 & beyond
Security-Driven Transportation Modifications	Construction	Operation				
Nicholas C. Metropolis Center Increased Levels of Operations	Gradual Increase					
Increase in the Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project	Ongoing Activity					

Figure J–1 Proposed Timeframes for Construction and Operation of Projects to Add New Infrastructure or Increase Levels of Operation

The projects included in this appendix are categorized into two broad groups: (1) those that would add new elements to LANL's present infrastructure; and (2) those that would increase the present operating levels at existing LANL facilities. A brief introduction to each project is presented below, with detailed analysis of the environmental consequences associated with each project presented in the following sections.

New Infrastructure. The *Security-Driven Transportation Modifications* Project is part of LANL's ongoing physical protection efforts around critical assets that directly support nuclear weapons, homeland security, and other nuclear-related national security missions. Since the September 11, 2001, terrorist attacks, security-related issues have risen in prominence and have been a driving consideration in LANL planning. As part of this ongoing security improvement effort, the National Nuclear Security Administration (NNSA) determined that there is a continuing need for upgrade physical protection in the area of the Pajarito Corridor West. This would involve restricting vehicle access, according to the security level, to LANL's core nuclear science and materials area between Technical Area (TA) 48 and TA-63. Staff and visitors would access this area through an internal shuttle system linked to parking areas in TA-48 and TA-63.

Increased Levels of Operation. The *Metropolis Center* is an existing facility that houses one of the world's largest and most advanced computers. It is part of an integrated tri-lab (LANL, Lawrence Livermore National Laboratory, and Sandia National Laboratories) effort to run supercomputers that allows researchers to integrate past weapons test data, materials studies, and current simulation experiments, thereby serving as an alternative to underground testing. While the computing capacity of the Metropolis Center is currently between 30 and 50 teraflops (30 to 50 trillion floating point operations per second), the long-term goal was to develop a computer system capable of performing up to at least 100 teraflops. With this goal in mind, the infrastructure was originally designed so that this projected computing capacity could be added without expanding the building. Since the 1998 *Environmental Assessment for the Proposed Strategic Computing Complex (SCC EA)* (DOE/EA-1250), NNSA has made the programmatic decision that in order to ensure the safety, reliability, and performance of the nation's nuclear weapons stockpile, the Metropolis Center's operations need to be upgraded to 100 teraflops, with the possibility that a future operating level of approximately 1,000 teraflops (1 petaflops) might be requested.

The *Increase in the Type and Quantity of Sealed Sources Managed at LANL by the Off-Site Source Recovery Project* is an ongoing effort that involves the recovery and storage of excess and unwanted radiological sources licensed by the U.S. Nuclear Regulatory Commission (NRC) to public or private organizations. As requested by the NRC, from 1979 to 1999, the U.S. Department of Energy (DOE) retrieved, on a case-by-case basis, approximately 1,100 sealed sources and sent them to LANL. The increased costs and inefficiencies associated with this case-by-case approach prompted DOE to formulate a management strategy that was addressed in the *Environmental Assessment for the Radioactive Source Recovery Program* (DOE 1995). In 2000, NNSA prepared the *Supplement Analysis, Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Modification of Management Methods for Certain Unwanted Radioactive Sealed Sources at Los Alamos National Laboratory*, DOE/EIS-0238-SA-01 (DOE 2000). Sealed sources would be packaged in multifunctional shielded containers (at the origination point or consolidated at a licensed commercial facility under contract to DOE) and shipped directly to LANL for storage as waste items.

In response to the events of September 11, 2001, NRC conducted a risk-based evaluation of potential terrorist threats and concluded that unwanted radiological sealed sources constituted a potential vulnerability. In order to meet this security need, NNSA's recovery mission was expanded, thereby necessitating the management of additional numbers and types of sealed sources. While NNSA intends to use commercial organizations and their facilities where appropriate, LANL site facilities would be utilized when commercial storage was not appropriate to fulfill the national security mission of the Off-Site Source Recovery Project.

J.1 Security-Driven Transportation Modifications Impacts Assessment

This section provides an assessment of the potential environmental impacts associated with proposed security-driven transportation modifications in the Pajarito Corridor West and nearby areas at LANL. Section J.1.1 provides background information including the purpose and need for the proposed security-driven transportation modifications. Section J.1.2 provides a summary of the Proposed Project and presents the option being considered, plus auxiliary actions to extend roadways across canyons to connect with mesas to the north. Section J.1.3 describes the affected environment in the Pajarito Corridor West and the mesas to the north, and impacts associated with the options and auxiliary actions.

J.1.1 Introduction, Purpose, and Need for Agency Action

Security-related issues have risen in prominence in the United States following the terrorist attacks of September 11, 2001. Similarly, security is figuring prominently in planning at LANL, affecting current and future concepts for controlling traffic on the site. Transportation planning at LANL is being conducted in response to updated NNSA security requirements and guidance.

Background

The current proposal is to implement security-driven transportation modifications that would further enhance security by restricting, according to the security level, privately-owned vehicles along portions of the Pajarito Corridor West between TA-48 and TA-63. Under this planned approach, vehicle traffic in the Pajarito Corridor West could be limited, according to the security level, to only government vehicles and physically inspected service vehicles. Access for staff and visitors to this controlled area would be provided by an internal shuttle system linked to large parking areas at TA-48 and TA-63. In addition to controlling potential vehicle-borne threats, this approach provides an opportunity for LANL to use transit systems to reduce onsite vehicle use, related resource consumption, and impacts on air quality. **Figure J–2** provides an overview of the proposed Pajarito Corridor West security-driven transportation plan.

This transportation plan reflects proposed modifications that would be implemented over the near term – that is, primarily over the next 5 years. Further development of the West Pajarito Corridor is expected, and a comprehensive development concept has been issued covering the next 20 to 30 years for the West Pajarito Corridor Planning Area (LANL 2006a). Further NEPA analyses would be needed for proposals developed from this long-term conceptual plan that are not addressed in this SWEIS.

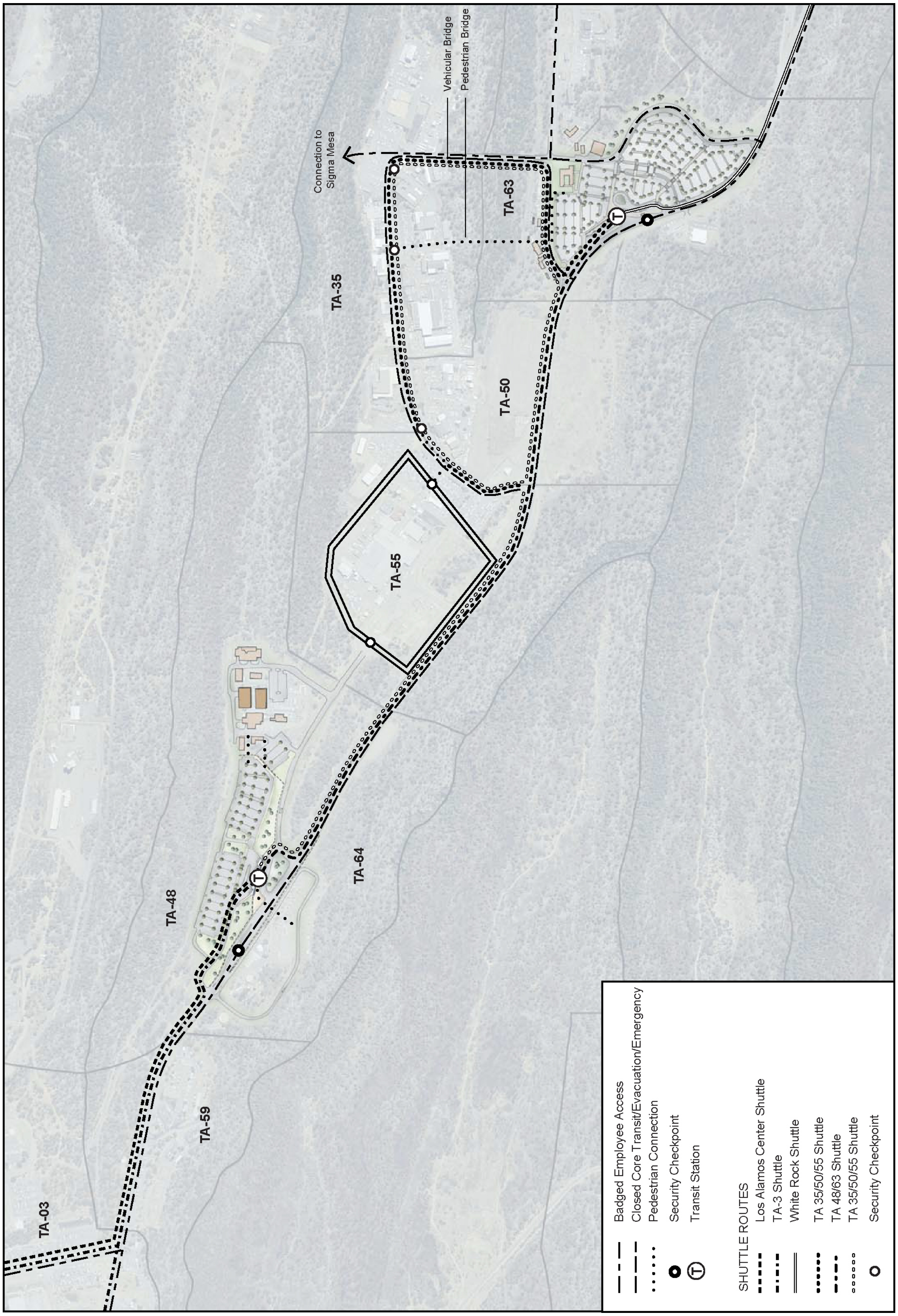

Figure J–2 Proposed Pajarito Corridor West Security-Driven Transportation Plan

Several NEPA documents are related to the Proposed Project. The *Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory, Los Alamos, New Mexico*, DOE/EA-1429 (DOE 2002) evaluated the impacts of constructing and implementing traffic control measures that would, according to the security level, restrict vehicle traffic in the vicinity of the core area of LANL, including the main administrative and technical area at TA-3.

The *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico*, DOE/EIS-0350 (DOE 2003), analyzed alternatives for upgrading or replacing the Chemistry and Metallurgy Research Building. The Record of Decision (ROD) issued in the *Federal Register* (FR) on February 12, 2004, (69 FR 6967) selected the Preferred Alternative, which is the construction of a new Chemical and Metallurgy Research Replacement facility at TA-55. Implementation of the ROD would result in the construction of a new nuclear Hazard Category 2 facility along the Pajarito Corridor West.

The Plutonium Facility Complex Refurbishment Impacts Assessment (see Appendix G of this SWEIS) evaluates the environmental consequences of a multi-year project to modernize and upgrade facilities and infrastructure at the TA-55 complex. The project would be implemented through a series of subprojects. The subprojects are all infrastructure- or facility-related as opposed to adding programmatic capabilities. They range from relatively simple emergency lighting replacement to more complex fire and criticality alarm systems upgrades and exhaust stack replacement.

The TA-Radiography Facility Impacts Assessment (see Appendix G of this SWEIS) evaluates the impacts of locating a radiography facility in TA-55 to serve pit production and surveillance programs needs. This project would result in a minor increase in the number of personnel in TA-55.

The Radiological Sciences Institute Impacts Assessment (see Appendix G of this SWEIS) evaluates the environmental consequences of consolidating radiochemistry and other related activities into a complex in TA-48. Currently the functions to be consolidated are distributed among a number of facilities in multiple TAs including the Sigma Complex and the radiological Machine Shops in TA-3, the Pajarito Site in TA-18, the Radiochemistry Laboratory in TA-48, and other facilities in TA-35, TA-46, and TA-59. This consolidation would result in demolition of old, and construction of new, facilities in TA-48 and an increase in the number of personnel in TA-48.

Other related activities in the vicinity of the Proposed Project are the Nuclear Materials Safeguards and Security Upgrades Project Phases I and II involving activities that were determined to be categorically excluded from NEPA evaluation. Phase I involves installing the data and communications backbone for the security system to the central and secondary alarm stations. Phase II will upgrade the security system at TA-55.

Purpose and Need

LANL's primary mission is to support national security. To carry out that and other assigned missions, LANL staff operates a number of nuclear and radiological facilities in the TAs along the upper end of Pajarito Road, or the Pajarito Corridor West, including the facilities in TA-35, TA-48, TA-50, and TA-55. Current planning includes moving nuclear and radiological capabilities from other locations at LANL into this area. This includes constructing a new facility in TA-55 to which most of the operations of the Chemistry and Metallurgy Research Building would be moved and a Proposed Project evaluated in this SWEIS to consolidate radiochemistry work in TA-48 (see Appendix G, Section G.3).

In recognition of increased and changing threats, NNSA determined that there is a continuing need to upgrade physical protection around critical assets that house quantities of nuclear and radiological materials and directly support LANL's core missions. Facilities and operations in this area are among the most sensitive to LANL nuclear weapons, homeland security, and other nuclear-related missions. LANL management has determined that an effective means of enhancing security would be to control threats that could be transported by vehicles into the area of the Pajarito Corridor West.

J.1.2 Options Descriptions

The two options identified for the Pajarito Corridor West Security-Driven Transportation Modifications Project are the No Action and the Proposed Project to construct and operate the Security-Driven Transportation Modifications. If the Proposed Project were implemented, two auxiliary actions could be implemented. Auxiliary Action A involves the construction of a two-lane bridge crossing between TA-35 and Sigma Mesa (in TA-60), with a new road proceeding west through TA-60 toward TA-3. Auxiliary Action B involves a two-lane bridge crossing between TA-60 and TA-61, with a new road proceeding northward to East Jemez Road.

J.1.2.1 No Action Option

Under this option, no action would be taken to change the current physical control of personally-owned vehicles entering the TAs along the Pajarito Corridor West. Transportation-related upgrades aimed at addressing the increased and changing needs for physical protection around facilities in TA-35, TA-48, TA-50, and TA-55 would not be undertaken. Vehicle traffic would continue to be screened at the existing access control stations located on Pajarito Road near Diamond Drive and near Route 4. Staff and visitors with DOE-issued security badges would continue to traverse Pajarito Road and be allowed to drive vehicles in the proximity of the facilities in TA-35, TA-48, TA-50, and TA-55.

J.1.2.2 Proposed Project: Construct Security-Driven Transportation Modifications in the Pajarito Corridor West

Under the Proposed Project, a comprehensive planned approach would be implemented to upgrade and enhance security in the Pajarito Corridor West area (LANL 2006d). In the near-term, this would include restricting, according to the security level, private through traffic along Pajarito Road at and between TA-48 and TA-63. Surface parking lots would be constructed at these two termini. Provision would be made at these two parking lots for incoming commuter buses. Within this secure project area, a shuttle bus system would be deployed; this would necessitate the modification of some existing roads as well as the construction of some new roads. Retaining walls and security barriers would be constructed, as needed, to provide physical separation of the security-controlled portion of the Pajarito Corridor West from the parking areas and other roadways. A pedestrian and bicycle pathway system also would be provided in this secure area. Shelters and related amenities (benches, bicycle racks, lighting, landscaping, etc.) would be provided at various locations within the project area. Finally, both a pedestrian crossing and a vehicular crossing would be constructed between TA-63 and TA-35.

West Pajarito Transit-Based Concept. The West Pajarito transit-based concept would create two large park-and-ride locations, one at TA-48 and the other at TA-63, with a shuttle transit system running between, transporting people to all the facility areas in TA-35, TA-48, TA-50, and TA-55.

During peak transit hours in the morning and afternoon, the shuttles would operate on intervals of 2 to 5 minutes. During nonpeak hours of operation, the shuttle intervals would be 15 to 30 minutes. Proposed routes for the shuttle system are as follows:

- A route originating from the TA-48 parking area circulating to TA-55, TA-50, and TA-35;
- A route originating from the TA-63 parking area circulating to TA-55, TA-50, and TA-35; and
- A loop between TA-48 and TA-63.

The shuttles would meet Americans with Disabilities Act requirements and allow for bicycle transport as well.

At each of the proposed TA-48 and TA-63 parking areas, transfer locations to local and regional buses would be provided to encourage and make practical the use of public transportation as a method of arriving to the site for employees and visitors. Because the proposed TA-48 and TA-63 parking locations are within a 5-to-10 minute walk of the secure zone, wide well-designed pedestrian walkways and connections would be provided as part of the basic infrastructure improvements of this plan. This would allow and encourage walking as an alternate during much of the year when weather permits. An all-weather pedestrian connection would be included connecting the parking area at TA-63 to the west end of TA-35 to further encourage walking as an alternate transportation mode.

Improvements West of TA-55. The Security-Driven Transportation Modifications Project improvements proposed in the areas west of TA-55 are described below. **Figure J–3** shows the conceptual plan for the proposed modifications around TA-48.

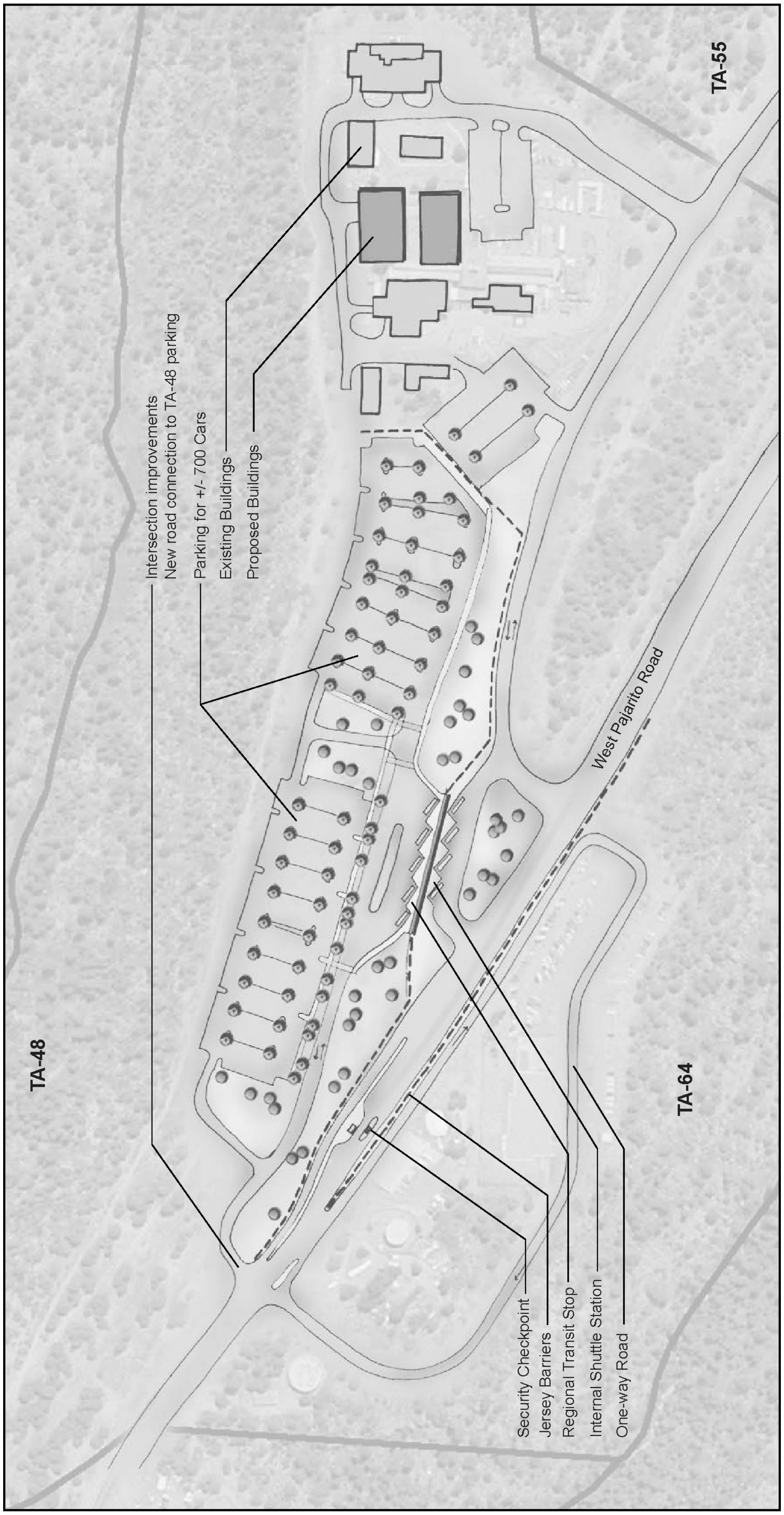

Figure J–3 Proposed Technical Area 48 Security-Driven Transportation Modifications

- A new intersection would be built west of the current guard gate creating the entrance to the TA-48 parking lot and TA-64. The total area to be covered by this new intersection would be approximately one-half acre (0.2 hectares). A standard signalized intersection or a roundabout would be used to control traffic. Vehicle types traveling through this intersection generally would be cars, light- and medium-duty trucks, vans, tank trucks, dump trucks, and sometimes forklifts and cranes. The existing guard gate would remain unchanged.

- A new paved one-way route through TA-64 would be established. The route would go east from the new intersection, running parallel and adjacent to Pajarito Road, then enter TA-64 at its current entrance. The route would circle through the TA-64 parking lot and head west back to the new intersection on a new paved road constructed on an existing dirt road. Much of the land for the new route is currently used as roadway. New sections of this road would be approximately 20 feet (6 meters) wide; retaining walls and side safety barriers would be installed as needed to separate this route from Pajarito Road.

- A new paved two-way road going north from the new intersection would be constructed to provide access to the expanded parking lots in TA-48. This road would be approximately 26 feet (7.9 meters) wide and 400 feet (122 meters) long. Retaining walls and side safety barriers would be built, as needed. The retaining walls could be substantial at the initial turn.

- New surface parking would be constructed at TA-48 to provide parking for approximately 700 cars. Grading and construction of the parking area would disturb approximately 11 acres (4.5 hectares) of land, some of which is currently undisturbed.

- A transit stop would be built at the edge of the TA-48 parking lot where commuters would catch the shuttles to the TAs in the secure area or transfer between buses and shuttles. Amenities would include shade and wind shelters, landscaping, benches, bicycle racks, lighting, phones, and emergency access. Approximately one-half acre (0.2 hectares) of land would be used for the transit stop, shuttle transfer, and associated amenities.

- New short connecting roads would be constructed between the transit stop and the existing road in the TA-48 area.

- An improved walkway would be built to connect the parking lot to the TA-48 complex. This walkway would be at least 10 feet (3 meters) wide and would incorporate rest sites along its length. The 10-foot width would accommodate bicycle use.

Improvements East of TA-55. The Security-Driven Transportation Modifications Project improvements proposed in the areas east of TA-55 are described below. **Figure J–4** shows the conceptual plan for the proposed transportation modifications around TA-35 and TA-63.

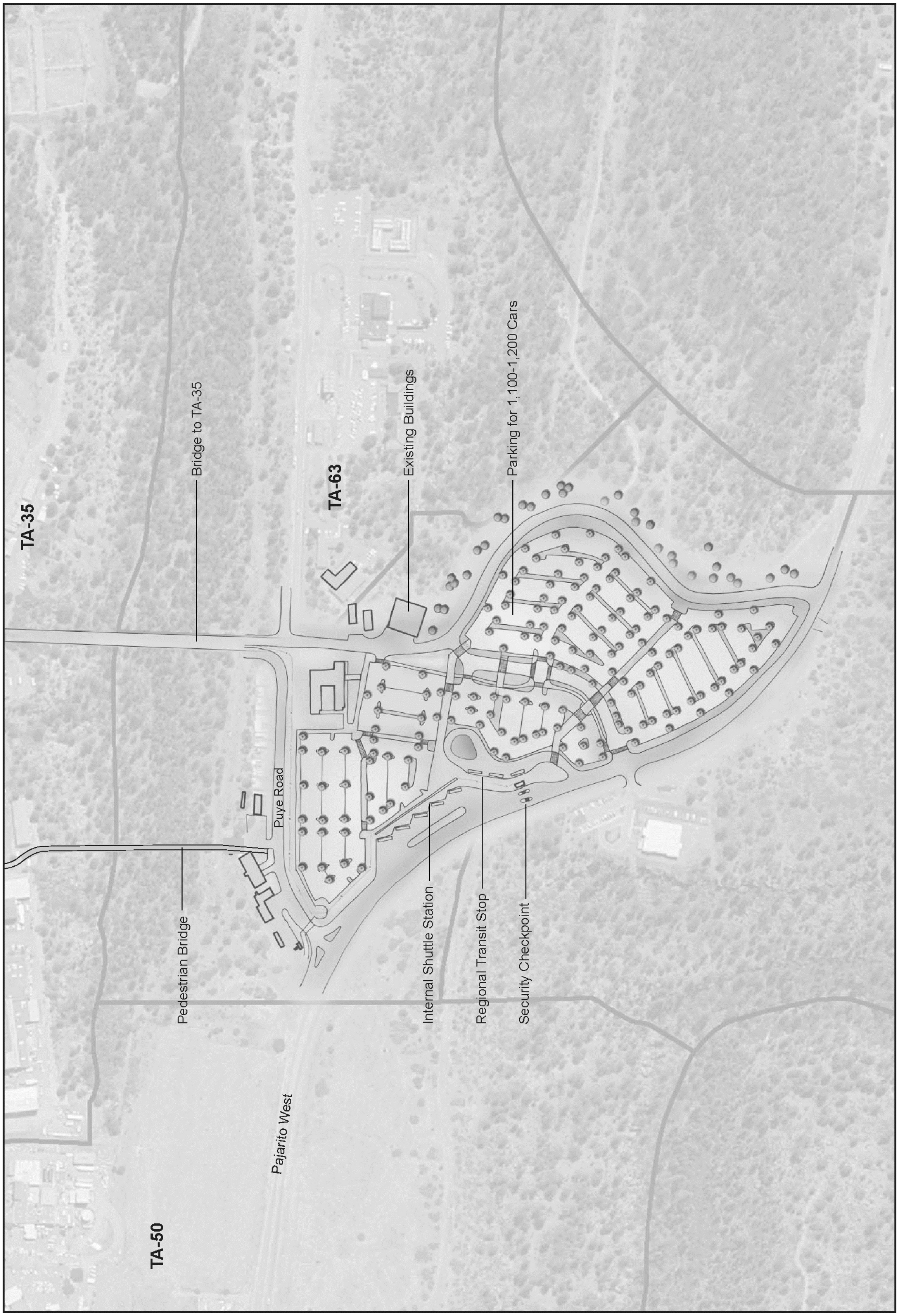

Figure J–4 Proposed Technical Area 35 and Technical Area 63 Security-Driven Transportation Modifications

- A new intersection east of TA-63 would be constructed to provide access to the proposed parking lot and other areas outside the secure area. The new intersection would cover approximately one-half acre (0.2 hectares), a portion of which is undisturbed land. Vehicle types traveling through this intersection generally would be cars, light- and medium-duty trucks, vans, tank trucks, dump trucks, and sometimes forklifts and cranes.

- A new paved two-lane road heading north from the new intersection on Pajarito Road would be constructed. The road would skirt the east edge of TA-63 going northward, and would be 26 feet (7.9 meters) wide and 1,250 feet (380 meters) long.

- A new vehicle crossing would be constructed between TA-63 and TA-35 over a branch of Mortandad Canyon (known locally as Ten Site Canyon). This crossing would align with the new road leading north from TA-63. The new vehicle crossing would be four lanes wide (48 feet [7.3 meters]), approximately 600 to 800 feet (180 to 240 meters) long, and would be about 100 feet (30 meters) above the canyon bottom. The bridge would have dividers down the center; the two west lanes would be for secured traffic traveling among TA-35, TA-48, TA-50 and TA-55; and two east lanes would be for limited secured traffic which would include personally-owned vehicles. **Figure J–5** shows the upper end of Ten Site Canyon that would be spanned by the vehicle bridge and a neighboring pedestrian bridge (described below). A variety of design alternatives would be investigated, including a land bridge and a span bridge.

Figure J–5 Photograph of Canyon to be Bridged between Technical Area 35 and Technical Area 63

- A redesigned road would be built from the end of the vehicle crossing to the north edge of TA-35. The total length of this redesigned road would be approximately 800 feet (240 meters). Routing of this road would likely require the removal of transportables, transportainers, and permanent structures.

- New surface parking additions, or modification of existing parking, would be constructed to accommodate approximately 1,100 to 1,200 cars at TA-63. The parking would be built in two phases, with approximately 450 parking spaces built in the first phase (LANL 2006d). A 126-foot (38-meter) by 78-foot (24-meter) retention pond would be built immediately south of the parking lot to serve as a catchment for parking lot runoff. Grading and construction would result in ground disturbance of about 19 acres (7.7 hectares). The northern portion of the existing site contains 200 existing parking spaces and two office trailers, while the southern portion is not developed. Two overhead power lines which traverse the site would not be relocated. The existing main water pipe that passes through the site would not be affected by the proposal (DMJM H&H 2005).

- A new transit stop similar to the one described above for TA-48 would be constructed.

- A new access control station would be built on Pajarito Road east of the new intersection for TA-63.

- Puye Road would be rerouted. From the Pajarito Road side, Puye Road would be routed to run parallel to, but not intersect, the new road around TA-63, as the two cross the new bridge.

- A permanent barrier system separating Puye Road from the new road along the east side of TA-63 and the TA-63 parking areas would be installed.

- A new pedestrian bridge connecting the TA-63 parking lot to the west portion of TA-35 would be constructed. This new pedestrian crossing would consist of an 8-foot- (2.4-meter-) wide lane, that would be approximately 200 feet (61 meters) long, and could be as much as 100 feet (30 meters) above the canyon bottom. A variety of design alternatives would need to be investigated, including a land bridge and a span bridge.

- New walkways would be constructed to connect the TA-63 parking lot to TA-55 and the new pedestrian bridge. These improved pedestrian walkways would be a minimum of 10-feet (3-meters) wide and would incorporate rest locations and provide for bicycle use.

- The existing TA-55 footprint would be expanded into the middle of the adjacent section of Pecos Drive, with a corresponding relocation of the TA-50 fence eastward to accommodate a new section of bicycle and walking paths.

- New shuttle stops would be built at TA-35, TA-48, TA-50, and TA-55. The size of these stops would be scaled to the expected populations at each area, and some TAs could require multiple stops. The largest shuttle stop would be at TA-55 and would be as large as, or larger, than the current onsite shuttle shelter. Each shuttle stop would have shelters, benches, bicycle racks, lighting, landscaping, and other amenities.

- Various walkway improvements would be made as needed within TA-35, TA-48, TA-50, and TA-55 to create safe walking systems from the transit stops to the individual facilities.

Auxiliary Actions. Auxiliary Action A would involve continuing from TA-35 across Mortandad Canyon to a roadway that would traverse the spine of TA-60 westward to TA-3. A two-lane bridge would be constructed across Mortandad Canyon from TA-35 to TA-60 (see **Figure J–6**). The bridge would be 600 to 800 feet (180 to 240 meters) long; each lane would be 12 feet (3.6 meters) wide. At this early stage in the planning for this project, the specific location of the crossing has not been determined, so for purposes of analysis, a 1,000-foot- (300-meter-) wide zone across Mortandad Canyon in which the bridge would be built has been identified (see Figure J–6). **Figure J–7** is a view from TA-35 across Mortandad Canyon to Sigma Mesa in the approximate location that the canyon would be crossed. The bridge would be 24 feet (7.3 meters) wide and approximately 100 feet (30 meters) above the canyon bottom. The design of the bridge is yet to be determined. Regardless of the design, construction would be necessary along the mesa edges and possibly in canyons. A new paved two-lane road (about 3,750 feet [1,140 meters] long would be constructed through TA-60 to connect the road crossing the bridge to a road extended east from TA-3. This new paved road would be constructed along the general alignment of an existing unpaved road. It would meet with an existing paved road located in the western portion of TA-60.

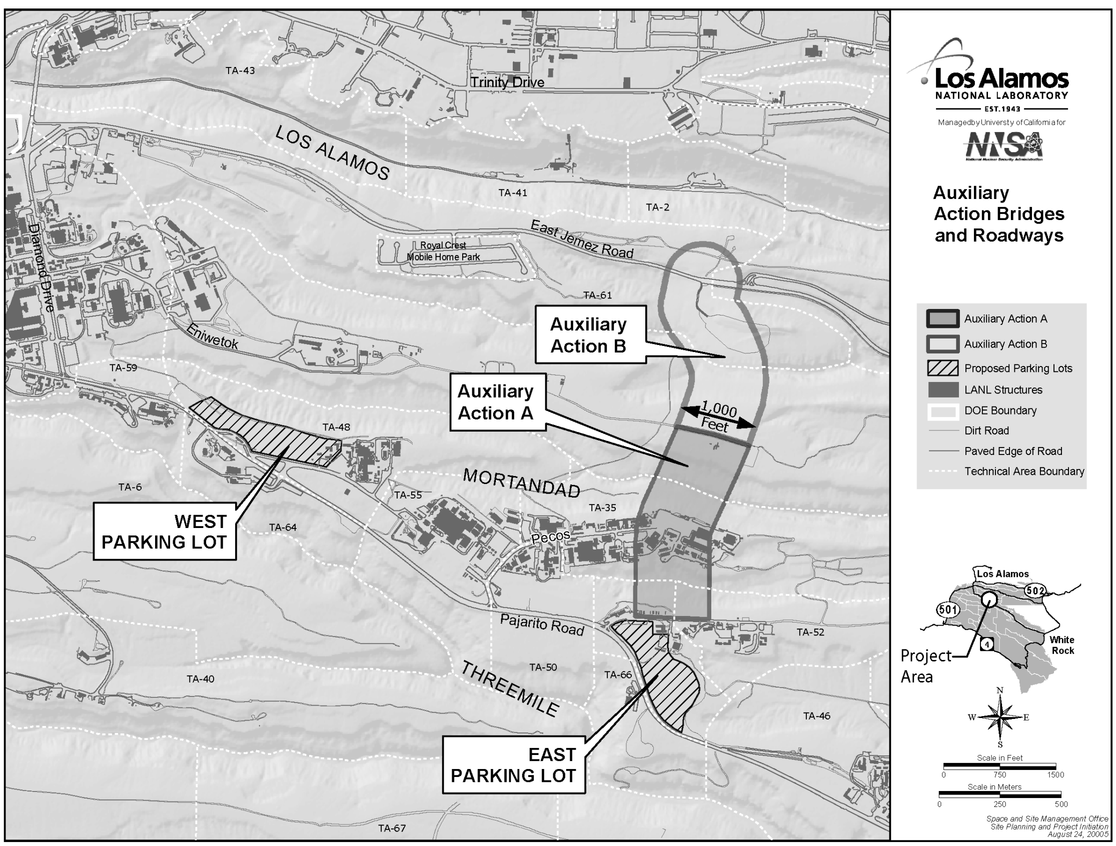

Figure J–6 General Locations of the Auxiliary Action Bridges and Roadways to Technical Area 60 and Technical Area 61

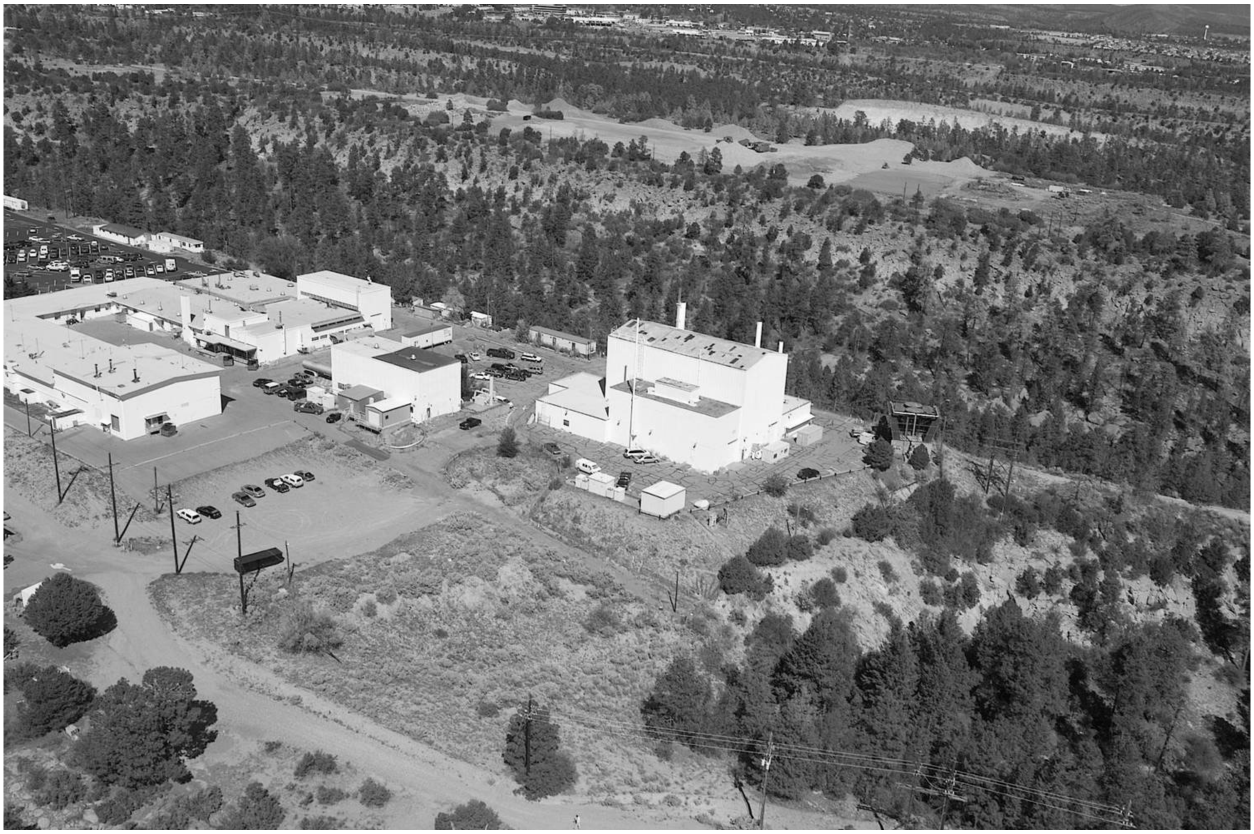

Figure J–7 Photograph Looking North Across Mortandad Canyon in the Area of the Bridge for Proposed Auxiliary Action A

Auxiliary Action B would involve continuing from TA-60 across Sandia Canyon to TA-61, where a new road would connect with East Jemez Road. Auxiliary Action B would provide the most benefit if it were implemented as an augmentation of Auxiliary Action A. A two-lane bridge would be constructed within a 1,000-foot- (300-meter-) wide zone across Sandia Canyon from TA-60 to TA-61 (see Figure J–6). As stated above for Auxiliary Action A, in this early stage of the project, the specific location of the crossing has not been determined, so for purposes of analysis a 1,000-foot- (300-meter-) wide zone across Sandia Canyon, in which the bridge would be built, has been identified (see Figure J–6). The bridge would be 600 to 800 feet (180 to 240 meters) long; each lane would be 12 feet (3.6 meters) wide, with an elevation of approximately 100 feet (30 meters) above the canyon bottom. The design of the bridge is yet to be determined; regardless of the design, however, construction would be necessary along the mesa edges and possibly in canyons. A new two-lane paved road 24 feet (7.3 meters) wide and approximately 750 to 1,000 feet (230 to 300 meters) long would be constructed northward from this bridge's northern terminus and proceed generally northward to meet East Jemez Road.

J.1.3 Affected Environment and Environmental Consequences

The analysis of environmental consequences relies heavily on the affected environment descriptions in Chapter 4 of this SWEIS. Where information specific to the security-driven transportation modifications is available and adds to the understanding of the affected environment, it is included here.

The proposed security-driven transportation modifications are located in the north-central portion of LANL along Pajarito Road between (and including) TA-48 and TA-63. This area includes the facilities in TA-35, TA-48, TA-50, and TA-55. It is anticipated that resource areas potentially affected by the Proposed Project include land resources, geology and soils, water resources, air quality and noise, ecological resources, cultural resources, infrastructure, and waste management.[1] An initial assessment of the potential impacts of the proposed project determined that there would be no or only negligible impacts to the following resource areas and that no further analysis was necessary.

- *Human Health* – There would be no change in practices or procedures associated with radiation exposure or the chemical environment.
- *Socioeconomics and Infrastructure* – It is not anticipated that socioeconomic impacts would occur as a consequence of the Proposed Project. Only infrastructure impacts are included in the impacts discussion.
- *Environmental Justice* – No disproportionately high and adverse environmental impacts on minority or low-income populations would be anticipated to occur.

J.1.3.1 No Action Option

There would be no change in the existing transportation network and no change to practices or procedures under the No Action Option. Therefore, it is anticipated that there would be no new impacts on land resources, visual resources, geology and soils, water resources, air resources, ecological resources, cultural resources, socioeconomics, infrastructure, transportation, or waste management. However, implementing the No Action Option would neither improve transportation flow within the Pajarito Corridor nor provide the needed security upgrades.

J.1.3.2 Proposed Project: Construct Security-Driven Transportation Modifications in the Pajarito Corridor West

Land Resources

Land Use

The Proposed Project would take place on lands in the Pajarito Corridor West. Auxiliary Action A would involve lands in TA-35 and TA-60, and Auxiliary Action B would involve lands in TA-60 and TA-61. The location of these TAs is shown in Chapter 4, Figure 4–3, of this SWEIS.

Pajarito Corridor West – The Pajarito Corridor West is located between Mortandad Canyon on the north and Twomile and Pajarito Canyons on the south, and is immediately southeast of TA-3. It includes TA-35, TA-48, TA-50, TA-52, TA-55, TA-63, TA-64, and TA-66, and totals 831 acres (336 hectares). Activities carried out within the Corridor include nuclear safeguards and chemical processes research and development, theoretical and computational programs

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[1] Plans and facility designs for the Security-Driven Transportation Modifications are conceptual and may be subject to change. To conservatively bound impacts to resource areas such as land use, geology and soils, infrastructure, or waste management, the analysis in this appendix is based on the assumption that the proposed new parking areas in TA-48 and TA-63 and other improvements would cover about one-third more land than the nominal 30 acres included in the project description.

related to nuclear reactor performance, research and applications in chemical and metallurgical processes relating to plutonium, and industrial partnership activities. Among the goals for the Pajarito Corridor West are a number related to transportation flow along the mesa and development of a pedestrian campus environment. Existing land use within the Pajarito Corridor West varies by TA, with all TAs including at least some areas designated as Reserve. **Table J–1** identifies the present and planned future land use within each TA that makes up the Corridor, as well as development designations as set forth in the *Comprehensive Site Plan 2001* (LANL 2001). Current land use categories are depicted in Chapter 4, Figure 4–4.

Table J–1 Land Use Designations and Development Areas for Technical Areas that Comprise the Pajarito Corridor West

Technical Area	*Current Land Use*	*Planned Future Land Use*	*Comprehensive Site Plan Development Designation(s)*
35	Experimental Science, Nuclear Materials Research and Development, Physical/Technical Support, Reserve	Experimental Science, Nuclear Materials Research and Development, Reserve	Secondary Development, Potential Infill
48	Experimental Science, Reserve	Nuclear Materials Research and Development, Reserve	Primary Development, Potential Infill, Parking
50	Waste Management, Reserve	Waste Management, Reserve	Secondary Development, Potential Infill, No Development (Hazard)
52	Experimental Science, Reserve	Experimental Science, Reserve	Secondary Development, Potential Infill
55	Nuclear Materials Research and Development, Reserve	Nuclear Materials Research and Development, Reserve	Primary Development, Potential Infill, Parking
63	Physical/Technical Support, Reserve	Waste Management, Reserve	Secondary Development, Potential Infill
64	Physical/Technical Support, Reserve	Physical/Technical Support, Reserve	Potential Infill
66	Experimental Science, Reserve	Experimental Science, Reserve	Secondary Development, Potential Infill

Sources: LANL 2001, 2003.

Technical Area 48 – Except for an existing powerline, the western portion of TA-48, where a surface parking lot for 700 cars is proposed, is vacant. Much of this area has been disturbed as a result of previous activities.

Technical Area 63 – The southern and southeastern areas of TA-63, where a surface parking lot for 1,100 to 1,200 cars is proposed, is vacant. Much of the site has been disturbed as a result of previous activities; the northwestern and central portions of the proposed parking lot have existing surface parking areas, and two powerlines traverse the area.

Technical Area 60 – TA-60, Sigma Mesa, is located immediately east of TA-3 and is 445 acres (180 hectares) in size. The area contains physical support and infrastructure facilities, including the Target Fabrication Facility and Rack Assembly and the Alignment Complex (DOE 1999). Presently, most of the central section of the TA is classified as Physical/Technical Support, with a small area designated as Nuclear Materials Research and Development. Land use is not expected to change in the future (LANL 2003). According to the *Comprehensive Site Plan 2001*, TA-60 is within the Sigma Mesa Development Area (LANL 2001). While developed portions of the TA are classified as Potential Infill, most of the mesa is designated as Primary and Secondary Development. A small corridor of Potential Infill also exists in the eastern part of the TA and connects with a similarly designated area in TA-35. In general, the Plan indicates that considerable development growth is planned for TA-60 and other portions of the Sigma Mesa Area.

Technical Area 61 – TA-61 is located to the northeast of TA-3 and is 297 acres (120 hectares) in size. TA-61 is used for physical support and contains infrastructure facilities, including the Los Alamos County Landfill, which occupies 48 acres (19.4 hectares), and the onsite borrow pit (LANL 2004c). The generalized land use categories within which TA-61 is located are depicted in Chapter 4, Figure 4–4, of the SWEIS, and include Physical/Technical Support and Reserve. According to the *Comprehensive Site Plan 2001*, TA-61 falls within the Sigma Mesa Development Area, an area which could undergo considerable development growth in the future (LANL 2001).

Under the Proposed Project, a number of actions would be implemented within the Pajarito Corridor West. In terms of land area, the largest projects are two parking lots; one in TA-48 and one in TA-63. These would require the disturbance of approximately 11 acres (4.5 hectares) and 19 acres (7.7 hectares), respectively. Some of the land for the proposed parking area in TA-48 has been disturbed from previous activities, and is crossed by an electrical power line. TA-63 has existing parking areas, two temporary structures, and two power lines. Additional actions that would disturb vacant land include a new two-lane road along the east edge of TA-63, new auto and pedestrian crossings connecting TA-63 and TA-35, and a road through the northern edge of TA-35. Other actions associated with this option would involve relatively small areas of land, most of which are disturbed or vacant.

As noted above, the Pajarito Corridor West is highly developed, although vacant land is present. Land use plans for the Corridor have designated some of these vacant areas for future development, including the areas designated for parking. Specifically, the parking area within TA-48 has been designated for Primary Development and that in TA-63 for Secondary Development. Also, the new two-lane road along the eastern edge of TA-63 would pass through areas designated for Secondary Development and Potential Infill. The roadway connecting TA-63 and TA-35 would pass through a corridor designated as Potential Infill, as would the new road along the northern edge of TA-35. However, the new pedestrian walkway connecting the two TAs would not be within an area designated for development in the *Comprehensive Site Plan 2001* (LANL 2001). Many of the other actions under this option would take place largely within developed portions of the Pajarito Corridor West.

While this option would affect future land use by developing currently undeveloped portions of the Pajarito Corridor West, all construction, except the pedestrian walkway between TA-63 and TA-35, would take place within areas designated either for development or for infill. Thus, this option generally would be compatible with land use plans for the Pajarito Corridor West as set forth in the *Comprehensive Site Plan 2001* (LANL 2001).

Visual Environment

Pajarito Corridor West – The TAs that make up the Pajarito Corridor West, along with TA-3, extend along the upper 2.7 miles (4.3 kilometers) of Pajarito Road. Development has taken place within large parts of these TAs. Thus, this area presents the appearance of a mosaic of industrial buildings and structures interspersed with forests along the mesa. Views of the area from a distance are as described in Chapter 4, Section 4.1.2, of this SWEIS. When viewed from along Pajarito Road, the Pajarito Corridor West has an industrial appearance. Mortandad, Twomile and Pajarito Canyons located to the north and south of the mesa, respectively, are wooded and present a natural appearance when viewed from both a distance and nearby.

Technical Area 48 – Most development within TA-48 has occurred in the eastern portion of the TA. Some wooded areas occur in the northern edge of the TA. The proposed surface parking area would be located in the western portion of TA-48; this area is vacant except for a powerline that traverses the northern portion. The area where the proposed parking lot would be sited is readily visible from Pajarito Road.

Technical Area 63 – Most development within TA-63 has occurred in the northern portion of this TA along both sides of Puye Road. The proposed surface parking area would be located in the southern two-thirds of TA-63; this area is vacant except for two powerlines that traverse the site. The area where the proposed parking lot would be sited is readily visible from Pajarito Road.

Technical Area 60 – Most development within TA-60 has occurred within the western portion of the TA. Although some wooded areas occur on the mesa, much of it has been disturbed by a power line and road that runs its length. Additionally, a portion of the mesa is used for the storage of dirt, concrete, and miscellaneous materials. From higher elevations to the west, the mesa appears to be minimally developed; however, due to the power line and road, its appearance contrasts with the adjacent forested canyons. Because of security limitations, near views of the mesa are limited to LANL personnel. Those portions of the TA that include Mortandad Canyon and Sandia Canyon are forested and present a natural appearance.

Technical Area 61 – Most of the mesa within the western portion of TA-61 has been developed, with the Los Alamos County Landfill being the largest facility. The landfill is adjacent to East Jemez Road. Although developed portions of the landfill are not visible from the road, a large berm of stockpiled soil can be seen. The onsite borrow pit is two miles east of the county landfill. The borrow pit is not visible from East Jemez Road due to its location relative to the road, trees bordering the road, and a small hill on the north side of the pit. Although much of TA-61 presents a forested appearance from higher elevations to the west, the landfill and the borrow pit are visible as areas devoid of vegetation. Dust generated from current activities may at times also be visible to the public. Although East Jemez Road passes through the eastern portion of the TA, this part of the TA includes areas of undeveloped woodland both on the mesa and in Pueblo Canyon. This part of TA-61 presents a more natural appearance to those traveling along the road.

The Pajarito Corridor West is a highly developed area that is readily visible from both near and distant locations. While many actions associated with implementing the Security-Driven

Transportation Modifications Project would have little or no visual impact, the construction of the two parking lots, the new roads across TA-63 and TA-35, and the vehicle and pedestrian bridges over the Ten Site branch of Mortandad Canyon would noticeably add to the built-up appearance of the area.

Construction of the two parking lots would disturb approximately 30 acres (12.1 hectares) of land, some previously disturbed and some open and forested. The section of road crossing the eastern portion of TA-35 would disturb open and forested land. However, much of the rest of the roadway would be built within developed portions of the Pajarito Corridor West and would have minimal visual impact. The removal of open and forested land would add to the overall developed appearance of the Pajarito Corridor West as viewed from both nearby and higher elevations to the west. The construction of both the vehicle and pedestrian bridges across a branch of Mortandad Canyon would also have pronounced visual impacts since they would span a forested canyon that has an otherwise natural appearance. These bridges would be readily visible from the canyon where little development is presently apparent; they would also be visible from more distant areas. Careful planning related to site selection and bridge design could help to mitigate these impacts. Most remaining projects associated with the Security-Driven Transportation Modifications Project would be constructed within currently developed portions of the Corridor and, thus, would have little impact on the visual environment.

Geology and Soils

There would be a potential for seismic risk to the facilities constructed under the Security-Driven Transportation Modifications (including the proposed bridges). This risk would be related to seismicity on the nearest fault, the Rendija Canyon Fault (see Chapter 4, Section 4.2.2, of this SWEIS). The bridges under the Proposed Project would be approximately 0.8 miles (1.3 kilometers) east of the Rendija Canyon Fault. The potential for surface rupture at the bridge locations would be low, due in part to the distance from the fault zone, the absence of near-surface faults observed in TA-55 (located between the fault zone and the proposed bridges), and the low recurrence interval of motion on the fault. To minimize the risk of accident, the proposed facilities would be designed and constructed to current DOE seismic standards and applicable building codes.

Soil resources in the area of the Proposed Project include both those disturbed by previous LANL activities and undisturbed soils. The undisturbed soils maintain the present vegetative cover. The arid soils in this area are largely sandy loam material eroded from upslope basalt and tuff units and from underlying geologic units. The soils are generally 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.

Radionuclides are present at near or above background levels in sediments onsite and offsite; however, the overall pattern of radioactivity in sediments has not greatly changed since the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico (1999 SWEIS)* (LANL 2004b). Although it is not expected that the Proposed Project would result in the release of contaminants, the potential exists for some contaminated sediments to be disturbed. Prior to ground disturbance, potentially contaminated areas would be surveyed to determine the extent and nature of any contamination and, as necessary, contaminated areas would be remediated.

Construction of the Security-Driven Transportation Modifications would conservatively disturb approximately 240,000 cubic yards (183,000 cubic meters) of soil and rock. Aside from earth moving, deep trenching and excavation, work would generally be limited to that necessary to realign or install new piping, utility lines, and other conveyances that could be affected by this project. Most of the work would be done in areas where these resources already have been disturbed by existing or past activities including the proposed surface parking lots at TA-48 and TA-63. Minor exceptions would be areas along the southern and southeastern edges of the proposed TA-63 parking lot and along the northern edge of the proposed TA-48 parking lot. The undisturbed (native) soil resources would be irretrievably lost as a result of the construction. To mitigate this loss, valuable surface soil in this area may be scraped off of the building sites and stockpiled prior to beginning construction activities. The saved soil stockpiles (and any excavated rock) could then be used at other locations at LANL for site restoration following remediation. If soil or rock stockpiles are to be stored for longer than a few weeks, the stockpiles may 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 and building sites.

A number of potential release sites are in the project area. Grading and embankment excavation work, as well as establishing construction laydown pads, would directly impact sediments, soils, and tuff on the mesa and possibly near and in Mortandad Canyon. While no provisions for wet or flooded soils would likely be required, the potential exists for some contaminated sediments to be disturbed within the canyon areas. Prior to commencing any ground disturbance, potentially affected contaminated areas would be surveyed to determine the extent and nature of any contamination and required remediation in accordance with LANL procedures. Proposed parking lots, roadways, walkways, shuttle bus structures, and security facilities would be designed, constructed, and operated in compliance with applicable DOE Orders, requirements, and governing standards that have been established to protect public and worker health and the environment.

Geologic resource consumption would be small under this option and would not be expected to deplete local sources or stockpiles of required materials. Conservatively, about 50,000 cubic yards (38,000 cubic meters) of gravel, 25,000 cubic yards (19,000 cubic meters) of asphalt, and 9,000 cubic yards (6,900 cubic meters) of concrete would be needed during construction. Aggregate resources are readily available from onsite borrow areas and are otherwise abundant in Los Alamos County. Concrete and asphalt would be procured from an offsite supplier.

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

Water Resources

Mortandad Canyon receives natural runoff, as well as effluent from several National Pollutant Discharge Elimination System (NPDES) outfalls. The Radioactive Liquid Waste Treatment Facility at TA-50 discharges treated liquids via NPDES Outfall 051 into Mortandad Canyon (EPA 2001). The volume of treated effluent discharged from the TA-50 Radioactive Liquid Waste Treatment Facility has steadily decreased since the *1999 SWEIS*, and LANL is considering options for evaporating rather than discharging this effluent (see Appendix G, Section G.4). Annual flows are shown in Chapter 4, Table 4–9, of this SWEIS.

TA-55 is flanked by Mortandad Canyon to the north and Twomile Canyon to the south (USGS 1984). The site is largely comprised of a heavily developed facility complex with surface drainage primarily occurring 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 via NPDES Outfall 03A181 directly into Mortandad Canyon (EPA 2000, 2001).

TA-48 and TA-63 do not currently have any NPDES outfalls into Mortandad Canyon or its ancillary canyons. TA-48 and TA-63 are both located on mesa tops and are not within the 100-year or 500-year floodplain boundaries. Storm water flow from the buildings and parking lots in these TAs drain into the Mortandad Canyon system, with some runoff from TA-63 possibly entering Cañada del Buey or Pajarito Canyon.

Ephemeral streams flow in both Mortandad and its ancillary canyon north of TA-63, and in Sandia Canyon. Potential contamination of those streams is minimized by the LANL NPDES Industrial Storm Water Permit Program and the LANL NPDES Storm Water Construction Program.

While nearly every major watershed shows some level of impact from LANL operations, the overall quality of most surface water is described as good. Most samples are within normal ranges or at concentrations far below regulatory standards or risk-based advisory levels (LANL 2004c). Releases from the Radioactive Liquid Waste Treatment Facility have introduced some radionuclide and chemical contamination into surface waters of Mortandad Canyon. This surface water is not used as a drinking source and flows do not normally extend offsite. Beginning in 1999, LANL made significant upgrades to the Radioactive Liquid Waste Treatment Facility treatment system. As a result, for the 6 years ending in 2005, the Radioactive Liquid Waste Treatment Facility has met all DOE radiological standards, all NPDES requirements, and for all but 2 weeks has voluntarily met New Mexico groundwater standards for fluoride, nitrate, and total dissolved solids. In 2005, polychlorinated biphenyls above water quality standards were detected in storm runoff samples from Mortandad Canyon (LANL 2006e).

Effluent discharges have affected perched alluvial groundwater in Mortandad Canyon. Most notably, radionuclide constituents in effluents discharged to Mortandad Canyon from the Radioactive Liquid Waste Treatment Facility at TA-50 have created a localized area of alluvial groundwater with plutonium-238, plutonium-239, plutonium-240, americium-241, tritium, strontium-90, and gross beta measured above the 4-millirem DOE Derived Concentration Guides for drinking water or U.S. Environmental Protection Agency (EPA) drinking water criteria

(LANL 2004c). Nitrate also contained in the effluent has caused alluvial groundwater concentrations to exceed the New Mexico groundwater standard and EPA Maximum Contaminant Level of 10 milligrams per liter.

Perchlorate was detected in Mortandad Canyon in 2002 through 2005, before the EPA issued any water quality standard for this contaminant. In 2005, perchlorate concentrations in four Mortandad Canyon wells exceeded EPA's Drinking Water Equivalent Level of 24.5 micrograms per liter, which was established in January 2006. In 2005, 1,4-dioxane was detected in two perched intermediate aquifer wells in Mortandad Canyon. There is no Federal or State standard for 1,4-dioxane and LANL and the New Mexico Environment Department are currently working to determine the extent and impact of this contaminant. In 2005, a regional aquifer monitoring well in Mortandad Canyon indicated hexavalent chromium levels four times the EPA Maximum Contaminant Level. This is currently being investigated by LANL and New Mexico Environment Department staff and is likely due to past cooling tower discharges in Sandia Canyon (LANL 2006e).

Minimal impacts to surface water are expected during the construction of the Proposed Project. Adverse impacts from constructing the additional parking lots, intersections, and roads required for the Proposed Project would be minimized by the implementation of best management practices described in construction storm water pollution prevention plans. These plans meet the requirements of the NPDES Construction General Permit. Construction of the pedestrian and vehicular crossing between TA-63 and TA-35 would require a bridge over Ten Site Canyon, an ancillary branch of Mortandad Canyon. This bridge construction would require a general or individual 404 Permit from the U.S. Army Corps of Engineers and a New Mexico Environment Department 401 Water Quality Certification for linear transportation projects, because the effluent flows and ephemeral streams in the Mortandad Canyon system are considered "waters of the United States." Construction impacts to these canyon surface water flows and the canyon-bottom floodplains would be mitigated by the provisions provided in the permit and the construction storm water pollution prevention plan.

Minimal impacts to surface water would occur during the operation of the Proposed Project. The presence of large parking lots at TA-48 and TA-63 and additional paved roads would increase the amount of storm water runoff from those sites. Potential storm water contamination from parking lot runoff would be minimized by proper maintenance practices at the facility, including spill response and cleanup. Spill prevention and response procedures would also reduce any potential contamination that could occur as a result of spills on the bridge across TA-48 and TA-63. The Integrated Storm Water Monitoring Program that monitors runoff on a watershed basis would evaluate the effectiveness of these controls.

No adverse affects on groundwater are expected from the implementation of this project. Water used during construction is included in the utility requirements for the project. Groundwater quality would not be affected unless the surface water quality controls fail and contaminated surface water infiltrates through the soil to the groundwater.

Air Quality and Noise

Construction of parking lots, pedestrian walkways, roads, and bridges associated with this option would result in temporary increases in nonradiological air quality impacts from construction equipment, trucks, and worker vehicles. There would also be particulate emissions from disturbance of soil caused by the wind and equipment.

Operation of these facilities would result in emissions of criteria and toxic air pollutants from vehicles, including employee vehicles and shuttle buses. Since the number of employee vehicles is not expected to change as a result of this option, the change in emissions could be small, except for the addition of emissions from shuttle buses.

Construction or operation of these facilities would not result in an increase in the emissions of radiological air pollutants.

Construction of parking lots, pedestrian walkways, roads, and bridges associated with this alternative would result in some temporary increase in noise levels near the new roads from construction equipment and activities. Some disturbance of wildlife near the area could occur as a result of operation of construction equipment. There would be no change in noise impacts to 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 shipment.

Operation of these facilities would result in some change in noise levels along the new roadways and bus routes under both options. Some disturbance of wildlife near the area could occur.

Ecological Resources

This section first addresses the ecological setting (that is, terrestrial resources, wetlands, aquatic resources, and protected and sensitive species) of the Pajarito Corridor West and several TAs within it. This is followed by a discussion of the potential impacts on those resources. Discussions of protected and sensitive species concentrate on those species for which Areas of Environmental Interest have been established, since they receive protection under the Endangered Species Act of 1973. Ecological resources of LANL as a whole are described in Chapter 4, Section 4.5, of the SWEIS and the vegetation zones are depicted in Figure 4–25.

Pajarito Corridor West – The Pajarito Corridor West includes TA-35, TA-48, TA-50, TA-52, TA-55, TA-63, TA-64, and TA-66 (LANL 2001). The entire Corridor falls within the Ponderosa Pine Forest vegetation zone. Thus, vegetation present within the area is dominated by ponderosa pine (*Pinus ponderosa* P. & C. Lawson), gambel oak (*Quercus gambelii* Nutt.), kinnikinik (*Archtostaphylos uva-ursi* L.), New Mexico locust (*Robinia neomexicana* Gray), pine dropseed (*Blepharoneuron tricholepis* Torr Nash), mountain muhly (*Muhlenbergia montana* Nutt A.S. Hitchc), and little bluestem (*Schizachyrium scoparium* Michx.) (DOE 1999). Much of the mesa-top areas of the Pajarito Corridor West are fenced, highly developed industrial areas that are devoid of natural habitat and the wildlife that it typically supports. However, the canyons are very good wildlife habitats.

Nearly the entire Pajarito Corridor West was burned at a Low/Unburned severity level during the Cerro Grande Fire. However, the northern portion of TA-48 (that is, a portion of Mortandad

Canyon) was burned at a Medium severity level. At a Low/Unburned severity level, seed stocks are largely unaffected. Also, the existing species may recover quickly. At a Medium severity level, seed stocks can be adversely affected and erosion can increase due to the removal of vegetation and ground cover. In such areas, recolonization by different species of plants may occur. Wildlife response to the fire could include direct loss of less mobile species and young and displacement of more mobile species. As areas succeed to a more mature state, there is a corresponding change in the diversity, composition, and numbers of wildlife present (LANL 2000b).

Several wetlands occur within the Pajarito Corridor West, including four in TA-48 and one in TA-55. Three of the four wetlands in TA-48 are located between TA-48 and TA-60 in Mortandad Canyon. 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 smaller than 0.1 acre (0.04 hectares). The wetland within TA-55 is within a branch of Pajarito Canyon between TA-55 and TA-48; it covers 1.2 acres (0.48 hectares). This wetland is dominated by cattails (ACE 2005).

The Pajarito Corridor West falls within portions of the Sandia-Mortandad Canyon, Pajarito Canyon, and Threemile Canyon Mexican spotted owl (*Strix occidentalis lucida*) Areas of Environmental Interest (LANL 2000a). Specifically, parts of TA-48, TA-35, and TA-52 are within the core zone for the Sandia-Mortandad Canyon Areas of Environmental Interest, while portions of TA-55, TA-50, TA-63, and TA-66 are included in the core zone of the Pajarito Canyon Areas of Environmental Interest. No part of the Corridor is within the core zone of the Threemile Canyon Area of Environmental Interest. Since buffer zones extend beyond the core zone, they encompass additional land within the Pajarito Corridor West. In fact, with the exception of the western portions of TA-48 and TA-64, as well as a very small section of TA-55, nearly the entire Corridor falls within the buffer and core zones of the three Areas of Environmental Interest. No portion of the Pajarito Corridor West is within Areas of Environmental Interest for the bald eagle (*Haliaeetus leucocaphalus*) or southwestern willow flycatcher (*Empidonax trailii extimus*).

Technical Area 48 – Vegetation and wildlife present would include the same species as noted above for the Pajarito Corridor West. Much of the area proposed for surface parking has been disturbed because of previous activities, with vegetation principally comprising of grasses; the area along the northern edge contains mature conifers.

Technical Area 63 – Vegetation and wildlife present would include the same species as noted above for the Pajarito Corridor West. Much of the area proposed for surface parking has been disturbed because of previous activities; vegetation in undeveloped portions of this area principally comprises grasses and junipers.

Technical Area 60 – Vegetation and wildlife present would include the same species as noted above for the Pajarito Corridor West. Most of TA-60 was burned at a Low/Unburned severity level; however the south central portion of the site (that is, a portion of Mortandad Canyon) was burned at a Medium severity level. As noted above, at a Low/Unburned severity level, seed sources should remain viable; whereas, at a Medium level, this may not be the case, with the result that recolonization by different species of plants may occur (LANL 2000b).

The Sandia wetland is located between TA-60 and TA-61. Vegetation present within this wetland includes cattails and a number of species of grass. In 2000, the Sandia wetland encompassed 3.5 acres (1.4 hectares); however, this represented a 48 percent reduction in size from 1996. At present it is slightly less than 3 acres (1.2 hectares) in size (Bennett, Keller, and Robinson 2001; ACE 2005).

TA-60 falls within the Sandia-Mortandad Canyon and Los Alamos Canyon Mexican spotted owl Areas of Environmental Interest (LANL 2000a). Most of the eastern portion of the TA falls within either the core or buffer zone of the Sandia-Mortandad Canyon Areas of Environmental Interest, while only the very northern border of the TA is within the buffer zone of the Los Alamos Canyon Areas of Environmental Interest. No portion of TA-60 falls within Areas of Environmental Interest for the bald eagle or southwestern willow flycatcher.

Technical Area 61 – Vegetation and wildlife present would include the same species as noted above for the Pajarito Corridor West. Two major features of the TA are the Los Alamos County Landfill and the borrow pit where all vegetation has been removed. Without cover, the landfill and borrow pit provide minimal habitat for wildlife. Most of TA-61 was unaffected by the Cerro Grande Fire. However the very eastern portion of the TA was burned at a Low/Unburned severity level. At this level, seed sources should remain viable (LANL 2000b). The Sandia wetland located between TA-61 and TA-60 was discussed above in relation to TA-60.

As is the case for TA-60, TA-61 falls within the Sandia-Mortandad Canyon and Los Alamos Canyon Mexican spotted owl Areas of Environmental Interest (LANL 2000a). The southeastern portion of the TA is within the core zone of the Sandia-Mortandad Canyon Areas of Environmental Interest, while the northern edge is within the core zone of the Los Alamos Canyon Areas of Environmental Interest. The rest of the TA is included within the buffer zones of these Areas of Environmental Interest. No portion of the TA-61 is within Areas of Environmental Interest for the bald eagle or southwestern willow flycatcher.

Impacts of the project would be greatest on currently undeveloped land. Although the Pajarito Corridor West falls within the Ponderosa Pine vegetation zone, the area is highly developed, especially on the mesa. Most actions associated with implementing the Security-Driven Transportation Modifications Project would have little or no impact on ecological resources; however, the construction of the two parking lots, a portion of the new road across TA-63, and the vehicle and pedestrian bridges over the branch of Mortandad Canyon would affect undeveloped forest and open land. Other project elements would largely take place in currently developed portions of the Corridor.

Construction of the two parking lots would disturb a total of approximately 30 acres (12 hectares). The parking lot at TA-48 would total approximately 11 acres (4.5 hectares), of land consisting partly of open field and ponderosa pine forest. The parking lot at TA-63 would total approximately 19 acres (7.7 hectares) of land consisting partly of open field and junipers. Both habitats would be lost due to construction of the parking lots as well as a portion of the road around the eastern edge of TA-63. The pedestrian and vehicle bridges connecting TA-63 with

TA-35 would involve some loss of habitat due to construction of approaches and pier foundations. Clearing and grading for these projects would result in the loss of less mobile animals such as small mammals and reptiles. In general, more mobile species would be able to avoid the area during the construction period; however, depending upon the season, nests and young could be destroyed. Indirect impacts to wildlife could also result from equipment noise. During operation, noise and added human presence could cause some species to avoid nearby areas; however, considering the present level of human presence within the corridor it would be expected that many species have already adapted. Wetlands located within TA-48 would not be affected by the Proposed Project, since none are in the immediate area of the parking lots or bridges. Indirect impacts (such as sedimentation) to the wetland located between TA-48 and TA-60 from construction of the parking lot in TA-48 would be prevented by using best management practices. There are no aquatic resources on the mesa, therefore impacts to these resources would not occur.

As noted above, portions of the Pajarito Corridor West are within the Sandia-Mortandad Canyon, Pajarito Canyon, and Threemile Canyon Areas of Environmental Interest for the Mexican spotted owl. The parking lot and associated activities in TA-48 are not located in threatened or endangered species habitat. However, the parking lot in TA-63, the road across the eastern edge of TA-63, and the pedestrian and vehicle bridges fall within buffer habitat and a portion of the parking lot is within core habitat. A biological assessment prepared by NNSA determined that up to 18.8 acres (7.6 hectares) of buffer and 1 acre (0.4 hectares) of core Mexican spotted owl habitat consisting of disturbed grassland and ponderosa pine woodland would be lost. Additionally, the assessment noted that the project had the potential to disturb the Mexican spotted owl due to excess noise or light. Therefore, the biological assessment concluded that activities associated with the project may affect, and were likely to adversely affect, the Mexican spotted owl. Nevertheless, the biological assessment noted that reasonable and prudent alternatives should be implemented such as ensuring that all lighting complies with the New Mexico Night Sky Protection Act, employing appropriate erosion and runoff controls, avoiding unnecessary disturbance to vegetation, and revegetating all exposed soils as soon as feasible. Additionally, consultation with the U.S. Fish and Wildlife Service (USFWS) would be reinitiated if a land bridge instead of a span bridge were used over Ten Site Canyon (LANL 2006c). After reviewing the biological assessment, the USFWS concluded that the effects to the owl from construction activities associated with the Security-Driven Transportation Modifications Project would be insignificant and discountable, and would not result in adverse effects. This assessment was based on the fact that: 1) the parking lot in TA-48 would not be located in listed species habitat; 2) the parking lot at TA-63 consists of open field, junipers and ponderosa pine woodland.; and 3) reasonable and prudent alternatives would be implemented to reduce or avoid potential impacts (see Chapter 6, Section 6.5.2).

Areas disturbed by the Security-Driven Transportation Modifications Project do not fall within Areas of Environmental Interest for either the 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 project, the biological assessment concluded that provided appropriate reasonable and prudent alternatives were 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. Because the southwestern willow flycatcher Area of Environmental Interest is more than 2 miles (3.3 kilometers) from the project site, the biological assessment concluded that the proposed project would have no direct, indirect, or cumulative impacts on this species (LANL 2006c). 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).

Cultural Resources

Cultural resource surveys have been conducted within the TAs involved in the Security-Driven Transportation Modifications Project, including those within the Pajarito Corridor West (TA-35, TA-48, TA-50, TA-52, TA-55, TA-63, TA-64, and TA-66), TA-60, and TA-61. Due to the sensitive nature of cultural resource sites, only their general nature and National Register of Historic Places eligibility is discussed below; specific resource locations are not provided.

Pajarito Corridor West – A total of 22 archaeological resource sites have been identified within the Pajarito Corridor West. These sites include rock features, cavates, 1 to 3-room structures, lithic scatters, rock shelters, rock art, rock and wood enclosures, and article and artifact scatters. Of these sites, 1 has been excavated, 11 have been determined to be eligible for listing on the National Register of Historic Places, and 4 are of undetermined eligibility. One National Register of Historic Places-eligible building is located in the Pajarito Corridor West in TA-55.

Technical Area 48 – TA-48 contains 2 cultural resource sites. Neither of these sites is located at or in the vicinity of the proposed parking lot.

Technical Area 63 – TA-63 contains 2 cultural resource sites, one of which is an historic site situated near an area to be disturbed by the proposed parking lot.

Technical Area 55 – TA-55 contains 3 archaeological resource sites. One site is a prehistoric lithic scatter, while the other two sites are historic structures. Only one site is National Register of Historic Places-eligible. There are no buildings or structures located in TA-55 that are eligible for listing on the National Register of Historic Places.

Technical Area 60 – A total of 13 archaeological resource sites have been documented in TA-60. These resources include 1 to 3-room structures, rock features, lithic and ceramic scatters, and historic structures. Eight of these sites are eligible for the National Register of Historic Places, while 6 are of undetermined eligibility. Historic resources include homesteads and sites of an undetermined nature. There are no National Register of Historic Places-eligible buildings or structures located in TA-60.

Technical Area 61 – TA-61 contains 6 archaeological resource sites, 4 of which include a trail and stairs, cavates, and a historic structure. Four of the sites are National Register of Historic Places-eligible, while one is of undetermined status.

In terms of activities that would result in the disturbance of land, the largest projects associated with the Security-Driven Transportation Modifications Project are two parking lots, one in TA-48 and one in TA-63. These would require the disturbance of approximately 11 acres (4.5 hectares) and 19 acres (7.7 hectares), respectively. Additional actions that would disturb land include a new two-lane road along the east edge of TA-63, new auto and pedestrian crossings connecting TA-63 and TA-35, and a new road through the northern edge of TA-35. Other actions associated with this alternative would involve relatively small areas of land, most of which is disturbed or vacant (see Section J.1.3.2).

Implementation of these construction projects would not impact cultural resources within the Pajarito Corridor West. This is the case since no known cultural sites are located within any of the areas to be disturbed. A historic site is situated near an area to be disturbed within TA-63; however, direct impacts would be unlikely. In order to protect the site from indirect impacts, boundaries would be marked and the site fenced, as appropriate. Fencing would prevent accidental intrusion and disturbance of the site.

As noted in the above Visual Resources narrative, the proposed vehicle and pedestrian bridges would be highly visible from both nearby and distant locations. Thus, the potential exists for them to conflict with views of the affected branch of Mortandad Canyon from sites identified by Native American and Hispanic communities as traditional cultural properties. Although the specific locations have not been identified due to their sensitivity, 54 such locations are present on or near LANL (see Chapter 4, Section 4.7.3, of this SWEIS). Prior to construction of the proposed bridges, it would be necessary to consult with these groups so that potential impacts to traditional cultural properties could be taken into account early in the planning process.

Socioeconomics and Infrastructure

Within the proposed project area, 115-kilovolt and 13.2-kilovolt power lines now cross the proposed TA-63 parking area. In addition, there is a 13.2-kilovolt line along the northern portion of the proposed TA-48 parking area and a north-south 115-kilovolt line just west of the existing guard station.

Utility resource requirements to support proposed Security-Driven Transportation Modifications are expected to have a minor impact on site infrastructure. Approximately 3.4 million gallons (13 million liters) of liquid fuels (diesel and gasoline) would be consumed for site work (mainly by heavy equipment), including construction of new structures. Liquid fuels would be procured from offsite sources and therefore would not be limited resources. In addition, it is anticipated that approximately 16.6 million gallons (63 million liters) of water would be needed for construction, mainly for dust suppression and soil compaction. The existing LANL water supply infrastructure would be capable of handling this demand.

Some existing utilities, including water and telecommunications, might be relocated or rerouted. While this would have no long-term effect, it would involve trenching and placement of new lines and the capping and abandonment of existing lines or removal of the lines. Most of the trenching that would impact traffic would occur along Pajarito Road to serve the access-control and shuttle bus transit stations.

Waste Management

Key facilities within TA-35, TA-48, TA-50, and TA-55 produce large quantities of radioactive or chemical wastes that currently must be transported outside the Pajarito Corridor West for disposal. Wastes generated by these facilities are either shipped directly offsite for treatment and disposal or are transferred to the waste management facilities at TA-54 for later shipment offsite or disposal onsite (low-level radioactive waste only). A proposed project could result in the establishment of a transuranic waste management facility within the Pajarito Corridor West (see Appendix H, Section H.3, of this SWEIS).

During construction for the Proposed Project, a relatively small amount of construction-related waste would be generated. Approximately 1,300 cubic yards (990 cubic meters) of construction debris would be generated as a consequence of this option.

Once implemented, this option would impose restrictions, according to the security level, on transportation to and from TA-35, TA-48, TA-50, and TA-55. Wastes generated within these TAs are either shipped directly offsite for treatment and disposal or are transferred to the waste management facilities at TA-54. Because the Pajarito Corridor West would still be available for use by government vehicles and physically inspected service vehicles, the proposed transportation modifications would not have a major impact on waste transport trucks. Some minor delays would occur as vehicles are inspected, and some additional administrative controls might be imposed. The impacts associated with management and transportation of chemical and radioactive wastes in these affected TAs would remain the same as under the No Action Option.

Transportation

Traffic counts were taken in 2004 at specific locations throughout LANL. **Table J–2** presents the traffic counts taken along Pajarito Road at TA-48 and TA-63, approximately at the west terminus of the Proposed Project where traffic controls and a new security access station would be located. **Table J–3** presents the traffic counts taken along Pajarito Road immediately east of TA-63, which would be the eastern end of the proposed Security-Driven Transportation Modifications Project.

Table J–2 2004 Traffic Counts Along Pajarito Road at Technical Area 48 and Technical Area 64

Location	*Average Vehicles per Weekday*	*Average Vehicles per Weekend Day*	*AM Westbound Peak Vehicles per Hour*	*Noon Westbound Peak Vehicles per Hour*	*PM Westbound Peak Vehicles per Hour*
Pajarito Road at TA-48 and TA-64	9,119	942	570	562	440

TA = technical area.
Source: KSL 2004.

Table J–3 2004 Traffic Counts Along Pajarito Road Immediately East of Technical Area 63

Location	*Average Vehicles per Weekday*	*Average Vehicles per Weekend Day*	*AM Eastbound Peak Vehicles per Hour*	*PM Eastbound Peak Vehicles per Hour*
Pajarito Road immediately east of TA-63	5,758	674	859	825

TA = technical area.
Source: KSL 2004.

Because new roads would be constructed around TA-48 and TA-63, the Proposed Project would have some long-term effects on the existing transportation network at LANL. Some portion of the traffic shown on Tables J–2 and J–3 is associated with staff that works in TAs along Pajarito Road. Other traffic is through traffic, for instance people traveling from White Rock to TA-3 or the Los Alamos townsite. Implementation of the proposed project in a manner that restricts private vehicles from this section of Pajarito Road would result in increased traffic on other local roads – most likely the truck route (NM 501) and NM 502. Additional traffic information would be needed to fully assess the impacts that the Security-Driven Transportation Modification would have on local traffic. Project design and sequencing would be used to minimize traffic and infrastructure impacts during construction of the proposed bypass roads, bridge, and related access controls, including delayed response times for emergency vehicles.

Traffic control plans would be implemented to minimize delays and congestion during construction. Nevertheless, those traveling to and from LANL would experience some inconvenience and delays during construction. In the long term, traffic patterns would change for commuter traffic between White Rock and TA-3.

The location and access to total available parking would change following construction, possibly resulting in somewhat more circuitous trips and longer walks to work places. Parking lot shuttles would operate within the proposed access-controlled area, and service would not be disrupted because new parking lot access roads would be constructed.

After completion of the Security-Driven Transportation Modifications, current levels of employment at LANL would remain relatively unchanged. Since employment requirements in support of LANL operations would not change, commuter traffic volumes would not change. However, temporary (during construction) and permanent (after construction) road and lane restrictions could affect traffic flow and volumes throughout the site and affect the roads entering LANL. In addition, as noted in the Project Description, traffic patterns at LANL would permanently change.

J.1.3.3 Auxiliary Action A: Construct a Bridge from Technical Area 35 to Sigma Mesa and a New Road toward Technical Area 3

Land Resources

The bridge would be constructed within a 1,000-foot- (300-meter-) wide corridor across Mortandad Canyon in the vicinity of TA-35 (see Figure J–6). Additionally, a new two-lane road would be built from the north end of the new bridge westward through TA-60 to connect TA-35 with TA-3. According to the *Comprehensive Site Plan 2001*, the corridor across the canyon is designated Potential Infill. The route of the proposed road, which would involve new construction and upgrading of an existing unpaved road, passes through areas designated for Primary and Secondary Development. The proposed route itself is designated for Road Improvement (LANL 2001). Thus, although actions taken under this auxiliary action represent a change in land use along the proposed route between TA-35 and TA-3, they are within the scope of the *Comprehensive Site Plan 2001*.

The two parts of this auxiliary action (that is, bridge and road construction) would have varying impacts on the visual environment at LANL. The roadway through TA-60 would involve some new right-of-way, but would in large part follow an existing unpaved road. Thus, construction of the road would have minimal visual impact. However, the proposed bridge over Mortandad Canyon would represent a highly visible change in the appearance of the local environment and would be in contrast to the forested setting of the canyon. Although careful planning related to site selection and bridge design would help mitigate visual impacts, the bridge would nevertheless alter the natural appearance of the canyon as viewed from both nearby locations and higher elevations to the west.

Geology and Soils

Under Auxiliary Action A, direct impacts on geology and soils would occur from the construction of the bridge and road along the top of Sigma Mesa. Approximately 21,600 cubic yards (16,500 cubic meters) of earth moving would be required under this auxiliary action. The bridge crossing would involve some disturbance of geology and soil resources for approaches and pier foundations on the mesas and possibly in Mortandad Canyon. In addition, the degree of induration and fracturing of the Bandelier Tuff would need to be investigated at the crossing site to determine the actions needed to provide sufficient foundations for the bridge piers. Placement of a construction laydown pad to facilitate construction of the proposed bridge spans would have the potential to impact contaminated sediments within the canyon. Construction of the paved road along the mesa in TA-60 would also result in disturbance of geology and soil resources. As with the Proposed Project, this auxiliary action has the potential of encountering potential release sites, either on mesa tops or in Mortandad Canyon. Prior to commencing any ground disturbance, potentially affected areas would be surveyed to determine the extent and nature of any contamination and required remediation in accordance with LANL procedures.

Because the proposed two-lane paved road along Sigma Mesa would generally follow the alignment of the existing two-lane unpaved road, it is anticipated that impacts on geology and soils would be negligible, as best management practices for soil erosion and sediment control would be employed. After construction, disturbed areas that have not been paved would be revegetated or otherwise stabilized and would not be subject to long-term soil erosion.

Geologic resource consumption would be very small under this auxiliary action and would not be expected to deplete local sources or stockpiles of required materials. Approximately 3,400 cubic yards (2,600 cubic meters) of gravel, 2,000 cubic yards (1,500 cubic meters) of asphalt, and 2,500 cubic yards (1,900 cubic meters) of concrete would be needed during construction. Aggregate resources are readily available from onsite borrow areas and otherwise abundant in the region. Concrete and asphalt would be provided by an offsite supplier.

Once constructed, use of the bridge and roadway would not have any ongoing impact on geologic and soil resources.

Water Resources

Minimal impacts to surface water would occur under Auxiliary Action A. Bridge construction would require a general or individual 404 Permit from the U.S. Army Corps of Engineers and a

New Mexico Environment Department 401 Water Quality Certification for linear transportation projects, as the effluent flows and ephemeral streams in the Mortandad Canyon system are considered "waters of the United States." Impacts to these canyon surface water flows and canyon bottom floodplain would be minimized by the provisions provided in the permit application, which would mitigate impacts to the discharge amounts and water quality of those streams. The additional road construction impacts would be minimized by implementation of the best management practices described in construction storm water pollution prevention plans. These plans meet the requirements of the NPDES Construction General Permit.

Impacts during operation and maintenance of the proposed bridge and road corridor would be minimized by proper maintenance of the bridge, including spill response and cleanup. The Integrated Storm Water Monitoring Program that monitors runoff on a watershed basis would evaluate the effectiveness of these controls.

No adverse affects on groundwater are anticipated from the implementation of this project. Water used during construction is included in the utility requirements for the project. Groundwater quality would not be affected unless the surface water quality controls fail and contaminated surface water infiltrates through the soil to the groundwater.

Air Quality and Noise

Construction of the bridge and roadways associated with this auxiliary action would result in temporary nonradiological air quality impacts from construction equipment, trucks, and worker vehicles. There would also be particulate emissions from wind and equipment disturbance of soil.

Operation under this auxiliary action would result in emissions of criteria and toxic air pollutants from vehicles, including employee vehicles and buses. Since the number of through vehicles is not expected to change as a result of this auxiliary action, the change in emissions is expected to be minimal.

Construction of bridge and roadway associated with this auxiliary action would result in some temporary increase in noise levels from construction equipment and activities. Some disturbance of wildlife near the area could occur as a result of operation of construction equipment. There would be no change in noise impacts to 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 shipment.

Operation of these facilities would result in some change in noise levels along the new bridge and roadway. Some disturbance of wildlife near the area could occur.

Ecological Resources

Construction of the road through TA-60 would have minimal impact on habitat along the right-of-way since it would follow an existing unpaved road for much of its distance. However, short-term impacts to wildlife would likely occur due to increased noise and human presence. This could result in animals avoiding the construction area; however, following construction most animals would likely return. Ensuring that all equipment was properly maintained and posting construction zone limits would help mitigate these impacts. No wetlands or aquatic resources would be directly affected by roadway construction, and best management practices would prevent erosion and subsequent sedimentation of any such resources in the canyon bottom.

The new road proposed under this option would pass through undeveloped portions of core and buffer habitat within the Sandia-Mortandad Mexican spotted owl Area of Environmental Interest. Additionally, the bridge to be built over Mortandad Canyon is within the Mexican spotted owl Area of Environmental Interest. A biological assessment prepared by NNSA determined that this option would disturb up to 25.3 acres (10.2 hectares) of undeveloped core habitat and 0.1 acres (0.4 hectares) of undeveloped buffer habitat. Further, construction of the road and bridge would cause temporary increases in light and noise; these impacts would be permanent once the bridge was operational. Although reasonable and prudent alternatives would be implemented (such as moving the bridges as far west as possible, avoiding the use of land bridges, avoiding new roads in the canyon, permanently closing hiking trails, and muting back-up indicators on all trucks and heavy equipment), the biological assessment concluded that this option may affect, and was likely to adversely affect, the Mexican spotted owl (LANL 2006c). The USFWS determined that it could not adequately analyze the affects of the proposed action because the exact location and design of the bridge had not been determined. Instead the agency requested that NNSA submit a request for consultation when plans relating to this option were finalized (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 project site. However, recognizing that the bald eagle forages over all of LANL and that some habitat degradation would be associated with construction, the biological assessment concluded that with appropriate reasonable and prudent alternatives (see Section J.1.3.2), the project may affect, but would not likely to adversely affect, the bald eagle. Because the closest southwestern willow flycatcher Area of Environmental Interest is more than 2.3 miles (3.7 kilometers) from the nearest construction there would be no affect on this species (LANL 2006c). 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).

Piers for the bridge across Mortandad Canyon would be placed to avoid direct impacts on any wetlands present within the canyon. Best management practices would prevent erosion and subsequent sedimentation of any such resources in the canyon bottom.

Cultural Resources

The corridor within which the bridge over Mortandad Canyon would be built does not contain any known cultural resources, thus, it is unlikely that construction of the bridge would have a direct impact on such resources. There are a number of prehistoric sites and one historic site located to the east and west of the proposed bridge corridor. Due to the relative proximity of these resources to the bridge corridor, it may be necessary to conduct further detailed analyses. Additionally, it may be necessary to fence these sites.

As noted in the above Visual Environment narrative, the proposed bridge would be highly visible from both nearby and distant locations. Thus, the potential exists for it to conflict with views of Mortandad Canyon from sites identified by Native American and Hispanic communities as traditional cultural properties. Although specific locations have not been identified due to their sensitivity, 54 such locations are present on or near LANL (see Chapter 4, Section 4.7.3, of this SWEIS). Prior to construction of the proposed bridge, it would be necessary to consult with these groups so that consideration to this potential impact could be taken into account early in the planning process.

Socioeconomics and Infrastructure

Utility resource requirements to support Auxiliary Action A are expected to have a negligible impact on site infrastructure. Approximately 370,000 gallons (1.4 million liters) of liquid fuels (diesel and gasoline) would be consumed for site work, mainly by heavy equipment, including that for the construction of new structures. In addition, it is anticipated that about 2.1 million gallons (7.9 million liters) of water would be needed for construction. Finally, some existing utilities might be relocated or rerouted.

Waste Management

During construction under Auxiliary Action A, a relatively small amount of construction-related waste would be generated. Approximately 160 cubic yards (120 cubic meters) of waste materials would be generated as a consequence of this auxiliary action.

Once implemented, a change in the transport of waste that would otherwise use an open Pajarito Road would occur. It is anticipated that this potential transportation routing impact would be minor.

Transportation

Under Auxiliary Action A, it is anticipated that there would be some long-term effects on the existing transportation network at LANL, because a new bridge would be constructed between TA-35 and TA-60 and a new road on to TA-3. Effects on traffic and infrastructure would be minor. Project design and sequencing would be used to minimize traffic and infrastructure impacts during construction of the proposed bypass roads, bridge, and related access controls, including delayed response times for emergency vehicles.

Traffic control plans would be implemented to minimize delays and congestion during construction. Nevertheless, those traveling to and from LANL would experience some inconvenience and delays during construction. In the long term, traffic patterns would change for commuter traffic between White Rock and TA-3.

The current driving distance from the intersection of Route 4 and Pajarito Road to the intersection of Diamond Drive and East Jemez Road via Pajarito Road is approximately 7.6 miles (approximately 12.2 kilometers). Under Auxiliary Action A, the distance between these two end points would be approximately 8.3 miles (approximately 13.4 kilometers), a minor difference. The driving distance from the intersection of Pajarito Road and Route 4 to the intersection of East Jemez Road and Diamond Drive via Route 501 is approximately 10 miles (approximately 16 kilometers), while the driving distance from the intersection of Pajarito Road and Route 4 to the intersection of East Jemez Road and Diamond Drive via Route 502 is approximately 13 miles (approximately 21 kilometers). While this could result in an increase in vehicle miles traveled, it is anticipated that this would not be a major concern because of the introduction and use of shuttle buses for LANL staff.

After completion of this auxiliary action, current levels of employment at LANL would remain relatively unchanged. Since employment requirements in support of LANL operations would not change, commuter traffic volumes would also not change. However, temporary (during construction) and permanent (after construction) road and lane restrictions could affect traffic flow and volumes throughout the site and affect the roads entering LANL. In addition, as noted in the Project Description, traffic patterns at LANL would permanently change.

J.1.3.4 Auxiliary Action B: Construct a Bridge from Sigma Mesa to Technical Area 61 and a Road to Connect with East Jemez Road

Land Resources

Under Auxiliary Action B, a two-lane bridge would be constructed within a 1,000-foot- (300-meter-) wide corridor across Sandia Canyon (see Figure J–6). Although the terminus of the bridge and the new road to East Jemez Road would be within an area designated as Primary Development in the *Comprehensive Site Plan 2001*, there is no provision in the plan for a corridor for the bridge, as is the case for the bridge over Mortandad Canyon (LANL 2001). Thus, construction of the bridge would represent a departure from the current area development plan.

The two elements of this auxiliary action (that is, bridge and road construction) would have varying impacts on the visual environment at LANL. The roadway through TA-61 would involve a new right-of-way. Thus, construction of the road would alter the generally wooded appearance of the area. The bridge over Sandia Canyon would be constructed within a 1,000-foot- (300-meter-) wide corridor. Its presence would represent a highly visible change in the appearance of the local environment and would be in contrast to the forested setting of the canyon. As is the case for the proposed bridge over Mortandad Canyon, careful planning related to site selection and bridge design would help mitigate visual impacts; nevertheless, the bridge would alter the natural appearance of the canyon as viewed from both nearby locations and higher elevations to the west.

Geology and Soils

Under Auxiliary Action B, the bridge connecting TA-60 with TA-61 would involve some disturbance of geology and soil resources for approaches and pier foundations, and the construction of a paved road connecting the bridge's northern terminus with East Jemez Road would also result in some disturbance. In addition, the degree of induration and fracturing of the Bandelier Tuff would need to be investigated at any proposed canyon crossings where potential bridge foundations would be located.

Since the area between the northern terminus of the proposed bridge and East Jemez Road has been already disturbed by previous activities, it is anticipated that little or no impacts to geology or soil resources would occur. After construction, disturbed areas that have not been paved would be stabilized and revegetated and would not be subject to long-term soil erosion.

There are numerous potential release sites in the project area. In implementing the proposed auxiliary action, due care would be taken and appropriate procedures would be followed in order to ensure that contaminants are not released or that workers are not exposed to inappropriate contamination levels.

Major disturbance or consumption of geologic resources is not anticipated under Auxiliary Action B. Approximately 6,700 cubic yards (5,200 cubic meters) of earth would be disturbed as a consequence of implementing this auxiliary action; approximately 870 cubic yards (660 cubic meters) of gravel would be needed; approximately 690 cubic yards (530 cubic meters) of asphalt would be required; and 2,500 cubic yards (1,900 cubic meters) of concrete would be needed. Aggregate resources are readily available from onsite borrow areas and otherwise abundant in Los Alamos County. Concrete and asphalt would be supplied by an offsite supplier.

Following the completion of Auxiliary Action B, it is not anticipated that operations would result in additional impacts on geologic and soil resources at LANL.

Water Resources

Minimal impacts to surface water would likely occur during the construction of the Proposed Project under Auxiliary Action B, a road bridge crossing Sandia Canyon north of TA-60. Bridge construction would also require a general or individual 404 Permit from the U.S. Army Corps of Engineers and a New Mexico Environment Department 401 Water Quality Certification, which should specify project provisions that would minimize adverse impacts on the water quality and quantity of the Sandia Canyon ephemeral stream and canyon bottom floodplain. Adverse impacts from constructing the additional roads required for this auxiliary action would be minimized by implementation of the best management practices described in construction storm water pollution prevention plans. These plans meet the requirements of the NPDES Construction General Permit.

Impacts during operation and maintenance of the proposed bridge and road corridor would be minimized by proper maintenance of the bridge, including spill response and cleanup. The Integrated Storm Water Monitoring Program that monitors runoff on a watershed basis would evaluate the effectiveness of these controls.

Groundwater quality would not be affected unless the surface water quality controls fail and contaminated surface water infiltrates through the soil to the groundwater.

Air Quality and Noise

Operations under this auxiliary action would result in emissions of criteria and toxic air pollutants from vehicles, including employee vehicles and buses. Since the number of through vehicles is not expected to change as a result of this auxiliary action, the change in emissions is expected to be minimal.

Construction of the bridge and roadway associated with this auxiliary action would result in some temporary increase in traffic noise levels from construction equipment and activities. Some disturbance of wildlife near the area could occur as a result of the operation of construction equipment. There would be no change in noise impacts to 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 shipment.

Operation of these facilities would result in some change in noise levels near the new bridge and roadway. Some disturbance of wildlife near the area could occur. Under this auxiliary action, some increased traffic noise near the Royal Crest Mobile Home Park could result from increased traffic along East Jemez Road.

Ecological Resources

This auxiliary action involves the construction of a new bridge across Sandia Canyon and a road connecting the bridge with East Jemez Road. Construction of the road would necessitate the clearing and grading of up to 1.3 acres (0.5 hectares) (assuming a 55-foot [16.8-meter] by 1,000-foot [300-meter] construction corridor) of ponderosa pine forest. Additionally, the bridge would result in the loss of ponderosa pine habitat for its approaches and piers. The destruction of ponderosa pine forest would represent a permanent loss of wildlife habitat. Short-term impacts to wildlife from road construction would occur as a result of increased noise and human presence and would likely result in animals avoiding the construction area. However, following construction, most animals would likely return. Ensuring that all equipment was properly maintained and posting construction zone limits would help mitigate these impacts. No wetlands or aquatic resources would be directly affected by roadway construction, and best management practices would prevent erosion and subsequent sedimentation of any such resources in the canyon bottom.

Road and bridge construction would take place within the buffer zone of the Sandia-Mortandad Canyon and Los Alamos Canyon Mexican spotted owl Areas of Environmental Interest. Additionally, they would impact the core zone of the Sandia-Mortandad Canyon Mexican spotted owl Area of Environmental Interest. Construction would directly impact 37.1 acres (15 hectares) of undeveloped core habitat and 28.7 acres (11.6 hectares) of undeveloped buffer habitat. Further, noise and light levels would be permanently increased in undeveloped core habitat. Due to these factors a biological assessment prepared by NNSA determined that even after implementing reasonable and prudent alternatives (see Section J.1.3.3), this option may affect, and would likely adversely affect, the Mexican spotted owl (LANL 2006c). As is the case for Option A, the USFWS could not adequately analyze the effects of the proposed action because the exact location and design of the bridge had not been determined. The agency requested that NNSA submit a request for consultation when plans relating to this option were finalized (see Chapter 6, Section 6.5.2).

Similar to Option A, the biological assessment determined that with appropriate reasonable and prudent alternatives (see Section J.1.3.2), the project may affect, but would not likely to adversely affect, the bald eagle. Further, because the closest southwestern willow flycatcher Area of Environmental Interest is more than 2.3 miles (3.7 kilometers) from the nearest construction there would be no effect on this species (LANL 2006c). 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).

Cultural Resources

The proposed bridge would be highly visible from both nearby and distant locations. Thus, the potential exists for it to conflict with views of Sandia Canyon from sites identified by Native American and Hispanic communities as traditional cultural properties. As noted for the bridge over Mortandad Canyon, prior to construction, it would be necessary to consult with Native American and Hispanic groups so that potential impacts to traditional cultural properties could be taken into account early in the planning process.

Socioeconomics and Infrastructure

Infrastructure effects would primarily occur during construction of the proposed auxiliary action. Several existing utilities, including water and telecommunications, might be relocated or rerouted. While this would have no long-term effect, it would involve trenching and placement of new lines and the capping and abandonment of existing lines or removal of the lines.

Infrastructure effects would primarily occur during construction of the proposed auxiliary action. Approximately 217,000 gallons (821,000 liters) of fuel (diesel and gasoline) would be consumed for site work (including that for the construction of structures). In addition, it is anticipated that about 1.3 million gallons (4.9 million liters) of water would be needed for construction. Finally, some existing utilities might be relocated or rerouted.

Waste Management

During construction under Auxiliary Action B, a relatively small amount of construction-related waste would be generated. Approximately 110 cubic yards (84 cubic meters) of waste materials would be generated as a consequence of this action.

Once implemented, there would be a change in the transportation of waste that would otherwise use an open Pajarito Road. It is anticipated that this potential transportation routing impact would be minor.

Transportation

Traffic control plans would be implemented to minimize delays and congestion during construction. Nevertheless, those traveling to and from LANL would experience some inconvenience and delays during construction. In the long term, traffic patterns would change for commuter traffic between White Rock and TA-3, in that an additional option would be provided for traveling between these two points.

The current driving distance from the intersection of Route 4 and Pajarito Road to the intersection of Diamond Drive and East Jemez Road via Pajarito Road is approximately 7.6 miles (approximately 12.2 kilometers). Under Auxiliary Action B, the distance between these two end points would be approximately 8.5 miles (13.7 kilometers). The driving distance from the intersection of Pajarito Road and Route 4 to the intersection of East Jemez Road and Diamond Drive via Route 501 is approximately 10 miles (16 kilometers), while the driving distance from the intersection of Pajarito Road and Route 4 to the intersection of East Jemez Road and Diamond Drive via Route 502 is approximately 13 miles (21 kilometers). While this could result in an increase in vehicle miles traveled, it is anticipated that this would not be significant because of the introduction and use of shuttle buses for LANL staff.

Temporary (during construction) and permanent (after construction) road and lane restrictions could affect traffic flow and volumes throughout the site and affect the roads entering LANL. In addition, as noted in the project description, traffic patterns at LANL would permanently change.

J.2 Metropolis Center Increase in Levels of Operation Impacts Assessment

This section presents an assessment of potential impacts for expanding the computer operating capabilities within the existing Metropolis Center in TA-3 at LANL. NNSA plans to operate the Metropolis Center at a higher level than was analyzed in the *SCC EA*. Section J.2.1 presents the purpose and need for the expansion project and a description of the Metropolis Center. Section J.2.2 presents a description of the Proposed Project of expanding the computer operating capacity of the Metropolis Center, and the No Action Option of operating the Metropolis Center using its existing computing platform. Section J.2.3 provides an overview of the unique characteristics of TA-3 and LANL that could be affected by the expansion, as well as an assessment of impacts from the Proposed Project and the No Action Option. Chapter 4 of this SWEIS presents a description of the affected environment at LANL and TA-3. Any unique characteristics of TA-3 and LANL not covered in Chapter 4 that would be affected by the expansion of operations at the Metropolis Center are presented here.

J.2.1 Introduction, Purpose, and Need for Agency Action

The Metropolis Center (formerly called the Strategic Computing Complex, or SCC) is a 303,000-square-foot (28,179–square-meter) structure built at LANL in 2002 to house "Q," one of the world's largest and most advanced computers. The Metropolis Center is an integrated part of NNSA's tri-lab (LANL, Lawrence Livermore National Laboratory, and Sandia National Laboratories) mission to maintain, monitor, and assure the performance of the nation's nuclear weapons through the Advanced Simulation and Computing Program. LANL's Advanced Simulation and Computing Program supercomputers, such as the "Q" machine, run three-dimensional codes that simulate the physics of a nuclear detonation. These supercomputers allow researchers to integrate past weapons test data, materials studies, and current experiments in simulations of unprecedented size (LANL 2004a, 2006d).

Background

In 1998, the *SCC EA* was completed for the construction and operation of the facility now referred to as the Metropolis Center. The *SCC EA* considered the potential impacts associated with constructing and operating this facility with an initial computing capacity of 30 to 50 teraflops (DOE 1998a). Based on that analysis, DOE announced in its Finding of No Significant Impact (FONSI) that constructing and operating the proposed facility at up to 50 teraflops would not result in significant environmental impacts as defined by NEPA (DOE 1998b).

As stated in the *SCC EA*, DOE's long-term goal was to develop a computer system capable of performing 100 teraflops. By developing technologies to interconnect tens of thousands of advanced commodity processors, DOE planned to initially provide a collective computing power of at least 30 teraflops, with the 50- and 100-teraflops levels being short-term and long-term goals, respectively. As all of the computer hardware and software would be newly created, DOE's long-term goal of greater computational capability would, by necessity, need to be achieved through a series of technologically path-breaking hardware "platforms" at each of the three nuclear weapons laboratories, developed and employed in a phased-evolution approach (DOE 1998a). As such, the Metropolis Center facility infrastructure was designed to be scalable so that as the projected computing requirements of the Metropolis Center increased, mechanical and electrical equipment could be added in increments without expanding the building. The most recent of these planned incremental platforms is the "Roadrunner", which would provide almost four times the computational power as the Q machine but require only half the floor space (LANL 2006d).

At the time the *SCC EA* was issued in 1998, DOE had not yet made the programmatic decision to pursue levels of operation beyond those then associated with 50 teraflops. However, with the Metropolis Center presently operating near that 50-teraflops level, NNSA is now proposing expanding the existing platform to attain the increased operating capabilities necessary to meet the long-term goals for the Metropolis Center.

Purpose and Need

NNSA's Stockpile Stewardship and Management Program provides an integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. As an alternative to underground testing, and due to the aging of nuclear weapons beyond original expectations, NNSA must maintain a means to verify the transportation, safe storage, and reliability of nuclear weapons. Without underground nuclear weapons testing, computer simulations that can perform highly complex three-dimensional large-scale calculations have become the only means of integrating the complex processes that occur in the life span of a nuclear weapon. In order to best fulfill its prime stewardship mission to ensure the safety, reliability, and performance of the nation's nuclear weapons stockpile, NNSA needs to increase its existing computer system capability. At LANL's Metropolis Center, a capability of at least 100 teraflops is essential for effectively running these high-fidelity, full system weapon simulations. It is estimated that in the future, an operating level of approximately 1,000 teraflops (1 petaflops) might be requested.

J.2.2 Options Descriptions

J.2.2.1 No Action Option: Continue Metropolis Center Operations Using the Existing Computing Platform

Under the No Action Option, the existing computing center would continue to be operated at up to approximately the 50-teraflops level analyzed in the *SCC EA*. Computing capacity would not be expanded beyond that level, and NNSA would not attain the long-term goal of at least 100 teraflops functional capability that was identified in the *SCC EA* (DOE 1998a).

J.2.2.2 Proposed Project: Modify and Operate the Metropolis Center at an Expanded Computing Platform

Under the Proposed Project, NNSA would expand the computing capabilities of the Metropolis Center at TA-3 to support, at a minimum, a 100-teraflops capability, and approximately 1,000 teraflops (1 petaflops) eventually expected. This action would consist of the addition of mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units. Because the scope of the *SCC EA* analysis already considered the potential impacts of constructing a building to house equipment for upwards of a 50-teraflops computing capability at LANL, these new proposed enhancements would be added without a need to expand the external dimensions of the building or disturb additional land. These modifications would not result in any changes to the present number of employees operating the center or increase operating hazards (LANL 2006d).

J.2.3 Affected Environment and Environmental Consequences

The Metropolis Center is located in TA-3, which is situated in the west-central portion of LANL and is separated from the Los Alamos townsite by Los Alamos Canyon. It is the main entry point to LANL, and most of the administrative and public access activities are located within its approximately 357 acres (144 hectares). TA-3 is heavily developed and contains numerous buildings located on the top of a mesa between the upper reaches of Sandia and Mortandad Canyons.

The *SCC EA* and FONSI identified potential environmental concerns associated with projected water and electrical requirements. Because the proposed expansion of computing capacity at the existing Metropolis Center (up to a 15-megawatt platform) is expected to only affect water and electrical requirements, this analysis focuses on the affected environment and subsequent potential impacts to these infrastructure resources. The proposed expansion in operations would not physically disturb the building site or environs, result in additional emissions or waste, nor result in changes to the Metropolis Center or regional workforce. Therefore, the following resource areas would not be affected by the Proposed Project and are not part of this impact assessment: land resources, geology and soils, air quality and noise, ecological resources, human health, cultural resources, socioeconomics, transportation, waste management, and environmental justice.

J.2.3.1 No Action Option

Under the No Action Option, NNSA would operate the Metropolis Center only up to the 50-teraflops level analyzed in the *SCC EA*. **Table J–4** summarizes the operational requirements associated with the existing and proposed operating platforms compared with those originally forecast in the *SCC EA*, and current available utility infrastructure capacity.

As shown in Table J–4, the *SCC EA* conservatively estimated water usage of 63 million gallons (239 million liters) per year and an electric load demand of 7.1 megawatts for operating a 50 teraflops platform. Due to continued computer design efficiencies, actual requirements to date have been considerably less. Current water usage for operating the Metropolis Center is about 19 million gallons (72 million liters) per year and an electric load demand is about 5 megawatts (LANL 2006d).

Although the *SCC EA* and associated FONSI indicated that operating the Metropolis Center at up to 50 teraflops would result in no significant environmental impacts, NNSA acknowledged potential environmental concerns associated with facility water and electrical requirements. To address these concerns, the *SCC EA* indicated that: (1) cooling water for the facility would come from the Sanitary Effluent Recycling Facility, which polishes treated effluent from the Sanitary Wastewater Systems Plant; and (2) electric power constraints, common to all parts of Northern New Mexico, would need to be dealt with through mutual LANL and Los Alamos County Power Pool "shedding procedures" to balance the peak demand with load capabilities. Because the Sanitary Effluent Recycling Facility, which has been proposed to supply the Metropolis Center with its cooling water needs, has not been able to effectively meet the Metropolis Center's water requirements, much of this water has been supplied through groundwater. However, recently planned improvements to the Sanitary Effluent Recycling Facility have lead to a greater expectation that Metropolis Center cooling water needs shall increasingly use the recycled effluent and that reliance on groundwater shall diminish substantially.

Table J–4 Metropolis Center Operating Requirements

	Platform Analyzed in SCC EA (No Action) [a]	***Existing 5-Megawatt Platform*** [b]	***Expanded 15-Megawatt Platform (Proposed Project)*** [b]	***Total System Demand (2005)*** [c]	***System Capacity (2005)*** [c]
Water (million gallons per year)	63.1	19	51	1,393 (359)	1,806
Electricity					
Energy (megawatt-hours per year)	62,196 [d]	43,800 [e]	131,400 [e]	550,870 (421,413)	1,138,800 [f]
Peak Load (megawatts)	8.5 [g]	6 [g]	18 [g]	87.8 (69.5)	130 [f]
Workers	300	350	350	Not applicable	Not applicable

[a] DOE 1998a.
[b] LANL 2006d.
[c] Chapter 4, Section 4.8.2, of this SWEIS. Usage values and capacities reflect that of the utility systems that include LANL and other Los Alamos County users. Total usage is provided first, with LANL's usage in parenthesis.
[d] *SCC EA* projected 7.1 megawatt total load demand × estimated 8,760 hours per year.
[e] Megawatt load demand × estimated 8,760 hours per year.
[f] The system capacity of the Los Alamos Power Pool increased by 20 megawatts (equivalent to 175,200 megawatt-hours per year) in September 2007 with the installation of a new gas turbine generator at the TA-3 Co-Generation Complex.
[g] Megawatt load demand × estimated 1.2 peak loading factor.
Note: To convert gallons to liters, multiply by 3.7853.

J.2.3.2 Proposed Project: Modify and Operate the Metropolis Center at an Expanded Computing Platform

Water

The Los Alamos water supply system consists of 14 deep wells, 153 miles (246 kilometers) of main distribution lines, pump stations, and storage tanks. The system supplies potable water to all of Los Alamos County, LANL, and Bandelier National Monument. In September 2001, DOE completed the transfer of ownership of the water production system to Los Alamos County, along with 70 percent of its water rights (1,264 million gallons [4,785 million liters] per year). DOE has leased the remaining 30 percent of the water rights (542 million gallons [2,050 million liters] per year) to the county for 10 years, with the option to renew the lease for four additional 10-year terms (DOE 2003, LANL 2006b). In fiscal year 2005, LANL used approximately 359 million gallons (1,360 million liters) of water, of which 19 million gallons (72 million liters) were attributable to the Metropolis Center (LANL 2006b, 2006d). Los Alamos system and LANL site water use and capacity are compared to the Proposed Project and alternatives as presented in Table J–4.

Under the Proposed Project, NNSA would expand the computing capabilities of the Metropolis Center at TA-3. As shown in Table J–4, expanding to a 15-megawatt maximum operating platform is expected to potentially increase current water usage to 51 million gallons (193 million liters) per year. This higher usage would include the additional water lost to cooling tower evaporation and blowdown. Until the Sanitary Effluent Recycling Facility becomes more effective in supplying the Metropolis Center, most of this cooling water would be supplied through groundwater. Nonetheless, this water need would not exceed available system capacities.

During the operating timeframe evaluated in this SWEIS, continued enhancements to the Metropolis Center could theoretically be approximately 1,000 teraflops (1 petaflops) (LANL 2006d). Because each new generation of computing capability machinery continues to be designed with increased computational speed and more efficient cooling systems, it is anticipated that the net cooling water requirements for the Metropolis Center would not increase beyond 51 million gallons (193 million liters). Should use of the Sanitary Effluent Recycling Facility increase as planned, Metropolis Center groundwater requirements could eventually be reduced to zero (LANL 2006d).

Electricity

Electrical service to LANL is supplied through a cooperative arrangement with Los Alamos County, known as the Los Alamos Power Pool, established in 1985. Within LANL, the Contractor also operates a gas-fired steam and electrical power generating plant at TA-3 (TA-3 Co-Generation Complex), and maintains various low-voltage transformers at LANL facilities and approximately 34 miles (55 kilometers) of 13.8-kilovolt distribution lines. Onsite electrical generating capability for the Power Pool is limited by the TA-3 Co-Generation Complex, which is capable of producing up to 20 megawatts of electric power that is shared by the Power Pool under contractual arrangement. A new generator producing an additional 20 megawatts of electric power became operational in September 2007. Generally, onsite electricity production is used to fill the difference between peak loads and the electric power import capability (LANL 2004b, 2006a, 2006d).

As shown in Table J–4, electric power availability from the Power Pool is estimated at 1,138,800 megawatt-hours (reflecting the lower thermal rating of 110 megawatts for 8,760 hours per year on the existing transmission system plus 20 megawatts from the TA-3 Co-Generation Complex). In fiscal year 2005, LANL and other Los Alamos County users combined for a Power Pool total electric energy consumption of 550,870 megawatt-hours of electricity. The fiscal year 2005 peak load usage was about 69.5 megawatts for LANL and about 18.3 megawatts for the rest of the county (LANL 2006a).

Under the Proposed Project, NNSA would expand the computing capabilities of the Metropolis Center at TA-3 to support a 100-teraflops capability. This action would consist of the installation of additional mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units. As shown in Table J–4, increasing to a 15-megawatt maximum operating platform is expected to potentially increase current peak electricity consumption to 18 megawatts per year. Nonetheless, this would not exceed available system capacities.

During the operating timeframe evaluated in this SWEIS, continued enhancements to the Metropolis Center could theoretically be approximately 1,000 teraflops (1 petaflops) (LANL 2006d). However, even though the computational capabilities of these computer systems are projected to increase substantially, their power and cooling requirements would not. Because each new generation of computing capability machinery continues to be designed with increased computational speed and enhanced efficiency in electrical requirements, it is anticipated that average electrical requirements associated with such expansion would not exceed 15 megawatts. As newer computing components are installed, older, less efficient components would be retired; therefore, the number of teraflops should increase significantly while the amount of required electrical power stabilizes at less than 15 megawatts (LANL 2006d).

J.3 Increase in the Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project Impacts Assessment

NNSA proposes to modify the Off-Site Source Recovery Project to recover and store sealed sources[2] having a wider range of isotopes than that analyzed in previous NEPA analyses. The Off-Site Source Recovery Project has the responsibility to identify, recover, and store excess and unwanted sealed sources in cooperation with NRC. In 2004, the mission of the Off-Site Source Recovery Project was expanded. This section analyzes the impacts of receipt and storage of additional sealed sources at LANL. The analysis of environmental consequences relies on the affected environment descriptions in Chapter 4 of the SWEIS. Where information specific to the Off-Site Source Recovery Project is available and adds to the understanding of the affected environment, it is included here. Section J.3.1 provides background information on the Off-Site Source Recovery Project. Section J.3.2 provides a description of the Proposed Project and the No Action Option. Section J.3.3 provides a brief description of the affected environment and presents an impact assessment of the No Action Option and the Proposed Project.

J.3.1 Introduction, Purpose, and Need for Agency Action

From 1979 through 1999, DOE recovered excess and unwanted radioactive sealed sources containing plutonium-239 and beryllium, and other actinides on a case-by-case basis as requested by NRC. Since 1999, the Off-Site Source Recovery Project has successfully managed actinide-

[2] Sealed radioactive source means a radioactive source manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. The sealed radioactive source consists of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layers of nonradioactive material, or firmly fixed to a nonradioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material (10 CFR Part 835). Sealed sources are typically small.

bearing sealed sources, and in 2004 accepted some non-actinide sources. In 2004, following the transfer of management of the project to NNSA as part of the U.S. Radiological Threat Reduction Program, the previous mission of the Off-Site Source Recovery Project was expanded (DOE 2004b). The original scope of the Off-Site Source Recovery Project was to accept sealed sources containing actinide isotopes that exceeded Class C concentrations for these isotopes as listed in the NRC regulation, Title 10 *Code of Federal Regulations* (CFR) Part 61. The expanded scope would include acceptance of sealed sources containing these actinide isotopes in all concentrations (particularly transuranic isotopes), sealed sources containing other isotopes (in any concentration) for which Class C concentration limits are established in 10 CFR Part 61 (particularly strontium-90 and cesium-137), and sealed sources containing cobalt-60, iridium-192, radium-226, and californium-252.

In response to this change, the Off-Site Source Recovery Project began to develop a global inventory and to prepare for the management of a wider range of sealed sources. The Off-Site Source Recovery Project would continue to use commercial or other Federal organizations and facilities where appropriate, and LANL facilities would be used when these organizations and facilities were not appropriate to fulfill the national security mission of the Off-Site Source Recovery Project.

Background

Since the passage of the Atomic Energy Act of 1954, qualified public and private organizations have been licensed to possess and use nuclear materials for a wide variety of applications. These radioactive materials are typically placed within multiple stainless steel jackets and welded closed, or constructed in other ways to meet the NRC definition of a sealed source. During this period of radioactive source manufacture and use, future disposal mechanisms were not defined. Unwanted and excess sealed sources present a public health and safety risk when abandoned, lost, or disposed of inappropriately.

Since 1979, DOE has recovered excess and unwanted radioactive sealed sources containing plutonium-239 and beryllium, and other actinides. Additional sealed sources were recovered from the commercial sector on a case-by-case basis as requested by NRC. These actinide-containing sealed sources were recovered by DOE when there were no other options for their disposition such as reuse or disposal. There was no disposal capacity for commercial waste containing radionuclides in concentrations exceeding Class C limits as defined in 10 CFR Part 61.[3] This waste is commonly called Greater-Than-Class C waste. Commercial sealed sources considered waste may be determined to be Greater-Than-Class C waste due to the quantity of radioactive material and their small physical size. Similarly, there were sealed sources and wastes in the Federal sector that also lacked disposal capacity because of similar

[3] NRC regulations establish a classification system for disposal of commercially-generated low-level radioactive waste. Classification is determined by the concentrations in waste of a small number of specific isotopes. Waste containing the isotopes listed in 10 CFR 61.55 and in concentrations exceeding their Class C limits must be disposed of using technologies having greater confinement capacity or protection than "normal" near-surface disposal (47 FR 57446). This waste is commonly called Greater-Than-Class C waste. In 10 CFR 61.55, Class C limits are established for these isotopes that are commonly found in sealed sources: alpha-emitting transuranic isotopes having half-lives exceeding five years; strontium-90; and cesium-137. Class C limits are also established for these isotopes that are not commonly found in sealed sources: carbon-14, nickel-59, nickel-63, niobium-94, technetium-99, iodine-129, plutonium-241, and curium-242.

DOE restrictions on disposal of actinide (particularly transuranic) isotopes.[4] Therefore, the general criterion for DOE acceptance of these actinide sources was that, if considered as waste, their actinide concentrations would exceed the 10 CFR Part 61 Class C limits for these radionuclides.[5]

Recognizing the public danger posed by excess and unwanted radioactive sealed sources, the Congress addressed their disposition in the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240). This Act assigned the Federal government the responsibility for disposal of commercial low-level radioactive waste containing radionuclides in concentrations exceeding Class C limits as defined in 10 CFR Part 61. This Act also assigned the Federal government the responsibility for disposal of any other low-level radioactive waste owned or generated by DOE, by the U.S. Navy resulting from decommissioning naval vessels, or by the Federal government resulting from research, development, testing, or production of any atomic weapon.

In the early 1990s, DOE had encountered increased costs and inefficiencies associated with the mechanics of case-by-case-type response to NRC requests for the recovery and management of sealed sources. At LANL, these sealed sources were opened, their radioactive contents chemically separated, and the radioactive products and wastes stored separately. Facing the potential recovery of several thousands of these sealed sources, a different approach to recovery and management was required. Consequently, in 1995, DOE chose a management strategy that would continue and enhance the process of chemically separating the radioactive components from certain recovered sources. This nuclear material would be stored for future reuse, and the waste generated from the separation process would be disposed of or stored if a disposal facility was not available. This strategy, identified as the Radioactive Sources Recovery Program, and its environmental effects, were evaluated in DOE's *Environmental Assessment for the Radioactive Source Recovery Program* (DOE 1995) issued December 20, 1995. As of 1999, approximately 1,100 neutron-generating and other sealed sources had been recovered from regulated licensees, DOE sites, and other government agencies and sent to LANL.

An expanded Radioactive Sources Recovery Program was subsequently incorporated into the *1999 SWEIS* (DOE 1999) and the attendant environmental effects assessed. The *1999 SWEIS* Expanded Operations Alternative reflects the activities described for the Radioactive Sources Recovery Program (receiving and storing sealed sources; separating certain radioisotopes such as plutonium-238, plutonium-239, and americium-241; and storing and disposing of radioactive material and waste) at higher rates or greater volumes than analyzed previously in the 1995 environmental assessment. The projected sealed source material chemical separation rate identified in the *1999 SWEIS* was 10,000 curies per year for the 10-year period of analysis (or 100,000 curies total for 10 years). These rates and the resultant process wastes were included in

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[4] *These wastes are termed transuranic wastes by DOE. The criterion for transuranic waste determination is comparable to the Part 61 Class C limit for transuranic isotopes.*

[5] *In this appendix, the term "actinide source" is used for sealed sources containing actinide isotopes in quantities that could exceed Class C concentrations if disposed of as waste. Actinide sources may exceed Class C concentrations even if the quantity of radioactive material is small. For example, assuming a waste density of 2 grams per cubic centimeter, a 55-gallon (0.21-cubic meter) drum of waste could exceed the Class C concentration limit if it contained more than 0.42 curies of transuranic activity. Nonetheless, numerous sealed sources are in authorized circulation that do not contain sufficient quantities of actinide isotopes to exceed Class C concentration limits.*

the impacts analysis for the Chemistry and Metallurgy Research Building, the Plutonium Facility Complex, and Area G at TA-54.

In its 2000 *Supplement Analysis to the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0238-SA-01), NNSA decided that rather than chemically separating certain radioactive materials from the recovered sources, storing this separated nuclear material, and transferring the resulting process waste material to the Waste Isolation Pilot Plant (WIPP), NNSA would package sealed sources in multi-functional shielded containers (at the origination point or consolidated at a licensed commercial facility under contract to DOE) and ship them directly to LANL for storage (DOE 2000). Except for those containers of defense-related sealed sources that would be eligible for shipment to WIPP as transuranic waste,[6] this waste would be managed pursuant to the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240).

In response to the events of September 11, 2001, NRC conducted a risk-based evaluation of potential vulnerabilities to terrorist threats involving NRC-licensed nuclear facilities and materials. The NRC concluded that possession of unwanted radioactive sealed sources with no disposal path presents a potential vulnerability.

In 2004, NNSA proposed to recover six strontium-90 radioisotope thermoelectric generators[7] from the commercial sector and to place them in storage at TA-54, Area G, pending future disposal when an appropriate disposal site becomes available. The radioisotope thermoelectric generators contained sealed sources that were different from the actinide-bearing sealed sources previously evaluated through the NEPA compliance process for storage at LANL. The proposed action would result in a small amount of low-level radioactive waste being stored at TA-54 for an indeterminate period of time. After preparation of the *Supplement Analysis to the Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory in the State of* New *Mexico, Recovery and Storage of Strontium-90 (Sr-90) Fueled Radioisotope Thermal Electric Generators at Los Alamos National Laboratory* (DOE/EIS-0238-SA-04), (DOE 2004a), NNSA concluded that this amount of low-level radioactive waste was not projected to exceed the *1999 SWEIS* projections for low-level radioactive waste generation and disposal; four of the strontium-90 radioisotope thermoelectric generators were recovered and stored at LANL's Area G in March 2004. Two additional strontium-90 radioisotope thermoelectric generators were subsequently recovered in 2005.

In March 2004, the mission of the Off-Site Source Recovery Project was expanded as part of NNSA's Radiological Threat Reduction Program. The Project was expanded from recovery of

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[6] *Transuranic waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half lives greater than 20 years, except for: (1) high-level radioactive waste; (2) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the EPA, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations; of (3) waste that the NRC has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61 (DOE 435.1).*

[7] *A radioisotope thermoelectric generator is a source of self-contained power for various independent types of equipment with a steady voltage ranging typically 7 to 30 volts or less and the power capacity of a few watts up to 80 watts. Radioisotope thermoelectric generators are used in conjunction with various electrotechnical devices that accumulate and transform the electric energy produced by the generators. Common applications for radioisotope thermoelectric generators include uses as power sources for navigation beacons and seamarks, or other low wattage devices employed in remote locations without reliable sources of electrical energy.*

sources containing actinide isotopes in quantities that would exceed Class C concentration limits, if determined to be waste, to sources containing these isotopes in all quantities, plus sealed sources containing any quantity of certain other isotopes for which Class C concentration limits are specified. The Off-Site Source Recovery Project was additionally expanded to receive sealed sources containing isotopes of cobalt-60, iridium-192, radium-226, and californium-252 for which Class C concentration limits are not specified in NRC regulations (DOE 2004b). Thus, the question of whether the sealed sources would contain isotopes exceeding Class C concentration limits is not a constraining factor for the recovery of sources; national security is the primary driving factor for determining the need for recovery of sealed sources containing these isotopes.

A number of the sources that have been delivered to LANL have been determined to result from defense activities and are being shipped to WIPP for disposal. It is expected that many of the other sources stored at LANL will also be determined to be eligible for WIPP disposal. The remaining sources will be dispositioned by other means, such as disposal as Greater-Than-Class C waste pursuant to Public Law 99-240. On July 23, 2007, DOE issued a Notice of Intent (NOI) to prepare an *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste* (72 FR 40135). DOE intends that this environmental impact statement (EIS) would support selection of new or existing disposal locations, facilities, and methods for disposal of commercial Greater-Than-Class C waste and DOE waste having similar characteristics. The EIS will include a forecast of sources that would be considered Greater-Than-Class C wastes if disposed of. The forecast will include an estimate of the sources eligible for such disposal and managed by the Off-Site Source Recovery Project, based on the Off-Site Source Recovery Project recovery rate.

Purpose and Need

The NRC has determined that possession of unwanted sealed sources with no disposal path presents a potential vulnerability. Historically, LANL's Off-Site Source Recovery Project and predecessor projects have received actinide sources for recycling or for storage until a disposal method was determined. Six strontium-90 radioisotope thermoelectric generators were received and stored as waste. The Off-Site Source Recovery Project has now been tasked with managing additional numbers and types of sealed sources. The Off-Site Source Recovery Project would use commercial or other Federal organizations and facilities where appropriate, and LANL facilities when management by these organizations and facilities was not appropriate to fulfill its national security mission.

J.3.2 Options Descriptions

J.3.2.1 No Action Option

Under the No Action Option, LANL would continue to receive and store actinide sources at the previous rate. Actinide sources are packaged offsite at the origination point or consolidated at a licensed commercial facility under contract to DOE and shipped to LANL in compliance with U.S. Department of Transportation (DOT) regulations (49 CFR Part 71). Shipping containers are received at the LANL Supply Chain Management receiving warehouse, SM-30. The containers are then transported by truck over LANL roads to TA-54 or TA-55 for storage; because they are packaged to DOT specifications, road closures are not required. If materials in a container require additional handling, or are to be used by the Off-Site Source Recovery Project for specific purposes such as dose rate studies, use as calibration sources, or other needs, the containers are trans-shipped to Wing 9 of the Chemistry and Metallurgy Research Building.

Actinide sources that DOE determines were generated as part of defense activities are eligible for disposal at WIPP as transuranic waste. The Off-Site Source Recovery Project also expects to continue to receive a certain number of actinide sources that are not designated defense waste and are not eligible for disposal at WIPP. As NNSA further documents the origin and history of these actinide sources, some of them may meet the criteria for acceptance at WIPP, and others will be managed pursuant to Public Law 99-240 (see Section J.3.3.1).

As of February 2008, the Off-Site Source Recovery Project had managed about 16,750 sources, of which about 15,300 (91 percent) had been delivered to LANL for safe storage, and the remaining 9 percent had been managed by other means such as reuse or disposal by commercial entities. Of the sources that had been delivered to LANL by this date, about 3,500 were sent off site for disposition, mainly to WIPP. The remaining sources will be sent to WIPP if determined to be eligible for WIPP disposal, disposed of as Greater-Than-Class C waste, or managed by other means such as reuse. It the future, NNSA expects to manage about 2,000 actinide sources per year, most of which would be temporarily stored at LANL pending disposal at WIPP, disposal as Greater-Than-Class C waste, or disposition by other means (LANL 2006d). NNSA expects to begin to phase out or greatly downsize the Off-Site Source Recovery Project as Greater-Than-Class C disposal capacity becomes available, which is not expected before 2015.

J.3.2.2 Proposed Project: Increase in the Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project

Under the Proposed Project, the contractor would be prepared to receive additional sealed sources at LANL in addition to the actinide sources that are currently received by the Off-Site Source Recovery Project. **Table J–5** gives the additional sealed sources registered as of August 2005. As noted above, the Off-Site Source Recovery Project would use LANL facilities when management by commercial or other Federal entities was not appropriate to fulfill its national security mission. Many of the sources identified in Table J–5 may never require storage at LANL but would be transferred directly after recovery by the Off-Site Source Recovery Project to a disposal or other appropriate facility for disposition.

Table J–5 Additional Sources Registered with the Off-Site Source Recovery Project – Newly Eligible Materials

Nuclide	*Number of Sources*	*Curie Content*
Cobalt-60	354	419,919
Strontium-90	55	3,795,456
Cesium-137	419	9,366
Radium-226	22	5.6
Curium-244	80	135
Californium-252	24	0.1

Sources: LANL 2004d, 2006d.

Management of sealed sources containing additional radionuclides, if directed to LANL, would follow the same approach used for the actinide sources currently under management at LANL. Prior to source packaging and movement to LANL, the Off-Site Source Recovery Project staff would ensure that management at commercial or other Federal locations was not appropriate and would obtain concurrence from NNSA. In addition, existing planning processes would be employed to ensure all prerequisite activities were completed, including:

- Verification that sources meet eligibility requirements for recovery;
- Verification that no recycle or reuse potential exists that would eliminate the necessity for movement of materials to LANL for management;
- Identification that handling and storage facilities exist at LANL for materials to be recovered; and
- Verification that source recovery and management at LANL meet the compliance and authorization envelope of the site.

Upon receipt at LANL, the sealed sources would be managed to minimize impacts on existing and planned NNSA operations within the facilities used to support sealed source management. Shipping containers would be received at the LANL Supply Chain Management receiving warehouse, SM-30, or its replacement. At SM-30, the sealed sources would be subject to standard receiving requirements that include activities such as inspection for damage, radiological survey and, in some cases, verification measurements for special nuclear materials.

Sealed sources that need special handling would be transported to Wing 9 of the Chemistry and Metallurgy Research Building and either stored in DOT-compliant shipping containers or removed from packages for storage in the floor holes. These sealed sources may be moved to the Radiological Sciences Institute at TA-48 after closure of the Chemistry and Metallurgy Research Building (see Section G.3). Most of the remaining sources would remain in their original DOT-compliant shipping containers and would be transported to Area G, TA-54. High activity strontium-90 sources and other high activity sealed sources could be stored in a retrievable configuration in shafts. Radium-226, curium-244 and californium-252, if stored at LANL, would more than likely be stored in pipe overpack containers.

The proposed project would expand the Off-Site Source Recovery Project by a little more than 10 percent. The proposed expansion would require the annual management of about 200 to 250 additional sources compared to the No Action Option. As noted above, many of the additional sources may never require storage at LANL but would be transferred directly to a disposal or other appropriate facility for disposition. Sources delivered to LANL would be safely stored until they could be disposed of as low-level radioactive waste (including Greater-Than-Class C waste if appropriate), or dispositioned by other means such as reuse. NNSA expects to begin to phase out or greatly downsize the Off-Site Source Recovery Project as Greater-Than-Class C disposal capacity becomes available, which is not expected before 2015.

J.3.3 Affected Environment and Environmental Consequences

TA-54 is one of the largest TAs at LANL (943 acres [382 hectares]) (LANL 2003). Its primary function is management of radioactive solid and hazardous chemical wastes. The TA's 3-mile (4.8-kilometer) northern border forms the boundary between LANL and the Pueblo of San Ildefonso, and its southeastern boundary borders the White Rock community in Los Alamos County. Within TA-54, Area G covers approximately 63 acres (25 hectares) at the east end of LANL (LANL 2005). The SM-30 warehouse at TA-3 is LANL's main general warehouse; it can store limited quantities of hazardous or radioactive materials. NNSA has proposed to replace SM-30 with a new warehouse (See Appendix G) that would receive all shipments, including sealed sources.

Because the proposed increase in the type and quantity of increased sealed sources accepted for waste management would potentially affect the waste management and human health areas, this analysis focuses on the affected environment and subsequent potential impacts to these resources. An initial assessment of the potential impacts of the proposed project determined that there would be no or only negligible impacts to the following resource areas and that no further analysis was necessary.

- *Land Resources* – Storage would be in an area that is already disturbed. Activities would comply with land use plans.
- *Geology and Soils* – Activities are not expected to change geology, trigger seismic events, or change slope stability.
- *Water Resources* – Discharges to surface water would not be expected. Groundwater contamination would be highly unlikely because of the containment provided for the sealed sources.
- *Air Quality and Noise* – No air emissions are expected from sealed sources. The only noise would be continued ambient noise at existing levels.
- *Ecological Resources* – Storage of sealed sources would be in developed areas that are devoid of biota.
- *Cultural Resources* – Storage would be in developed areas having no identified cultural resources.
- *Socioeconomics and Infrastructure* – No additional full-time equivalent employees would be expected.
- *Environmental Justice* – No disproportionate impacts to minority or low-income populations are expected.

Transportation, waste management, and human health are discussed in more detail in the following section, because, after arriving at LANL, some of these additional sealed sources would be stored at LANL as waste with no current disposal path.

J.3.3.1 No Action Option

Waste Management

In fiscal year 2003, the DOE General Counsel determined that, due to the source of isotopic materials used in the construction of plutonium-239-bearing sealed sources and the continuous ownership of the contained plutonium-239 by DOE, all plutonium-239 sources resulted from defense activities. This determination made this particular class of sources eligible for disposal at WIPP. As of October 31, 2006, 132 drums of plutonium-239 sealed sources had been shipped to WIPP, and it is expected that remaining plutonium-239 sources will continue to be shipped. This is part of the waste management analysis in the SWEIS.

Table J–6 lists typical types of actinide sources, other than plutonium-239 sources, that have been received or are expected to be received at LANL under the Off-Site Source Recovery Project. Recently, however, the Off-Site Source Recovery Project received a defense determination for some of these plutonium-238 and americium-241 sources. This determination would allow the shipment of 211 drums of plutonium-238 and americium-241 sealed sources from the TA-54 storage site to WIPP. The transportation analysis in this appendix and Chapter 5 addresses the impacts of the shipment of all plutonium-238 and americium-241 sources to WIPP, should a defense determination be made for the remaining material. In addition, there are four strontium-90 radioisotope thermoelectric generators retrievably stored in a below-ground shaft at Area G in TA-54; two other strontium-90 radioisotope thermoelectric generators are being stored above-ground at Area G. The transportation analysis in this appendix and in Chapter 5 addresses the impacts of shipping the generators to the Nevada Test Site, which is being considered for their disposal.

Table J–6 Typical Types of Actinide Sources to be Received at LANL [a]

Source Type [b]	*Typical Activity (curies/each)*
Americium-241 calibration sources	0.005
Plutonium-238 medical sources	8
Americium-241 medical sources	0.1
Americium-241 Be well logging sources	3
Plutonium-238 Be well logging sources	10
Americium-241 Be general neutron sources	1
Americium-241 Be and Cesium-137 portable gauge sources	0.045/0.01
Americium-241 Be portable gauge sources	0.045
Americium-241 fixed gauges	0.124
Americium-241 XRF sources	0.18

Be = beryllium, XRF = x-ray fluorescence.
[a] Some sources may be eligible for disposal at WIPP. Others would be managed pursuant to Public Law 99-240.
[b] Additional plutonium-239 sources from defense activities that may be received by the Project would be disposed of at WIPP.
Note: To convert cubic yards to cubic meters, multiply by 0.76456.
Source: LANL 2004d.

Until DOE identifies a disposal location consistent with the statutory requirements of Public Law 99-240, there would be no defined disposal facility for some of the actinide sources recovered by the Off-Site Source Recovery Project. In July 2007, however, DOE issued an NOI to prepare an *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste* (72 FR 40135). DOE intends that this EIS would enable DOE to select any new or existing disposal locations, facilities, and methods for disposal of commercial Greater-Than-Class C waste and DOE waste having similar characteristics.

Transportation

The *1999 SWEIS* addressed the shipment of actinide sealed sources to LANL as part of the transportation analysis. The continued shipment of these sources is included in the No Action Alternative transportation impacts in Chapter 5 of this SWEIS.

As discussed above, some of the actinide sources have received a defense determination and are eligible for disposal at WIPP. This section presents the transportation impacts of shipping actinide sources to WIPP; these impacts are included in the No Action Alternative transportation impacts in Chapter 5 of the SWEIS. It was assumed that about 17,000 actinide sources stored at LANL would be shipped to WIPP. The total numbers of waste containers and shipments were assessed assuming the types of actinide sources listed in Table J–6 and using waste packaging efficiencies estimated by the Off-Site Source Recovery Project (LANL 2004d). This estimate would envelope the impacts from shipping all of the roughly 11,000 actinide sources currently stored at LANL to WIPP. (No sealed sources or other transuranic waste would be shipped to WIPP unless they were determined to be defense-related and met the acceptance criteria for disposal at WIPP.)

Transportation impacts would entail radiation exposure to the transportation crew and to the public along the route from LANL to WIPP, as well as potential radiation exposure and fatalities from traffic accidents. The impacts are presented in terms of doses and latent cancer fatalities (LCFs). (See Appendix K of the SWEIS for a description of the analysis methodology.)

Table J–7 shows the results of this analysis. The maximum total dose to the public for shipment to WIPP would be 0.81 person-rem and the likelihood of an excess LCF would be less than 1 (0.00048 LCF). The collective dose to the crew would be 0.58 person-rem, with less than 1 LCF (0.00035). The risk of an LCF in the population from radiation exposure from a traffic accident is less than 1 (9.9×10^{-8}) and no traffic fatalities would be expected.

As noted, the analysis was for shipping about 17,000 actinide sources from LANL to WIPP. Assuming that LANL annually manages an additional 2,000 actinide sources similar to the types listed in Table J–6, and all are brought to LANL for temporary safe storage (see Section J.3.2.1), then over a 10-year period about 20,000 actinide sources would be managed at LANL in addition to the 11,000 discussed above. If all were sent to WIPP, the impacts for shipping 31,000 actinide sources to WIPP would be about twice as large as those listed in Table J–7.

In addition, six strontium-90 radioisotope thermoelectric generators are stored at LANL until they can be disposed of at a low-level radioactive waste disposal site. The data in Table J–7 show the impacts of shipping them to the Nevada Test Site for disposal. No LCFs would be expected to the population along the route (0.000028 LCFs) or to the transportation crew (0.000021 LCFs), and no traffic fatalities would be expected.

Table J–7 Incident-Free and Accident Transportation Impacts – No Action Option

Disposal Location	Number of Shipments	Total Distance Traveled (kilometers)	Crew Dose and Risk		Public Dose and Risk		Accidents Radiological and Nonradiological	
			Dose (person-rem)	Risk (LCF)	Dose (person-rem)	Risk (LCF)	Risk (LCF)	Risk (traffic fatalities)
WIPP	21	25,402	0.58	0.00035	0.81	0.00048	9.9×10^{-8}	0.0003
Nevada Test Site	1	2,500	0.035	0.000021	0.047	0.000028	5.8×10^{-10}	0.000025

LCF = latent cancer fatality, WIPP = Waste Isolation Pilot Plant.
Note: To convert kilometers to miles, multiply by 0.62137.

J.3.3.2 Proposed Project: Increase in the Type and Quantity of Sealed Sources Managed at Los Alamos National Laboratory by the Off-Site Source Recovery Project

Human Health Impacts

All sealed sources received or planned to be received at LANL are encapsulated or otherwise confined, and no release of the enclosed radioisotopes to the environment is expected during normal operations. Transportation, handling, and storage of sealed sources in properly shielded containers would minimize the radiation dose to involved workers from those sources, which are gamma and neutron radiation emitters. The metal of the sealed source itself would shield beta and alpha radiation emitting radioisotopes. The use of proper operating and administrative procedures coupled with appropriate shielding would ensure that involved worker doses are maintained below their appropriate limits. Noninvolved workers and the public are not expected to receive any measurable doses from the Off-Site Source Recovery Project sources during normal operations.

The *Environmental Assessment for the Radioactive Source Recovery Program* (DOE 1995) provided an estimate of 2.3 millirem for the Chemistry and Metallurgy Research Building Wing 9 Hot Cell involved worker dose for all activities associated with each neutron sealed source. At 100 sources per year, the worker dose would be equivalent to the historical average worker dose at the Chemistry and Metallurgy Research Wing 9 Hot Cell Facility. Furthermore, the environmental assessment estimated a total 15-year campaign worker dose of 17.3 person-rem, which is equivalent to a risk of an LCF in this group of workers of 0.01, or 1 chance in 100.

Waste Management

Under the Proposed Project, the Off-Site Source Recovery Project could bring an expanded range of sealed sources to LANL for storage. Stored sources having radionuclides in concentrations smaller or equal to the Part 61 Class C limits would be evaluated for disposal at existing commercial or DOE low-level radioactive waste disposal facilities. Sources having radionuclides in concentrations larger than the Part 61 Class C limits would be stored until a suitable disposal facility is identified. As noted in Section J.3.3.1, preparation of the *Environmental Impact Statement for the Disposal of Greater-Than-Class C Low-Level*

Radioactive Waste would enable DOE to select any new or existing disposal locations, facilities, and methods for disposal of commercial Greater-Than-Class C waste and DOE waste having similar characteristics.

Transportation

This analysis presents the transportation impacts of each shipment of sealed sources to LANL under the Proposed Project. As discussed above, only the sealed sources for which commercial or other Federal management is not appropriate would be transported to LANL. Because the locations of the sealed sources that would be transported to LANL have not been identified, the analysis used a bounding distant location (Bangor, Maine). Each shipment would involve one sealed source transported by a trailer truck. Each package is assumed to have the same characteristics (dimension and dose rate). The maximum inventories per package for cobalt-60 and cesium-137 isotopes are 6,000 and 10,000 curies, respectively. The maximum inventory for strontium-90 is that of a Sentinel 100F with a maximum of 183,400 curies (as of December 2003). The external dose rate one meter from the trailer is assumed to be 10 millirem per hour.

Table J–8 shows the results of this analysis. The maximum total dose to the public per shipment would be 0.0035 person-rem and the likelihood of an excess LCF would be less than 1 (0.000021 LCF). The collective dose to the crew would be 0.42 person-rem, with less than 1 LCF (0.00025). For each shipment the maximum risk of an LCF in the population from radiation exposure from a traffic accident is less than 1 (9.0×10^{-6}) and no traffic fatalities would be expected.

The stored sources would be ultimately shipped to a facility for disposal or other disposition. Although this facility has not been identified, the impacts of shipment would be bounded by those listed in Table J–8. The impacts from shipping to a facility as distant as Bangor, Maine, would be the same as those for shipping from Bangor, Maine.

Table J–8 Per Shipment Incident-Free and Accident Transportation Impacts – Proposed Project

Sealed Source Isotope	*Total Distance Traveled (kilometers)*	*Crew Dose and Risk*		*Public Dose and Risk*		*Accidents Radiological and Nonradiological*	
		Dose (person-rem)	*Risk (LCF)*	*Dose (person-rem)*	*Risk (LCF)*	*Risk (LCF)*	*Risk (traffic fatalities)*
Cesium-137	8,144	0.42	0.00025	0.035	0.000021	1.1×10^{-6}	0.000092
Cobalt-60	8,144	0.42	0.00025	0.035	0.000021	9.5×10^{-7}	0.000092
Strontium-90	8,144	0.42	0.00025	0.035	0.000021	9.0×10^{-6}	0.000092

Note: to convert kilometers to miles, multiply by 0.62137.

Facility Accidents

Results of the sealed source accident analysis are presented for two different facilities, Wing 9 of the Chemistry and Metallurgy Research Building and TA-54, Area G, where sealed sources are planned to be handled, stored, and transported. The Wing 9 of the Chemistry and Metallurgy Research Building accident is analyzed at either TA-3 or TA-48. Unlike many other radiological accidents analyzed for LANL, accidents involving sealed sources involve both an air release and external exposure component because the sealed sources include significant gamma radiation emitters: cobalt-60, cesium-137, and iridium-192. Most other LANL SWEIS accident scenarios involve only plutonium-239 or tritium, neither of which poses an external radiation danger, because they are principally alpha or beta radiation emitters. Therefore, total accident consequences for sealed source bounding accidents are a combination of the airborne release and external radiation contributors. External radiation is a major component of the total noninvolved worker dose, while airborne releases dominate MEI and population dose and contribute to noninvolved worker doses. This is due to the effect of distance on calculated doses. External radiation is reduced by distance and the small, but not insignificant, shielding effect of air over large distances. Airborne releases are diluted over distances, but can maintain significant concentrations, especially if lofted by plume energy resulting from fires and explosions.

As a result of the planning for expanding the project, specific limits on activity of sealed sources to be stored and managed at TA-54, Area G, and Wing 9 of the Chemistry and Metallurgy Research Building were established (LANL 2006d). These limits are based on equivalence to plutonium-239 curies as sources of inhalation dose associated with postulated accidents. The limits refer to the allowable inventory of each nuclide. If one nuclide were present at its limiting inventory, then none of the other nuclides could be present. These limits are presented in **Tables J–9** and **J–10**.

Table J–9 Maximum Allowable Sealed Source Radioisotope Inventory at Technical Area 54, Area G

Radioisotope	*All Domes (curies)*	*Individual Dome (curies)*	*Shipping Container (curies)* [a]
Cobalt-60	8.18×10^5	1.36×10^5	6,000
Strontium-90	5.88×10^7 [b]	9.8×10^6 [b]	431,000 [b]
Cesium-137	1.37×10^6	2.27×10^5	10,000
Iridium-192	2.05×10^4	3.41×10^3	150
Radium-226	630	105	5
Curium-244	13,700	2,270	100
Californium-252	30	30	30

[a] LANL 2006d.
[b] DOE 2004a.

Table J–10 Maximum Allowable Sealed Source Radioisotope Inventory at Chemistry and Metallurgy Research Building Wing 9

Radioisotope	*Total Hot Cell and Corridor (curies)*	*Floor Including the Pit (curies)*	*Each Floor Hole (curies)*	*Security (curies)*	*Shipping Container (curies)*
Cobalt-60	3.42×10^6	88,400	291	1.0×10^7	6,000
Strontium-90	580,000	15,000	3,880	No Limit	431,000 [a]
Cesium-137	2.35×10^7	607,000	4,070	No Limit	10,000
Iridium-192	2.64×10^7	681,000	530	10,000	150
Radium-226	87,400	2,260	156	No Limit	5
Curium-244	2,850	73.7	129	1,000	100
Californium-252	6,100	158	60.3	200	30

[a] DOE 2004a.
Source: LANL 2006d.

This approach provides a conservative estimate of the doses associated with an accident involving storage of sealed sources because the entire allowable plutonium-239-equivalent inventory at a storage location would not be committed to storage of a single type of sealed source. Instead, most of the allowable inventory would be reserved for other operations in the facility and only a portion would be used for storage of sealed sources. In addition, the portion that would be allowed for storage of sealed sources would likely be used for a variety of sources rather than sources containing a single isotope. Therefore, the results presented in the following discussion provide a hypothetical upper limit of the radiological impacts of an accident. This approach is used to provide an enveloping risk because of the unavailability of accurate data on the magnitude of sealed sources of each type that the Off-Site Source Recovery Project may need to manage at LANL. However, the storage of the sealed sources would be coordinated such that the plutonium-239-equivalent inventory would be managed within each facility's allowable inventory limit.

LANL staff evaluated the storage of sealed sources at TA-54, Area G, and determined that the bounding accident for this location would be an aircraft crash into one dome, with a resulting fire of 300 gallons (1,140 liters) of JP-5 fuel carried by the aircraft (LANL 2004e). This accident would result in a 2-minute fire with a fire energy of 294.3 megawatts. This accident, with an annual frequency of 1.3×10^{-5} (1 chance in 77,000) was analyzed using the MACCS2 computer code for airborne release of sealed source radioisotopes and by the ZYLIND computer code for direct external gamma radiation dose from one shipping container with the maximum allowed sealed source radioisotope content exposed without shielding. MACCS2 was used to calculate noninvolved worker, maximally exposed individual (MEI), and 50-mile (80-kilometer) radius population dose from airborne releases. ZYLIND was used to calculate the external radiation dose to the noninvolved worker and MEI. ZYLIND is a digital interactive computer code that calculates gamma radiation dose rate from cylindrical sources with multiple shielding capabilities (ORNL 1990). ZYLIND accounts for dose buildup factors and shielding effects. External exposure to gamma radiation is not a contributor to the 50-mile (80-kilometer) radius population dose. The accident analysis was repeated for each nuclide using the assumptions and inputs indicated in **Tables J–11** and **J–12**.

Cobalt-60 was found to cause the maximum exposure to the noninvolved worker as a result of the external radiation exposure pathway. Inhalation of transuranics, curium-244 from TA-54, and californium-252 from Wing 9, resulted in the maximum MEI exposure; the direct external radiation exposure at these distances was less important. Cesium-137 resulted in maximum exposure to the surrounding population because of its external dose plus its contribution to internal dose through ingestion of food stuffs. **Table J–13** shows the exposure consequences and risks from this accident, assuming that cesium-137 is present at its limits.

Table J–11 Sealed Source Aircraft Impact Crash Accident at Technical Area 54, Area G Dome Airborne Release Source Term for MACCS2 Calculation

Sealed Source Radioisotope	*Damage Ratio*	*Airborne Release Fraction*	*Respirable Fraction*	*Leak Path Factor*	*Source Term*
Impact					
Cobalt-60	0.05	0.001	0.3	1.0	2.04
Strontium-90	0 [a]	0.001	0.3	1.0	0
Cesium-137	0.05	0.001	0.3	1.0	3.41
Iridium-192	0.05	0.001	0.3	1.0	0.0512
Curium-244	0.05	0.001	0.3	1.0	0.0341
Californium-252	0.05	0.001	0.3	1.0	0.00045
Fire					
Cobalt-60	0.05	0.006	0.01	1.0	0.408
Strontium-90	0 [a]	0.006	0.01	1.0	0
Cesium-137	0.05	0.006	0.01	1.0	0.681
Iridium-192	0.05	0.006	0.01	1.0	0.0102
Curium-244	0.05	0.006	0.01	1.0	0.00682
Californium-252	0.05	0.006	0.01	1.0	0.00009

[a] Strontium-90 sources will be kept in a covered belowground shaft a distance from any dome.
Source: LANL 2004e.

Table J–12 Sealed Source Aircraft Impact Crash Accident at Technical Area 54, Area G Dome Air Release and Direct Radiation Source Terms (in curies)

Sealed Source Radioisotope	*Air Release Source Term*	*Direct Radiation Source Term (one shipping container)*
Cobalt-60	2.45	6,000
Strontium-90 [a]	0	0
Cesium-137	4.09	10,000
Iridium-192	0.0614	150
Curium-244	0.0409	100
Californium-252	0.00054	30

[a] Strontium-90 sources will be kept in a covered belowground shaft a distance from any dome.
Source: LANL 2004e.

Table J–13 Dose and Risk Consequences of Sealed Source Aircraft Impact Crash Accident at Technical Area 54, Area G Dome

Accident Component	*Noninvolved Worker at (110 Yards [100 meters])*	*Maximally Exposed Individual*	*50-Mile (80-kilometer) Population*
Airborne Release from One Dome			
Dose	0.017 rem [a]	0.084 rem [b]	111 person-rem [c]
Annual Risk (LCF per year)	1.3×10^{-10}	6.6×10^{-10}	8.7×10^{-7}
2-Hour Exposure to Direct Radiation from One Breached Shipping Container			
Dose	0.5 rem [a]	Insignificant	Insignificant
Annual Risk (LCF per year)	3.9×10^{-9}	Insignificant	Insignificant
Accident Total			
Dose	0.52 rem [a]	0.084 rem [b]	111 person-rem [c]
Risk (LCF per year)	4.0×10^{-9}	6.6×10^{-10}	8.7×10^{-7}

LCF = latent cancer fatality.
[a] Maximum total dose would result from direct exposure to and airborne release of cobalt-60.
[b] Maximum total dose would result from airborne release of curium-244.
[c] Maximum total dose would result from airborne release of cesium-137.

Results of this accident are the total of the airborne release and unshielded shipping container direct external radiation dose calculation. The high plume energy from the burning aircraft fuel decreases the dose to the noninvolved worker and MEI because a portion of the plume is carried beyond these close-in locations. This same higher energy plume, however, contributes to a larger population dose by decreasing deposition near the release location. The accident contribution from just one unshielded shipping container is a significant component of the total dose to the noninvolved worker because the effects of direct exposure to external radiation are largest near the accident. The external radiation dose to the 50-mile (80-kilometer) radius population is small because the dose rate would drop as the square of the distance at the relatively large distances of the population. Only the gamma dose rate was calculated for exposure to external radiation, based on a factor of 1,000 to 10,000 lower source term for the neutron emitters curium-244 and californium-252, compared to the gamma emitters cobalt-60, cesium-137, and iridium-192.

Based on the Chemistry and Metallurgy Research Building's Basis of Interim Operations and other SWEIS calculations of accidents, the bounding, risk-dominant accident was determined to be a severe earthquake collapse followed by a fire in Wing 9.[8] This accident (plume energy of 2.4 megawatts and 30-minute duration) has a frequency of 2.4×10^{-4} (1 chance in 4,200) per year and can be assumed to cause a level of damage to sealed sources in the corridor and hot cell equivalent to the aircraft crash accident at TA-54, Area G. Using the same values of damage ratio, airborne release fraction, respirable fraction, and leak path factor as for TA-54, Area G, but using the material at risk for Wing 9 of the Chemistry and Metallurgy Research Building, **Table J–14** presents the airborne release and external radiation source terms assuming that one shipping container having the maximum allowed sealed source radioisotope content is exposed without any shielding. Calculation results are presented in **Tables J–15** and **J–16** for both the airborne release and external exposure from sealed sources at Wing 9 of the Chemistry and Metallurgy Research Building or TA-48, a proposed future location for hot cell operations (see Appendix G).

Table J–14 Sealed Source Severe Earthquake and Fire Accident at Chemistry and Metallurgy Research Building Wing 9 Air Release and Direct Radiation Source Terms (in curies)

Sealed Source Radioisotope	*Air Release Source Term*	*Direct Radiation Source Term (one shipping container)*
Cobalt-60	61.6	6,000
Strontium-90	10.4	431,000
Cesium-137	423	10,000
Iridium-192	475	150
Radium-226	1.6	5
Curium-244	0.051	100
Californium-252	0.11	30

[8] *Wing 9 of the Chemistry and Metallurgy Research Building has a hot cell, floor holes, and other storage areas. The Wing 9 hot cell capabilities are planned to be part of the Radiological Sciences Institute proposed to be constructed in TA-48. The accident analysis for materials stored in Wing 9 was performed for the current Chemistry and Metallurgy Research Building location in TA-3 as well as for a location in TA-48.*

Table J–15 Sealed Source Severe Earthquake Collapse and Fire Accident at Chemistry and Metallurgy Research Building Wing 9 Dose and Risk Consequences at Technical Area 3 Location

Accident Component	*Noninvolved Worker at 110 Yards (100 meters)*	*Maximally Exposed Individual*	*50-Mile (80-kilometer) Population*
Airborne Release from Wing 9 Total Hot Cell and Corridor			
Dose	0.71 rem [a]	0.099 rem [b]	11,600 person-rem [c]
Annual Risk	1.0×10^{-7}	1.4×10^{-8}	0.0017
2-Hour Exposure to Direct Radiation from One Breached Shipping Container			
Dose	0.5 rem [a]	Insignificant	Insignificant
Annual Risk	7.2×10^{-8}	Insignificant	Insignificant
Accident Total			
Dose	1.2 rem [a]	0.099 rem [b]	11,600 person-rem [c]
Risk	1.7×10^{-7}	1.4×10^{-8}	0.0017

[a] Maximum total dose would result from direct exposure to and airborne release of cobalt-60.
[b] Maximum total dose would result from airborne release of californium-252.
[c] Maximum total dose would result from airborne release of cesium-137.

Table J–16 Sealed Source Severe Earthquake Collapse and Fire Accident Dose and Risk Consequences at Technical Area 48 Location

Accident Component	*Noninvolved Worker at 110 Yards (100 meters)*	*Maximally Exposed Individual*	*50-Mile (80-kilometer) Population*
Airborne Release from Wing 9 Total Hot Cell and Corridor			
Dose	0.71 rem [a]	0.098 rem [b]	11,400 person-rem [c]
Annual Risk	1.0×10^{-7}	1.4×10^{-8}	0.0016
2-Hour Exposure to Direct Radiation from One Breached shipping Container			
Dose	0.5 rem [a]	Insignificant	Insignificant
Annual Risk	7.2×10^{-8}	Insignificant	Insignificant
Accident Total			
Dose	1.2 rem [a]	0.098 rem [b]	11,400 person-rem [c]
Risk	1.7×10^{-7}	1.4×10^{-8}	0.0016

[a] Maximum total dose would result from direct exposure to and airborne release of cobalt-60.
[b] Maximum total dose would result from airborne release of californium-252.
[c] Maximum total dose would result from airborne release of cesium-137.

As addressed in Appendix D, Section D.4, an updated probabilistic seismic hazard analysis providing an improved understanding of the seismic characteristics of LANL was completed in 2007. Based on the updated information, the probability of exceedance for the ground acceleration used in this accident analysis, and the corresponding radiological risk, is higher than previously estimated by 50 percent. This increase results in a risk of an LCF of 2.1×10^{-8} (1 chance in 48 million) for the MEI and 1.5×10^{-7} (1 chance in 6.5 million) for the noninvolved worker, and an increased chance of an LCF in the general population of 0.0025 (1 chance in 400).

The nearest public access to the Chemistry and Metallurgy Research Building, Diamond Drive, which is approximately 164 feet (50 meters) from the Chemistry and Metallurgy Research Building, is closer than the nearest site boundary to this facility. The same assumptions used to calculate dose to the MEI were applied to an individual at this location. The dose to an individual outside at Diamond Drive during the duration of the release would be 4.32 rem, 42 percent of which would be from external exposure to gamma radiation. Such a dose would result in an increased chance of a fatal latent cancer during the lifetime of the individual of 0.0026, or approximately 1 chance in 385.

The total (airborne release and direct radiation) accident dose and risk to the noninvolved worker, MEI, and population for accidents involving sealed sources at TA-54, Area G, Wing 9 of the Chemistry and Metallurgy Research Building at TA-3, and a facility with capabilities equivalent to Wing 9 located at TA-48 are presented in **Table J–17**.

Table J–17 Total Accident Doses and Risks From Sealed Sources at Technical Area 3, Technical Area 48, and Technical Area 54

Dose Receptor	*Aircraft Crash and Fire at TA-54 Area G*	*Severe Seismic Event and Fire CMR Wing 9 TA-3*	*Severe Seismic Event and Fire TA-48*
Noninvolved Worker Dose (rem)	0.52	1.2	1.2
Noninvolved Worker Risk	4.0×10^{-9}	1.7×10^{-7}	1.7×10^{-7}
MEI Dose (rem)	0.084	0.099	0.098
MEI Risk	6.6×10^{-10}	1.4×10^{-8}	1.4×10^{-8}
Population Dose (person-rem)	111	11,600	11,400
Population Risk	8.7×10^{-7}	0.0017	0.0016

TA = technical area, CMR = Chemistry and Metallurgy Research Building, MEI = maximally exposed individual.

The higher doses for the Wing 9 accident are principally due to the larger source term. Its larger risks are attributed to the larger accident frequency along with the larger source term.

All three accident scenarios analyzed involving sealed sources result in a risk of a LCF during the lifetime of a noninvolved worker or MEI at no greater than 1.7×10^{-7} (one chance in 5,900,000) per year of operation. The 50-mile (80-kilometer) population would not receive a fatal radiation dose for any of these accidents. The highest LCF risk to the population would result from the Wing 9 accident.

If mitigation measures are needed for potential sealed source accidents, they would include placing sealed sources in locations where they would not be susceptible to damage from an aircraft crash, fire, or seismic event (kept underground like the strontium-90 radioisotope thermoelectric generators at TA-54). Another potential mitigation measure might include the use of lower limits for maximum allowable source radioisotope activity in shipping containers, the TA-54 domes, or Wing 9 of the Chemistry and Metallurgy Research Building. Storage containers that can be shown to maintain their integrity under fire, crash, and seismic event loads also would mitigate the consequences of these potential accidents.

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